PROJECT MANUAL

SIGNAL MOUNTAIN STP IMPROVEMENTS

ACCESS ROAD PROJECT

WWTA PROJECT NO. 22-310

AMERICAN RESCUE PLAN (ARP), SWIG GRANT ID:2022-8379,

PROJECT NUMBER WW-PDC-1

HAMILTON COUNTY, TENNESSEE

JUNE 2023

LJA ENGINEERING

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SECTION 00010
INVITATION TO BID

Name of Project: Signal Mountain Sewage Treatment Plant Improvements, Access Road Project American Rescue Plan (ARP), SWIG Grant ID:2022-8379, Project Number WW-PDC-1

Project Number: WWTA Project Number 22-310

Owner: Hamilton County, Tennessee
Hamilton County Water and Wastewater Treatment Authority (WWTA)
1250 Market Street, Suite 3050
Chattanooga, TN 37402-2713

Submit Bids to:

Hamilton County WWTA

C/O LJA Engineering, Inc.

1110 Market Street, Suite 314

Chattanooga, TN 37402-2253

Attention: Vickie Wilhite

SEPARATE sealed BIDS for WWTA's Contract to construct a new access road to the existing Signal Mountain Sewage Treatment Plant, including the furnishing of all labor, material, equipment, tools, supervision, incidental, and any other items necessary or convenient to satisfactorily complete the construction will be received by Hamilton County WWTA C/O LJA Engineering, Inc., **before 2:00 PM local time on September 7th** at which time the Bids received will be publicly opened and read.

The work to be bid on is as follows: The project will entail the construction of a new access road to the existing Signal Mountain STP facility. The access road will be built to allow large vehicles to access the site as well as provide access to construct a proposed wastewater facility expansion at a future date. The new access road will consist of a combination concrete and asphalt paved entrance to Suck Creek Road to include approximately 650 linear feet of paved surfaces. An additional 850 linear feet of access roads consisting of concrete pavement to service the existing facility and a gravel access road to the proposed wastewater expansion area. To minimize excavation quantities and land disturbance impacts for the project, a new mechanically stabilized earthen (MSE) retaining wall will be required. The MSE wall will be approximately 300 feet long and 10-20 feet in height. The access road and wall installation will require stormwater drainage improvements due to the grading required for the new access roads by the inclusion of properly lined drainage ditches and stormwater drainage system to convey water through the site and across Suck Creek Road, a designated Tennessee State Route Highway.

The Project has a Substantial Completion of **330** days with Final Completion of **365** days.

An Additive (or Deductive) Alternate A is included for jack and bore installation of 50 linear feet of 30-inch restrained ductile iron carrier pipe within 42 linear feet of 60-inch steel casing pipe and appurtenances for the storm culvert crossing at Suck Creek Road in lieu of open-cut methods.

Bids will be received for a single prime Contract.

Special note regarding bid submission: Due to the current pandemic and building restrictions in place, bidders are cautioned to allow additional time for delivery of any mailed bid submissions including any mailed overnight delivery or guaranteed to be delivered by a specified time. All bid submissions must be received prior to the specified date/time, regardless of delivery method.

Bid openings currently will not be held in-person due to safety concerns and current mandates in place relative to size restrictions on group gatherings related to COVID-19. Any interested proposer, or member of the public, may attend the scheduled bid opening via the instructions below:

> To participate in the bid opening, contact Vickie Wilhite vwilhite@lja.com or 865-328-3141 to obtain the MS Teams Invite.

LJA Engineering will not provide a conference room/meeting space or equipment such as computer access or telephones for interested parties to participate in bid openings. All conference call attendees will be asked to provide name, company, and phone number for each bid opening attended. To make the size of any call more manageable, vendors with multiple representatives are asked to call in from one (1) line only.

Preliminary pricing will be read aloud for any vendor submission received prior to the listed deadline, with each vendor identified by name. Official Notification of Award, including bid tab, will be released once the solicitation has gone through evaluation and recommendation of award.

No bids will be received or accepted after the above specified time and will be deemed invalid and returned unopened to the bidder. The bidding Contractor must be licensed in appropriate classification before such bid will be considered and shall comply with applicable codes, laws and regulations. The successful bidder will be required to furnish acceptable Performance and Payment Bonds in the amount of one hundred percent (100%) of the contract price, each bond. The Owner reserves the right to waive any irregularity or reject any or all bids. Hamilton County Disadvantaged Business Enterprise (DBE) procedures will be part of bid evaluation. Any Bidder unfamiliar with this policy should contact the DBE Liaison at (423) 209-6146. Project will utilize American Rescue Plan funding and bidding Contractor must follow requirements outlined in Uniform Guidance 2 CFR 200.317 through 200.327.

Pre-bid Conference

A virtual, non-mandatory pre-bid conference for the Project will be held on **August 22nd, 2023,** at **2:00 PM** local time**.** Attendance at the pre-bid conference is encouraged but not required. A MS Teams call-in meeting invite, and sign-in sheet will be sent to plan holders. Contact Vickie Wilhite vwilhite@lja.com or 865-328-3141 for invite information.

Electronic copies of BIDDING DOCUMENTS are available for download. Please contact Vickie Wilhite at vwilhite@lja.com 865-328-3141 for instructions on how to access the BIDDING DOCUMENTS. Partial sets of Bidding Documents will not be available from the Issuing Office. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including addenda, if any, obtained from sources other than the Issuing Office.

No Bid may be withdrawn within 120 days after the scheduled time for receipt of bids.

Instructions to Bidders

For all further requirements regarding bid submittal, bid security, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents.

This Advertisement is issued by:
Owner: **Hamilton County Water and Wastewater Treatment Authority**
By: **Michael Patrick**
Title: **Executive Director**
Date: **August 7, 2023**

END OF SECTION

INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

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ARTICLE 1—DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. *Issuing Office*—The office from which the Bidding Documents are to be issued, and which registers plan holders.

ARTICLE 2—BIDDING DOCUMENTS

2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.

2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.

2.03 Bidder may register as a plan holder and obtain complete sets of Bidding Documents, in the number and format stated in the Advertisement or invitation to bid, from the Issuing Office. Bidders may rely on sets of Bidding Documents obtained from the Issuing Office are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.

2.04 Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) can make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are required to register as a plan holders from the Issuing Office. Owner is not responsible for omissions in Bidding Documents or other documents obtained from plan rooms, or for a Bidder's failure to obtain Addenda from a plan room.

2.05 Electronic Documents

1. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.

    a. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version **2016** or later. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

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2. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.05.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

3.01 Bidder is to submit the following information with its Bid to demonstrate Bidder's qualifications to perform the Work:

A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.

B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.

C. Bidder's state or other contractor license number, if applicable.

D. Subcontractor and Supplier qualification information.

E. Other required information regarding qualifications.

3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4—PRE-BID CONFERENCE

4.01 A virtual, non-mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference; however, attendance at this conference is not required to submit a Bid.

4.02 Information presented at the pre-bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

5.01 *Site and Other Areas*

A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of

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materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

5.02 *Existing Site Conditions*

A. *Subsurface and Physical Conditions; Hazardous Environmental Conditions*

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:

a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.

b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.

c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.

d. Technical Data contained in such reports and drawings.

2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

5.03 *Other Site-related Documents*

A. No other Site-related documents are available.

5.04 *Site Visit and Testing by Bidders*

A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.

B. Bidders visiting the Site are required to arrange their own transportation to the Site.

C. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

D. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional

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examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site. Bidder is responsible for establishing access needed to reach specific selected test sites.

E. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

F. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5.05 *Owner's Safety Program*

A. Site visits and work at the Site may be governed by an Owner safety program. If an Owner safety program exists, it will be noted in the Supplementary Conditions.

5.06 *Other Work at the Site*

A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Express Representations and Certifications in Bid Form, Agreement*

A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.

B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 7—INTERPRETATIONS AND ADDENDA

7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.

7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:

A. Questions shall be submitted in writing to LJA Engineering, Inc.: Attn: Vickie Wilhite vwilhite@lja.com

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7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than six days prior to the date for opening of Bids may not be answered.

7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8—BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of **10** percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions.

8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract and furnish the required Contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

ARTICLE 9—CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment are to be achieved, are set forth in the Agreement.

9.02 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 10—SUBSTITUTE AND "OR EQUAL" ITEMS

10.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or "or-equal" item of

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material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.

10.02 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

11.01 A Bidder must be prepared to retain specific Subcontractors and Suppliers for the performance of the Work if required to do so by the Bidding Documents or in the Specifications. If a prospective Bidder objects to retaining any such Subcontractor or Supplier and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

11.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work within five days after Bid opening:

A. **Paving, Stormwater Infrastructure Install, Retaining Wall, and Traffic Control.**

11.03 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

11.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.

ARTICLE 12—PREPARATION OF BID

12.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

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12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.

12.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.

12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.

12.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.

12.06 A Bid by an individual must show the Bidder's name and official address.

12.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.

12.08 All names must be printed in ink below the signatures.

12.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.

12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.

12.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.

12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 13—BASIS OF BID

13.01 *Unit Price*

A. Bidders must submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.

B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity", which Owner or its representative has set forth in the Bid Form, for the item and the corresponding "Bid Unit Price" offered by the

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Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

D. Bidders must include a separate price for each alternate described in the Bidding Documents and as provided for in the Bid Form. The price for each alternate will be the amount added to the base Bid if Owner selects the alternate. Alternates will not be applied in the comparison of Bids.

13.02 *Allowances*

A. For cash allowances the Bid price must include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

ARTICLE 14—SUBMITTAL OF BID

14.01 A copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.

14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.

14.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

15.01 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bis. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.

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ARTICLE 16—OPENING OF BIDS

16.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

17.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.

18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.

18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.

18.04 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.

18.05 *Evaluation of Bids*

A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

B. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

1. Alternate costs will be reviewed when evaluating balanced bids.

2. Bids submitted without costs for ALL alternatives will be considered unresponsive.

18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for

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those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

18.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

18.08 The contract will be awarded to the responsive, responsible Bidder submitting the lowest Base Bid complying with the conditions of the Contract Documents.

ARTICLE 19—BONDS AND INSURANCE

19.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds, other required bonds (if any), and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.

19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20—SIGNING OF AGREEMENT

20.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21 - FUNDING AGENCY REQUIREMENTS

Contractor must follow requirements outlined in Uniform Guidance 2 CFR 200.317 through 200.327.

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BID FORM FOR CONSTRUCTION CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to: **Hamilton County Water and Wastewater Treatment Authority C/O LJA Engineering, Inc., 1110 Market Street, Suite 314 Chattanooga, TN 37402-2253, Attention Vickie Wilhite, Signal Mountain Sewage Treatment Plant Access Road Project/ WWTA Project No. 22-310; ARP, SWIG Grant ID: 2022-8379, Project Number WW-PDC-1**

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

A. Acknowledgement of Addenda;

B. Bid Bond;

C. Drug Free Workplace Affidavit;

D. DBE Good Faith Effort Affidavit (Form A);

E. Statement of Compliance Illegal Immigrants;

F. Qualification Statement;

G. Iran Divestment Act Certification;

H. Authorization to Bind;

I. Contractor's Identification Form;

J. DBE Solicitation Verification (Form B);

K. DBE Sub-Contract Services Verification (Form C);

L. Affidavit of No Collusion By Prime Bidder

M. Affidavit of No Collusion by Subcontractor

N. Certification by Proposed Prime or Subcontractor Regarding Equal Employment Opportunity

O. Certification of Non-Boycott of Israel form

P. List of Proposed Subcontractors (with applicable qualifications);

Q. List of Proposed Suppliers;

R. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;

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ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 *Unit Price Bids*

A. Bidder will perform the following Work at the indicated unit prices:

Prices must be included for both Base and Alternative A. Any Bid submitted without Alternative will be considered a non-responsive Bid.

Item No.	Item Description	Bid Schedule Quantity	Unit	Unit Price	Total Price
1	**Mobilization**				
a.	Mobilization	1	LS	$	$
2	**Traffic Control**			$	$
a.	Traffic Control Plans Implementation	1	LS	$	$
3	**Site Photography and Video**			$	$
a.	Pre-Construction Site Photography and Video	1	LS	$	$
4	**Erosion Control and Permanent Vegetation Stabilization**				
a.	Erosion Control Installation & SWPPP Implementation (All phases)	1.5	LS	$	$
b.	Permanent Vegetation	3	Acre	$	$
c.	Temporary Vegetation	3	Acre	$	$
d.	Riprap (TDOT CLASS A-1 at 18-inch Minimum Thickness)	90	TON	$	$
e.	Riprap (TDOT CLASS B at 24-inch Minimum Thickness)	75	TON	$	$
f.	Slope Stabilization (Erosion Control Matting)	2	Acre	$	$
g.	Ditch Stabilization (Erosion Control Matting)	0.5	Acre	$	$
h.	Bank Stabilization Live Oak Staking	40	EA	$	$
5	**Clearing & Grubbing (to be Performed ONLY from October 1st through March 31st)**				
a.	Clearing & Grubbing	4.5	Acre	$	$

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Item No.	Item Description	Bid Schedule Quantity	Unit	Unit Price	Total Price
6	**Earthwork & Grading**				
a.	Road & Drainage Excavation (Unclassified)	11000	CY	$	$
b.	Road & Drainage Excavation (Rock)	11000	CY	$	$
c.	Embankment (Compacted in Place)	22000	CY	$	$
7	**Storm Drainage Pipe and Structures**				
a.	15-inch Reinforced Concrete Pipe (Class III)	7	LF	$	$
b.	18-inch Reinforced Concrete Pipe (Class III)	89	LF	$	$
c.	24-inch Reinforced Concrete Pipe (Class III)	66	LF	$	$
d.	30-inch Reinforced Concrete Pipe (Class III)	51	LF	$	$
e.	15-Inch Straight Type Concrete Headwall	1	EACH	$	$
f.	18-Inch Type "U" Concrete Headwall	1	EACH	$	$
g.	30-Inch Type "A" Concrete Headwall	1	EACH	$	$
h.	Precast Concrete Drop Inlet, 4-feet Diameter (0-6 feet Deep)	1	EACH	$	$
i.	Precast Concrete Drop Inlet, 4-feet Diameter (10-12 feet Deep)	1	EACH	$	$
j.	Precast Concrete Drop Inlet, 5-feet Diameter (0-6 feet Deep)	2	EACH	$	$
8	**Roadway Subbase, Pavement, and Roadway Appurtenances**				
a.	Gravel Surface (6-inch Minimum Depth)	1170	SY	$	$
b.	Asphalt Paving (6-inch Minimum Depth)	1090	SY	$	$
c.	Concrete Paving (9-inch Minimum Depth)	1390	SY	$	$
d.	Pavement Restoration (TDOT Highway)	52	LF	$	$
e.	Mineral Aggregate Base, TDOT Class A, Grade D	1250	TON	$	$
f.	Concrete Lined Ditches (0.09 CY Class A Concrete/LF)	550	LF	$	$

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Item No.	Item Description	Bid Schedule Quantity	Unit	Unit Price	Total Price
g.	Permanent Signage	220	SF	$	$
h.	Permanent Pavement Markings and Striping	1	LS	$	$
i.	Guardrail (Complete-in-Place TDOT "W" Beam Guardrail with TDOT Type 13 Terminal Anchors Each End)	1	LS	$	$
9	**Retaining Wall**				
a.	Mechanically Stabilized Earthen Retaining Wall (Complete-in-Place)	1	LS	$	$
10	**Fencing & Gates**				
a.	Chain-link Fence, 7-foot High w/ 3 Rows Barbed Wire	176	LF	$	$
b.	Chain-link Fence, 8-foot High w/ 3 Rows Barbed Wire	48	LF	$	$
c.	Swing Gate- 14-foot Double-Leaf Chain-link Gate (28-foot Total Opening)	1	EA	$	$
d.	Swing Gate- 18-foot Double-Leaf Chain-link Gate (36-foot Total Opening)	1	EA	$	$
11	**Professional Services**				
a.	Traffic Control Plans Development	1	LS	$	$
12	**Cash Allowances**				
a.	Soils, Mineral Aggregate Base, Asphaltic Pavement, and Concrete Testing			Allowances:	$25,000.00
b.	Endangered Plant Mitigation			Allowances:	$10,000.00
				Total Base Bid	$

BASE BID TOTAL – ITEMS 1 THROUGH 12, INCLUSIVE, IN THE AMOUNT OF

_____ DOLLARS

($_____)

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Additive (or Deductive) Alternative A- Jack and Bore Storm Pipe Under Roadway

Item No.	Item Description	Bid Schedule Quantity	Unit	Unit Price	Total Price
A-1	**Casing Pipe Jack and Bore Installation-** Complete-In-Place Installation as needed to install 50 linear feet, more or less, of 30-inch restrained ductile iron carrier pipe to be installed within a 42 linear feet of 60-inch steel casing pipe and appurtenances for the storm culvert crossing at Suck Creek Road (Tennessee State Route 27) in lieu of open-cut methods as depicted and detailed in the Drawings. **NOTE:** CONTRACTOR to provide a positive value to indicate additional cost for installation for Jack and Bore methods in comparison of the Base Bid by open-cut methods and a negative value to indicate a deduction of cost for installation by Jack and Bore Methods from the Base Bid.	1	LS	$	$

ADDITIVE (OR DEDUCTIVE) ALTERNATIVE A BID TOTAL – ITEM 1, INCLUSIVE, IN THE AMOUNT OF _____ DOLLARS ($_____)

B. Bidder acknowledges that:

1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 4—TIME OF COMPLETION

4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

4.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

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ARTICLE 5—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

5.01 *Bid Acceptance Period*

A. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

5.02 *Instructions to Bidders*

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

5.03 *Receipt of Addenda*

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Bidder's Representations*

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and

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procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.

7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.

2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.

3. Bidder has not solicited or induced any individual or entity to refrain from bidding.

4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:

a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.

b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.

c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.

d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

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BIDDER hereby submits this Bid as set forth above:

Bidder:

_____

(typed or printed name of organization)

By: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

Address for giving notices:

_____

_____

Bidder's Contact:

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Phone: _____

Email: _____

Address:

_____

_____

_____

Bidder's Contractor License No.: (if applicable) _____

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SECTION 00400
ACKNOWLEDGMENT OF ADDENDA

I acknowledge receipt of the following addenda:

ADDENDA NUMBER	DATE ISSUED

SIGNATURE

NAME PRINTED

COMPANY

DATE

END OF SECTION

BID BOND (PENAL SUM FORM)

Bidder	**Surety**
Name:	Name:
Address *(principal place of business)*:	Address *(principal place of business)*:
Owner	**Bid**
Name: **Hamilton County Water and Wastewater Treatment Authority**	Project *(name and location)*:
Address *(principal place of business)*: **P. O. Box 8856 Chattanooga, TN 37414 Attn: Rodney Ashby**	**Signal Mountain Sewage Treatment Plant Access Road Project; WWTA PO#22-310, ARP SWIG GRANT ID:2022-8379, PROJECT #WW-PDC-1 Hamilton County, TN**
	Bid Due Date: **September 7, 21023**
Bond	
Penal Sum: **[Amount]**	
Date of Bond: **[Date]**	

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

Bidder	Surety
_____ *(Full formal name of Bidder)*	_____ *(Full formal name of Surety) (corporate seal)*
By: _____ *(Signature)*	By: _____ *(Signature) (Attach Power of Attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____
Attest: _____ *(Signature)*	Attest: _____ *(Signature)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title:	Title:

Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.

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1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
    3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
    3.2. All Bids are rejected by Owner, or
    3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

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SECTION 00415

BIDDER AFFIDAVIT ON COMPLIANCE WITH DRUG-FREE WORKPLACE ACT AND CERTIFICATE DRUG-FREE WORKPLACE AFFIDAVIT OF PRIME BIDDER

STATE OF _____

COUNTY OF _____

Comes the affiant after having first been duly sworn and testifies as follows:

1. My name is _____. I hold the principal office of _____ for _____.
(Name of Principal Office) *(Name of Bidding Entity)*

2. _____ has submitted a bid to the
(Name of Bidding Entity)
Hamilton County Water and Wastewater Authority for construction of Signal Mountain Sewage Treatment Plant Access Road Project, WWTA Project No. 22-310 ARP SWIG Grant ID: 2022-8379

3. _____ employs more than five (5) employees.
(Name of Bidding Entity)

4. In accordance with Tenn. Code Ann. §50-9-113, this is to certify that

_____ after being first duly sworn, affirms that it
(Name of Bidding Entity)

Has a Drug-Free Workplace Program that complies with Tennessee Code Annotated, Title 50, Chapter 9, in effect at the time of submission of its bid to perform the construction of the Hamilton County Water & Wastewater Treatment Authority project identified above, at least to the extent required of governmental entities. Bidder affirms that:

1. It has received a Certificate of Compliance with the applicable proportions of the Drug-Free Workplace Act from the Department of Labor and Workforce Development and has attached a copy of such certificate to this Affidavit; or,

2. It operates a drug and alcohol testing program at least as stringent as the Hamilton County Water and Wastewater Treatment Authority's drug and alcohol testing program as contained in Employee Handbook and shall, upon request, provide documentation of such program to the Owner.

3. This affidavit is made on personal knowledge.

Further the affiant saith not this ____ day of _____

_____
Signature

Subscribed and sworn to before me this ___ day of _____

_____
Notary Public

My Commission Expires:

_____
(Date)

END OF SECTION

SECTION 00416
DBE GOOD FAITH EFFORT AFFIDAVIT

The undersigned Contractor, having bid on the construction project commonly known as _____, as solicited by Hamilton County, Tennessee (a political subdivision of the State of Tennessee), on _____, 20___, does hereby attest that it has negotiated in good faith with the herein-below named Disadvantaged Business Enterprise(s) (DBE) to be included as sub-contractor(s) in the Contractor's performance of said project.

Name of DBE	Address	Phone	% of Project

In addition, the Contractor commits to promote Hamilton County's expressed goals of inclusion of DBE's whenever and wherever possible on the subject project.

Dated this ____ day of _____, 20___. _____
Name of Contractor

By: _____

Title: _____

SECTION 00418

STATEMENT OF COMPLIANCE CERTIFICATE
ILLEGAL IMMIGRANTS

EACH CONTRACTOR BIDDING SHALL FILL IN AND SIGN THE FOLLOWING:

This is to certify that _____
have fully complied with all the requirements of Chapter No. 878 (House Bill No. 111 and Senate Bill No. 411) which serves to amend Tennessee Code Annotated Title 12, Chapter 4, Part 1.

All Bidders for construction services on this project shall be required to submit an affidavit (by executing this compliance document) as part of their bid, that attests that such Bidder shall comply with requirements of Chapter No. 878.

Signed: _____

State of _____)
) ss
County of _____)

Personally appeared before me, _____the undersigned Notary Public, _____, the within named bargainor, with whom I am personally acquainted, and known to me to be the President/Owner/Partner (as applicable) of the _____, Corporation, Partnership, Sole Proprietorship (as applicable) and acknowledged to me that he/she executed the foregoing document for the purposes recited therein.

Witness my hand, at office, this _____ day of _____, 20___.

_____
Notary Public

My commission expires_____

ARTICLE 1—GENERAL INFORMATION

1.01 Provide contact information for the Business:

Legal Name of Business:			
Corporate Office			
Name:		Phone number:	
Title:		Email address:	
Business address of corporate office:			
Local Office			
Name:		Phone number:	
Title:		Email address:	
Business address of local office:			

1.02 Provide information on the Business's organizational structure:

Form of Business:	☐ Sole Proprietorship ☐ Partnership ☐ Corporation		
☐ Limited Liability Company ☐ Joint Venture comprised of the following companies:			
	1.		
	2.		
	3.		
Provide a separate Qualification Statement for each Joint Venturer.			
Date Business was formed:		State in which Business was formed:	
Is this Business authorized to operate in the Project location?	☐ Yes ☐ No ☐ Pending		

1.03 Identify all businesses that own Business in whole or in part (25% or greater), or that are wholly or partly (25% or greater) owned by Business:

Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			

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1.04 Provide information regarding the Business's officers, partners, and limits of authority.

Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	

ARTICLE 2—LICENSING

2.01 Provide information regarding licensure for Business:

Name of License:			
Licensing Agency:			
License No:		Expiration Date:	
Name of License:			
Licensing Agency:			
License No:		Expiration Date:	

ARTICLE 3—DIVERSE BUSINESS CERTIFICATIONS

3.01 Provide information regarding Business's Diverse Business Certification, if any. Provide evidence of current certification.

Certification	Certifying Agency	Certification Date
☐ Disadvantaged Business Enterprise		
☐ Minority Business Enterprise		
☐ Woman-Owned Business Enterprise		
☐ Small Business Enterprise		
☐ Disabled Business Enterprise		
☐ Veteran-Owned Business Enterprise		
☐ Service-Disabled Veteran-Owned Business		
☐ HUBZone Business (Historically Underutilized) Business		
☐ Other		
☐ None		

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ARTICLE 4—SAFETY

4.01 Provide information regarding Business's safety organization and safety performance.

Name of Business's Safety Officer:		
Safety Certifications		
Certification Name	Issuing Agency	Expiration

4.02 Provide Worker's Compensation Insurance Experience Modification Rate (EMR), Total Recordable Frequency Rate (TRFR) for incidents, and Total Number of Recorded Manhours (MH) for the last 3 years and the EMR, TRFR, and MH history for the last 3 years of any proposed Subcontractor(s) that will provide Work valued at 10% or more of the Contract Price. Provide documentation of the EMR history for Business and Subcontractor(s).

Year									
Company	EMR	TRFR	MH	EMR	TRFR	MH	EMR	TRFR	MH

ARTICLE 5—FINANCIAL

5.01 Provide information regarding the Business's financial stability. Provide the most recent audited financial statement, and if such audited financial statement is not current, also provide the most current financial statement.

Financial Institution:		
Business address:		
Date of Business's most recent financial statement:		☐ Attached
Date of Business's most recent audited financial statement:		☐ Attached
Financial indicators from the most recent financial statement		
Contractor's Current Ratio (Current Assets ÷ Current Liabilities)		
Contractor's Quick Ratio ((Cash and Cash Equivalents + Accounts Receivable + Short Term Investments) ÷ Current Liabilities)		

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ARTICLE 6—SURETY INFORMATION

6.01 Provide information regarding the surety company that will issue required bonds on behalf of the Business, including but not limited to performance and payment bonds.

Surety Name:			
Surety is a corporation organized and existing under the laws of the state of:			
Is surety authorized to provide surety bonds in the Project location?	☐ Yes ☐ No		
Is surety listed in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" published in Department Circular 570 (as amended) by the Bureau of the Fiscal Service, U.S. Department of the Treasury? ☐ Yes ☐ No			
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

ARTICLE 7—INSURANCE

7.01 Provide information regarding Business's insurance company(s), including but not limited to its Commercial General Liability carrier. Provide information for each provider.

Name of insurance provider, and type of policy (CLE, auto, etc.):			
Insurance Provider		Type of Policy (Coverage Provided)	
Are providers licensed or authorized to issue policies in the Project location?		☐ Yes ☐ No	
Does provider have an A.M. Best Rating of A-VII or better?		☐ Yes ☐ No	
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

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ARTICLE 8—CONSTRUCTION EXPERIENCE

8.01 Provide information that will identify the overall size and capacity of the Business.

Average number of current full-time employees:	
Estimate of revenue for the current year:	
Estimate of revenue for the previous year:	

8.02 Provide information regarding the Business's previous contracting experience.

Years of experience with projects like the proposed project:				
As a general contractor:		As a joint venturer:		
Has Business, or a predecessor in interest, or an affiliate identified in Paragraph 1.03:				
Been disqualified as a bidder by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been barred from contracting by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been released from a bid in the past 5 years? ☐ Yes ☐ No				
Defaulted on a project or failed to complete any contract awarded to it? ☐ Yes ☐ No				
Refused to construct or refused to provide materials defined in the contract documents or in a change order? ☐ Yes ☐ No				
Been a party to any currently pending litigation or arbitration? ☐ Yes ☐ No				
Provide full details in a separate attachment if the response to any of these questions is Yes.				

8.03 List all projects currently under contract in Schedule A and provide indicated information.

8.04 List a minimum of three and a maximum of six projects completed in the last 5 years in Schedule B and provide indicated information to demonstrate the Business's experience with projects similar in type and cost of construction.

8.05 In Schedule C, provide information on key individuals whom Business intends to assign to the Project. Provide resumes for those individuals included in Schedule C. Key individuals include the Project Manager, Project Superintendent, Quality Manager, and Safety Manager. Resumes may be provided for Business's key leaders as well.

ARTICLE 9—REQUIRED ATTACHMENTS

9.01 Provide the following information with the Statement of Qualifications:

A. If Business is a Joint Venture, separate Qualifications Statements for each Joint Venturer, as required in Paragraph 1.02.

B. Diverse Business Certifications if required by Paragraph 3.01.

C. Certification of Business's safety performance if required by Paragraph 4.02.

D. Financial statements as required by Paragraph 5.01.

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E. Attachments providing additional information as required by Paragraph 8.02.

F. Schedule A (Current Projects) as required by Paragraph 8.03.

G. Schedule B (Previous Experience with Similar Projects) as required by Paragraph 8.04.

H. Schedule C (Key Individuals) and resumes for the key individuals listed, as required by Paragraph 8.05.

I. Additional items as pertinent.

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This Statement of Qualifications is offered by:

Business: _____
(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(date signed)

(If Business is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address for giving notices:

_____

_____

_____

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

_____

_____

_____

Phone: _____

Email: _____

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Schedule A—Current Projects

Name of Organization					
Project Owner		Project Name			
General Description of Project					
Project Cost		Date Project			
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner		Project Name			
General Description of Project					
Project Cost		Date Project			
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner		Project Name			
General Description of Project					
Project Cost		Date Project			
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

EJCDC® C-451, Qualifications Statement—Schedule A—Current Projects.
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Schedule B—Previous Experience with Similar Projects

Name of Organization				
Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

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Schedule B—Previous Experience with Similar Projects

Name of Organization				
Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner		Project Name		
General Description of Project				
Project Cost		Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

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Schedule C—Key Individuals

Project Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	
Project Superintendent			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

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Safety Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

Quality Control Manager			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

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STATE OF TENNESSEE

IRAN DIVESTMENT ACT CERTIFICATION

SUBJECT CONTRACT NUMBER(S):	
CONTRACTOR LEGAL ENTITY NAME:	
EDISON SUPPLIER IDENTIFICATION NUMBER:	

The Iran Divestment Act, Tenn. Code Ann. § 12-12-101 et. seq. requires a person that attempts to contract with the state, including a contract renewal or assumption, to certify at the time the bid is submitted or the contract is entered into, renewed, or assigned, that the person or the assignee is not identified on a list created pursuant to § 12-12-106.

Currently, the list is available online at the following website: https://www.tn.gov/generalservices/procurement/central-procurement-office--cpo-/library-/public-information-library.html

The Contractor, identified above, certifies by signature below that it is not included on the list of persons created pursuant to Tenn. Code Ann. § 12-12-106 of the Iran Divestment Act.

CONTRACTOR SIGNATURE

NOTICE: This certification MUST be signed by an individual with legal capacity to contractually bind the Contractor.

PRINTED NAME AND TITLE OF SIGNATORY

DATE

SECTION 00490
AUTHORIZATION TO BIND

By signing this proposal, I certify and acknowledge that the information contained in this document is true and correct, containing NO misrepresentations. The information is **NOT** tainted by any collusion. I certify and acknowledge that I have reviewed and approved the release of this bid for Hamilton County's consideration. Further, I am authorized to bind my company to the responses and pricing in these bid documents, and any subsequent negotiations, as well as execute the actual Contracted Documents, if selected.

AUTHORIZED SIGNATURE

NAME PRINTED

TITLE

FIRM NAME

TAXPAYER IDENTIFICATION NUMBER

FIRM ADDRESS (CITY, STATE, ZIP CODE)

TELEPHONE NUMBER

EMAIL ADDRESS

DATE

END OF SECTION

SECTION D491

CONTRACTOR'S IDENTIFICATION

Hamilton County WWTA
c/o LJA Engineering, Inc.
1110 Market Street, Suite 314
Chattanooga, TN 37404
Attention: Vickie Wilhite

SEALED BID PROPOSAL FOR:
Signal Mountain Sewage Treatment Plant Access Road Project; WWTA PO# 22-310 ARP SWIG Grant ID: 2022-8379, Project Number WW-PDC-1

Date of Bid Opening: September 7, 2023 2:00 PM Local Time

Attach this form to the sealed envelope containing the Bid. Failure to provide required information on the sealed envelope will be considered a non-responsive Bid.

BIDDER:

Name: _____

_____

Address: _____

_____

_____

_____

Tennessee License No. _____

Expiration Date _____

Classification _____

Monetary Limit $_____

Subcontractor (Geothermal): _____

_____

Tennessee License No. _____

License Expiration Date _____

License Classification _____

TDEC License No. _____

TDEC License Expiration Date _____

TDEC License Classification _____

Complete the following for all required Subcontractors:

Subcontractor (HVAC): _____

_____

Tennessee License No. _____

License Expiration Date _____

License Classification _____

Subcontractor (Electrical): _____

_____

Tennessee License No. _____

License Expiration Date _____

License Classification _____

Subcontractor (Plumbing): _____

_____

Tennessee License No. _____

License Expiration Date _____

License Classification _____

Subcontractor (Masonry): _____

_____

Tennessee License No. _____

Expiration Date _____

License Classification _____

Subcontractor (Other): _____

Tennessee License No. _____ Exp. Date _____ Classification _____

CAUTION: T.C.A. Section 62-6-119(b) requires all bidders to list the name, license number, expiration date thereof, and license classification of the contractors applying to bid for the prime contract and for the electrical, plumbing, heating, ventilation, air conditioning, and geothermal heating and cooling contracts on the outside of the envelope containing the bid if the subcontractor's bid amount(s) is $25,000.00 or more.

END OF SECTION

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between **Hamilton County Water & Wastewater Treatment Authority** ("Owner") and **_____** ("Contractor").

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: The project will entail the construction of a new access road to the existing Signal Mountain STP facility. The access road will be built to allow large vehicles to access the site as well as provide access to construct a proposed wastewater facility expansion at a future date. The new access road will consist of a combination concrete and asphalt paved entrance to Suck Creek Road to include approximately 650 linear feet of paved surfaces. An additional 850 linear feet of access roads consisting of concrete pavement to service the existing facility and a gravel access road to the proposed wastewater expansion area. To minimize excavation quantities and land disturbance impacts for the project, a new mechanically stabilized earthen (MSE) retaining wall will be required. The MSE wall will be approximately 300 feet long and 10-20 feet in height. The access road and wall installation will require stormwater drainage improvements due to the grading required for the new access roads by the inclusion of properly lined drainage ditches and stormwater drainage system to convey water through the site and across Suck Creek Road, a designated Tennessee State Route Highway.

The Project has a Substantial Completion of **330** days with Final Completion of **365** days.

An Additive (or Deductive) Alternate A is included for jack and bore installation of 50 linear feet of 30-inch restrained ductile iron carrier pipe within 42 linear feet of 60-inch steel casing pipe and appurtenances for the storm culvert crossing at Suck Creek Road in lieu of open-cut methods.

The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **Signal Mountain Sewage Treatment Plant Access Road Project - WWTA Project Number 22-310; ARP, SWIG ID: 2022-8379, Project Number WW-PDC-1**

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ARTICLE 2—ENGINEER

2.01 The Owner has retained **LJA Engineering, Inc.** ("Engineer") to act as Owner's representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

2.02 The part of the Project that pertains to the Work has been designed by **LJA Engineering, Inc**.

ARTICLE 3—CONTRACT TIMES

3.01 *Time is of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

3.02 *Contract Times: Days*

A. The Work will be substantially complete within **330** days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **365** days after the date when the Contract Times commence to run.

3.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. *Substantial Completion:* Contractor shall pay Owner **$1,000.00** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.

2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner **$1,000.00** for each day that expires after such time until the Work is completed and ready for final payment.

3. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.

B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

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ARTICLE 4—CONTRACT PRICE

4.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

ARTICLE 5—PAYMENT PROCEDURES

5.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

5.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the 10th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.

a. **95** percent of the value of the Work completed (with the balance being retainage).

1) If 50 percent or more of the Work has been completed, as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and

b. **100** percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less **200** percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

5.03 *Final Payment*

A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

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5.04 *Consent of Surety*

A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

5.05 *Interest*

A. All amounts not paid when due will bear interest at the rate of **3** percent per annum.

ARTICLE 6—CONTRACT DOCUMENTS

6.01 *Contents*

A. The Contract Documents consist of all of the following:

1. This Agreement.
2. Bonds:
    a. Performance bond (together with power of attorney).
    b. Payment bond (together with power of attorney).
3. General Conditions.
4. Supplementary Conditions.
5. Specifications as listed in the table of contents of the project manual (copy of list attached).
6. Drawings (not attached but incorporated by reference) consisting of **33** sheets with each sheet bearing the following general title: Signal Mountain Sewage Treatment Plant Access Road Project.
7. Addenda (numbers _____ to _____, inclusive).
8. Exhibits to this Agreement
    a. Geotechnical Engineering Report – Suck Creek WWTP Expansion.
    b. Supplemental Exploration and Shear Strength Testing – Suck Creek WWTP Expansion
    c. Signal Mountain Waste Water Treatment Plant Access Road – Presence/Absence Mist Netting Survey
    d. Signal Mountain Floral Survey
    e. TDEC SWPPP
9. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    a. Notice to Proceed.
    b. Work Change Directives.
    c. Change Orders.
    d. Field Orders.
    e. Warranty Bond, if any.

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B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 7.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 7—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

7.01 *Contractor's Representations*

A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:

1. Contractor has examined and carefully studied the Contract Documents, including Addenda.

2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.

5. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.

6. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

7. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

8. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

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9. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

10. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

7.02 *Contractor's Certifications*

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

7.03 *Standard General Conditions*

A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

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IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ 202_ (which is the Effective Date of the Contract).

Owner:	Contractor:
Hamilton County Water & Wastewater Treatment Authority	
(typed or printed name of organization)	*(typed or printed name of organization)*
By: _____	By: _____
(individual's signature)	*(individual's signature)*
Date: _____	Date: _____
(date signed)	*(date signed)*
Name: _____	Name: _____
(typed or printed)	*(typed or printed)*
Title: _____	Title: _____
(typed or printed)	*(typed or printed)*
	*(If **[Type of Entity]** is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*
Attest: _____	Attest: _____
(individual's signature)	*(individual's signature)*
Title: _____	Title: _____
(typed or printed)	*(typed or printed)*
Address for giving notices:	Address for giving notices:
P. O. Box 8856	
Chattanooga, TN 37414	
Attn: Rodney Ashby	
Designated Representative:	Designated Representative:
Name: _____	Name: _____
(typed or printed)	*(typed or printed)*
Title: _____	Title: _____
(typed or printed)	*(typed or printed)*
Address:	Address:
Phone: _____	Phone: _____
Email: _____	Email: _____
If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.	License No.: _____ *(where applicable)*
	State: _____

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SECTION 00503
NOTICE OF APPARENT SUCCESSFUL BID

DATE: _____
VIA: X fax _____
□ mail

TO: _____
ATTENTION: _____
ADDRESS: _____
_____

OWNER'S PROJECT NO. : _____

PROJECT: _____

You are notified that your Bid dated _____ for the above Project has been recommended as the apparent lowest and best bid.

In accordance with the Hamilton County WWTA Disadvantaged Business Policy, you have seventy-two (72) hours in which to submit your DBE Solicitation Verification (Form B) and DBE Sub-contract Services Verification (Form C). These forms are Sections 00510 and 00511 of the project bid specifications and are attached hereto for your convenience. This information will be evaluated by the DBE Liaison Officer for compliance with the County's DBE policy.

You must comply with the following conditions precedent within seventy-two (72) hours of the date of this Notice, which is by _____.

1. You must deliver to the Hamilton County WWTA, 1250 Market St., Suite 3050, Chattanooga, TN 37402-2713, (423) 209-7842, (423) 209-7843 fax, completed Forms B and C, see attached.

Failure to comply with these conditions within the time specified shall entitle the OWNER to consider your bid abandoned, to annul this Notice, and to proceed with evaluation of other Bids.

Hamilton County, Tennessee

By_____
(Authorized Signature)
Rodney Ashby
Manager,WWTA

cc: File: Contract Documents
Micheal Patrick, Excutive Director, WWTA
Procurment Department

SECTION 00510
DBE SOLICITATION VERIFICATION

The undersigned Contractor, having bid on the construction project commonly known as _____, as solicited by Hamilton County, Tennessee (a political subdivision of the State of Tennessee), on _____, 20___, does hereby attest that it has made a good faith effort to enter into a contractual agreement with the herein-below named Disadvantaged Business Enterprise(s) (DBE) for the providing of certain sub-contractual jobs and workings on this project:

	Trade	Name of Company	Address	Phone	% of Project	Quote
DBE						
DBE						
Selected Sub						

DBE						
DBE						
Selected Sub						

DBE						
DBE						
Selected Sub						

DBE						
DBE						
Selected Sub						

Dated this ____ day of _____, 20___.

_____
Name of Contractor

By: _____

Title: _____

SECTION 00511
DBE SUB-CONTRACT SERVICES VERIFICATION

The undersigned Contractor, upon being awarded the construction project commonly known as _____, as solicited by Hamilton County, Tennessee (a political subdivision of the State of Tennessee), on _____, 20___, does hereby verify that it will enter into a contractual agreement with the herein-below named Disadvantaged Business Enterprise(s) (DBE) for the providing of certain subcontract work and/or the purchase of supplies and materials on this project:

Name of DBE	Job Assignment	Percentage of Project

Dated this ____ day of _____, 20___.

_____
Name of Contractor

By: _____

Title: _____

PERFORMANCE BOND

Contractor	**Surety**
Name:	Name:
Address *(principal place of business)*:	Address *(principal place of business)*:
Owner	**Contract**
Name: **Hamilton County Water and Wastewater Treatment Authority**	Description *(name and location)*:
Mailing address *(principal place of business)*:	**Signal Mountain Sewage Treatment Plant Access Road Project; WWTA Project Number 22-310; ARP SWIG Grant ID: 2022-8379, Project Number WW-PDC-1; Hamilton County, TN**
P. O. Box 8856	Contract Price: **[Amount from Contract]**
Chattanooga, TN 37414	Effective Date of Contract: **[Date from Contract]**

Bond

Bond Amount: **[Amount]**

Date of Bond: **[Date]**

(Date of Bond cannot be earlier than Effective Date of Contract)

Modifications to this Bond form:

☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

Contractor as Principal	Surety
_____	_____
(Full formal name of Contractor)	*(Full formal name of Surety) (corporate seal)*
By: _____	By: _____
(Signature)	*(Signature)(Attach Power of Attorney)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____
Attest: _____	Attest: _____
(Signature)	*(Signature)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:

    3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;

    3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

    3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

    5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

    5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

    5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

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5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.

12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said

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statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

    14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

    14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

    14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

    14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

    14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

16. Modifications to this Bond are as follows: **[Describe modification or enter "None"]**

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PAYMENT BOND

Contractor	**Surety**
Name:	Name:
Address *(principal place of business)*:	Address *(principal place of business)*:

Owner	**Contract**
Name: **Hamilton County Water & Wastewater Treatment Authority**	Description *(name and location)*: **Signal Mountain Sewage Treatment Plant Access Road Project; WWTA Project Number 22-310; ARP SWIG Grant ID: 2022-8379, Project Number WW-PDC-1; Hamilton County, TN**
Mailing address *(principal place of business)*: **P. O. Box 8856 Chattanooga, TN 37414**	Contract Price: **[Amount, from Contract]**
	Effective Date of Contract: **[Date, from Contract]**

Bond

Bond Amount: **[Amount]**

Date of Bond: **[Date]**

(Date of Bond cannot be earlier than Effective Date of Contract)

Modifications to this Bond form:

☐ None ☐ See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

Contractor as Principal	Surety
_____	_____
(Full formal name of Contractor)	*(Full formal name of Surety) (corporate seal)*
By: _____	By: _____
(Signature)	*(Signature)(Attach Power of Attorney)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____
Attest: _____	Attest: _____
(Signature)	*(Signature)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond will arise after the following:

    5.1. Claimants who do not have a direct contract with the Contractor

        5.1.1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

        5.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).

    5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

    7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

    7.2. Pay or arrange for payment of any undisputed amounts.

    7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

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8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

    16.1. *Claim*—A written statement by the Claimant including at a minimum:

        16.1.1. The name of the Claimant;

        16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;

        16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;

        16.1.4. A brief description of the labor, materials, or equipment furnished;

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16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;

16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;

16.1.7. The total amount of previous payments received by the Claimant; and

16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

18. Modifications to this Bond are as follows: **[Describe modification or enter "None"]**

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*

a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

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requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.

c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.

d. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

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recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.

23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

    a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

    b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

    c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.

28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.

32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

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33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.

34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.

36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion of such Work.

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43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.

44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

46. *Technical Data*

    a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.

    b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.

    c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

48. *Unit Price Work*—Work to be paid for on the basis of unit prices.

49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

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1.02 *Terminology*

A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*: The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*: The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

1. does not conform to the Contract Documents;

2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

3. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

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F. *Contract Price or Contract Times*: References to a change in "Contract Price or Contract Times" or "Contract Times or Contract Price" or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term "or both" is not expressed.

G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).

B. *Evidence of Contractor's Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.

C. *Evidence of Owner's Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

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into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.

B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

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ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or

2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

A. *Standards Specifications, Codes, Laws and Regulations*

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility

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inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

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B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract.

4.02 Starting the Work

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer

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whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. Abnormal weather conditions;

3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and

4. Acts of war or terrorism.

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D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:

1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.

2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.

3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.

E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:

1. The circumstances that form the basis for the requested adjustment;

2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;

3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;

4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and

5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.

G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

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B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

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and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;

2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and

3. Technical Data contained in such reports and drawings.

B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

D. *Limitations of Other Data and Documents*: Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;

3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or

4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

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5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;

2. is of such a nature as to require a change in the Drawings or Specifications;

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

E. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

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Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;

b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:

1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

2. complying with applicable state and local utility damage prevention Laws and Regulations;

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3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;

4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.

C. *Engineer's Review*: Engineer will:

1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;

2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;

3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and

4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

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or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and

c. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;

2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

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of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.

H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

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conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.

B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

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Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.

E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.

F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.

H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.

D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

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Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.

F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

H. Contractor shall require:

1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and

2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.

I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.

K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

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L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.

M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.

N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

A. *Required Insurance*: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.

B. *General Provisions*: The policies of insurance required by this Paragraph 6.03 as supplemented must:

1. include at least the specific coverages required;

2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;

3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;

4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and

5. include all necessary endorsements to support the stated requirements.

C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:

1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;

2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;

3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

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4. not seek contribution from insurance maintained by the additional insured; and

5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.

B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.

E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

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Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.

C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.

D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

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6.06 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

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B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 *"Or Equals"*

A. *Contractor's Request; Governing Criteria*: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that the proposed item:

1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

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2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) has a proven record of performance and availability of responsive service; and

4) is not objectionable to Owner.

b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

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3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:

    a. will certify that the proposed substitute item will:

        1) perform adequately the functions and achieve the results called for by the general design;

        2) be similar in substance to the item specified; and

        3) be suited to the same use as the item specified.

    b. will state:

        1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;

        2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

        3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

    c. will identify:

        1) all variations of the proposed substitute item from the item specified; and

        2) available engineering, sales, maintenance, repair, and replacement services.

    d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

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E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.

F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

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H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.

J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.

K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.

L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

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7.09 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.11 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

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7.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.

B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.

C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.

F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.

H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

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I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:

a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determine and verify:

1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;

2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;

c. confirm that the Submittal is complete with respect to all related data included in the Submittal.

2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

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3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.

2. *Samples*

a. Contractor shall submit the number of Samples required in the Specifications.

b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Engineer's Review of Shop Drawings and Samples*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will

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document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.

2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:

   a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.

   b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

   c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

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d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.

2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03. 2.04, and 2.05.

F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.

B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:

1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and

2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.

C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:

1. Observations by Engineer;

2. Recommendation by Engineer or payment by Owner of any progress or final payment;

3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. Use or occupancy of the Work or any part thereof by Owner;

5. Any review and approval of a Shop Drawing or Sample submittal;

6. The issuance of a notice of acceptability by Engineer;

7. The end of the correction period established in Paragraph 15.08;

8. Any inspection, test, or approval by others; or

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9. Any correction of defective Work by Owner.

E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.

B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

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D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:

1. Checking for conformance with the requirements of this Paragraph 7.19;

2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and

3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.

F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.

G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.

D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

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E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. An itemization of the specific matters to be covered by such authority and responsibility; and

3. The extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

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B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.

1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.

2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.

C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

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9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

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ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.

B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

A. Engineer has the authority to reject Work in accordance with Article 14.

B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.

C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.

D. Engineer's authority as to changes in the Work is set forth in Article 11.

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E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

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ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

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B. If Owner has issued a Work Change Directive and:

1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.

2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.

B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.

C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

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1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);

2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or

3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit will be determined as follows:

1. A mutually acceptable fixed fee; or

2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;

b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;

c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;

d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and

f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

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11.08 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

A. *Purpose and Content*: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal*: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.

2. *Supporting Data*: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.

    a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.

    b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

    The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review*: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.

4. *Engineer's Full Review and Action on the Change Proposal*: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

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Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and

4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

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and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

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2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.

5. Other costs consisting of the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are

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consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.

2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.

3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

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g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. The cost of purchasing, renting, or furnishing small tools and hand tools.

3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

6. Expenses incurred in preparing and advancing Claims.

7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:

a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.

b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:

1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.

2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.

2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

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Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.

C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

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thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

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D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,

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losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

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or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

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establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

   b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

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4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

    a. to supervise, direct, or control the Work;

    b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;

    c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;

    d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or

    e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

    a. the Work is defective, requiring correction or replacement;

    b. the Contract Price has been reduced by Change Orders;

    c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

    d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

    e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

    a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

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b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. The Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. The Contract Price has been reduced by Change Orders;

i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or

l. Other items entitle Owner to a set-off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

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submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

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significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.

2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.

2. The final Application for Payment must be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents;

   b. consent of the surety, if any, to final payment;

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

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d. a list of all duly pending Change Proposals and Claims; and

e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Final Application and Recommendation of Payment*: If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Notice of Acceptability*: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.

D. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.

E. *Final Payment Becomes Due*: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

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appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;
2. correct such defective Work;
3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.

B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.

C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

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F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

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attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

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provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and

2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person, by a commercial courier service or otherwise, to the recipient's place of business;

2. by registered or certified mail, postage prepaid, to the recipient's place of business; or

3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

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18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

These Supplementary Conditions amend or supplement EJCDC® C-700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added—for example, “Paragraph SC-4.05.”

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

SC-1.01 Add the following sentence after the second sentence of paragraph 1.01.A.42:

A.42 Substantial completion of each segment of sewer for repair under this contract shall entail rehabilitation or replacement of said section of sewer, adjacent manholes and/or structures, sewer service connections and cleanouts; testing of said section of sewer; repair of roadways and driveways and acceptance of the work for operation by the Owner and/or Engineer. Substantial completion for the entire contract shall entail completion of all segments as described above and acceptance of all segments for operation by the Owner and/or Engineer.

SC-1.01 Add the following sentence after the first sentence of paragraph 1.01.A.50:

A.42 A work change directive will be executed on a Change Request Form. Work Change Directives will not be issued without identifying proposed not to exceed changes in quantities or contract times.

ARTICLE 2—PRELIMINARY MATTERS

2.02 *Copies of Documents*

SC-2.02 Delete Paragraph 2.02.A in its entirety and insert the following new paragraph in its place:

A. Owner shall furnish to Contractor **two (2)** printed copies of conformed Contract Documents incorporating and integrating all Addenda and any amendments negotiated prior to the Effective Date of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies of the conformed Contract Documents will be furnished upon request at the cost of reproduction.

2.06 *Electronic Transmittals*

SC-2.06 Delete Paragraphs 2.06.B and 2.06.C in their entirety and insert the following in their place:

B. *Electronic Documents Protocol:* The parties shall conform to the following provisions in Paragraphs 2.06.B and 2.06.C, together referred to as the Electronic Documents Protocol (“EDP” or “Protocol”) for exchange of electronic transmittals.

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1. *Basic Requirements*

    a. To the fullest extent practical, the parties agree to and will transmit and accept Electronic Documents in an electronic or digital format using the procedures described in this Protocol. Use of the Electronic Documents and any information contained therein is subject to the requirements of this Protocol and other provisions of the Contract.

    b. The contents of the information in any Electronic Document will be the responsibility of the transmitting party.

    c. Electronic Documents as exchanged by this Protocol may be used in the same manner as the printed versions of the same documents that are exchanged using non-electronic format and methods, subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.

    d. Except as otherwise explicitly stated herein, the terms of this Protocol will be incorporated into any other agreement or subcontract between a party and any third party for any portion of the Work on the Project, or any Project-related services, where that third party is, either directly or indirectly, required to exchange Electronic Documents with a party or with Engineer. Nothing herein will modify the requirements of the Contract regarding communications between and among the parties and their subcontractors and consultants.

    e. When transmitting Electronic Documents, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the receiving party's use of software application packages, operating systems, or computer hardware differing from those established in this Protocol.

    f. Nothing herein negates any obligation 1) in the Contract to create, provide, or maintain an original printed record version of Drawings and Specifications, signed and sealed according to applicable Laws and Regulations; 2) to comply with any applicable Law or Regulation governing the signing and sealing of design documents or the signing and electronic transmission of any other documents; or 3) to comply with the notice requirements of Paragraph 18.01 of the General Conditions.

2. *System Infrastructure for Electronic Document Exchange*

    a. Each party will provide hardware, operating system(s) software, internet, e-mail, and large file transfer functions ("System Infrastructure") at its own cost and sufficient for complying with the EDP requirements. With the exception of minimum standards set forth in this EDP, and any explicit system requirements specified by attachment to this EDP, it is the obligation of each party to determine, for itself, its own System Infrastructure.

        1) The maximum size of an email attachment for exchange of Electronic Documents under this EDP is **5** MB. Attachments larger than that may be exchanged using large file transfer functions or physical media.

        2) Each Party assumes full and complete responsibility for any and all of its own costs, delays, deficiencies, and errors associated with converting, translating,

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updating, verifying, licensing, or otherwise enabling its System Infrastructure, including operating systems and software, for use with respect to this EDP.

b. Each party is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for maintaining operations of its System Infrastructure during the Project, including coordination with the party's individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.

c. Each party will operate and maintain industry-standard, industry-accepted, ISO-standard, commercial-grade security software and systems that are intended to protect the other party from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. To the extent that a party maintains and operates such security software and systems, it shall not be liable to the other party for any breach of system security.

d. In the case of disputes, conflicts, or modifications to the EDP required to address issues affecting System Infrastructure, the parties shall cooperatively resolve the issues; but, failing resolution, the Owner is authorized to make and require reasonable and necessary changes to the EDP to effectuate its original intent. If the changes cause additional cost or time to Contractor, not reasonably anticipated under the original EDP, Contractor may seek an adjustment in price or time under the appropriate process in the Contract.

e. Each party is responsible for its own back-up and archive of documents sent and received during the term of the contract under this EDP, unless this EDP establishes a Project document archive, either as part of a mandatory Project website or other communications protocol, upon which the parties may rely for document archiving during the specified term of operation of such Project document archive. Further, each party remains solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract, or after termination of the Project document archive, if one is established, for as long as required by the Contract and as each party deems necessary for its own purposes.

f. If a receiving party receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission.

g. The parties will bring any non-conforming Electronic Documents into compliance with the EDP. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the communication.

h. The Owner will operate a Project information management system (also referred to in this EDP as "Project Website") for use of Owner, Engineer and Contractor during the Project for exchange and storage of Project-related communications and information. Except as otherwise provided in this EDP or the General

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Conditions, use of the Project Website by the parties as described in this Paragraph will be mandatory for exchange of Project documents, communications, submittals, and other Project-related information. The following conditions and standards will govern use of the Project Website:

1) Describe the period of time during which the Project Website will be operated and be available for reliance by the parties;

2) Provide any minimum system infrastructure, software licensing and security standards for access to and use of the Project Website;

3) Describe the types and extent of services to be provided at the Project Website (such as large file transfer, email, communication and document archives, etc.); and

4) Include any other Project Website attributes that may be pertinent to Contractor's use of the facility and pricing of such use.

C. *Software Requirements for Electronic Document Exchange; Limitations*

1. Each party will acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the software formats required in this section of the EDP.

a. Prior to using any updated version of the software required in this section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or adjust its transmission to comply with this EDP.

2. The parties agree not to intentionally edit, reverse engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes any Electronic Document or information contained therein that was transmitted in a software data format, including Portable Document Format (PDF), intended by sender not to be modified, unless the receiving party obtains the permission of the sending party or is citing or quoting excerpts of the Electronic Document for Project purposes.

3. Software and data formats for exchange of Electronic Documents will conform to the requirements set forth in Exhibit A to this EDP, including software versions, if listed.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

No suggested Supplementary Conditions in this Article.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

SC-4.01 Amend the last sentence of Paragraph 4.01.A to read as follows:

A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A

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Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract.

ARTICLE 5—SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

SC-5.01 Add the following sentence after the first sentence of paragraph 5.01.C:

Copies of agreements entered into by Contractor for use of additional lands and access thereto shall be provided to Owner.

5.02 *Use of Site and Other Areas*

SC-5.02 Add the following subparagraphs immediately after paragraph 5.02.C:

A. The Contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his employees or work, and at the completion of the work he shall remove all his tools, scaffolding, and surplus materials and shall leave his work in a clean and usable condition, satisfactory to the Engineer, unless more exactly specified. In case of dispute, the Owner may remove the rubbish and charge the cost to the Contractor as the Engineer shall determine to be just.

B. The Contractor shall direct his forces to clean up streets, sidewalks, drainage channels, or private property affected by his construction operations when, in the opinion of the Engineer, such clean-up is needed promptly.

C. The contract shall not be considered complete until all construction structures, equipment, and rubbish from construction are cleaned from the site of the work. All damage to existing paving, grounds, and structures caused by the Contractor's operation must be repaired or owners compensated for such damage before contract will be considered complete.

SC-5.02 Add the following paragraphs immediately after paragraph 5.02.D:

5.02.E Property and Right of Way. The property on which all work under this Contract is to be located and constructed and all right-of-way, whether located in streets, alleys, or other public ways, or through private property, shall be provided by the City without cost to the Contractor. The Contractor shall be responsible for obtaining permission and correcting problems for any areas that are used outside of the designated working areas.

5.02.F Driveways. The Contractor shall make every effort to minimize the time of disruption of driveways and all driveways shall be left in a useable state at the end of each working day. The Contractor shall inform any resident, prior to engaging in that work, whose driveway is to be obstructed to avoid blocking anyone in or out.

5.02G. Barricades. The Contractor shall establish barricades, danger warnings, detour signs, lights, etc., of conventional types, wherever required or wherever they will add to the public safety and convenience. At night, the Contractor shall maintain all lights burning and barricades in place.

5.03 *Subsurface and Physical Conditions*

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SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.D:

E. The following table lists the reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely:

Report Title	Date of Report	Technical Data
Geotechnical Engineering Report – Suck Creek WWTP Expansion	9/3/2021	Geotechnical Report
Supplemental Exploration and Shear Strength Testing – Suck Creek WWTP Expansion	7/27/2022	Geotechnical Report

F. The following table lists the drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data, and specifically identifies the Technical Data upon which Contractor may rely:

Drawings Title	Date of Drawings	Technical Data
Signal Mountain Waste Water Treatment Plant Access Road – Presence/Absence Mist Netting Survey	5/31/2023	Bat Survey
Signal Mountain Floral Survey	6/29/2023	Flower Survey

5.06 *Hazardous Environmental Conditions*

SC-5.06 Add the following new paragraphs immediately after Paragraph 5.06.A.3:

4. The following table lists the reports known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and the Technical Data (if any) upon which Contractor may rely:

Report Title	Date of Report	Technical Data
[None]	[N/A]	[N/A]

5. The following table lists the drawings known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and Technical Data (if any) contained in such Drawings upon which Contractor may rely:

Drawings Title	Date of Drawings	Technical Data
[None]	[N/A]	[N/A]

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

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SC-6.01 Add the following paragraphs immediately after Paragraph 6.01.A:

1. *Required Performance Bond Form:* The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2010, 2013, or 2018 edition). If Contractor chooses to provide their own form, all items listed in the provided Performance Bond Form must be included.

2. *Required Payment Bond Form:* The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2010, 2013, or 2018 edition). If Contractor chooses to provide their own form, all items listed in the provided Performance Bond Form must be included.

SC-6.01 Add the following sentence to the end of Paragraph 6.01.B:

Contractor and surety shall jointly complete and execute the Performance and Payment Bonds.

SC-6.01 Add the following sentence to the end of Paragraph 6.01.I:

All bonds shall be issued by a surety qualified to do business in the State of Tennessee, rated "A" or better by AM Best, and be in a form acceptable to the Owner.

6.02 *Insurance—General Provisions*

SC-6.02 Add the following paragraph immediately after Paragraph 6.02.N:

6.02.O Certificates of insurance containing a cancellation clause including the phrases "will endeavor to" and "but failure to mail such notice shall impose no obligation or liability of any kind upon the company, its agents, or representatives" (or phrases that have the same meaning) shall have these phrases deleted from the insurance certificate.

6.03 *Contractor's Insurance*

SC-6.03 Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

D. *Other Additional Insureds:* As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies must include as additional insureds (in addition to Owner and Engineer) the following: **None**

E. *Workers' Compensation and Employer's Liability:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	**Policy limits of not less than:**
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory

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Workers' Compensation and Related Policies	Policy limits of not less than:
Jones Act (if applicable)	
Bodily injury by accident—each accident	$1,000,000
Bodily injury by disease—aggregate	$1,000,000
Employer's Liability	
Each accident	$1,000,000
Each employee	$1,000,000
Policy limit	$1,000,000

F. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:

1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
2. damages insured by reasonably available personal injury liability coverage, and
3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

G. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage.
    a. Such insurance must be maintained for three years after final payment.
    b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
4. Underground, explosion, and collapse coverage.
5. Personal injury coverage.
6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

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H. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:

1. Any modification of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
2. Any exclusion for water intrusion or water damage.
3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
4. Any exclusion of coverage relating to earth subsidence or movement.
5. Any exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than worker's compensation).
6. Any limitation or exclusion based on the nature of Contractor's work.
7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

I. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	**Policy limits of not less than:**
General Aggregate	$1,000,000
Products—Completed Operations Aggregate	$1,000,000
Personal and Advertising Injury	$1,000,000
Bodily Injury and Property Damage—Each Occurrence	$1,000,000

J. *Automobile Liability:* Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	**Policy limits of not less than:**
Bodily Injury	
Each Person	$1,000,000
Each Accident	$1,000,000
Property Damage	
Each Accident	$1,000,000
[or]	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	$1,000,000

K. *Umbrella or Excess Liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

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Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	$5,000,000
General Aggregate	$5,000,000

L. *Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements:* Contractor may meet the policy limits specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy's policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of $**4,000,000** after accounting for partial attribution of its limits to underlying policies, as allowed above.

M. *Contractor's Pollution Liability Insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor's Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	$1,000,000
General Aggregate	$1,000,000

N. *Contractor's Professional Liability Insurance:* If Contractor will provide or furnish professional services under this *Contract*, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

Contractor's Professional Liability	Policy limits of not less than:
Each Claim	$1,000,000
Annual Aggregate	$1,000,000

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.03 *Labor; Working Hours*

SC-7.03 Add the following new subparagraphs immediately after Paragraph 7.03.C:

1. Regular working hours will be **8 hours per day between 7am and 6pm at the schedule proposed by the contractor**.

2. Owner's legal holidays are **as published by Owner and subject to change.**

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SC-7.03 Amend the first and second sentences of Paragraph 7.03.C to state "…all Work at the Site must be performed during regular working hours, **Monday** through **Friday.** Contractor will not perform Work on a **Saturday**, **Sunday**, or any legal holiday."

SC-7.03 Add the following new paragraph immediately after Paragraph 7.03.C:

D. **Contractor** shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

SC-7.03 Add the following new subparagraph immediately after Paragraph SC-7.03.D:

1. For purposes of administering the foregoing requirement, additional overtime costs are defined as **rates shown in table below:**

Title	Classification	Hourly Billing Rate Range*
Principal Project Manager	PM7	$260 to $270
Senior Project Manager	PM6	$230 to $255
Project Manager V	PM5	$180 to $225
Project Manager IV	PM4	$150 to $175
Senior Project Engineer	E5	$180 to $225
Project Engineer IV	E4	$160 to $180
Project Engineer III	E3	$145 to $155
Project Engineer II	E2	$135 to $140
Project Engineer I	E1	$120 to $135
Staff Professional	P1	$100 to $125
Senior Project Professional	P5	$175 to $185
Project Professional IV	P4	$150 to $170
Project Professional III	P3	$140 to $155
Project Professional II	P2	$120 to $135
Project Professional I	P1	$100 to $115
Project Coordinator III	P3	$140 to $155
Project Coordinator II	P2	$120 to $135
Project Coordinator I	P1	$100 to $115
Senior GIS Professional	G5	$170 to $200

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GIS Professional IV	G4	$140 to $165
GIS Professional III	G3	$130 to $140
GIS Professional II	G2	$115 to $130
GIS Professional I	G1	$95 to $120
Senior Resident Project Representative	R5	$165 to $195
Resident Project Representative IV	R4	$150 to $165
Resident Project Representative III	R3	$130 to $150
Resident Project Representative II	R2	$115 to $130
Resident Project Representative I	R1	$90 to $115
Senior CAD Designer	C5	$140 to $150
CAD Designer IV	C4	$130 to $140
CAD Designer III	C3	$115 to $130
CAD Designer II	C2	$110 to $120
CAD Designer I	C1	$95 to $110
Senior Engineering Technician	T4	$105 to $120
Engineering Technician III	T3	$90 to $100
Engineering Technician II	T2	$75 to $85
Engineering Technician I	T1	$65 to $70
Project Controls Coordinator / Business Manager	A4	$105 to $120
Senior Administrator	A3	$90 to $105
Administrator II	A2	$75 to $85
Administrator 1	A1	$65 to $70

*2023 Rates shown, subject to annual escalation

7.06 *Substitutes*

SC-7.06.B Add the following new language immediately after the last sentence in Paragraph 7.05.B:

If no time constraint is defined elsewhere in the specifications, all applications shall be made within 15 days of the effective date of the Owner-Contractor Agreement. No applications will be considered thereafter unless the Contractor produces satisfactory evidence to the Engineer that the specified item is no longer manufactured or is unavailable for the project.

SC-7.06.G Add the following new Paragraph immediately after Paragraph 7.06.F:

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If the substitute item requires modifications to the structures, piping, layouts, or any other portion of the project as detailed in the Contract Documents, the application shall also include details of proposed modifications necessary to accommodate the substitute item. Such details shall include scaled layouts, dimensions, and other pertinent information as necessary to enable the Engineer to evaluate the entire application. If the substitute item and proposed modifications are approved, the Contractor, at no additional cost to the Owner, shall do all work necessary to make such modifications and absorb all costs of any related changes imposed on other Contractors and Subcontractors. Final details of such modifications shall be prepared and submitted for approval by the Contractor under the Shop Drawing submittal requirements specified elsewhere.

SC-7.06.H Add the following new Paragraph immediately after Paragraph 7.06.G:

In order to aid the Engineer in determining the equality of a proposed 'or equal' or substitute item (when compared to the item actually specified), Contractor shall arrange for performance of any test requested by the Engineer necessary to ascertain the equality of the proposed substitute or 'or equal' item. Nature, extent, tester, and supervisions of such tests including engineering costs and all other costs associated with the tests shall be borne solely by Contractor. Certified test results shall be mailed directly to the Engineer for all tests requested.

SC-7.06.I Add the following new Paragraph immediately after Paragraph 7.06.H:

Substitutions will not be accepted if they are only shown or implied on Shop Drawings or Submittal Data.

7.09 *Permits*

SC-7.09 Add the following subparagraphs immediately after Paragraph 7.09.A:

1. Owner will obtain and pay for permits from the following agencies:
    a. None
2. Contractor shall obtain and pay for all other required permits. These may include but are not limited to permits from the following agencies:
    a. Local highway/roadway departments which require permits for road cuts and road crossings.
    b. Local agencies which administer Excavation and Grading Permits and Building Permits. Owner and/or Engineer may assist Contractor in obtaining these permits, but cost of permits shall be responsibility of Contractor.
    c. State or local agencies which regulate blasting operations.

7.12 *Record Drawings*

SC-7.12.B Add a new paragraph immediately after Paragraph 7.12.A.:

If Owner utilizes any part of the project in accordance with paragraph GC-15.04, Contractor shall provide to Engineer for the Owner a complete set of record drawings current to the date of the Owner's utilization together with all required operation and maintenance manuals, shop drawings, etc., relating to the part of the project being utilized. Contractor shall submit said documents prior to Owner accepting the part of the project to be utilized,

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and Contractor will be required to submit an updated set up final record documents upon final completion of the project.

SC-7.12.C Add a new paragraph immediately after new Paragraph 7.12.B:

Record documents shall be routinely updated and made available for Engineer to review at each monthly Progress Meeting. Failure to update and make Documents available shall be grounds for withholding monthly payments until updates and review of Documents have been made. Failure of Contractor to furnish Engineer with compete and accurate Record Documents at project's close-out may be grounds for withholding final payment until such Record Documents have be furnished.

7.13 *Safety and Protection*

SC-7.13.C.4 Insert the subparagraphs after Paragraph 7.13.C.3:

4.a. The Contractor shall be responsible for the safety of existing structures whether above or below ground level and shall use all precaution to avoid damage to such structures. Wherever water, sewer lines, or other underground utilities are broken, damaged, or disconnected, they shall be replaced promptly with a minimum interruption of service and the incident shall be recorded and reported to the Engineer. Locations of existing utilities shown on the plans are approximate and for the Contractor's assistance only. It is the Contractor's responsibility to determine exact locations of all existing utilities.

4.b. Interference with any property owned and operated by the Owner and utilities furnishing water, electricity, transportation, and the communication service, shall have the approval of the existing company or department as to the methods and manner of construction used by the Contractor, and the Contractor shall pay all costs incidental to maintenance of service and for the replacement of poles, anchors, or other existing works disturbed by the construction of this work.

SC-7.13.C.5 Add a new paragraph immediately after new Paragraph 7.13.C.4.b:

Video Recording: It is the Contractor's responsibility to restore all disturbed areas as nearly as possible to original condition. To verify the success of this action and to assist in mediating property owner complaints, the Contractor is to video tape the proposed working area of the entire construction project route prior to any construction activity. Particular attention is to be noted to broken headwall, cracked foundations, etc. which have sustained damage prior to the construction activity. The video tape is to be turned over to the Engineer prior to starting the construction. The video tape is to be indexed for easy review throughout the duration of the job. It is imperative that the videotaping will be done in a professional manner, i.e. containing a narrative describing the location of the camera relative to street addresses, manhole stations, etc. and its direction as well as any findings concerning the surrounding area. Movement of the camera should be slow and steady especially when a zoom mode is being used.

SC-7.13.K Add a new paragraph immediately after Paragraph 7.13.J:

Confined Space Requirements: Certain aspects of work performed under this contract may involve the entry into manholes, tanks, pits, etc. which are defined as confined spaces by the OSHA requirements which are detailed in the Combined Federal Register 1910.146. The Contractor is advised to become familiar with all aspects and requirements of this OSHA policy in order for the Contractor to protect his employees and all others involved from the

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dangers that maybe associated with the limited access and hazardous atmospheres that may exists in these confined spaces. It is the Contractor's responsibility to become familiar with and institute the various permitting, sampling and other associated safety requirements for confined space entry. Contractor shall perform work in accordance with the City's confined space entry requirements as presently outlined in City Occupational Safety and Health Program. Requirements include notifying the City Fire and Rescue Department prior to entering a confined space and when operations in the confined space cease. Contractor shall also complete a confined space entry form and maintain a copy in his project record files.

SC-7.13.L Add a new paragraph immediately after new Paragraph 7.13.K:

Neither Owner, Engineer or other consultants, agents or employees of Owner and Engineer shall have any duty, obligation or responsibility for supervising, directing, inspecting, monitoring, overseeing, enforcing or otherwise ensuring Contractor's compliance with and performance of safety requirements or procedures. If the Owner or Engineer happens to observe or become aware of a failure to comply with safety requirements or procedures by the Contractor, its employees or subcontractors, the Owner or Engineer may, at his discretion, so notify Contractor. If, in the judgment of the Owner or Engineer, observed failure to comply constitutes an immediate threat to persons or property, or prevents Owner or Engineer from safely gaining access to work or otherwise performing his duties, the Owner may order work stopped until problem is rectified, and Contractor, or subcontractor, shall immediately comply with such order. Contractor shall have no claim for delay or damages against Owner, nor shall Contractor be entitled to an extension of contract time due to any work stoppage arising from Contractor's failure to comply with safety requirements or procedures.

SC-7.13.M Add a new paragraph immediately after new Paragraph 7.13.L:

Contractor shall designate one person to respond to emergencies and act on the Contractor's behalf during off-work hours at the project site. The person's name, address, and telephone number shall be provided to the Owner prior to work commencing and the designated person shall be on call during off-work hours. Response time shall not exceed one hour after notification is given by Owner or Engineer that an emergency exists at the projects site.

7.16 *Submittals*

SC-7.16.B Revise the first sentence of Paragraph 7.16.B by deleting the words "and approval".

SC-7.16.B.3 Revise the first sentence of Paragraph 7.16.B.3 by deleting the words "and approval".

SC-7.16.C.1 Revise the second sentence of Paragraph 7.16.C.1 by deleting the words "and approval".

SC-7.16.C.2 Revise the first sentence of Paragraph 7.16.C.2 by deleting the words "and approval".

SC-7.16.C.3 Revise the first sentence of Paragraph 7.16.C.3 by deleting the words "and approval".

SC-7.16.C.4 Revise the first sentence of Paragraph 7.16.C.4 by deleting the words "and approval".

SC-7.16.C.5 Revise the first sentence of Paragraph 7.16.C.5 by deleting the words "and approval".

SC-7.16.C.6 Revise the first sentence of Paragraph 7.16.C.6 by deleting the words "and approval".

SC-7.16.C.7 Replace Paragraph 7.16.C.7 with the following:

Neither Engineer's receipt or review of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

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SC-7.16.C.8 Revise the first sentence of Paragraph 7.16.C.8 by replacing the word “approved” with the word “reviewed”.

SC-7.16.D.1 Revise the first sentence of Paragraph 7.16.D.1 by deleting the words “and approval”.

SC-7.16.D.2 Replace Paragraph 7.16.D.2 with the following:

Contractor shall furnish required submittals with sufficient information and accuracy to complete Engineer review of an item with no more than three submittals. Engineer will record Engineer’s time for reviewing a fourth or subsequent submittal of a shop drawing, sample, or other item requiring review, and Contractor shall be responsible for Engineer’s charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

SC-7.16.D.3 Revise the first sentence of Paragraph 7.16.D.3 by replacing the word “approved” with the word “reviewed”.

7.17 *Contractor’s General Warranty and Guarantee*

SC-7.17.D.5 Revise the first sentence of Paragraph 7.17.D.5 by deleting the words “and approval”.

ARTICLE 8—OTHER WORK AT THE SITE

No suggested Supplementary Conditions in this Article.

ARTICLE 9—OWNER’S RESPONSIBILITIES

No suggested Supplementary Conditions in this Article.

ARTICLE 10—ENGINEER’S STATUS DURING CONSTRUCTION

10.03 *Resident Project Representative*

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.B:

C. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR’s actions. The RPR will:

1. General: RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. RPR shall generally communicate with OWNER only with the knowledge of and under the direction of Engineer.

2. *Schedules:* Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.

2. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor’s safety meetings), and as appropriate prepare and circulate copies of minutes thereof.

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3. *Safety Compliance:* Using risk analysis, develops the safety guidelines that covers all Engineer personnel and the Owner on the Project Site. Ensures the safety guidelines are followed by the applicable personnel.

4. *Liaison*

    a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

    b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

    c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.

5. *Interpretation of Contract Documents*: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.

6. *Shop Drawings and Samples:*

    a. Record date of receipt of Samples and Contractor-approved Shop Drawings.

    b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.

    c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been reviewed by Engineer.

7. *Modifications:* Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.

8. *Review of Work; Defective Work*

    a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.

    b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test, or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection, or approval.

9. *Inspections and Tests*

    a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to those performed by public or other agencies having jurisdiction over the Work.

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b. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.

c. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.

d. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.

10. *Records*

a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

b. Record names and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.

c. Maintain records for use in preparing Project documentation.

11. *Reports*

a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.

b. Assist Engineer in recommending proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.

c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.

12. *Payment Requests:* Review Applications for Payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

13. *Certificates, Operation and Maintenance Manuals:* During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals, and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

14. *Completion*

a. Participate in Engineer's visits to the Site to determine Substantial Completion and assist in the determination of Substantial Completion.

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b. Assist in the preparation of a punch list of items to be completed or corrected.

c. Participate in Engineer's final visit to the Site in the company of Owner and Contractor regarding completion of the Work, and prepare a final punch list of items to be completed or corrected by Contractor.

d. Observe whether items on the final punch list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.

D. The RPR will not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction.

5 Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Authorize Owner to occupy the Project in whole or in part.

8. Accept Shop Drawing or Sample submittals from anyone other than Contractor.

ARTICLE 11—CHANGES TO THE CONTRACT

No suggested Supplementary Conditions in this Article.

ARTICLE 12—CLAIMS

No suggested Supplementary Conditions in this Article.

ARTICLE 13—COST OF WORK; ALLOWANCES, UNIT PRICE WORK

13.01 *Cost of the Work*

SC-13.01 Delete Paragraph 13.01.B.5.c. in its entirety and insert the following in its place:

c. Construction Equipment and Machinery:

1. Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

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2. The rental rate on shelf-owned equipment used for periods of under one week will be the Associated Equipment Distributor's published monthly rate divided by 22 days to establish a daily rate and divided again by eight hours to establish an hourly rate. Equipment used for periods of five days or more will be billed at a rate equal to 45 percent of the base hourly rate; the base hourly rate shall be calculated by dividing the published daily rate by eight. In the alternative, the Owner may approve for reimbursement a rate representing the allocable costs of ownership. Self-owned equipment is defined to include equipment rented from controlled or affiliated companies. Contractor shall be responsible for providing to Owner and Engineer copies of the most recent Associated Equipment Distributor's monthly rates upon request of Engineer.

3. When requested by Engineer, Contractor shall identify sources used to determine rental rates of equipment and submit related evidence to Engineer to support such data.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCCEPTANCE OF DEFECTIVE WORK

No suggested Supplementary Conditions in this Article.

ARTICLE 15—PAYMENTS TO CONTRACTOR, SET OFFS; COMPLETIONS; CORRECTION PERIOD

15.01 *Progress Payments*

SC-15.01 Add the following new subparagraphs to Paragraph 15.01.B:

1. For payment for materials and equipment stored at another approved ("off-site") location, Contractor shall reimburse Owner for the charges of Engineer for visiting Contractor's place of storage and checking items on Contractor's certificate.

2. By signing the Application and Certificate for Payment, the Contractor certifies that all items, units, quantities, and prices of Work and material in the estimate are correct, that all Work has been performed, and materials supplied in full accordance with the contract, and that the Contractor has no claims for damages, losses, or expense against the Owner for compensation in addition to that provided for in the application except such claims for change of contract price as the Contractor has filed with the Engineer and Owner in writing prior to the date of his certifying the application.

SC-15.01 Add the following language after the last sentence of Paragraph 15.01.C.5:

Engineer may also refuse to recommend any such payment when Contractor fails to submit certifications, affidavits, revised progress schedule, or a revised Shop Drawing and Sample submittal schedule in accordance with the General Requirements, Contractor's failure to submit shop drawings in accordance with the Contract Documents, when Contractor fails to maintain record documents required by paragraph 6.12, or, because of subsequently discovered evidence or the results of subsequent inspections or tests.

15.03 *Substantial Completion*

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SC-15.03 Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, will be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under this Article 15.

15.06 *Final Payment*

SC-15.06 Add the following new subparagraph to Paragraph 15.06.A.3:

4. The application shall be made on forms acceptable to the Engineer. By signing the application and certificate for payment, the Contractor certifies that the total cost of the Work and the amount due the Contractor for payment is full compensation for all Work done under the terms of the contract in its original form; that the payment is full compensation for all Work ordered to be done under Change Orders; and that the payment is full compensation for all other Work done by the Contractor and for all damages, losses, and expense incurred by the Contractor for doing and furnishing everything relating to or arising out of the Work, and that the Contractor waives all right to claim or receive any further compensation in addition to that provided for in the Final Payment.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

No suggested Supplementary Conditions in this Article.

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

17.02 *Arbitration*

A. All matters subject to final resolution under this Article will be settled by arbitration administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules (subject to the conditions and limitations of this Paragraph SC-17.02). Any controversy or claim in the amount of $100,000 or less will be settled in accordance with the American Arbitration Association's supplemental rules for Fixed Time and Cost Construction Arbitration. This agreement to arbitrate will be specifically enforceable under the prevailing law of any court having jurisdiction.

B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitration administrator, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the specific time required in Article 17, or if no specified time is applicable within a reasonable time after the matter in question has arisen, and in no event will any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be barred by the applicable statute of limitations.

C. The arbitrator(s) must be licensed engineers, contractors, attorneys, or construction managers. Hearings will take place pursuant to the standard procedures of the Construction

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Arbitration Rules that contemplate in-person hearings. The arbitrators will have no authority to award punitive or other damages not measured by the prevailing party's actual damages, except as may be required by statute or the Contract. Any award in an arbitration initiated under this clause will be limited to monetary damages and include no injunction or direction to any party other than the direction to pay a monetary amount.

D. The Arbitrators will have the authority to allocate the costs of the arbitration process among the parties, but will only have the authority to allocate attorneys' fees if a specific Law or Regulation or this Contract permits them to do so.

E. The award of the arbitrators must be accompanied by a reasoned written opinion and a concise breakdown of the award. The written opinion will cite the Contract provisions deemed applicable and relied on in making the award.

F. The parties agree that failure or refusal of a party to pay its required share of the deposits for arbitrator compensation or administrative charges will constitute a waiver by that party to present evidence or cross-examine witness. In such event, the other party shall be required to present evidence and legal argument as the arbitrator(s) may require for the making of an award. Such waiver will not allow for a default judgment against the non-paying party in the absence of evidence presented as provided for above.

G. No arbitration arising out of or relating to the Contract will include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:

1. the inclusion of such other individual or entity will allow complete relief to be afforded among those who are already parties to the arbitration;

2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration, and which will arise in such proceedings;

3. such other individual or entity is subject to arbitration under a contract with either Owner or Contractor, or consents to being joined in the arbitration; and

4. the consolidation or joinder is in compliance with the arbitration administrator's procedural rules.

H. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Laws and Regulations relating to vacating or modifying an arbitral award.

I. Except as may be required by Laws or Regulations, neither party nor an arbitrator may disclose the existence, content, or results of any arbitration hereunder without the prior written consent of both parties, with the exception of any disclosure required by Laws and Regulations or the Contract. To the extent any disclosure is allowed pursuant to the exception, the disclosure must be strictly and narrowly limited to maintain confidentiality to the extent possible.

ARTICLE 18—MISCELLANEOUS

No suggested Supplementary Conditions in this Article.

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Add the following Article:

ARTICLE 19—ARP GUIDELINES

Contractor must comply with the applicable requirements of the Uniform Guidance (2 CFR Part 200) regarding procurement, contracting, and conflicts of interest and must follow the applicable laws and regulations in their jurisdictions.

19.01 *Equal Employment Opportunity*

During the performance of this contract, the contractor agrees as follows:

A. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

B. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

C. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

D. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

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E. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

F. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

G. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law. (8) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through

H. In every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

   Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

19.02 *Davis Bacon Act*

During the performance of this contract, the contractor agrees as follows:

A. All transactions regarding this contract shall be done in compliance with the Davis-Bacon Act (40 U.S.C. 3141- 3144, and 3146-3148) and the requirements of 29C.F.R. pt. 5 as may be applicable. The contractor shall comply with 40 U.S.C. 3141-3144, and 3146-3148 and the requirements of 29 C.F.R. pt. 5 as applicable.

B. Contractors are required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor.

C. Additionally, contractors are required to pay wages not less than once a week.

19.03 *Copeland Anti-Kickback Act*

During the performance of this contract, the contractor agrees as follows:

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A. Contractor. The contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this contract.

B. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clause above and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.

C. Breach. A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12."

19.04 *Contract Work Hours and Safety Standards Act*

During the performance of this contract, the contractor agrees as follows:

A. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

B. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the t $27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

C. Withholding for unpaid wages and liquidated damages. The (write in the name of the Federal agency or the loan or grant recipient) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

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D. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

19.05 *Clean Air Act and Federal Water Pollution Control Act*

During the performance of this contract, the contractor agrees as follows:

Clean Air Act

A. The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq

B. The contractor agrees to report each violation to the (name of subrecipient entering into the contract) and understands and agrees that the (name of the subrecipient entering into the contract) will, in turn, report each violation as required to assure notification to Treasury, and the appropriate Environmental Protection Agency Regional Office.

C. The contractor agrees to include these requirements in each subcontract exceeding $150,000.

Federal Water Pollution Control Act

D. The contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 ets eq.

E. The contractor agrees to report each violation to the (name of the subrecipient entering into the contract) and understands and agrees that the (name of the subrecipient entering into the contract) will, in turn, report each violation as required to assure notification to the Treasury, and the appropriate Environmental Protection Agency Regional Office.

F. The contractor agrees to include these requirements in each subcontract exceeding $150,000.

19.06 *Debarment and Suspension*

During the performance of this contract, the contractor agrees as follows:

A. This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such, the contractor is required to verify that none of the contractor's principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).

B. The contractor must comply with 2 C.F.R. pt. 180, subpart C and2 C.F.R. pt. 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

C. This certification is a material representation of fact relied upon by (insert name of recipient/subrecipient/applicant). If it is later determined that the contractor did not comply

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with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to (insert name of recipient/subrecipient/applicant), the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

D. The bidder or proposer agrees to comply with the requirements of2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

19.07 *Byrd Anti-Lobbying Amendment*

During the performance of this contract, the contractor agrees as follows:

A. Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352

Contractors who apply or bid for an award of $100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the awarding agency.

19.08 *Procurement of Recovered Materials*

During the performance of this contract, the contractor agrees as follows:

A. In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired competitively within a timeframe providing for compliance with the contract performance schedule; meeting contract performance requirements; or at a reasonable price. Information about this requirement, along with the list of EPA-designated items, is available at EPA's Comprehensive Procurement Guidelines webpage.

The Contractor also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act.

19.09 *Domestic Preference for Procurement*

During the performance of this contract, the contractor agrees as follows:

A. As appropriate, and to the extent consistent with law, the contractor should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States. This includes, but is not limited to iron, aluminum, steel, cement, and other manufactured products.

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For purposes of this clause:

Produced in the United States means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. Manufactured products mean items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

19.10 *Access to Records*

A. The Contractor agrees to provide (insert name of state agency or local or Indian tribal government), (insert name of recipient), Treasury, the Comptroller General of the United States, or any of their authorized representatives access to any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, and transcriptions.

B. The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

C. The Contractor agrees to provide the Treasury or authorized representatives access to construction or other work sites pertaining to the work being completed under the contract.

19.11 Compliance with Federal Law, Regulations and Executive Orders

A. This is an acknowledgement that Treasury ARP SLFRF financial assistance will be used to fund all or a portion of the contract. The contractor will comply with all applicable Federal law regulations, executive orders, Treasury policies, procedures, and directives.

19.12 Program Fraud and False or Fraudulent Statements or Related Acts

A. The Contractor acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to the Contractor's actions pertaining to this contract."

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EXHIBIT A—SOFTWARE REQUIREMENTS FOR ELECTRONIC DOCUMENT EXCHANGE

Item	Electronic Documents	Transmittal Means	Data Format	Note (1)
a.1	General communications, transmittal covers, meeting notices and responses to general information requests for which there is no specific prescribed form.	Email	Email	
a.2	Meeting agendas, meeting minutes, RFI's and responses to RFI's, and Contract forms.	Email w/ Attachment	PDF	(2)
a.3	Contactors Submittals (Shop Drawings, "or equal" requests, substitution requests, documentation accompanying Sample submittals and other submittals) to Owner and Engineer, and Owner's and Engineer's responses to Contractor's Submittals, Shop Drawings, correspondence, and Applications for Payment.	Email w/ Attachment	PDF	
a.4	Correspondence; milestone and final version Submittals of reports, layouts, Drawings, maps, calculations and spreadsheets, Specifications, Drawings and other Submittals from Contractor to Owner or Engineer and for responses from Engineer and Owner to Contractor regarding Submittals.	Email w/ Attachment or LFE	PDF	
a.5	Layouts and drawings to be submitted to Owner for future use and modification.	Email w/ Attachment or LFE	DWG	
a.6	Correspondence, reports and Specifications to be submitted to Owner for future word processing use and modification.	Email w/ Attachment or LFE	DOC	
a.7	Spreadsheets and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	EXC	
a.8	Database files and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	DB	

Notes	
(1)	All exchanges and uses of transmitted data are subject to the appropriate provisions of Contract Documents.
(2)	Transmittal of written notices is governed by Paragraph 18.01 of the General Conditions.

Key	
Email	Standard Email formats (.htm, .rtf, or .txt). Do not use stationery formatting or other features that impair legibility of content on screen or in printed copies
LFE	Agreed upon Large File Exchange method (FTP, CD, DVD, hard drive)
PDF	Portable Document Format readable by Adobe® Acrobat Reader Version **2016** or later
DWG	Autodesk® AutoCAD .dwg format Version **2018 or later**
DOC	Microsoft® Word .docx format Version **2016**
EXC	Microsoft® Excel .xls or .xml format Version **2016**
DB	Microsoft® Access .mdb format Version **2016**

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NOTICE TO PROCEED

Owner:	Hamilton County Water and Wastewater Treatment Authority	Owner's Project No.:	22-310
Engineer:	LJA Engineering, Inc.	Engineer's Project No.:	2956-0012
Contractor:		Contractor's Project No.:	
Project:	Signal Mountain Sewage Treatment Plant Access Road Project –WWTA Project Number 22-310; ARP SWIG Grant ID: 2022-8379; Project Number WW-PDC-1		
Contract Name:	Signal Mountain Sewage Treatment Plant Access Road Project –WWTA Project Number 22-310; ARP SWIG Grant ID: 2022-8379; Project Number WW-PDC-1		
Effective Date of Contract:			

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on **[date Contract Times are to start]** pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

In accordance with the Agreement:

The number of days to achieve Substantial Completion is **330 of days, from Agreement** from the date stated above for the commencement of the Contract Times, resulting in a date for Substantial Completion of **[date, calculated from commencement date above]**; and the number of days to achieve readiness for final payment is **365 of days, from Agreement** from the commencement date of the Contract Times, resulting in a date for readiness for final payment of **[date, calculated from commencement date above]**.

Before starting any Work at the Site, Contractor must comply with the following:

[Note any access limitations, security procedures, or other restrictions]

Owner:	**Hamilton County Water and Wastewater Treatment Authority**
By *(signature)*:	
Name *(printed)*:	
Title:	
Date Issued:	

Copy: Engineer

EJCDC® C-550, Notice to Proceed.
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CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:	Hamilton County Water & Wastewater Treatment Authority	Owner's Project No.:	22-310
Engineer:	LJA Engineering, Inc.	Engineer's Project No.:	2956-0012
Contractor:		Contractor's Project No.:	
Project:	Signal Mountain Sewage Treatment Plant Access Road Project –WWTA Project Number 22-310; ARP SWIG Grant ID: 2022-8379; Project Number WW-PDC-1		
Contract Name:	Signal Mountain Sewage Treatment Plant Access Road Project –WWTA Project Number 22-310; ARP SWIG Grant ID: 2022-8379; Project Number WW-PDC-1		

This ☐ Preliminary ☐ Final Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

[Describe the portion of the work for which Certificate of Substantial Completion is issued]

Date of Substantial Completion: **[Enter date, as determined by Engineer]**

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

Amendments to Owner's Responsibilities: ☐ None ☐ As follows:

[List amendments to Owner's Responsibilities]

Amendments to Contractor's Responsibilities: ☐ None ☐ As follows:

[List amendments to Contractor's Responsibilities]

The following documents are attached to and made a part of this Certificate:

[List attachments such as punch list; other documents]

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Engineer

By *(signature)*: _____

Name *(printed)*: _____

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Title: _____

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NOTICE OF ACCEPTABILITY OF WORK

Owner:	Hamilton County Water & Wastewater Treatment Authority	Owner's Project No.:	22-310
Engineer:	LJA Engineering, Inc.	Engineer's Project No.:	2956-0012
Contractor:		Contractor's Project No.:	
Project:	Signal Mountain Sewage Treatment Plant Access Road Project –WWTA Project Number 22-310; ARP SWIG Grant ID: 2022-8379; Project Number WW-PDC-1		
Contract Name:	Signal Mountain Sewage Treatment Plant Access Road Project –WWTA Project Number 22-310; ARP SWIG Grant ID: 2022-8379; Project Number WW-PDC-1		
Notice Date:	Effective Date of the Construction Contract:		

The Engineer hereby gives notice to the Owner and Contractor that Engineer recommends final payment to Contractor, and that the Work furnished and performed by Contractor under the Construction Contract is acceptable, expressly subject to the provisions of the Construction Contract's Contract Documents ("Contract Documents") and of the Agreement between Owner and Engineer for Professional Services dated **[date of professional services agreement]** ("Owner-Engineer Agreement"). This Notice of Acceptability of Work (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree:

1. This Notice has been prepared with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.
2. This Notice reflects and is an expression of the Engineer's professional opinion.
3. This Notice has been prepared to the best of Engineer's knowledge, information, and belief as of the Notice Date.
4. This Notice is based entirely on and expressly limited by the scope of services Engineer has been employed by Owner to perform or furnish during construction of the Project (including observation of the Contractor's Work) under the Owner-Engineer Agreement, and applies only to facts that are within Engineer's knowledge or could reasonably have been ascertained by Engineer as a result of carrying out the responsibilities specifically assigned to Engineer under such Owner-Engineer Agreement.
5. This Notice is not a guarantee or warranty of Contractor's performance under the Construction Contract, an acceptance of Work that is not in accordance with the Contract Documents, including but not limited to defective Work discovered after final inspection, nor an assumption of responsibility for any failure of Contractor to furnish and perform the Work thereunder in accordance with the Contract Documents, or to otherwise comply with the Contract Documents or the terms of any special guarantees specified therein.
6. This Notice does not relieve Contractor of any surviving obligations under the Construction Contract, and is subject to Owner's reservations of rights with respect to completion and final payment.

Engineer

By *(signature)*: _____

Name *(printed)*: _____

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Title: _____

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Davis-Bacon Wage Rates

"General Decision Number: TN20230145 01/06/2023

Superseded General Decision Number: TN20220145

State: Tennessee

Construction Type: Heavy
Including Water and Sewer Line Construction

Counties: Hamilton and Sequatchie Counties in Tennessee.

HEAVY CONSTRUCTION PROJECTS (including sewer/water construction).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number Publication Date

0 01/06/2023

ELEC0175-012 01/01/2022

Hamilton County

	Rates	Fringes
ELECTRICIAN	$ 32.77	14.5%+8.25

ELEC0429-008 06/01/2022

Sequatchie County

	Rates	Fringes
Electrician	$ 31.55	14.08

ENGI0917-022 05/01/2017

	Rates	Fringes
Operating Engineers:		
Bulldozer and Crane	$ 28.26	10.10
Forklift	$ 25.97	10.10

LABO0846-001 05/01/2018

	Rates	Fringes
LABORER: Common or General	$ 15.36 **	5.97

SUTN2009-144 12/02/2009

	Rates	Fringes
LABORER: Flagger	$ 8.73 **	0.00
LABORER: Pipelayer	$ 11.68 **	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	$ 16.82	0.00
OPERATOR: Loader	$ 13.50 **	0.00
TRUCK DRIVER: Dump Truck	$ 10.76 **	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($16.20) or 13658 ($12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year.

Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion

date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the

interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

CHANGE ORDER NO.: [Number of Change Order]

Owner:	Hamilton County Water & Wastewater Treatment Authority	Owner's Project No.:	22-310
Engineer:	LJA Engineering, Inc.	Engineer's Project No.:	2956-0012
Contractor:		Contractor's Project No.:	
Project:	Signal Mountain Sewage Treatment Plant Access Road Project –WWTA Project Number 22-310; ARP SWIG Grant ID: 2022-8379; Project Number WW-PDC-1		
Contract Name:	Signal Mountain Sewage Treatment Plant Access Road Project –WWTA Project Number 22-310; ARP SWIG Grant ID: 2022-8379; Project Number WW-PDC-1		
Date Issued:		Effective Date of Change Order:	

The Contract is modified as follows upon execution of this Change Order:

Description:

[Description of the change]

Attachments:

[List documents related to the change]

Change in Contract Price	**Change in Contract Times [State Contract Times as either a specific date or a number of days]**
Original Contract Price: $ _____	Original Contract Times: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] from previously approved Change Orders No. 1 to No. **[Number of previous Change Order]**: $ _____	**[Increase] [Decrease]** from previously approved Change Orders No.1 to No. **[Number of previous Change Order]**: Substantial Completion: _____ Ready for final payment: _____
Contract Price prior to this Change Order: $ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] this Change Order: $ _____	**[Increase] [Decrease]** this Change Order: Substantial Completion: _____ Ready for final payment: _____
Contract Price incorporating this Change Order: $ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for final payment: _____

	Recommended by Engineer (if required)	Authorized by Owner
By:	_____	_____
Title:	_____	_____
Date:	_____	_____

	Authorized by Owner	Approved by Funding Agency (if applicable)
By:	_____	_____

EJCDC® C-941, Change Order.
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Title:		
Date:		

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FIELD ORDER NO.: [Number of Field Order]

Owner:	Hamilton County Water & Wastewater Treatment Authority	Owner's Project No.:	22-310
Engineer:	LJA Engineering, Inc.	Engineer's Project No.:	2956-0012
Contractor:		Contractor's Project No.:	
Project:	Signal Mountain Sewage Treatment Plant Access Road Project –WWTA Project Number 22-310; ARP SWIG Grant ID: 2022-8379, Project Number WW-PDC-1		
Contract Name:	Signal Mountain Sewage Treatment Plant Access Road Project –WWTA Project Number 22-310; ARP SWIG Grant ID: 2022-8379, Project Number WW-PDC-1		
Date Issued:		Effective Date of Field Order:	

Contractor is hereby directed to promptly perform the Work described in this Field Order, issued in accordance with Paragraph 11.04 of the General Conditions, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

[Description of the change to the Work]

Attachments:

[List documents supporting change]

Issued by Engineer

By: _____

Title: _____

Date: _____

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Certified Disadvantaged Business Enterprises (DBE) List

Using Governor's Diversity Business Office and State DOT and CCR DBE Directories to Find Certified WBEs and MBEs

Here are the links:

https://tn.diversitysoftware.com/FrontEnd/VendorSearchPublic.asp?TN=tn&XID=1215

www.osdbu.dot.gov/DBEProgram/StateDOTDBESites.cfm

CCR can be used to search for SBA SDBs. Since the SBA SDB certification is considered acceptable under the EPA DBE Program, firms found using the following search criteria can count toward EPA MBE/WBE fair share objectives.

Access the CCR search page at www.bpn.gov/CCRSearch/Search.aspx

http://www.epa.gov/osbp/dbe_team.htm

SIGNAL MOUNTAIN SEWAGE TREATMENT
PLANT IMPROVEMENTS, ACCESS ROAD PROJECT
WWTA PROJECT NO. 22-310; ARP SWIG GRANT ID: 2022-8379,
PROJECT NUMBER WW-PDC-1
HAMILTON COUNTY, TENNESSEE

STATE OF _____

COUNTY OF _____

The undersigned, _____, having been duly sworn, deposes and states as follows:

1. I am the (title) _____ of
(sole owner, a partner, president, secretary, etc.)

_____
(Name of Corporation) (Proprietorship) (Partnership) (Limited Partnership) (Joint Venture)

which is a _____ in good standing
(Corporation) (Proprietorship) (Partnership) (Limited Partnership) (Joint Venture)

formed under the law of _____, hereinafter
(State of Incorporation or formation)

referred to as "bidder."

2. I am authorized to make this affidavit on behalf of said bidder, and I have personal knowledge of the matters set forth herein.

3. On _____, said bidder is submitting a bid to the OWNER for the above captioned contract. This bid was prepared under my personal supervision and direction. During the preparation of the bid, I have taken affirmative steps to inquire about the circumstances of the bid preparation in general and about any contacts between or among this bidder and any other bidders or prospective bidders in particular.

4. I am aware of the Federal and State laws including without limitation, the Sherman Act (15 U.S.C. 1) and the Tennessee antitrust laws (T.C.A. 47-25-101, et seq.), which make it illegal to agree to fix or rig bids or otherwise agree to restrain competition in bidding for contracts with the OWNER. I am aware in particular that violations of the Sherman Act are federal crimes punishable by a fine of up to $1.0 million for a corporation, and a fine of up to $100,000 for an individual or by imprisonment not exceeding three years, or both.

5. I hereby certify and attest that the bid identified in paragraph 3 is based solely upon the independent knowledge, expertise and business judgment of the bidder acting through its officers and agents and is not the product of, nor was it prepared in connection with, any contract, combination, conspiracy, understanding or collusion between or among any other bidder or prospective bidder on said contract.

_____
Signature

Subscribed and sworn to before me this _____ day of _____.

_____
Notary Public

My Commission Expires:

_____
(Date)

(SEAL)

END OF SECTION

Affidavit of No Collusion By Subcontractor for Owner

SIGNAL MOUNTAIN SEWAGE TREATMENT
PLANT IMPROVEMENTS, ACCESS ROAD PROJECT
WWTA PROJECT NO. 22-310; ARP SWIG GRANT ID: 2022-8379,
PROJECT NUMBER WW-PDC-1
HAMILTON COUNTY, TENNESSEE

STATE OF _____

COUNTY OF _____

The undersigned, _____, having been duly sworn, deposes and states as follows:

1. I am the (title) _____ of
(sole owner, a partner, president, secretary, etc.)

_____
(Name of Corporation) (Proprietorship) (Partnership) (Limited Partnership) (Joint Venture)

which is a _____ in good standing
(Corporation) (Proprietorship) (Partnership) (Limited Partnership) (Joint Venture)

formed under the law of _____, hereinafter
(State of Incorporation or formation)

referred to as "subcontractor."

2. I am authorized to make this affidavit on behalf of said subcontractor, and I have personal knowledge of the matters set forth herein.

3. On _____, said subcontractor is submitting a bid to the OWNER for the above captioned contract. This bid was prepared under my personal supervision and direction. During the preparation of the bid, I have taken affirmative steps to inquire about the circumstances of the bid preparation in general and about any contacts between or among this subcontractor and any other subcontractor or prospective subcontractors in particular.

4. I am aware of the Federal and State laws including without limitation, the Sherman Act (15 U.S.C. 1) and the Tennessee antitrust laws (T.C.A. 47-25-101, et seq.), which make it illegal to agree to fix or rig bids or otherwise agree to restrain competition in bidding for contracts with the OWNER. I am aware in particular that violations of the Sherman Act are federal crimes punishable by a fine of up to $1.0 million for a corporation, and a fine of up to $100,000 for an individual or by imprisonment not exceeding three years, or both.

5. I hereby certify and attest that the bid identified in paragraph 3 is based solely upon the independent knowledge, expertise and business judgment of the subcontractor acting through its officers and agents and is not the product of, nor was it prepared in connection with, any contract, combination, conspiracy, understanding or collusion between or among any other subcontractor or prospective subcontractor on said contract.

_____
Signature

Subscribed and sworn to before me this _____ day of _____.

_____
Notary Public

My Commission Expires:

_____
(Date)

(SEAL)

END OF SECTION

STATE OF TENNESSEE

CERTIFICATION REGARDING DEBARMENT, SUSPENSION AND OTHER RESPONSBILITY MATTERS

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

☐ Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

☐ Have not within a three-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statues or
commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

☐ Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (b) of this certification; and

☐ Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both.

Signature of Authorized Representative	**Date**
Printed Name	**Phone Number / Email Address**

☐ I am unable to certify to the above statements. Explanation is attached.

CERTIFICATION BY PROPOSED PRIME OR SUBCONTRACTOR REGARDING EQUAL EMPLOYMENT OPPORTUNITY

_____

Name of Prime Contractor **Project Number**

INSTRUCTIONS

This certification is required pursuant to Executive Order 11246, Part II, Section 203 (b), 30 F.R. 12319-25). Any bidder or prospective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicated that the prime or subcontractor has not filed a compliance report due under applicable instruction, such contractor shall be required to submit a compliance report.

CONTRACTOR'S CERTIFICATION

Contractor's Name: _____

Address: _____

_____

_____

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause. Yes □ No □

2. Compliance Reports were required to be filed in connection with such contract or subcontract. Yes □ No □

   If yes, state what reports were filed and with what agency.

   _____

3. Bidder has filed all compliance reports due under applicable instructions, including SF-100. Yes □ No □

4. If answer to Item 3 is NO, please explain in detail on reverse side of this certification.

Certification - The information above is true and complete to the best of my knowledge and belief. (A willfully false statement is punishable by law-U.S. Code, Title 18, Section 1001.)

_____

Name and title of signer (Please type)

_____ _____

Signature **Date**

STATE OF TENNESSEE

BYRD ANTI-LOBBYING AMENDMENT CERTIFICATION

Contractors who apply or bid for an award of $100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352.

Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the awarding agency.

APPENDIX A, 44 C.F.R. PART 18 – CERTIFICATION REGARDING LOBBYING – REQUIRED FOR CONTRACTS OVER $100,000 *Certification for Contracts, Grants, Loans, and Cooperative Agreements*

The undersigned certifies, to the best of his or her knowledge and belief, that:

☐ No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

☐ If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.

☐ The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The Contractor certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Chap. 38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

Signature of Authorized Representative	**Date**
Printed Name and Title	**Phone Number / Email Address**

STATE OF TENNESSEE

NON-BOYCOTT OF ISRAEL CERTIFICATION

The Bidder certifies that it is not currently engaged in, and will not for the duration of the contract engage in, a boycott of Israel as defined by Tenn. Code Ann. § 12-4-119. This provision shall not apply to contracts with a total value of less than two hundred fifty thousand dollars ($250,000) or to contractors with less than ten (10) employees.

According to the law, a boycott of Israel means engaging in refusals to deal, terminating business activities, or other commercial actions that are intended to limit commercial relations with Israel, or companies doing business in or with Israel or authorized by, licensed by, or organized under the laws of the State of Israel to do business, or persons or entities doing business in Israel, when such actions are taken:

1) In compliance with, or adherence to, calls for a boycott of Israel, or

2) In a manner that discriminates on the basis of nationality, national origin, religion, or other unreasonable basis, and is not based on a valid business reason. Tenn. Code Ann. § 12-4-119.

Signature of Authorized Representative	**Date**
Printed Name	**Phone Number / Email Address**

PART 1 General

1.01 Scope

A. The Project consists of improvements to be performed for the Signal Mountain Sewer Treatment Plant (STP) owned and operated by Hamilton County Water and Wastewater Authority located in Chattanooga, Tennessee. The project will entail the construction of a new access road to the existing Signal Mountain STP facility. The access road will be built to allow large vehicles to access the site as well as provide access to construct a proposed wastewater facility expansion at a future date. The new access road will consist of a combination concrete and asphalt paved entrance to Suck Creek Road to include approximately 650 linear feet of paved surfaces. An additional 850 linear feet of access roads consisting of concrete pavement to service the existing facility and a gravel access road to the proposed wastewater expansion area. To minimize excavation quantities and land disturbance impacts for the project, a new mechanically stabilized earthen (MSE) retaining wall will be required. The MSE wall will be approximately 300 feet long and 10-20 feet in height. The access road and wall installation will require stormwater drainage improvements due to the grading required for the new access roads by the inclusion of properly lined drainage ditches and stormwater drainage system to convey water through the site and across Suck Creek Road, a designated Tennessee State Route Highway.

   An Additive (or Deductive) Alternate A is included for jack and bore installation of 50 linear feet of 30-inch restrained ductile iron carrier pipe within 42 linear feet of 60-inch steel casing pipe and appurtenances for the storm culvert crossing at Suck Creek Road in lieu of open-cut methods.

B. All work as part of the infrastructure improvements shown will be performed under the American Rescue Plan (ARP), SWIG Grant ID: 2022-8379, Project Number WW-PDC-1 for the Project identified as Signal Mountain STP Improvements – Access Road.

C. The scope of the project will include all necessary labor, tools, and equipment required to complete the jobs according to the specifications and the satisfaction of the OWNER.

D. The scope of the project will include commissioning and startup of new water booster stations, all temporary water main relocations and by-pass as needed for

installation, pipe preparation, disinfection and testing of new water mains, erosion prevention and sediment control measures, and any necessary tools or equipment required to complete the jobs according to the specifications and as depicted in the Construction Drawings. The allotted time for construction is 180 calendar days for substantial completion 210 calendar days for final completion.

E. The materials to be furnished will be installed at the locations shown on the Drawings.

1.02 Description of Work

A. The OWNER reserves the right to substitute, add, delete, increase, decrease in any form or fashion as necessary, the scope of work under the provisions of this Contract. Any additions, deductions, and/or substitutions will be made as construction progresses as outlined in Section C941, Change Order, and Section 012500, Substitution Procedures.

B. The work covered under each of these projects shall consist of furnishing all materials, equipment, and labor for the installation of the infrastructure improvements, including, but not limited to, any pavement and roadway subbase installation or replacement, sheeting and shoring, erosion control measures, bank stabilization measures, stormwater drainage measures, traffic control measures, excavation, retaining wall installation, backfilling, grading, topsoiling, sodding, seeding, fencing, site cleanup, and all work necessary for a complete-in-place commercial entrance to the satisfaction of the OWNER.

C. The CONTRACTOR shall be responsible for documenting existing field conditions prior to construction. A copy of photos and videos will be made available to the ENGINEER upon request.

1.03 Items Regulating the Execution of the Work

A. Attention to Work

For each one of the unique projects, the CONTRACTOR shall give his personal attention to and shall supervise the work to the end that it shall be prosecuted faithfully; and, when he is not personally present on the work, he shall at all times be represented by a competent superintendent or foreman who shall be present at the work and who shall receive and obey all instruction or orders given under

this Contract, and who shall have full authority to execute the same, and to supply materials, tools and labor without delay, and who shall be the legal representative of the CONTRACTOR. The CONTRACTOR shall be liable for the faithful observance of any instructions delivered to him or to his authorized representatives.

B. Access to Work

The CONTRACTOR shall at all times provide proper facilities for access and inspection of the work by representatives of the OWNER and all such authorities having jurisdictions (AHJ) as may be designated by the OWNER or as having jurisdictional rights to inspect the work.

C. Work in Streets and Alleys

1. The CONTRACTOR shall secure the approval and obtain operation procedures from the OWNER, the Tennessee Department of Transportation (TDOT), and/or the AHJ for such activities as necessary before closing or starting construction within the right-of-way of any street or alley. All Work areas shall be protected in conformance to the *Manual on Uniform Traffic Control Devices* (MUTCD).

2. Throughout the performance of the work or in connection with this Contract, the CONTRACTOR shall construct and adequately maintain suitable and safe crossing over the trench and such detours as are necessary to care for public and private traffic. The material excavated from trenches shall be compacted and deposited along the sides of the trench or elsewhere in such a manner as shall give as little inconvenience as possible to the CONTRACTORS or to the OWNER.

3. For underground utility installations, the CONTRACTOR shall limit excavation to an area where the new underground utilities can be installed within a day or as detailed by the approved Traffic Control Plan (TCP) for such work. As a minimum, all open trenches and shall be backfilled with stone backfill to existing grade prior to leaving the project area each day. Additional steel sheet plates, adequately secured, to allow safe vehicular crossing will be required in all traffic areas outside the protected work areas as determined by the TCP. All temporary trench stabilization and measures implemented to provide a safe crossing will be considered incidental with at no additional cost to the OWNER.

D. Work in Vicinity of Existing Sewers or Water Mains

1. Where the work on this project is in the vicinity of existing Public or Private Sewers or Water Mains, the CONTRACTOR shall schedule his operations in such a manner that all existing sewer service made be adequately maintained.

2. Where existing sanitary sewers are to be removed from service permanently or temporarily, the CONTRACTOR shall convey, in a manner acceptable to the ENGINEER, and without bypassing to the environment, all sewage and drainage which may be received by those sewers until the existing sewers are returned to service or replaced.

3. The CONTRACTOR shall not use any existing sanitary sewer to divert or dispose of storm, dewatering from trenches, or surface water. After a connection has been made to any existing sanitary sewers, the CONTRACTOR shall plug the nearest opening to said connection and make such provisions that are necessary for pumping, bypassing, and conducting storm or surface water, to insure the above until the acceptance of the project.

E. Work on State Highway

1. Where the work on this project encroaches upon the right-of-way of any State or Interstate Highway right-of-way, the OWNER will execute a contract with proper authorities for the installation of the new underground utilities to be installed.

2. The CONTRACTOR shall notify the proper authorities prior to entering upon such right-of-way and shall be responsible for all damage and for satisfying the requirements of these authorities.

F. Work on Private Property

1. Where the work on this project encroaches upon private property, the OWNER shall provide easements and/or right-of-entry in or beneath which pipes and structures will be constructed by the CONTRACTOR under this contract.

2. The CONTRACTOR will be responsible for complying with all easement conditions as shown on the signed easement agreement. If no signed easement agreement exists, then an easement of prescription shall be implemented allowing a fifteen foot (15') wide work area over the centerline of the existing underground utility. In no case shall an easement of prescription shall be implemented if there is a change in horizontal alignment and/or an increase in the pipe diameter where the work is to be performed.

3. The CONTRACTOR shall be responsible for obtaining any additional area which may be deemed necessary for the construction of this project. The CONTRACTOR shall obtain a written agreement between the CONTRACTOR and Landowner and forward it to the ENGINEER prior to use of said property.

4. The CONTRACTOR shall be responsible for the preservation of and shall use every precaution to prevent damage to all trees, shrubbery, fences, culverts, bridges, pavements, driveways, sidewalks, houses, or buildings, and all water, sewer, gas, telephone, and electric lines thereto and all other private and public property along or adjacent to the work not indicated to be removed in the Contractual Drawings.

5. Any damage that occurs will be restored to a like condition as existed prior to construction, in the Contract Documents, unless otherwise indicated or specified.

6. Forty-eight (48) hours prior to construction in any easement or streets, the CONTRACTOR shall notify in writing the affected property owners in the area. This notification shall include the CONTRACTOR's name, and the name and phone number of the contact person.

G. Contract Working Hours

All work at the site shall be performed during regular working hours as identified in the General and Supplemental Conditions. The Contractor may request to work on Saturday or Holidays no later than 48 hours prior. The actual costs of the OWNER's and ENGINEER's inspection of the work performed outside of regular working hours will be billed to the CONTRACTOR and deducted from the CONTRACTOR's application for payment as they occur.

H. Service Line Identification

The CONTRACTOR shall be responsible for the identification of all active service lines for the purpose of reinstatement. All damages caused by the blocking of service lines or active service lines not reinstated shall be the sole responsibility the CONTRACTOR for a period of one (1) year from the contract completion date.

1.04 Quantities

The Owner reserves the right to alter the quantities of work to be performed or to extend or shorten the improvements at any time when and as found necessary, and the Contractor shall perform the work as altered, increased or decreased. Payment for such increased or decreased quantity will be made in accordance with the General and Supplementary Conditions. No allowance will be made for any change in anticipated profits nor shall such changes be considered as waiving or invalidating any conditions or provisions of the Contract and Bond

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Scope

A. Payment for the Work to be performed will be made on a unit price basis as indicated in the Unit Price Bid (Bid Form) as provided in Section C-410, Article 3, Basis of Bid, Lump Sum Bid and Unit Prices. The Bid Form lists each item of the Project for which payment will be made. No payment will be made for any items other than those listed in the Bid Form.

B. Required items of work and incidentals necessary for the satisfactory completion of the work which are not specifically listed in the Bid Form, and which are not specified in this Section to be measured, shall be considered as incidental to the work. All costs thereof, including Contractor's overhead costs and profit, shall be considered as included in the lump sum or unit prices for the various bid items. The Contractor shall prepare the bid accordingly.

C. Work includes furnishing all labor, equipment, tools and materials, which are not furnished by the Owner and performing all operations required to complete the work satisfactorily, in place, as specified and as indicated on the Drawings and Specifications.

1.02 Descriptions

A. Measurement of an item of work will be by the unit indicated in the Bid Form.

B. Final payment quantities shall be determined from the documented field measurements. The precision of final payment quantities shall match the precision shown for that item in the Bid Form.

C. Payment will include all necessary and incidental related work not specified to be included in any other item of work listed in the Bid Form.

D. Unless otherwise stated in individual Sections of the Specifications or in the Bid Form, no separate payment will be made for any item of work, materials, parts, equipment, supplies or related items required to perform and complete the work. The costs for all such items required shall be included in the bid price for each item of which it is a part.

E. Payment will be made by extending unit prices multiplied by quantities provided and then summing the extended prices to reflect actual work. Such price and payment shall constitute full compensation to the Contractor for furnishing all plant, labor, equipment, tools and materials not furnished by the Owner and for performing all operations required to provide to the Owner the entire Project, complete in place, as specified and as indicated on the Drawings.

F. “Products” shall mean materials or equipment permanently incorporated into the work.

1.03 Mobilization

A. Mobilization bid item is a one-time cost to include all CONTRACTOR-incurred mobilization costs associated with mobilizing to the site. Demobilization and project cleanup is not a pay item and shall be considered a necessary part of the work and the cost of such included herein. In the event that the CONTRACTOR has to pull all crews and equipment off the job at the request of the OWNER and subsequently has to re-mobilize, then he would be paid the lump sum price for mobilization a second time.

B. Payment shall be made at the bid unit price as shown in the Bid Form. No separate or additional payment will be made for completing this work.

C. Pay item to perform the work is a lump sum (LS) pay item to include all mobilization cost incurred to mobilize and demobilize from the site. CONTRACTOR shall request payment for 50% of the mobilization bid amount upon starting work at the site and 50% after all initial project submittals have been reviewed and returned with no exceptions taken.

1.04 Traffic Control

A. Payment will be made for the development of traffic control plans. The pay item to perform the work is a lump sum (LS) unit pay item to include the implementation of traffic control plans to perform work within public right-of-way as needed to direct traffic around the work zone. The work shall be implemented in accordance to Traffic Control Plans (TCP) developed by the Contractor as needed to obtain necessary permits to execute work with the authority having jurisdiction. The lump sum (LS) item will exclude the development of traffic control plans in which payment will be made by Professional Services Items as provided in another section.

1.05 Pre-Construction and Post Construction Site Photography & Video

A. Payment will be made for pre-construction site photographs and video prior to construction. The pay item to perform the work is a lump sum (LS) unit pay item to include taking photographs and videos of existing features within the proposed areas of disturbance. The photographs and videos will be provided in digital format to the Owner as documentation to preexisting conditions prior to construction. Payment will be made once site photographs and videos are delivered to the Owner and determined to be complete, accurate, and accepted by the Owner.

1.06 Clearing and Grubbing

A. Payment will be made for clearing and grubbing activities as needed for the installation of the access road and all drainage features as depicted in the Drawings. The pay item will be made as an acre (Acre) bid item which shall include the clearing and grubbing activities of all trees, vegetation and overgrowth from the

site including. All tree stumps shall be removed, and any brush properly disposed. Pavement will be made once clearing activities are completed and the site is ready for earthwork activities. All work to commence in conformance with the site-specific Erosion Prevention and Sediment Control Plans.

1.07 Erosion Control and Permanent Vegetation Stabilization

A. Payment shall be made for the installation and implementation of the Erosion Prevention and Sediment Control (EPSC) Plan developed for each project as depicted in the Drawings. The pay item to perform the work is a lump sum (LS) pay item to include the installation, inspection, and maintenance of all temporary erosion prevention and sediment control measures excluding temporary vegetation and erosion control mattings as needed to execute work as depicted in the Drawings and meeting all permitting requirement by authority having jurisdiction as applicable for the duration of the project. Payments for this lump sum item will be made based on monthly basis percentage of work complete for the duration of project to substantial completion.

B. Payment shall be made for the installation of permanent vegetation and straw mulch. The pay item to perform the work is an acre (ACRE) unit pay item to include the installation of permanent vegetation and straw much needed to stabilize the site in accordance with the Erosion Prevention and Sediment Control Plan depicted in the Drawings and the TDEC best management practices. The work includes the inspection, ground preparation, seeding, fertilizing, watering, and maintenance of all disturbed areas receiving vegetation until vegetation is fully established. Areas needing to be reseeded where grass is not successfully established, as determined by the Owner or Engineer, will be included as part of the initial area where vegetation was applied with no additional compensation made to reestablish.

C. Payment shall be made for the installation of temporary vegetation and straw mulch. The pay item to perform the work is an acre (ACRE) unit pay item to include the installation of permanent vegetation and straw much needed to stabilize the site in accordance with the Erosion Prevention and Sediment Control Plan depicted in the Drawings and the TDEC best management practices. The work includes the inspection, ground preparation, seeding, fertilizing, watering, and maintenance of all disturbed areas receiving vegetation until vegetation is fully established. Areas needing to be reseeded where grass is not successfully established, as determined by the Owner or Engineer, will be included as part of the initial area where vegetation was applied with no additional compensation made to reestablish.

D. Payment shall be made for the installation of riprap lined ditches to be installed at depths, stone sizes, and dimensions as depicted in the drawings. The pay item to perform the work is a ton (TON) unit pay item to include the installation of riprap needed to stabilize the wet weather conveyances in accordance with the Erosion Prevention and Sediment Control Plan and the TDEC best management practices for erosion control. The work includes the grading, ground preparation, stone bedding, geotextile filter fabric, approximately sized riprap stone, and stone placement as needed for a functioning riprap lined system. Payment for this item will be made once the work has been completed and the lined ditch has been

installed and accepted by the Engineer.

E. Payment shall be made for the installation of riprap lined ditches to be installed at depths, stone sizes, and dimensions as depicted in the drawings. The pay item to perform the work is a ton (TON) unit pay item to include the installation of riprap needed to stabilize the wet weather conveyances in accordance with the Erosion Prevention and Sediment Control Plan and the TDEC best management practices for erosion control. The work includes the grading, ground preparation, stone bedding, geotextile filter fabric, approximately sized riprap stone, and stone placement as needed for a functioning riprap lined system. Payment for this item will be made once the work has been completed and the lined ditch has been installed and accepted by the Engineer.

F. Payment shall be made for the installation of erosion control blankets needed for slope stabilization at locations where the final slopes are steeper than 3(h): 1(v) or at locations as depicted in the Drawings. The pay item to perform the work is a square yard (SY) unit pay item of erosion control blankets installed to include the installation of erosion control matting as needed to stabilize the site in accordance with the Erosion Prevention and Sediment Control Plan depicted in the Drawings and the TDEC best management practices for erosion prevention and sediment control. The work includes the inspection, and maintenance of all disturbed areas erosion control blankets until vegetation is fully stabilized. Areas needing to be repaired before vegetation is fully established will be included as part of the initial area with no additional compensation made.

G. Payment shall be made for the installation of erosion control blankets needed for ditch stabilization at location where the side slopes are steeper than 3(h): 1(v) or at locations as depicted in the Drawings. The pay item to perform the work is a square yard (SY) unit pay item of erosion control blankets installed to include the installation of erosion control matting as needed to stabilize the site in accordance with the Erosion Prevention and Sediment Control Plan depicted in the Drawings and the TDEC best management practices for erosion prevention and sediment control. The work includes the inspection, and maintenance of all disturbed areas erosion control blankets until vegetation is fully stabilized. Areas needing to be repaired before vegetation is fully established will be included as part of the initial area with no additional compensation made.

H. Payment shall be made for the installation of erosion control blankets needed for slope stabilization at location where the final slopes are steeper than 3(h): 1(v) or at locations as depicted in the Drawings. The pay item to perform the work is a square yard (SY) unit pay item of erosion control blankets installed to include the installation of erosion control matting as needed to stabilize the site in accordance with the Erosion Prevention and Sediment Control Plan depicted in the Drawings and the TDEC best management practices for erosion prevention and sediment control. The work includes the inspection, and maintenance of all disturbed areas erosion control blankets until vegetation is fully stabilized. Areas needing to be repaired before vegetation is fully established will be included as part of the initial area with no additional compensation made.

I. Payment shall be made for the installation of erosion control blankets needed for channel stabilization at location where the final channel slopes are steeper than 3(h): 1(v) or at locations as depicted in the Drawings. The pay item to perform the work is a square yard (SY) unit pay item of erosion control blankets installed to include the installation of erosion control matting as needed to stabilize the site in accordance with the Erosion Prevention and Sediment Control Plan depicted in the Drawings and the TDEC best management practices for erosion prevention and sediment control. The work includes the inspection, and maintenance of all disturbed areas erosion control blankets until vegetation is fully stabilized. Areas needing to be repaired before vegetation is fully established will be included as part of the initial area with no additional compensation made.

J. Payment shall be made for the installation of live willow plant staking (live stake) as needed for additional permanent channel stabilization as depicted and detailed in the Drawings for a riprap lined ditch. The pay item to perform the work is an each (EA) unit pay item as needed to install for the live stakes to be placed along riprap channel at locations to provide a more natural long-term stabilization in aquatic areas as recognized by the Tennessee Department of Environment and Conservation (TDEC). Payment includes replacing any live stakes that fail to root and grow as construction commences or during the extents of the warranty period as defined by other sections of the Contracted Documents with no additional compensation made.

1.08 Earthwork and Grading

A. Payment will be made for the earthwork and grading activities to install the access road and retaining wall as depicted in the drawings. The items will consist of excavation, hauling, site preparation, testing, filling, and grading including the placement of topsoil as needed to achieve final grades.

B. Payment will be made for the earthwork activities to achieve final grades as depicted in the drawings. The pay item will be made as a cubic yard (CY) item for excavated material classified as rock or unclassified excavation as determined by the Engineer. The work shall include, but not limited to, excavating, hauling, topsoil stripping, undercutting, subgrade compaction and subgrade preparation, grading with select borrow material to achieve final grades or subgrades in stone pad or riprap areas. All excavated material not suitable for backfilling or grading will be properly removed from the site with no additional payment being made for such work.

C. Payment will be made for the installation of select fill material needed to achieve the final grade or subgrade as depicted in the Drawings. The pay item will be made as a cubic yard (CY) item which shall include, but not limited to, the subgrade preparation, testing, hauling, placement, compaction of fill material and topsoiling areas to receive permanent vegetation. The cubic yard of material will be compacted-in-place volumes with no swell or shrinkage factors applied. The undercutting of existing soils to achieve the final compaction requirements will be excavated and property disposed without any additional payment being made for such work.

1.09 Storm Drainage Pipe and Structures

A. Payment will be made for the storm drainage related items needed for the installation of the access road. The items to include the installation of storm water manholes, catch basins, drop inlets, piping, headwalls, and associated appurtenances needed convey stormwater at the site.

B. Payment will be made for stormwater piping to be installed at locations indicated and detailed in the drawings. The pay item will be a linear foot (LF) pay item as needed for the installation of stormwater piping to include excavation, stone bedding, piping, pipe connections, and stone or select backfill (paved or unpaved) to final grade or subgrade as depicted in the drawings.

C. Payment will be made for stormwater structures to be installed at locations indicated and detailed in the Drawings. The pay item will be an each (EA) item as needed for the installation of a precast concrete manholes, drainage structures, and end treatments to include trench excavation, stone bedding, precast concrete manhole and appurtenances, precast drainage structures, manhole frame and cover, connections to storm pipe(s), and backfill to final grade or roadway subgrades as depicted in the drawings.

1.10 Roadway Subbase, Pavement and Roadway Appurtenances

A. Payment will be made for the asphaltic or concrete pavement, or gravel placement or replacement which includes asphalt or concrete pavement saw cuts as required, existing pavement removal and disposal, excavation and grading, subgrade preparation, compaction, compaction testing, aggregate base, asphaltic concrete or concrete pavement, asphaltic binders (prime coat and tack coat) and all appurtenances needed to place, replace, or restore pavement as depicted in the Drawings.

B. Pay item for new gravel surface for the access road will be square yard (SY) pay item for the stone material to be installed at locations depicted and detailed in the Drawings. Payment for subgrade preparation to be paid for separately by other items.

C. Pay item for new asphalt pavement will be square yard (SY) pay item for the asphalt roadway installations to be installed at locations depicted and detailed in the Drawings. Prime coat and tack coat will be included with no additional payment being made for such items. Payment for subgrade stone material, TDOT Mineral Aggregate Base to be for separately by other items.

D. Pay item for new concrete pavement will be square yard (SY) pay item for the entrance to be installed at locations depicted in the Drawings. Payment for subgrade preparation and stone bedding material, TDOT Mineral Aggregate Base, to be paid by separately by other items.

E. Pay item for permanent asphalt pavement removal and restoration will be linear foot (LF) pay item for existing pavement to be sawcut and removed as needed for the installation of storm sewer pipes. The pay item will include the mineral aggregate base for dimensions detailed in the Drawings to include the mineral aggregate base, asphaltic binder to final grades to the depths specified. Additionally, the pay item includes the cold planing, “milling”, the existing asphalt surface from the centerline for a distance as dimensioned and installation of the final asphaltic surface to depths specified. Prime coat and tack coat will be included with no additional payment being made for such items. Payment will be paid once the pavement has been restored and accepted by the Engineer.

F. Pay item the mineral aggregate base required for asphaltic and concrete pavement areas will a ton (TON) pay item for the stone material to be installed at locations depicted and detailed in the Drawings. Payment for subgrade preparation and asphalt or concrete pavement material to be paid for separately by other items. Payment will be made by hauling tickets to be provided by the Contractor in monthly pay applications for the stone subbase installed.

G. Pay item for concrete lined ditches to be installed along roadway and above retaining wall at locations as depicted in the Drawings. The pay items will be paid by the linear feet (LF) of concrete line ditch installed including any subgrade preparation and bedding material as applicable for the installation.

H. Pay item for permanent signage to be installed at entrance of the access road will be paid by the square yards (SY) surface area for the signage to be installed at locations as depicted in the Drawings. All signage to include excavation, post, and signage material in conformance with the authority having jurisdiction and be in conformance with the current edition of the Manual of Uniform Traffic Control Devices.

I. Pay items for permanent pavement markings and stripings will be made as lump sum (LS) item for pavement markings and stripings as depicted in the Drawings. All striping shall be 100 mills extruded or ribbon thermoplastic material with Type I & Type IV bead package conforming with the Tennessee Department of Transportation (TDOT) 2021 Standard Specifications for Road and Bridge Construction, Section 706, Pavement Markings.

J. Pay items for guardrail will be made as lump sum (LS) item for the complete-in-place guardrail as depicted in the Drawings. All guardrail, post, and terminal anchors shall conform with the Tennessee Department of Transportation (TDOT) 2021 Standard Specifications for Road and Bridge Construction, Section 705, Guardrail.

1.11 Retaining Wall

A. Payment will be made for the installation of a mechanically stabilized earthen (MSE) retaining wall at locations as depicted and detailed in the Drawings. The MSE wall, as a minimum, shall meet *“MSE WALL SPECIFICATIONS*” as provided in the Drawings. Payment for the MSE wall shall be made as lump sum (LS) item which

shall include stamped MSE Wall Plans along with Detailed Design Computations assembled by a Professional Engineer actively practicing in the State of Tennessee which meets all local building codes and approval for the authority having jurisdiction. The Plans and Detailed Design Computations will be provided to Engineer through the Submittal process for review and approval. Once approved by the Engineer, the Contractor shall acquire approvals from the authority having jurisdiction. Installation of the MSE wall shall include excavation, site preparation, all materials and appurtenances, wall assembly, backfilling, and grading including the placement of topsoil as needed for a complete-in-place wall. Permanent stabilization at the top and toe of wall will be excluded from this item and be paid for by separate bid items. Payments for the MSE wall installation will be made on a monthly basis at a percentage of the wall completed once the installation of the wall commences until wall is completed and accepted by the Engineer.

1.12 Fencing and Gates

A. Payment will be made for the installation for security chain link fences and gates at locations as depicted in the Drawings. Payment includes clearing and grubbing, grading, staking, post excavation, concrete backfill, chain link fence and gate materials, posts, and fencing appurtenances as needed for a complete-in-place security fence system at locations depicted in the Drawings.

B. Pay item for chain link fencing will be a linear foot (LF) pay item for existing as needed for the installation of chain link fence at the heights depicted in the Drawings. Payment includes clearing and grubbing, grading, staking, fence post excavation, concrete backfill, chain link fence meshing, posts and rails, and fencing appurtenances as needed for a complete-in-place security fence system at locations depicted and detailed in the Drawings.as needed for a complete-in-place security fence system at locations depicted in the Drawings. Payment will be made once the fence has been installed and accepted by the Engineer.

C. Pay item for chain link gate will be an each (EA) pay item as needed for the installation of chain link fence gate at the heights and dimensions as depicted in the Drawings. Payment includes clearing and grubbing, grading, staking, fence post excavation, concrete backfill, chain link fence meshing, gate post and rails, and all fencing and gate appurtenances as needed for a complete-in-place security fence system at locations depicted and detailed in the Drawings. Payment will be made once the fence has been installed and accepted by the Engineer.

1.13 Professional Services

A. Payment will be made for the professional services needed for the development of Traffic Control Plans for all work to be performed which affects the movement of traffic around the work zones. Traffic control plans shall be developed and stamped by a Professional Engineer practicing in the State of Tennessee. The plan, as a minimum, shall meet the current edition of the Manual of Uniform Traffic Control Devices and the authority having jurisdiction (AHJ) for the maintenance of traffic. The pay item for the development of traffic control plans will be a lump sum (LS) pay item as indicated in the Bid Form and paid upon submittal and acceptance by

the AHJ and the Engineer.

1.14 Cash Allowances

A. Payment will be made for cash allowances as needed for the subgrade, crushed stone aggregate, bituminous materials, and concrete testing for the services by an Engineer approved geotechnical engineering firm and testing laboratory to verify soils conditions including trench excavation, concrete ditch lining, grading and backfill, asphaltic pavement, and for the testing of concrete cylinders for cast-in-place concrete as applicable for the project.

B. Payment will be made for cash allowances as needed for the mitigation of potential endangered plant species identified by the Engineer. Contactor must adhere to local, state, and federal requirements to relocate the plants to an area acceptable to a qualified ecologist and the United States Fish and Wildlife Service (USFWS) at the expense of the Contractor. Ecologists must coordinate with the local USFWS for prior approval and all necessary permits before relocation efforts.

END OF SECTION

Part 1 – General

1.01 Scope

A. This Section outlines the restrictions and requirements for substitutions, product and manufacturer options, and construction method options.

B. Related Requirements:

1. Section 013000 – Administrative Requirements

1.02 Definitions

A. For the purposes of these Contract Documents, a “substitute item” shall be defined as one of the following:

1. A product or manufacturer offered as a *replacement* to a specified product or manufacturer.

2. A product or manufacturer offered *in addition* to a specified product or manufacturer.

B. For the purposes of these Contract Documents, a “substitute construction method” shall be defined as one of the following:

1. A means, method, technique, sequence, or procedure of construction offered as a *replacement* for a specified mean, method, technique, sequence, or procedure of construction.

2. A means, method, technique, sequence, or procedure of construction offered *in addition* to a specified mean, method, technique, sequence, or procedure of construction.

1.03 General

A. An item or construction method, which is offered where no specific product, manufacturer, mean, method, technique, sequence, or procedure of construction is specified or shown on the Drawings, shall not be considered a substitute and

shall be at the option of the CONTRACTOR, subject to the provisions in the Contract Documents for that item or construction method.

B. For products specified only by a referenced standard, the CONTRACTOR may select any product by any manufacturer, which meets the requirements of the Specifications, unless indicated otherwise in the Contract Documents.

C. If the manufacturer is named on the Drawings or in the Specifications as an acceptable manufacturer, products of that manufacturer meeting all requirements of the Specifications and Drawings are acceptable.

D. Whenever the ENGINEER's design is based on a specific product of a particular manufacturer, that manufacturer will be shown on the Drawings and/or listed first in the list of approved manufacturers in the Specifications. Any Bidder intending to furnish products of other than the first listed manufacturer, or furnish substitute items, shall:

1. Verify that the item being furnished will fit in the space allowed, perform the same functions, and have the same capabilities as the item specified,

2. Include in its Bid the cost of all accessory items which may be required by the other listed substitute product,

3. Include the cost of any architectural, structural, mechanical, piping, electrical, or other modifications required, and

4. Include the cost of required additional work by the ENGINEER, if any, to accommodate the item.

E. Whenever a product specification includes minimum experience requirements which the manufacturer selected by the CONTRACTOR cannot meet, the manufacturer shall furnish the OWNER with a cash deposit or bond acceptable to the OWNER in an amount equal to the cost of the product, which shall remain in effect until the experience requirement has been met.

1.04 Approvals

A. Approval, of a substitution as an acceptable manufacturer, of the ENGINEER is dependent on determination that the product offered:

1. Is essentially equal in function, performance, quality of manufacture, ease of maintenance, reliability, service life, and other criteria to that on which the design is based, and

2. Will require no major modifications to structures, electrical systems, control systems, or piping systems.

1.05 Substitutions and Options

A. No substitutions will be considered for the manufacturers listed in the Bid.

B. After Notice to Proceed

1. Substitute items will be considered only if the term “equal to” precedes the names of acceptable manufacturers in the Specification.

2. Where items are specified by referenced standard or specified as indicated above in Article 1.03, Paragraph A, such items shall be submitted to the ENGINEER for review.

3. The CONTRACTOR shall submit shop drawings on the substitute item for the ENGINEER's review in accordance with the *Section 013000 – Administrative Requirements*.

Part 2 - Products (Not Applicable)

Part 3 - Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Equipment Delivery and Construction Schedule

A. CONTRACTOR shall provide a tentative schedule of work at the pre-construction conference in the form of a Gantt Chart outlining individual work tasks, the anticipated start date, the anticipated finish date, and pertinent associated details.

B. Not later than ten (10) consecutive calendar days after the issuance of the "Notice to Proceed", the CONTRACTOR shall submit to the ENGINEER for review a detailed schedule of major equipment delivery and installation and general construction operations, indicating the sequence of the work, the estimated dates of starting each task, and the estimated time of completion of each task. The schedule shall be broken down with respect to individual structures and facilities, indicating when existing structures or equipment would be taken out of service (if applicable). The form and content of the schedule shall be satisfactory to the ENGINEER.

1.02 Shop Drawings and Product Data

A. The CONTRACTOR shall submit to the ENGINEER for review, for design concept, electronic submittals in PDF format and shall include successive page numbers for each page of the PDF file. In lieu of electronic PDF copies, six (6) copies of complete drawings and engineering data for all equipment, materials, and products to be incorporated into the work shall be submitted to ENGINEER. Final reviewed submittals will be posted by ENGINEER on a ShareFile site hosted by ENGINEER and made available to both CONTRACTOR and OWNER. Otherwise, hard copies that have been reviewed by ENGINEER will be distributed.

B. Shop drawings shall be submitted to ENGINEER for review no later than fifteen (15) days after a fully executed contract has been received by CONTRACTOR. CONTRACTOR shall not mobilize to the site without first providing all required submittals. CONTRACTOR will be held to the contract time as indicated in the Notice-to-Proceed regardless of whether submittals have been provided to ENGINEER.

C. Shop drawings and engineering data shall be provided and the ENGINEER 'S review will be conducted in accordance with the requirements of the General Provisions. Shop drawings and/or engineering data, as appropriate, shall be submitted for the following items, including, but not limited to:

1. All piping, pipe fittings, pipe supports, hangers, couplings, and insulation

including mill tests if requested by the ENGINEER.

2. Hatches, valve boxes, manhole frames and covers, PVC riser connections, miscellaneous iron castings and gratings, manhole frames and covers, curb inlets, manhole steps.

3. All concrete and masonry accessories and steel reinforcement, including bending diagrams and bar schedules, ties, spreaders, chairs, and inserts.

4. Form coatings, waterstops, curing and sealing compounds, and epoxy bonding agents.

5. Premixed grouts and mortars.

6. All paints and protective coatings.

7. Grass seed, fertilizer, and commercial mulches.

8. Precast concrete manhole and/or wet well structures.

9. Precast concrete drop inlets, grates and covers, steps, junction boxes, etc., inclusive of pipe connection boots, and joint material, etc.

10. Septic tank top replacement concrete design information.

11. New septic tank precast concrete design information.

12. Any pumping equipment and associated control panel units and other associated ancillary items.

13. Any septic field equipment and associated ancillary items.

14. Electrical System components and associated materials.

15. Portland Cement Concrete design mix for Class A and Class B Concrete.

16. All equipment and ancillary mechanical and electrical components.

17. Paving mix design inclusive of sieve analysis and bituminous content.

D. Shop drawings and engineering data for equipment supplied as a pre-engineered or

pre-assembled system shall include complete shop drawings and engineering data on each component of that system. In all cases, the information provided shall be sufficient to determine if the material or product conforms with the requirements of the specifications.

E. Shop drawings and engineering data shall be prepared by the original equipment vendors or fabricators, as applicable. Purchased specifications by the CONTRACTOR or his Supplier shall not be acceptable as a substitute for actual vendor drawings and data.

F. All shop drawings shall include a legend or other suitable means to identify all symbols and abbreviations used on the drawing. Where an accepted, industry-wide drafting symbol or standard has been established for a particular item, information depicted on the shop drawings shall conform to that standard.

G. Shop drawings shall be dimensioned using the U.S. standard unit of measurement (feet and/or inches). Size of drawing shall not exceed twenty-four inches (24”) by thirty-six inches (36”). All scaled drawings and details shall have the scale clearly noted on the drawing or detail. All information shall be clear and legible.

H. Each shop drawing and each item of engineering data shall bear the CONTRACTOR's APPROVED stamp indicating that the CONTRACTOR has reviewed the drawing or data for conformance with the Contract Documents.

I. All design calculations and drawings for foundation and footings, sheeting and shoring, and concrete formwork shall bear the signed and dated stamp of a licensed professional engineer.

1.03 Miscellaneous Submittals

A. The CONTRACTOR shall submit to the ENGINEER miscellaneous information, procedures, test data, samples, etc., in the manner and at the time specified in these Specifications and Contract Documents. Miscellaneous submittals shall include, but not be limited to, the following:

1. Procedures for handling and disposing of sewage flows during construction.

2. Factory test data and results where specified for specific items of equipment.

3. Preliminary concrete mix design reports.

4. Satisfactory written evidence in the form of laboratory or mill test reports indicating that all cement, aggregate, masonry, structural steel, fencing, castings, steel reinforcement, conduit, pipe, grout, waterproof materials, grass seed, and other items incorporated into the work are in compliance with the requirements of these Specifications.

5. Project record documents.

6. Copies of original invoices of all equipment delivered to the site.

7. When requested, analysis and design data on concrete formwork and sheeting and shoring.

8. Drawings and details of erosion and sediment control structures, if significantly different from Drawings.

9. Written evidence of equipment warranties.

1.04 Schedule of Work

CONTRACTOR shall submit a SCHEDULE OF WORK in sequential order by dates in which he expects to perform the contract specifying the areas or locations in the order the work is anticipated beginning with work commencement date. "The Work" may include related sections or items (individually or grouped) such as clearing and grubbing, gradework (cut & fill), structure installation, rehabilitation of storm sewer pipelines, manholes, catch basins, and related construction, erosion control, base, paving, etc., as examples.

1.05 Samples

A. At the ENGINEER's request, the CONTRACTOR shall furnish certified samples of materials utilized in the fabrications or production of equipment, materials, and products supplied under these Contract Documents. Cost of all such samples shall be borne by the CONTRACTOR. The samples will be tested by a qualified, independent, testing laboratory selected by the OWNER to determine if the mechanical and chemical properties of the materials supplied are in accordance with the requirements of these Specifications and Contract Documents.

B. The OWNER shall pay for the laboratory testing of material samples provided by the

CONTRACTOR. The CONTRACTOR shall pay for all retests made necessary by the failure of materials to conform to the requirements of these Specifications and Contract Documents.

1.06 Schedules, Reports, and Records

A. The CONTRACTOR shall submit to the ENGINEER such schedule of quantities and costs, progress schedules, reports, estimates, records and other data where applicable as are required by the CONTRACT DOCUMENTS for the Work to be performed.

B. Prior to the first partial payment estimate, the CONTRACTOR shall submit construction schedules showing the order in which the CONTRACTOR proposes to carry on the Work, including dates, at which the various parts of the Work will be started, estimated date of completion of each part, and, as applicable:

1. The dates on which special detail drawings will be required. Submittal must allow sufficient time for review by the ENGINEER. Final approval must be obtained prior to commencement of construction of that portion of work to which they pertain.

2. Respective dates for submission of shop drawings, the beginning of manufacture, the testing and the installation of materials, supplies, and equipment.

C. The CONTRACTOR shall also submit a schedule of payments that the CONTRACTOR anticipates will be earned during the course of the Work.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

PART 1 General

1.01 Scope

A. This section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Pre-Construction Conference.

2. Pre-Installation Conferences.

3. Coordination Meetings.

4. Progress Meetings.

B. Construction schedules are specified in another Division 1 section.

1.02 Related Documents

A. Drawings and General Provisions of the Contract and other Division 1 specification sections apply to this section.

1.03 Pre-Construction Conference

A. Attend and participate in a pre-construction conference and organizational meeting at the project site or other convenient location no later than fifteen (15) days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees – The OWNER, ENGINEER, their consultants, the CONTRACTOR and its superintendent, major subcontractors, manufacturers, suppliers, and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. Agenda – Discuss items of significance that could affect progress including such topics as:

1. Tentative construction schedule.

2. Critical work sequencing.

3. Designation of responsible personnel.

4. Procedures for processing field decisions and Change Orders.

5. Procedures for processing Applications for Payment.

6. Distribution of Contract Documents.

7. Submittal of shop drawings, product data, and samples.

8. Preparation of record documents.

9. Use of the premises.

10. Office, work, and storage areas.

11. Equipment deliveries and priorities.

12. Safety procedures.

13. First aid.

14. Security.

15. Housekeeping.

16. Working hours.

1.04 Pre-Installation Conferences

A. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the ENGINEER of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:

    a. Contract Documents.

    b. Options.

    c. Related Change Orders.

    d. Purchases.

    e. Deliveries.

    f. Shop drawings, product data, and quality control samples.

    g. Possible conflicts.

    h. Compatibility problems.

    i. Time schedules.

    j. Weather limitations.

    k. Manufacturer’s recommendations.

    l. Compatibility of materials.

    m. Acceptability of substrates.

    n. Temporary facilities.

    o. Space and access limitations.

    p. Governing regulations.

    q. Safety.

    r. Inspection and testing requirements.

    s. Required performance results.

t. Recording requirements.

u. Protection.

2. Record significant discussions and agreements and disagreements at each conference, along with approved schedule. Distribute a record of the meeting to everyone concerned, promptly, including the OWNER and ENGINEER.

3. Do not proceed if the conference cannot be successfully conducted. Initiate whatever actions are necessary to resolve impediment performance of work and reconvene the conference at the next feasible date.

1.05 Coordination Meetings

A. Conduct project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Request representation at each meeting party currently involved in coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.06 Progress Meetings

A. Conduct progress meetings at the project site at regularly scheduled intervals but not less than monthly. Notify the OWNER and ENGINEER of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees – In addition to representatives of the OWNER and ENGINEER, each CONTRACTOR, subcontractor, supplier, representative of governmental or other regulatory agency, or other entity concerned with current progress, or involved in planning, coordination, or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

C. Agenda – Review and correct or approve minutes of the previous progress meeting. Minimum agenda shall include:

1. Review work progress since last meeting.

2. Note observations of work in progress, problems and decisions.

3. Identify problems which impede planned progress.

4. Review fabrication problems.

5. Develop corrective measures and procedures to regain planned schedule.

6. Revise construction schedule as indicated.

7. Coordinate projected progress with other CONTRACTORS and Suppliers.

8. Review submittal schedules and expedite as required to maintain schedule.

9. Maintain quality and work standards.

10. Complete other current business.

D. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the project.

1. CONTRACTOR's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the CONTRACTOR's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.

2. CONTRACTOR's Submittal Schedule: Review progress since the last meeting. Determine where each activity is in relation to the CONTRACTOR's Submittal Schedule, whether on time or ahead or behind schedule. Determine how submittals behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether

schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.

3. Review the present and future needs of each entity present, including such items as:

   a. Interface requirements.

   b. Time.

   c. Sequences.

   d. Deliveries

   e. Off-site fabrication problems.

   f. Access.

   g. Site utilization.

   h. Temporary facilities and services.

   i. Hours of work.

   j. Hazards and risks.

   k. Housekeeping.

   l. Quality and work standards.

   m. Change Orders.

   n. Documentation of information for payment requests.

E. The ENGINEER will schedule and administer progress meetings and shall:

1. Prepare agendas.

2. Distribute written notice and agendas of called meetings two (2) days in advance of meeting date.

3. Make physical arrangements for meetings.

4. Preside at meetings.

5. Record minutes, including significant proceedings and decisions.

6. Furnish copies of minutes to participants within seven (7) days after meetings.

7. Distribute copies of minutes to participants within seven (7) days after meetings.

F. The ENGINEER will attend meetings to ascertain that work is expedited consistent with construction schedule and with Contract Documents.

G. The CONTRACTOR shall attend progress meetings, as specified, during and until final acceptance of the work described under these Contract Documents.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section includes preparing, furnishing, distributing, and periodic updating of the construction schedules as specified herein.

B. The purpose of the schedule is to demonstrate that the CONTRACTOR can complete the overall Project within the Contract Time and meet all required interim milestones.

1.02 Submittals

A. Overall Project Schedule (OPS)

1. Submit the schedule within ten (10) days after date of the Notice to Proceed.

2. The ENGINEER will review the schedule and return it within ten (10) days after receipt.

3. If required, resubmit within ten (10) days after receipt of a returned copy.

B. Near Term Schedule (NTS)

1. Submit the first Near Term Schedule within ten (10) days of the Notice to Proceed.

2. The ENGINEER will review the schedule and return it within five (5) days after receipt.

C. Submit an update of the OPS and NTS with each progress payment request.

D. Submit the number of copies required by the CONTRACTOR, plus four (4) copies to be retained by the ENGINEER.

1.03 Schedule Review

Review of the CONTRACTOR's detailed construction program and revisions thereto shall in no way relieve the CONTRACTOR of any of CONTRACTOR's duties and obligations under the Contract. Approval is limited to the format of the schedule and does not in any way

indicate approval of, or concurrence with, the CONTRACTOR's means, methods and ability to carry out the Work.

1.04 Overall Project Schedule (OPS)

A. The CONTRACTOR shall submit to the OWNER for approval a detailed Overall Project Schedule (OPS) of the CONTRACTOR's proposed operations for the duration of the Project. The OPS shall be in the form of a Gantt/Bar Chart.

B. Gantt/Bar Chart Schedule

1. Each activity with a duration of five (5) or more days shall be identified by a separate bar. Activities with a duration of more than twenty (20) days shall be sub-divided into separate activities.

2. The schedule shall include activities for shop drawing preparation and review, fabrication, delivery, and installation of major or critical path materials and equipment items.

3. The schedule shall show the proposed start and completion date for each activity. A separate listing of activity start and stop dates and working day requirements shall be provided unless the information is shown in text form on the Gantt/Bar Chart.

4. The schedule shall identify the Notice to Proceed date, the Contract Completion date, major milestone dates, and a critical path.

5. The schedule shall be printed on a maximum 11x17 inch size paper. If the OPS needs to be shown on multiple sheets, a simplified, one page, summary bar chart showing the entire Project shall be provided.

6. The schedule shall have a horizontal time scale based on calendar days and shall identify the Monday of each week.

7. The schedule shall show the precedence relationship for each activity.

1.05 Near Term Schedule (NTS)

A. The CONTRACTOR shall develop and refine a detailed Near Term Schedule (NTS) showing the day to day activities with committed completion dates which must be

performed during the upcoming thirty (30) day period. The detailed schedule shall represent the CONTRACTOR's best approach to the Work which must be accomplished to maintain progress consistent with the Overall Project Schedule (OPS).

B. The NTS shall be in the form of Gantt/Bar chart and shall include a written narrative description of all activities to be performed and describe corrective action to be taken for items that are behind schedule.

C. If regular working hours are to be exceeded, a week advance notice to the ENGINEER shall be given and shall be reflected in the NTS

1.06 Updating

A. Show all changes occurring since previous submission of the updated schedule.

B. Indicate progress of each activity and show actual completion dates.

C. The CONTRACTOR shall be prepared to provide a narrative report at the Project Coordination Meetings. The report shall include the following:

1. A description of the overall Project status and comparison to the OPS.

2. Identify activities which are behind schedule and describe corrective action to be taken.

3. A description of changes or revisions to the Project and their effect on the OPS.

4. A description of the Near Term Schedule of the activities to be completed during the next thirty (30) days. The report shall include a description of all activities requiring participation by the ENGINEER and/or OWNER.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Scope

A. The CONTRACTOR shall furnish all equipment and labor materials required to provide the OWNER with digital construction videos and photographs of the Project. Videos shall be recorded on a compact disc in *DVD Minus R* (DVD-R) format, or on a hard disk drive in a media format deemed acceptable by the ENGINEER.

B. Photo and video files shall become the property of the OWNER and none of the videos or photographs herein shall be published without express permission of the OWNER.

1.02 Pre- and Post-Construction Videos and Photographs

A. Prior to the beginning of any work, the CONTRACTOR shall take project videos and photographs of the work area to record existing conditions. The pre-construction videos and photographs shall be submitted to the ENGINEER within thirty (30) calendar days after the date of receipt by the CONTRACTOR of Notice to Proceed.

B. Following completion of the work, another recording and photos shall be made showing the same areas and features as in the pre-construction videos and photographs. Post-construction videos on each segment shall not be completed any earlier than thirty (30) days following the repairs on each associated areas.

C. Post-construction videos and photographs shall be provided for all sewer systems installed, replaced, or rehabilitated prior to final acceptance of each pipe as indicated in the Project scope. Post-construction videos on each segment shall not be completed any earlier than thirty (30) calendar days following the repairs on each associated segment. Post-construction videos and photographs shall be provided prior to final acceptance of each pipe in the Project scope.

D. All conditions which might later be subject to disagreement shall be shown in sufficient detail to provide a basis for decisions.

1.03 Progress Photographs

A. Photo files shall be provided in *.jpeg* format on compact discs (CD's) or on a portable USB drive, as requested by the ENGINEER/OWNER.

B. The photographs shall include the date and time marking of the recording. All photographs shall be labeled on a tab connected to the bottom of the photo to indicate date and description of work shown.

1.04 Submittals

A. Construction photographs shall be submitted with each payment request.

B. Videos shall be submitted with a log of the items video-taped and referenced to stations and property numbers.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Description

A. Whenever reference is made to conforming to the standards of any technical society, organization, body, code, or standard, it shall be construed to mean the latest standard, code, specification, or tentative specification adopted and published at the time of advertisement for Bids. This shall include the furnishing of materials, testing of materials, fabrication, and installation practices. In those cases where the CONTRACTOR's quality standards establish more stringent quality requirements, the more stringent requirement shall prevail. Such standards are made a part hereof to the extent which is indicated or intended.

B. The inclusion of an organization under one category does not preclude that organization’s standards from applying to another category.

C. In addition, all work shall comply with the applicable requirements of local codes, utilities, and other authorities having jurisdiction.

D. All material and equipment, for which a UL Standard, an AGA, or NSF approval or an ASME requirement is established, shall be so approved and labeled or stamped. The label or stamp shall be conspicuous and not covered, painted, or otherwise obscured from visual inspection.

E. The standards which apply to this Project are not necessarily restricted to those organizations which are listed in Article 1.02.

1.02 Standard Organizations

A. Piping and Valves

ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
DIPRA	Ductile Iron Pipe Research Association
FCI	Fluid Controls Institute

MSS	Manufacturers Standardization Society
NCPI	National Clay Pipe Institute
NSF	National Sanitation Foundation
PPI	Plastic Pipe Institute
Uni-Bell	PVC Pipe Association

B. Materials

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials

C. Painting and Surface Preparation

NACE	National Association of Corrosion Engineers
SSPC	Steel Structures Painting Council

D. Electrical and Instrumentation

AEIC	Association of Edison Illuminating Companies
AIEE	American Institute of Electrical Engineers
EIA	Electronic Industries Association
ICEA	Insulated Cable Engineers Association
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	The Instrumentation, Systems, and Automation Society
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
REA	Rural Electrification Administration
TIA	Telecommunications Industries Association
UL	Underwriter's Laboratories
VRCI	Variable Resistive Components Institute

E. Aluminum

AA	Aluminum Association
AAMA	American Architectural Manufacturers Association

F. Steel and Concrete

ACI	American Concrete Institute
AISC	American Institute of Steel Construction, Inc.
AISI	American Iron and Steel Institute
CRSI	Concrete Reinforcing Steel Institute
NRMA	National Ready-Mix Association
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute

G. Welding

ASME	American Society of Mechanical Engineers
AWS	American Welding Society

H. Government and Technical Organizations

AIA	American Institute of Architects
APHA	American Public Health Association
APWA	American Public Works Association
ASA	American Standards Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASQC	American Society of Quality Control
ASSE	American Society of Sanitary Engineers
CFR	Code of Federal Regulations
CSI	Construction Specifications Institute
EDA	Economic Development Administration
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
FmHA	Farmers Home Administration
FS	Federal Specifications
IAI	International Association of Identification
ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
ITE	Institute of Traffic ENGINEERs
NBFU	National Board of Fire Underwriters
(NFPA)	National Fluid Power Association
NBS	National Bureau of Standards
NISO	National Information Standards Organization

OSHA	Occupational Safety and Health Administration
SI	Salt Institute
SPI	The Society of the Plastics Industry, Inc.
USDC	United States Department of Commerce
WEF	Water Environment Federation

I. General Building Construction

AHA	American Hardboard Association
AHAM	Association of Home Appliance Manufacturers
AITC	American Institute of Timber Construction
APA	American Parquet Association, Inc.
APA	American Plywood Association
BHMA	Builders Hardware Manufacturers Association
BIFMA	Business and Institutional Furniture Manufacturers Association
DHI	Door and Hardware Institute
FM	Factory Mutual Fire Insurance Company
HPMA	Hardwood Plywood Manufacturers Association
HTI	Hand Tools Institute
IME	Institute of Makers of Explosives
ISANTA	International Staple, Nail and Tool Association
ISDSI	Insulated Steel Door Systems Institute
IWS	Insect Screening Weavers Association
MBMA	Metal Building Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NAGDM	National Association of Garage Door Manufacturers
NCCLS	National Committee for Clinical Laboratory Standards
NFPA	National Fire Protection Association
NFSA	National Fertilizer Solutions Association
NKCA	National Kitchen Cabinet Association
NWMA	National Woodwork Manufacturers Association
NWWDA	National Wood Window and Door Association
RMA	Rubber Manufacturers Association
SBC	SBCC Standard Building Code
SDI	Steel Door Institute
SIA	Scaffold Industry Association
SMA	Screen Manufacturers Association
SPRI	Single-Ply Roofing Institute
TCA	Tile Council of America
UBC	Uniform Building Code

J. Roadways

AREA	American Railway Engineering Association
DOT	Department of Transportation

K. Plumbing

AGA	American Gas Association
NSF	National Sanitation Foundation
PDI	Plumbing Drainage Institute
SPC	SBCC Standard Plumbing Code

L. Refrigeration, Heating, and Air Conditioning

AMCA	Air Movement and Control Association
ARI	American Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
CGA	Compressed Gas Association
CTI	Cooling Tower Institute
HEI	Heat Exchange Institute
IIAR	International Institute of Ammonia Refrigeration
NB	National Board of Boilers and Pressure Vessel Inspectors
PFMA	Power Fan Manufacturers Association
SAE	Society of Automotive Engineers
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SMC	SBCC Standard Mechanical Code
TEMA	Tubular Exchangers Manufacturers Association

M. Equipment

AFBMA	Anti-Friction Bearing Manufacturers Association, Inc.
AGMA	American Gear Manufacturers Association
ALI	Automotive Lift Institute
CEMA	Conveyor Equipment Manufacturers Association
CMAA	Crane Manufacturers Association of America
DEMA	Diesel Engine Manufacturers Association
MMA	Monorail Manufacturers Association
OPEI	Outdoor Power Equipment Institute, Inc.
PTI	Power Tool Institute, Inc.

RIA	Robotic Industries Association
SAMA	Scientific Apparatus Makers Association

1.03 Symbols

Symbols and material legends shall be as scheduled on the Drawings.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Scope

A. This Section includes testing which the OWNER may require, beyond that testing required of the manufacturer, to determine if materials provided for the Project meet the requirements of these Specifications.

B. This work also includes all testing required by the OWNER to verify work performed by the CONTRACTOR is in accordance with the requirements of these Specifications, i.e., concrete strength and slump testing, soil compaction, etc.

C. This work does not include materials testing required in various sections of these Specifications to be performed by the manufacturer, e.g., testing of pipe.

D. The testing laboratory or laboratories will be selected by the OWNER. The testing laboratory or laboratories will work for the OWNER.

1.02 Payment for Testing Services

A. The cost of testing services required by the Contract to be provided by the CONTRACTOR shall be paid for by the OWNER through the CASH ALLOWANCE, *i.e.*, concrete testing, soil compaction, and asphalt testing.

B. The cost of additional testing services not specifically required in the Specifications, but requested by the OWNER or ENGINEER, shall be paid for by the OWNER through the CASH ALLOWANCE.

C. The cost of material testing described in various sections of these Specifications or as required in referenced standards to be provided by a material manufacturer, shall be included in the price bid for that item and shall not be paid for by the OWNER.

D. The cost of retesting any item that fails to meet the requirements of these Specifications shall be paid for by the CONTRACTOR. Retesting shall be performed by the testing laboratory working for the OWNER.

1.03 Laboratory Duties

A. Cooperate with the OWNER, ENGINEER, and CONTRACTOR.

B. Provide qualified personnel promptly on notice.

C. Perform specified inspections, sampling and testing of materials.

1. Comply with specified standards, ASTM, other recognized authorities, and as specified.

2. Ascertain compliance with requirements of the Contract Documents.

D. Promptly notify the ENGINEER and CONTRACTOR of irregularity or deficiency of work which are observed during performance of services.

E. Promptly submit three (3) copies (two [2] copies to the ENGINEER and one [1] copy to the CONTRACTOR) of report of inspections and tests in addition to those additional copies required by the CONTRACTOR with the following information included:

1. Date issued

2. Project title and number

3. Testing laboratory name and address

4. Name and signature of inspector

5. Date of inspection or sampling

6. Record of temperature and weather

7. Date of test

8. Identification of product and Specification section

9. Location of Project

10. Type of inspection or test

11. Results of test

12. Observations regarding compliance with the Contract Documents

F. Perform additional services as required.

G. The laboratory is not authorized to release, revoke, alter, or enlarge on requirements of the Contract Documents, or approve or accept any portion of the Work.

1.04 Contractor Responsibilities

A. Cooperate with laboratory personnel; provide access to Work and/or manufacturer's requirements.

B. Provide to the laboratory, representative samples, in required quantities, of materials to be tested.

C. Furnish copies of mill test reports.

D. Furnish required labor and facilities to:

1. Provide access to Work to be tested;

2. Obtain and handle samples at the site;

3. Facilitate inspections and tests;

4. Build or furnish a holding box for concrete cylinders or other samples as required by the laboratory.

E. Notify the laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.

F. Laboratory Tests: Where such inspection and testing are to be conducted by an independent laboratory agency, the sample(s) shall be selected by such laboratory or agency, or the ENGINEER, and shipped to the laboratory by the CONTRACTOR at CONTRACTOR's expense.

G. Copies of all correspondence between the CONTRACTOR and testing agencies shall be provided to the ENGINEER.

1.05 Quality Assurance

Testing shall be in accordance with all pertinent codes and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM).

1.06 Product Handling

Promptly process and distribute all required copies of test reports and related instructions to insure all necessary retesting or replacement of materials with the least possible delay in the progress of the Work.

1.07 Furnishing Materials

The CONTRACTOR shall be responsible for furnishing all materials necessary for testing.

1.08 Code Compliance Testing

Inspections and tests required by codes or ordinances or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of, and shall be paid for by the CONTRACTOR, unless otherwise provided in the Contract Documents.

1.09 Contractor's Convenience Testing

Inspection or testing performed exclusively for the CONTRACTOR's convenience shall be the sole responsibility of the CONTRACTOR.

1.10 Schedules for Testing

A. Establishing Schedule

1. The CONTRACTOR shall, by advance discussion with the testing laboratory selected by the OWNER, determine the time required for the laboratory to perform its tests and to issue each of its findings, and make all arrangements for the testing laboratory to be on site to provide the required testing.

2. Provide all required time within the construction schedule.

B. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the testing laboratory as required.

C. When the testing laboratory is ready to test according to the determined schedule,

but is prevented from testing or taking specimens due to incompleteness of the Work, all extra costs for testing attributable to the delay will be back-charged to the CONTRACTOR and shall not be borne by the OWNER.

1.11 Taking Specimens

Unless otherwise provided in the Contract Documents, all specimens and samples for tests will be taken by the testing laboratory or the ENGINEER.

1.12 Transporting Samples

The CONTRACTOR shall be responsible for transporting all samples, except those taken by testing laboratory personnel, to the testing laboratory.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Scope

A. The Work to be performed shall consist of the development, implementation, maintaining, relocating, and removing temporary traffic control devices and services as required by the traffic control plan (TCP) and as required for the purpose of safely directing traffic through construction zones.

B. Preparation and submittal for the maintenance of traffic applications and approvals to and by the governing body having jurisdiction over the right-of-way is the responsibility of the CONTRACTOR prior to any construction in the public right-of-way and through the project work zone for work affected by the Contractor's operations.

C. The Work to be performed under this Section will conform to Part VI of the Manual on Uniform Traffic Control Devices (MUTCD) and shall be subject to local codes, policies, and regulations of the agency having jurisdiction over the area where the Work is performed.

Part 2 Products

2.01 Temporary Traffic Control Devices (TCD)

A. All signage, channeling devices, arrow displays, lighting devices, traffic control signals, and other traffic control devices shall conform to the design requirements contained in the MUTCD, Part VI which specifically govern such features as size, contrast, colors, shape, composition, use of symbols, etc.

B. Sign sheeting material for all temporary construction signing shall be Type B or better, Fluorescent Orange color meeting the requirements of AASHTO M 268.

C. Sign supports shall be steel post meeting TDOT Specifications, Section 916.

D. Unless otherwise specified, the material for pavement marking line shall be either temporary pavement marking tape, or reflectorized paint with raised reflective pavement markers placed as indicated in the Drawings.

E. All temporary cones shall be a minimum of 28 inches high and weighted at the

base.

F. All temporary drums shall be flexible non-metallic drums meeting Part VI of the Manual on Uniform Traffic Control Devices, Section 6F.67, Drums.

G. All barricades shall be portable barricades meeting Part VI of the Manual on Uniform Traffic Control Devices, Section 6F.68, Type 1, 2, or 3 Barricades.

Part 3 Execution

3.01 Traffic Control Plan (TCP)

A. CONTRACTOR shall have a TCP prepared by a qualified Professional Engineer practicing in the State of Tennessee and submit to the agency having jurisdiction for all of the work requiring maintenance of traffic.

B. CONTRACTOR shall obtain all necessary permits required for implementation of the TCP in coordination with the authorities having jurisdiction prior to any construction in public right-of-ways.

C. CONTRACTOR shall install and maintain temporary traffic control devices and all advanced warning signage in accordance with the approved TCP and the MUTCD prior to the start of construction operations affecting the flow of traffic.

3.02 Traffic Control Devices (TCD)

A. Furnish and place Traffic Control Devices before the start of construction operations within public right-of-way or locations where public traffic will be impacted by the work.

B. Install only those Traffic Control Devices needed for each stage or phase of construction as required by the TCP and the MUTCD.

C. When the TCP requires, provide flagmen or traffic control officers who are trained and equipped in accordance with the requirements of Part VI of the MUTCD.

D. Flaggers shall use Type III or Type IV retro reflective Stop/Slow paddles. Use of flags is prohibited unless it is an emergency situation in low-speed, low-volume locations, which can best be controlled by a single flagger.

E. The flagger or traffic control officer shall wear a retro reflective vest at all times during traffic control operations.

F. Relocate temporary or permanent Traffic Control Devices as required by the phasing of the Work. Remove devices that no longer apply to the Work in progress.

G. Temporarily cover signs when they are not applicable to current conditions.

H. Immediately clean, service, or replace any Traffic Control Device that is defaced, damaged, or when its retro reflectivity is reduced due to fading, dirt, etc. Keep all temporary Traffic Control Devices clean and serviceable.

I. Maintain Traffic Control Devices 24 hours a day with adequate barricades, lights, arrows, etc. to protect the public from traffic hazards and accidents as need for to complete the work affected by Contractor's operations.

J. Use flares and/or lights during times of low visibility to delineate traffic lanes and to guide traffic as needed.

K. Remove all temporary Traffic Control Devices upon completion of the Work and repair all damage caused by their installation.

END OF SECTION

Part 1 General

1.01 Scope

Limit blowing dust caused by construction operations by applying water or employing other appropriate means or methods to maintain dust control, subject to the approval of the OWNER. As a minimum, this may require the use of a water wagon two (2) times per day to suppress dusty conditions.

1.02 Protection of Adjacent Property

A. The Bidders shall visit the site and note the buildings, landscaping, roads, parking areas, and other facilities near the Work site that may be damaged by their operations. The CONTRACTOR shall make adequate provision to fully protect the surrounding area and will be held fully responsible for all damages resulting from CONTRACTOR's operations.

B. Protect all existing facilities (indoors or out) from damage by dust, fumes, spray, or spills (indoors or out). Protect motors, bearings, electrical gear, instrumentation, and building or other surfaces from dirt, dust, welding fumes, paint spray, spills, or droppings causing wear, corrosion, malfunction, failure, or defacement by enclosure, sprinkling, or other dust palliatives, masking and covering, exhausting, or containment.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Barricades, Lights, and Signals

A. The CONTRACTOR shall furnish and erect such barricades, fences, lights, and danger signals, and shall provide such other precautionary measures for the protection of persons or property and of the Work as necessary. Barricades shall be painted in a color that will be visible at night. From sunset to sunrise, the CONTRACTOR shall furnish and maintain at least one (1) warning light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any Work under construction. Warning lights where multiple barricades have been installed shall be setup in alternating “steady-burn” and ‘flashing” modes for increased visibility.

B. All barricades, lights, and signals to be used in areas for the maintenance of traffic shall be in conformance to portable barricades and signals meeting Part VI of the Manual on Uniform Traffic Control Devices, Section 6F.68, Type 1, 2, or 3 Barricades or as required by authority having jurisdiction for traffic control.

C. The CONTRACTOR will be held responsible for all damage to the Work due to failure of barricades, signs, and lights, and whenever evidence is found of such damage, the CONTRACTOR shall immediately remove the damaged portion and replace it at CONTRACTOR's cost and expense. The CONTRACTOR's responsibility for the maintenance of barricades, signs, and lights shall not cease until the Project has been accepted by the OWNER.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Scope

A. Submittals

1. Provide and maintain temporary and permanent erosion and sedimentation controls as shown on the Drawings. This Section also specifies the subsequent removal of temporary erosion and sedimentation controls.

2. Temporary and permanent erosion and sedimentation controls include grassing and mulching of disturbed areas and structural barriers at those locations which will ensure that erosion during construction will be maintained within acceptable limits. Acceptable limits are as established by Section 402 of the Federal Clean Water Act, and applicable codes, ordinances, rules, regulations, and laws of local and municipal authorities having jurisdiction. If a Storm Water Pollution Prevention Plan (SWPPP) is obtained for this project, all erosion and sedimentation controls contained in it shall be followed.

3. Submit product data in accordance with the requirements of *Section 013000 – Administrative Requirements* of these Specifications.

4. At the Preconstruction Conference, submit a written plan for both temporary and permanent grassing. The plan shall include selection of species, dates, and rates of application for seeding, fertilizer, and mulching. No work shall be started until the erosion and sedimentation control schedule and methods of operation have been approved by the ENGINEER.

B. Related Work:

1. Section 013000 – Administrative Requirements

2. Section 329219 – Seeding

C. Basic Principles

1. The CONTRACTOR is responsible for inspecting and maintaining all existing erosion and sedimentation control measures.

2. Conduct the earthwork and excavation activities in such a manner to fit the topography, soil type, and condition.

3. Minimize the disturbed area and the duration of exposure to erosion elements.

4. Stabilize disturbed areas immediately.

5. Safely convey run-off from the site to an outlet such that erosion will not be increased off site.

6. Retain sediment on site that was generated on site.

7. Minimize encroachment upon watercourses.

D. Construction Requirements

1. The ENGINEER has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, the surface of erodible earth material exposed by excavation, borrow and fill operations and to direct the CONTRACTOR to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, or other water impoundment. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be seeded and mulched as the excavation proceeds.

2. The CONTRACTOR shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in his accepted schedule. Temporary pollution control measures shall be used to correct conditions that develop during construction that were not foreseen during the design state; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices but are not associated with permanent control features on the project.

3. Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit, otherwise erosion control measures may be

required between successive construction stages.

4. The ENGINEER will limit the area of excavation, borrow, and embankment operations in progress commensurate with the CONTRACTOR's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

5. Under no condition shall the amount of surface area or erodible earth material exposed at one time be excavation or fill within the project area exceed two-hundred seventeen-thousand square feet (217,000 ft^2), five (5) acres, without prior approval by the ENGINEER.

6. The ENGINEER may increase or decrease the amount of surface area of erodible earth material to be exposed at one time by clearing and grubbing, excavation, and borrow and fill operations as determined by his analysis of project conditions.

7. In the event of conflict between these requirements and pollution control laws, rules, or regulations or other Federal, State, or Local agencies, the more restrictive laws, rules, or regulations shall apply.

E. Implementation

1. The erosion and sedimentation control measures shown on the Drawings are minimal requirements. The CONTRACTOR's methods of operation may dictate additional erosion and sedimentation control measures not shown on the Drawings which shall be the CONTRACTOR's responsibility to determine and install said measures. The CONTRACTOR's failure to stabilize disturbed areas immediately following intermediate or final grading may dictate additional erosion and sedimentation control measures not shown on the Drawings which shall be the CONTRACTOR's responsibility to determine and install said measures.

2. The CONTRACTOR shall notify the ENGINEER of any changes and/or additions to the erosion and sedimentation control plan necessary to accommodate the CONTRACTOR's methods of operation. No additional payment shall be made for erosion and sedimentation control measures made necessary by the CONTRACTOR's methods of operation.

3. The CONTRACTOR shall be solely responsible for control of erosion within the Project site and prevention of sedimentation of any adjacent waterways.

4. The CONTRACTOR shall install controls which will ensure that stormwater and drainage from the disturbed area of the Project site shall pass through some type of filter system before being discharged. The filter system must meet the requirements of the Tennessee Department of Environment & Conservation (TDEC).

F. Temporary Erosion and Sedimentation Control: In general, temporary erosion and sedimentation control procedures shall be directed toward:

1. Preventing soil erosion at the source.

2. Preventing silt and sediment from entering any waterway if soil erosion cannot be prevented.

3. Preventing silt and sediment from migrating downstream in the event it cannot be prevented from entering the waterway.

G. Permanent Erosion Control: Permanent erosion control measures shall be implemented to prevent sedimentation of the waterways and to prevent erosion of the Project site.

1.02 Quality Assurance

A. General: Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated herein and these Specifications.

B. Conflicts: Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.

Part 2 Products

2.01 Temporary Erosion and Sedimentation Control Materials

A. Silt Fence

1. Silt fence shall be polymer type netting with a built-in cord running throughout the top edge of the fabric. Posts shall be either steel or pressure treated fir, southern pine, or hemlock, and shall be spaced not more than six feet (6') on center. Silt fence shall be provided with netting to provide reinforcing when necessary. Silt fence shall have an Equivalent Opening Size (EOS) of forty (40) to one hundred (100). Silt fence fabric shall have a maximum permeability of forty gallons per minute per square foot (40 gpm/ft^2).

2. Silt fence fabric shall be equal to Mirafi 100X, Amoco 1380, or Exxon GTF-100 Series.

B. Straw bales shall be clean, seed free, cereal straw type containing five cubic feet (5 ft^3) or more of material. Straw erosion checks shall be embedded in the ground four to six inches (4" to 6") to prevent water flowing under them. The bales shall also be anchored securely to the ground by wooden stakes driven through the bales into the ground. Bales shall be removed after they have served their purpose and the area is stabilized. The CONTRACTOR shall keep the checks in good condition by replacing broken or damaged bales immediately after damage occurs. Normal debris clean-out will be considered routine maintenance.

C. Netting shall be one-half inch (½") galvanized steel, chicken wire mesh.

D. Filter stone shall be crushed stone conforming to Tennessee Department of Transportation (TDOT) Specifications, mineral aggregate size 57.

E. Concrete block shall be hollow, non-load-bearing type.

F. Plywood shall be three-fourth inch (3/4") thick exterior type.

G. Erosion Control Matting shall be North American Green S-75 or approved equal.

2.02 Riprap

A. Stone Riprap: Use sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Specific gravity shall be 2.0 or greater. Riprap shall have less than sixty-six percent (66%) wear when tested in accordance with AASHTO T-96. Unless shown or specified otherwise, stone riprap shall be Type A-1 riprap.

1. Type A-1 Machined Riprap: The pieces shall vary in size from two inches (2")

to 1.25 feet, with no more than twenty percent (20%) by weight being less than four inches (4”). The thickness of the stone layer shall be 1.5 feet with a tolerance of three inches (3”).

2. Type A-2 Machined Riprap: Shall be identical to Class A-1 except that hand placed rubble stone riprap placed one foot (1’) thick may be substituted for 1.5 feet of machined riprap.

3. Type A-3 Machined Riprap: Shall vary in size from two inches (2”) to six inches (6”), with no more than twenty percent (20%) by weight being less than four inches (4”).

4. Type B machined riprap shall vary in size from three inches (3”) to twenty-seven inches (27”), with no more than twenty percent (20%) by weight being less than six inches (6”).

5. Type C machined riprap shall vary in size from five inches (5”) to thirty-six inches (36”), with no more than twenty percent (20%) by weight being less than nine inches (9”)

2.03 Filter Fabric

A. The filter fabric for use under riprap shall be a monofilament, polypropylene woven fabric meeting the specifications as established by Task Force 25 for the Federal Highway Administration. The filter fabric shall have an equivalent opening size (EOS) of seventy (70).

B. Filter fabric shall meet the requirements of Trivera Spunbound 011/280, Mirafi 180N, or Amoco 4553.

2.04 Riparian Live Stakes

A. When required, placement of Riparian Live Stakes shall consist of the harvest, transport, maintenance, and installation of live stake materials into the bank from low flow to bank-full at hydraulic structures and locations specified within the Plans or as directed by the ENGINEER

B. Live Stakes for this item shall be a mixture of species specified within the Plans and the ENGINEER. Live cuttings for live stakes shall be 0.5 to 1.5 inches in diameter and two to three feet (2’-3’) in length. Side branches shall be removed and the bark left intact prior

to installation. Buds on the stakes shall be oriented in an upward position. The basal ends shall be tapered to a point for easy insertion into the soil. The top shall be cut smooth and square to the length of the stake.

C. Source and Supplier Requirements – The source of all live cuttings shall be from purchased stock, located on-site, or within twenty-five (25) miles of the project site. If the CONTRACTOR is unable to locate sufficient harvesting sites for the live stakes, the CONTRACTOR may, upon approval from the ENGINEER, purchase live branch material from a state-certified nursery or other source approved by the ENGINEER. The material shall meet all of the specifications found in this section.

D. Substitutions – Any proposed species substitutions or changes in percent composition of species shall require prior written approval by the ENGINEER. Only specified plant species will be accepted. No cultivated varieties (cultivars) are acceptable.

Part 3 Execution

3.01 General

Standards: Provide all materials and promptly take all actions necessary to achieve effective erosion and sedimentation control in accordance with the Tennessee Department of Environment & Conservation (TDEC), local enforcing agency guidelines, and these Specifications.

3.02 Temporary Erosion and Sedimentation Control

A. Temporary erosion and sedimentation control procedures should be initially directed toward preventing silt and sediment from leaving the construction area. The preferred method is to provide an undisturbed natural buffer, extending a minimal twenty-five feet (25') from the top of the bank, to filter the run-off. Should this buffer prove infeasible due to construction activities being too close to the creek, or if the amount of sediment overwhelms the buffer, the CONTRACTOR shall place silt fences to filter the run-off and, if necessary, place permanent riprap to stabilize the creek banks.

When excavation activities disturb the previously stated preventative measures, or if they are not maintained, or whenever the construction activities cross the creeks, the check dams shall be installed downstream and within two-hundred feet (200') of the affected area.

B. Construction Exits, Silt dams, silt fences, traps, barriers, check dams, appurtenances,

and other temporary measures and devices shall be installed as indicated on the approved plans and working drawings, shall be maintained until no longer needed, and shall then be removed. Deteriorated hay bales and dislodged filter stone shall be replaced with new materials. Sedimentation basins or sediment traps, if constructed, shall be maintained in a condition ensuring that unfiltered water will not leave the pond.

C. Where permanent grassing is not appropriate, and where the CONTRACTOR's temporary erosion and sedimentation control practices are inadequate, the ENGINEER may direct the CONTRACTOR to provide temporary vegetative cover with fast growing seedings. Such temporary vegetative cover shall be provided by the CONTRACTOR in compliance with the Tennessee Department of Environment & Conservation (TDEC), specifically in the selection of species, planting dates, and application rates for seedings, fertilizer, and mulching, with the exception that kudzu shall not be permitted. All disturbed earthen areas not stabilized by temporary or permanent erosion control measures shall receive temporary vegetative cover within 14-calendar days of last disturbance as required per TDEC’s regulations.

D. All erosion and sedimentation control devices, including check dams, shall be inspected by the CONTRACTOR at least bi-weekly and after each rainfall occurrence, and cleaned out and repaired by the CONTRACTOR as necessary.

E. Temporary erosion and sedimentation control devices shall be installed and maintained from the initial land disturbance activity until the satisfactory completion and establishment of permanent erosion control measures. At that time, temporary devices shall be removed.

3.03 Permanent Erosion Control

A. Permanent erosion control shall include:

1. Restoring the work site to its original contours, unless shown otherwise on the Drawings or directed by the ENGINEER.

2. Permanent vegetative cover shall be performed in accordance with Article 3.05 of this Section.

3. Permanent stabilization of steep slopes and creeks shall be performed in accordance with Article 3.04 of this Section.

B. Permanent erosion control measures shall be implemented as soon as practical after the completion of pipe installation or land disturbance for each segment of the Project. In no event shall implementation be postponed when no further construction activities will impact that portion or segment of the Project. Partial payment requests may be withheld for those portions of the Project not complying with this requirement.

3.04 Riparian Live Stakes

A. Schedule and Conditions – The harvest and installation of live stakes shall be performed only during the dormant season between November 1 and March 31, or as directed by the ENGINEER. When special conditions warrant a variance to the planting operations, proposed planting times shall be submitted for approval by the ENGINEER.

B. Harvesting The CONTRACTOR shall notify the ENGINEER seventy-two (72) hours prior to harvesting to review and approve all harvesting sites. The CONTRACTOR shall locate, flag, and code the live cutting sites. Upon approval by the ENGINEER, the CONTRACTOR shall be responsible for harvesting and transporting the cuttings to the job site.

C. Protection During Delivery – Live materials must be protected against drying out and overheating before/during transport (*e.g.*, they shall be covered, transported in unheated vehicles, moistened, kept in soak pits).

D. Inspection – All materials and construction techniques shall be inspected and approved by the ENGINEER prior to installation.

E. Storage - Live materials must be protected against drying out and overheating on-site prior to installation (*e.g.*, by storing in controlled conditions, storing in shade, covering with evergreen branches or plastic, placing in moist soil, or spraying with anti-transparent chemicals). Live materials shall receive continuous shade, shall be sheltered from the wind, and shall be continuously protected from drying by being heeled into moist soils. Where water is available, live cuttings shall be sprayed or immersed. Warm water (over one-hundred-fifty degrees Fahrenheit [150° F]) stimulates growth and should be used only upon the approval of the ENGINEER. Any costs associated with such storage are incidental to the overall unit costs. Live materials shall be installed the same day that the cuttings are harvested. If installation of live materials cannot be accomplished on the same day and storage is required, live materials shall be stored for a period no longer than two (2) days. Any storage of live materials must be approved by the ENGINEER prior to storing.

F. Installation

1. Planting Area – Live stakes shall be installed in areas specified by the Plans and the ENGINEER. In general, live stakes are planted on stream banks at an elevation no higher than bankfull and no lower than the low-flow water surface. Live stakes shall not be planted on the inside bank of meander bends.

2. Installation – Drive live stakes through the erosion control fabric and into the ground so that eighty percent (80%) of the stake is below the ground surface. The CONTRACTOR shall use a dead-pan hammer for driving the stake directly into the ground or drive a pilot hole, smaller in diameter then the live stake, and then driving the live stake into the pilot hole. Stagger the live stakes in a random pattern throughout the specified planting area at the density specified by the Plans and the ENGINEER. Live stakes shall be installed above the low flow water surface and below bankfull elevation. All live stakes split during installation may be left in place, but must be supplemented with a new live stake that remains un-split after installation.

3. Establishment Commencement – The period of care and replacement shall begin after inspection and approval of the initial installation of all live stakes, and continue for one (1) year, with one (1) potential replacement period.

G. Warranty – The CONTRACTOR shall provide a period of care and replacement after inspection and approval of the initial installation of all live stakes, continuing for one (1) year, with one (1) potential replacement period. This shall consist of eighty-five percent (85%) care and replacement warranty for all live stakes. Replacement of live stakes shall be conducted in accordance with the materials and construction methods shown in these specifications. The CONTRACTOR will not be responsible for live stakes that have been damaged by vandalism, fire, flooding, wildlife predation, or other activities beyond the CONTRACTOR'S control.

3.05 Grassing

A. General

1. All references to grassing, unless noted otherwise, shall relate to establishing permanent vegetative cover as specified herein or shown on the Drawings for seeding, fertilizing, mulching, etc.

2. When final grade has been established, all bare soil, unless otherwise required by the Contract Documents, shall be seeded, fertilized and mulched in an effort to restore to a protected condition. Critical areas shall be sodded as approved or directed by the ENGINEER.

3. Specified permanent grassing shall be performed at the first appropriate season following establishment of final grading in each section of the site.

4. Permanent grassing shall be of a perennial species.

B. Replant grass removed or damaged in residential areas using the same variety of grass and at the first appropriate season. Where sod is removed or damaged, replant such areas using sod of the same species of grass at the first appropriate season. Outside of residential or landscaped areas, grass the entire area disturbed by the work on completion of work in any area. In all areas, promptly establish successful stands of grass.

C. Grassing activities shall comply with the Tennessee Department of Environment & Conservation (TDEC) best management practices as required by the current edition of the *Tennessee Erosion and Sediment Control Handbook* for permanent and temporary vegetation cover, specifically for the selection of species with the exception that kudzu shall not be permitted, planting dates, topsoiling and seedbed preparation, and application rates for seeding, fertilizer, mulching, and watering. Where permanent vegetative cover (grassing) cannot be immediately established (due to season or other circumstances), the CONTRACTOR shall provide temporary vegetative cover. The CONTRACTOR must return to the site (at the appropriate season) to install permanent vegetation in areas that have received temporary vegetative cover.

3.06 Riprap

A. Unless shown otherwise on the Drawings, riprap shall be placed where ordered by the ENGINEER, at all points where banks of streams or drainage ditches are disturbed by excavation, or at all points where natural vegetation is removed from banks of the streams or drainage ditches. Carefully compact backfill and place riprap to prevent subsequent settlement and erosion. This requirement applies equally to construction alongside a stream or drainage ditch as well as crossing a stream or drainage ditch.

B. When trenching across a creek, place riprap a distance of ten feet (10’) upstream and

ten feet (10') downstream from the top of the trench excavation. Place riprap across creek bottom, across creek banks, and extend riprap placement five feet (5') beyond the top of each creek bank.

C. Preparation of Foundations: The ground surface upon which the riprap is to be placed shall be brought in reasonably close conformity to the correct lines and grades before placement is commenced. Where filling of depressions is required, the new material shall be compacted with hand or mechanical tampers. Unless at creek banks or otherwise shown or specified, riprap shall begin in a toe ditch constructed in original ground around the toe of the fill or the cut slope. The toe ditch shall be two feet (2') deep in original ground, and the side next to the fill or cut shall have that same slope. After the riprap is placed, the toe ditch shall be backfilled and the excess dirt spread neatly within the construction easement.

D. Placement of Filter Fabric: The surface to receive fabric shall be prepared to a relatively smooth condition free from obstructions, depressions, and debris.

1. The fabric shall be placed with the long dimension running up the slope, and shall be placed to provide a minimum number of overlaps. The strips shall be placed to provide a minimum width of one foot (1') of overlap for each joint. The filter fabric shall be anchored in place with securing pins of the type recommended by the fabric manufacturer. Pins shall be placed on or within three inches (3") of the centerline of the overlap.

2. The fabric shall be placed so that the upstream strip overlaps the downstream strip. The fabric shall be placed loosely so as to give and therefore avoid stretching and tearing during placement of the stones. The stones shall be dropped no more than three feet (3') during construction. The fabric shall be protected at all times during construction from clogging due to clay, silts, chemicals, or other contaminants. Any contaminated fabric or any fabric damaged during its installation or during placement of riprap shall be removed and replaced with uncontaminated and undamaged fabric at no expense to the OWNER.

E. Placement of Riprap: The riprap shall be placed on a six inch (6") layer of soil, crushed stone or sand overlaying the filter fabric. This six inch (6") layer shall be placed to maximize the contact between the soil beneath the filter fabric and the filter fabric. Riprap shall be placed with its top elevation conforming with the finished grade or the natural slope of the stream bank and stream bottom.

F. Stone Riprap: Stone riprap shall be dumped into place to form a uniform surface and

to the thickness specified on the Drawings. The thickness tolerance for the course shall be minus-six inches (-6”) and plus-twelve inches (+12”). If the Drawings or the Bid do not specify a thickness, the course shall be placed to a thickness of not less than eighteen inches (18”).

3.07 Maintenance

A. The temporary erosion control features installed by the CONTRACTOR shall be maintained by the CONTRACTOR until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the CONTRACTOR.

B. In the event that temporary erosion and pollution control measures are required due to the CONTRACTOR’s negligence, carelessness, or failure to install permanent controls as a part of work as scheduled, such work shall be performed by the CONTRACTOR at his own expense.

END OF SECTION

Part 1 General

1.01 Scope

The CONTRACTOR shall make provisions for transportation of all equipment, materials, and products furnished under these Contracts Documents to the site of the work. In addition, the CONTRACTOR shall provide preparation for shipment and storage, unloading, handling and re-handling, short term storage, extended storage, storage facilities, maintenance, and protection during storage, preparation for installation, and all other work and incidental items necessary or convenient to the CONTRACTOR for the satisfactory prosecution and completion of the work.

1.02 Transportation

A. All equipment shall be suitably boxed, crated, or otherwise protected during transportation.

B. All equipment shall be shipped and delivered in the largest assembled sections practical or permitted by carrier regulations to minimize the number of field connections.

C. The CONTRACTOR shall be responsible for ensuring that the equipment is assembled and transported in such a manner so as to clear buildings, power lines, bridges, and similar structures encountered during shipment or delivery to the site of the work.

D. Where equipment will be installed using existing cranes or hoisting equipment, the CONTRACTOR shall ensure that the weights of the assemble sections do not exceed the capacity of the cranes or hoisting equipment.

E. Small items and appurtenances such as gauges, valves, switches, instruments, and probes which could be damaged during shipment shall be removed from the equipment prior to shipment and packaged and shipped separately. All openings shall be plugged or sealed to prevent the entrance of water or dirt.

F. Temporary shipping braces and supports shall be painted orange or yellow for easy Identification.

1.03 Handling

A. All equipment, materials, and products shall be carefully handled to prevent damage or excessive deflections during unloading or transportation. All equipment, materials, and products damaged during transportation or handling shall be repaired or replaced by the CONTRACTOR at no additional cost to the OWNER prior to being incorporated into the work.

B. Lifting and handling drawings and instructions furnished by the manufacturer or supplier shall be strictly followed. Eyebolts or lifting lugs furnished on the equipment shall be used in handling the equipment. Shafts and operating mechanisms shall not be used as lifting points. Spreader bars or lifting beams shall be used when the distance between lifting points exceeds that permitted by standard industry practice. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.

C. Under no circumstances shall equipment or products, such as pipe structural steel, casting, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground.

D. Items such as nonmetallic pipe, nonmetallic conduit, flagpoles, and lighting poles shall be handled using nonmetallic slings or straps.

E. Plastic pipe and fittings shall not be exposed to direct sunlight for an extended period of time, (if more than one [1] year, see Specifications,) as specified by the manufacturer of these materials.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Scope

Equipment and materials used in the project shall be received inspected, unloaded, handled, stored, maintained, and protected by the CONTRACTOR in a suitable location on or off site, if necessary, until such time as installation is required.

1.02 Storage

A. The CONTRACTOR shall be responsible for providing satisfactory storage facilities which are acceptable to the ENGINEER. In the event that satisfactory facilities cannot be provided on site, a bonded warehouse, acceptable to the OWNER and ENGINEER, will be provided by the CONTRACTOR for such time until the equipment, materials, and products can be accommodated at the site.

B. Original unaltered invoices from manufacturers and suppliers must be presented with the pay request, with no erasures, white-outs or other alterations. Payment will be authorized for no more than the amounts of the invoices (material, freights and taxes). The subcontractor shall submit his requests for payment to the General CONTRACTOR. The General CONTRACTOR will review and, if acceptable, will include the request on the monthly Application for Payment from the General CONTRACTOR to the OWNER submitted through the ENGINEER for review and approval.

C. Each request for payment which includes amounts for materials or equipment stored off-site in a bonded warehouse in said County of the project, and must have an original Certificate of Insurance attached to the request for payment stating on the face of the original Certificate of Insurance a description of the insured stored material, the name and address of the bonded warehouse, and naming the General CONTRACTOR, the OWNER, and the OWNER's Agents, each as Certificate Holders, each as Additional Insureds and each as Loss Payee for the said material at the said location.

D. Materials and Equipment that are properly and securely stored: 1) on the project site, or (2) in a bonded warehouse in said County of the project, will be eligible to be included on an application for payment. "Materials" and "Equipment" are defined as items which have been manufactured or fabricated to the point they are

ready for delivery to the Project Site and ready for installation, but the CONTRACTOR has chosen for his own purposes to delay their delivery and installation.

E. For example: Such Materials and Equipment would include assembled cabinets and casework, but would not include unassembled panels and other components to be used in fabricating cabinets and casework; such Materials and Equipment would also include the structural and miscellaneous steel which has been punched, drilled, fitted, and otherwise uniquely fabricated for this project, but would not include steel shapes which have not been through the fabricator's shop; such Materials and Equipment would not include lumber and plywood for the purpose of constructing formwork, but would include lumber and plywood to be incorporated as part of the building construction as framing and decking.

F. The CONTRACTOR shall be responsible for the maintenance and protection of all equipment, materials, and products placed in storage, and shall bear all costs of storage, preparation for transportation, transportation, re-handling, and preparation for installation.

G. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending between supports. Items such as pipe, structural steel, and sheet construction products shall be stored with one end elevated to facilitate drainage.

H. Unless otherwise permitted in writing by the ENGINEER, building products and materials such as cement, grout, plaster, gypsum board, particleboard, resilient flooring, acoustical tile, paneling, finish lumber, insulation, wiring, etc. shall be stored indoors in a dry location. Building products such as rough lumber, plywood, concrete block, and structural tile may be stored outdoors under a properly secured waterproof covering.

I. Tarps and other covering shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation. Tarps and covers shall be arranged to prevent ponding of water.

1.03 Extended Storage

In the event that certain items of major equipment such as air compressors, pumps, and mechanical aerators have to be stored for an extended period of time, the CONTRACTOR shall provide satisfactory long-term storage facilities which are acceptable to the

ENGINEER. The CONTRACTOR shall provide all special packaging, protection coverings, protective coatings, power, nitrogen purge, desiccants, lubricants, and exercising necessary or recommended by the manufacturer to properly maintain and protect the equipment during the period of extended storage.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Scope

This section covers the general cleaning which the CONTRACTOR shall be required to perform during the construction process and a thorough cleaning before final acceptance of the project unless otherwise shown on the Drawings or specified elsewhere in these Specifications.

1.02 Hazard Control

A. The CONTRACTOR shall store volatile wastes in covered metal containers and remove from premises daily.

B. The CONTRACTOR shall prevent accumulation of wastes which create hazardous conditions.

C. Burning or burying rubbish and waste materials on the site shall not be allowed.

D. Disposal of volatile wastes into sanitary or storm sewers shall not be allowed.

E. CONTRACTORS shall control dust on streets, and remove debris, dust, and etc. from all properties during the construction process.

1.03 Disposal of Surplus Materials

A. Unless otherwise shown on the Drawings specified or directed, the CONTRACTOR shall dispose of all surplus excavated materials and materials and equipment from demolition, legally off the site, and shall provide his own suitable, off-site spoil area, or on a site designated by the OWNER.

B. The OWNER shall have the opportunity to inspect any equipment or materials removed prior to disposal by the CONTRACTOR. If said equipment and/or materials are determined to be salvageable by the OWNER, the CONTRACTOR shall transport said equipment and material to a building or area designated by the OWNER.

1.04 Final Cleaning

A. Schedule cleaning operations so that dust and other contaminants resulting from the cleaning process will not fall on wet, newly painted surfaces.

B. Vacuum clean interior building areas when ready to receive finish painting, and continue vacuum cleaning on an as needed basis until building is ready for substantial completion or occupancy.

C. Employ experienced workmen or professional cleaners for final cleaning.

D. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces and of concealed spaces.

E. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to shine finish.

F. Repair, patch, and touch up marred surfaces to specified finish to match adjacent surfaces.

G. Broom clean paved surfaces. Rake clean other surfaces of ground.

H. Remove snow and ice for access to building.

I. Replace air conditioning filters if units were operated during construction.

J. Clean ducts, blowers, and coils if air conditioning units were operated without filters during construction.

K. Maintain cleaning until project or portion thereof is occupied by OWNER.

L. Additional cleaning and site securement for high pedestrian areas required as stipulated by the OWNER or ENGINEER.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Project Maintenance and Warranty

A. Maintain and keep in good repair the Work covered by these Drawings and Specifications until acceptance by the OWNER.

B. The CONTRACTOR shall warrant for a period of one (1) year from the date of OWNER's written final acceptance of the Project, as defined in the Contract Documents, that the completed Work is free from all defects due to faulty products or workmanship and the CONTRACTOR shall promptly make such corrections as may be necessary by reason of such defects.

C. The OWNER will give notice of observed defects with reasonable promptness. In the event that the CONTRACTOR should fail to make such repairs, adjustments or other work that may be made necessary by such defects, the OWNER may do so and charge the CONTRACTOR the cost thereby incurred. The Performance Bond shall remain in full force and effect throughout the warranty period.

D. For sewer rehabilitation projects requiring the installation of manhole liners, the CONTRACTOR shall provide proof that all manhole liners installed in the project have a ten (10) year manufacturers' and installers' warranty in addition to the one (1) year warranty as described.

E. For sewer rehabilitation projects, the OWNER will perform Closed Circuit Television (CCTV) inspections prior to the end of the warranty period on a percentage of the total footage rehabilitated within the scope of the project, at the expense of the OWNER.

G. The CONTRACTOR shall not be obligated to make replacements which become necessary because of ordinary wear and tear, or as a result of improper operation or maintenance, or as a result of improper work or damage by another CONTRACTOR or the OWNER, or to perform any work which is normally performed by a maintenance crew during operation.

H. In the event of multiple failures of major consequences prior to the expiration of the one (1) year warranty described above, the affected unit shall be disassembled,

inspected, and modified or replaced as necessary to prevent further occurrences. All related components which may have been damaged or rendered non-serviceable as a consequence of the failure shall be replaced. A new twelve (12) month warranty against defective or deficient design, workmanship, and materials shall commence on the day that the item is reassembled and placed back into operation.

I. As used herein, multiple failure shall be interpreted to mean two (2) or more successive failures of the same kind in the same item or failures of the same kind in two (2) or more items. Major failures may include, but are not limited to: cracked or broken housings, piping, or vessels, excessive deflections, bent or broken shafts, broken or chipped gear teeth, premature bearing failure, excessive wear, or excessive leakage around seals.

J. Failures which are directly and clearly traceable to operator abuse, such as operations in conflict with published operating procedures, or improper maintenance, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over-lubrication or under-lubrication, and using maintenance procedures not conforming with published maintenance instructions, shall be exempted from the scope of the one (1) year warranty. Should multiple failures occur in a given item, all products of the same size and type shall be disassembled, inspected, modified, or replaced as necessary, and re-warranted for one (1) year.

K. The CONTRACTOR shall, at CONTRACTOR'S own expense, furnish all labor, materials, tools, and equipment required, and shall make such repairs and removals and shall perform such work or reconstruction as may be made necessary by any structural or functional defect or failure resulting from neglect, faulty workmanship, or faulty materials, in any part of the Work performed by the CONTRACTOR. Such repair shall also include refilling of trenches, excavations, or embankments, which show settlement or erosion after backfilling or placement.

L. Except as noted on the Drawings or as specified, all structures such as embankments and fences shall be returned to their original condition prior to the completion of the Contract. Any and all damage to any facility not designated for removal, resulting from the CONTRACTOR'S operations, shall be promptly repaired by the CONTRACTOR at no cost to the OWNER.

M. The CONTRACTOR shall be responsible for all road and entrance reconstruction and repairs, and maintenance of same, for a period of one (1) year from the date of

final acceptance. In the event the repairs and maintenance are not made immediately and it becomes necessary for the OWNER of the road to make such repairs, the CONTRACTOR shall reimburse the OWNER of the road for the cost of such repairs.

N. In the event the CONTRACTOR fails to proceed to remedy the defects upon notification within fifteen (15) days of the date of such notice, the OWNER reserves the right to cause the required materials to be procured and the work to be done, as described in the Drawings and Specifications, and to hold the CONTRACTOR and the sureties on CONTRACTOR'S bond liable for the cost and expense thereof.

O. Notice to CONTRACTOR for repairs and reconstruction will be made in the form of a registered letter addressed to the CONTRACTOR at CONTRACTOR'S home office.

P. Neither the foregoing paragraphs nor any provision in the Contract Documents, nor any special guarantee time limit implies any limitation of the CONTRACTOR'S liability within the law of the place of construction.

R. Should the results indicate that greater than twenty percent (20%) of the inspections are found to be defective in any part, the CONTRACTOR shall be required to perform CCTV inspections on the remaining segments where rehabilitation was performed to verify conditions, at no expense to the OWNER, and shall be completed prior to the end of the warranty period.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section includes, but is not necessarily limited to, the compiling, maintaining, recording, and submitting of project record documents as herein specified.

B. The CONTRACTOR shall maintain accurate record documents related to the furnishing and installation of equipment, materials, and products at the site of the Project during the course of the work.

C. CONTRACTOR shall prepare and submit cut sheets for the ENGINEER’s approval prior to starting construction. No separate payment is allowed for this item.

D. Record documents include, but are not limited to:

1. Contract Drawings;

2. Specifications;

3. Change Orders and other modifications to the Contract;

4. ENGINEER field orders or written instructions, including Requests for Information (RFI) and Clarification Memorandums;

5. Reviewed shop drawings, product data, and samples;

6. Test records;

7. Addenda.

E. The CONTRACTOR shall maintain on the Project site throughout the Contract Time an up-to-date set of Record Drawings.

1.02 Maintenance of Documents and Samples

A. Storage

1. Store documents and samples in the CONTRACTOR's field office, apart from

documents used for construction.

2. Provide files and racks for storage of documents.

3. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with format of these Specifications.

C. Maintenance

1. Maintain documents in a clean, dry, legible condition, and in good order.

2. Do not use record documents for construction purposes.

3. Maintain at the site for the OWNER one (1) copy of all record documents.

D. Make documents and samples available at all times for inspection by ENGINEER.

E. Failure to maintain the Record Documents in a satisfactory manner may be cause for withholding of a certificate for payment.

1.03 Quality Assurance

A. Unless noted otherwise, Record Drawings shall provide dimensions, distances, and coordinates to the nearest 0.1 foot.

B. Unless noted otherwise, Record Drawings shall provide elevations to the nearest 0.01 foot for all pertinent items constructed by the CONTRACTOR.

1.04 Recording

A. Label each document “Project Record” in neat, large printed letters.

B. Recording

1. Record information concurrently with construction progress.

2. Do not conceal any work until required information is recorded.

1.05 Record Drawings

A. Record Drawings shall be reproducible, shall have a title block indicating that the drawings are Record Drawings, the name of the company preparing the Record Drawings, and the date the Record Drawings were prepared. The CONTRACTOR will be provided paper sepias of the Drawings, or it may elect to provide reproducible drawings via another method. Reproducible shall be defined as being translucent so as to allow a blueline print to be produced.

B. Legibly mark drawings to record actual construction, including:

1. All Construction

a. Changes of dimension and detail.

b. Changes made by Requests for Information (RFI), field order, clarification memorandums, change request form, or by change order.

c. Details not on original Drawings.

2. Site Improvements, Including Underground Utilities

a. Horizontal and vertical locations of all exposed and underground utilities and appurtenances, both new facilities constructed and those utilities encountered, referenced to permanent surface improvements or mean sea level.

b. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.

c. Location of and dimensions of roadways and parking areas, providing dimensions to back of curb when present.

d. The locations shall be referenced to at least two (2) easily identifiable, permanent landmarks (e.g., power poles, valve markers, etc.) or benchmarks.

e. Field changes of dimension and detail, including elevations of foundations.

f. Changes made by Change Order, Field Order, work Change

Directive, or Change Request Form.

g. Details not on original drawings.

1.06 Specifications

A. Legibly mark each section to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.

2. Changes made by Requests for Information (RFI), field order, clarification memorandums, or by change order.

3. Other matters not originally specified.

1.07 Submittal

A. At the completion of the work and prior to final acceptance by the OWNER, the CONTRACTOR shall deliver the Project Record Documents to the ENGINEER for the OWNER. The Project Record Documents shall be acceptable to the ENGINEER before final payment is made.

B. With the submittal of the Project Record Documents, the CONTRACTOR shall submit a list of each document submitted and a certification that each document as submitted is complete and accurate.

C. Accompany submittal with transmittal letter, in duplicate, containing:

1. Date

2. Project title and number

3. CONTRACTOR's name and address

4. Title and number of each record document

5. Signature of CONTRACTOR or CONTRACTOR'S authorized representative

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

END OF SECTION

Part 1 General

1.01 Scope

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified and required for demolition, removal, and disposal Work.

2. The Work under this Section includes, but is not necessarily limited to:

a. Demolition and removal of existing materials and equipment as shown or indicated in the Contract Documents. The Work includes demolition of structural concrete, foundations, walls, doors, windows, structural steel, metals, roofs, masonry, attachments, appurtenances, piping, electrical and mechanical systems and equipment, paving, curbs, sidewalks, gutters, fencing and similar existing facilities.

b. Demolition and removal of all Underground Facilities underneath, and above-grade piping and utilities in, the building(s) and structures shown or indicated for demolition, unless the Underground Facilities or above-grade facilities are shown or indicated as to remain.

c. Remove from slabs, foundations, walls, and footings that are to be demolished all utilities and appurtenances embedded in such construction.

d. Demolitions and removals specified under other Sections shall comply with requirements of this Section.

3. Perform demolition Work within areas shown or indicated in the Contracted Drawings.

4. Pay all costs associated with transporting and, as applicable, disposing of materials and equipment resulting from demolition.

B. Coordination:

1. Comply with Section C700, General Conditions.

2. Review procedures under this and other Sections and coordinate the Work that will be performed with or before demolition and removals.

C. Related Sections:

1. Section 011100, Summary of Work

2. Section 031100, Clearing and Grubbing

3. Section 312000, Excavation and Fill (Trenching)

4. Section 312300, Excavation and Fill (Grading)

5. Section 321000, Bases, Ballast, and Paving

1.02 Quality Assurance

A. Qualifications:

1. Electrical Removals: Entity and personnel performing electrical removals shall be electrician legally qualified to perform electrical construction and electrical work in the jurisdiction where the Site is located.

2. Plumbing Removals: Entity and personnel performing plumbing removals shall be plumber legally qualified to perform plumbing construction and plumbing work in the jurisdiction where the Site is located.

B. Regulatory Requirements:

1. Demolition, removal, and disposal Work shall be in accordance with 29 CFR 1926.850 through 29 CFR 1926.860 (Subpart T - Demolition), and all other Laws and Regulations.

2. Comply with requirements of authorities having jurisdiction.

Part 2 Submittals

A. Procedure Submittals:

1. Demolition and Removal Plan: Not less than ten days prior to starting demolition Work, submit acceptable plan for demolition and removal Work, including:

a. Plan for coordinating shut-offs, capping, temporary services, and continuing utility services.

b. Other proposed procedures as applicable.

c. Equipment proposed for use in demolition operations.

d. Recycling/disposal facility(ies) proposed, including facility owner, facility name, location, and processes. Include copy of appropriate permits and licenses, and compliance status.

e. Planned demolition operating sequences.

f. Detailed schedule of demolition Work in accordance with the accepted Process Schedule.

B. Notification of Intended Demolition Start: Submit in accordance with Paragraph 3.1.A of this Section.

C. Qualifications Statements:

1. Name and qualifications of entity performing electrical removals, including copy of licenses required by authorities having jurisdiction.

2. Name and qualifications of entity performing plumbing removals, including copy of licenses required by authorities having jurisdiction.

Part 3 Execution

1.01 Preparation

A. Notification:

At least 48 hours prior to commencing demolition or removal, notify Engineer in writing of planned start of demolition Work. Do not start removals without permission of Engineer.

B. Protection of Surrounding Areas and Facilities:

1. Perform demolition and removal Work in manner that prevents damage and injury to property, structures, occupants, the public, and facilities. Do not interfere with use of, and free and safe access to and from, structures and properties.

2. Closing or obstructing of roads, drives, sidewalks, and passageways adjacent to the Work is not allowed unless indicated otherwise in the Contract Documents. Conduct the Work with minimum interference to vehicular and pedestrian traffic.

3. Provide temporary barriers, lighting, sidewalk sheds, and other necessary protection.

4. Repair damage to facilities that are to remain.

C. Existing Utilities:

1. In addition to requirements of the General Conditions, Supplementary Conditions, and Division 01 Specifications, do the following:

   a. Should uncharted or incorrectly charted Underground Facilities be encountered, Contractor responsibilities shall be in accordance with the General Conditions as may be modified by the Supplementary Conditions. Cooperate with utility owners in keeping adjacent services and facilities in operation.

   b. Sanitary Sewer: Before proceeding with demolition, locate and cap all sewer lines and service laterals discharging from the building or structure being demolished. Additionally, abandon-in-place by grouting all sewer lines as depicted in the Drawings, scheduled to be grouted in the Basis of Bid Unit Price Items, or as Ordered to be grouted by the Engineer as the project commences.

   c. Storm Water: Existing storm water system shall remain in place until demolitions of existing buildings or structures are completed. Upon completing demolition, cut and cap storm sewer laterals at locations shown on the Drawings. Remove existing storm water piping and related structures between points of cutting, and backfill, restore to grade, and stabilize the area over the removed facilities.

   d. Water Piping: Before proceeding with demolition, locate and cap all potable and non-potable waterlines and service laterals serving the building or structure being demolished.

   e. Other Utilities: Before proceeding with demolition, locate and cap as required all other utilities, such as fuel and gas; heating, ventilating, and air conditioning; electric; and communications; and service laterals serving the building or structure being demolished.

f. Shutdown of utility services shall be coordinated by Contractor, assisted by Owner as required relative to contacting utility owners.

D. Remediation:

Prior to performing demolition Work involving lead-based paint, remediate lead in accordance with Section 02 83 33.01, Lead Paint Removal, as applicable.

1.02 Demolition (General)

A. Locate construction equipment used for demolition Work and remove demolished materials and equipment to avoid imposing excessive loading on supporting and adjacent walls, floors, framing, facilities, and Underground Facilities.

B. Pollution Controls:

1. Use water sprinkling, temporary enclosures, and other suitable methods to limit emissions of dust and dirt to lowest practical level. Comply with Section 01 57 13, Erosion Prevention and Sediment Control, and Laws and Regulations.

2. Do not use water when water may create hazardous or objectionable conditions such as icing, flooding, or pollution.

3. Clean adjacent structures, facilities, properties, and improvements of dust, dirt, and debris caused by demolition Work, in accordance with the General Conditions.

C. Explosives, if applicable:

1. Do not bring explosives to the Site or use explosives without written consent of Owner and authorities having jurisdiction. Obtaining such written consent will not relieve Contractor of responsibility for injury or damage caused by Contractor's blasting operations.

2. Perform blasting, when permitted, in compliance with Laws and Regulations, and blasting plan accepted by Owner.

D. Comply with Section 31 20 00, Excavation and Fill (Trenching), 31 23 00 Excavation and Fill (Grading), and 32 10 00, Bases, Ballasts, and Paving.

E. Building or Structure Demolition:

1. Unless otherwise approved by Owner, proceed with demolition from top of building or structure to the ground. Complete demolition Work above each floor or tier before disturbing supporting members of lower levels.

2. Demolish concrete and masonry in small sections.

3. Remove structural framing members and lower to ground using hoists, cranes, or other suitable methods. Do not throw or drop to the ground.

4. Break up and remove foundations and slabs-on-grade unless otherwise shown or indicated as remaining in place.

F. Demolition of Site Improvements:

1. Pavement, Sidewalks, Curbs, and Gutters: Demolition of asphalt or concrete pavement, sidewalks, curbs, and gutters, as applicable, shall terminate at cut edges. Edges shall be linear and have a vertical cut face.

2. Fencing, Guardrails, and Bollards: Remove to the limits shown or indicated on the Drawings. Completely remove below-grade posts and concrete.

3. Manholes, Vaults, Chambers, and Handholes: Remove to the limits shown or indicated on the Drawings.

4. Underground Facilities Other than Manholes, Vaults, Chambers, and Handholes: Remove to the extent shown or indicated on the Drawings. Unless otherwise shown or indicated, cap ends of piping to remain in place in accordance with the “Mechanical Removals” Article in this Section.

5. Landscaping: Comply with Section 31 11 00, Clearing and Grubbing.

G. Salvage and Ownership:

1. Refer to Section 01 11 00, Summary of Work, for requirements on salvage, ownership, and handling of equipment and materials removed during demolition and removal Work.

2. Materials and equipment to remain Owner’s property shall be carefully removed and appropriately handled by Contractor to avoid damage and invalidation of warranties in effect, and shall be cleaned and stored at the Site (or other site specified in the Contract Documents) at place designated by the Owner.

H. Finishing of Surfaces Exposed by Removals: Unless otherwise shown or indicated in the Contract Documents, surfaces of walls, floors, ceilings, and other areas exposed by removals, and that will remain as finished surfaces, shall be repaired and re-finished with materials that match existing adjacent surface, or as otherwise approved by Owner.

1.03 Structural Removals

A. Remove structures to lines and grades shown or indicated, unless otherwise directed by the Owner. Where limits are not shown or indicated, limits shall be four inches outside item to be installed. Removals beyond limits shown or indicated shall be at Contractor's expense and such excess removals shall be reconstructed to satisfaction of Owner without additional cost to Owner.

B. Recycling and Reuse of Demolition Materials:
   1. All concrete, brick, tile, masonry, roofing materials, reinforcing steel, structural metals, miscellaneous metals, plaster, wire mesh, and other items contained in or upon building or structure to be demolished shall be removed, transported, and disposed of away from the Site, unless otherwise approved by Engineer.
   2. Do not use demolished materials as fill or backfill adjacent to structures, in pipeline trenches, or as subbase under structures or pavement.

C. After removing concrete and masonry walls or portions thereof, slabs, and similar construction that ties into the Work or to existing construction, neatly repair the junction point to leave exposed only finished edges and finished surfaces.

D. Where parts of existing structures are to remain in service following demolition, remove the portions shown or indicated for removal, repair damage, and leave the building or structure in proper condition for the intended use.
   1. Remove concrete and masonry to the lines shown or indicated by sawing, drilling, chipping, and other suitable methods. Leave the resulting surfaces true and even, with sharp, straight corners that will result in neat joints with new construction and be satisfactory for the purpose intended.
   2. Do not damage reinforcing bars beyond the area of concrete and masonry removal. Do not saw-cut beyond the area to be removed.
   3. Reinforcing bars that are exposed at surfaces of removed concrete and masonry that will not be covered with new concrete or masonry shall be removed to 1.5 inches below the final surface. Repair the resulting hole, with repair mortar for concrete and grout for masonry, to be flush with the surface.

4. Where existing reinforcing bars are shown or indicated to extend into new construction, remove existing concrete so that reinforcing bars are clean and undamaged.

E. Where equipment or material anchored to concrete or masonry are removed and anchors are not to be re-used, remove the anchors to not less than 1.5 inches beneath surface of concrete or masonry member. Repair the resulting hole, using repair mortar for concrete and grout for masonry, to be flush with the surface. Alternately, when the anchor is stainless steel, the anchor may be cut flush with the surface of the concrete or masonry, when so approved by Engineer.

F. Jambs, sills and heads of windows, passageways, doors, or other openings (as applicable) cut-in to the Work or to existing construction shall be dressed with masonry, concrete, or metal to provide smooth, finished appearance.

G. Where anchoring materials, including bolts, nuts, hangers, welds, and reinforcing steel, are required to attach the Work to existing construction, provide such materials under this Section, unless specified elsewhere in the Contract Documents.

1.04 Mechanical Removals

A. Mechanical demolition and removal Work includes dismantling and removing existing piping, ductwork, pumps, equipment, tanks, and appurtenances as shown, indicated, and required for completion of the Work. Mechanical removals include cutting and capping as required, except that cutting of existing piping and ductwork to make connections is included under Section C700, General Conditions; Section 01 73 29, Cutting and Patching, and Sections of Division 40, Process Integration, if applicable.

B. Demolition and Removals of Piping, Ductwork, and Similar Items:
1. Purge piping and tanks (as applicable) of chemicals or fuel (as applicable) and make safe for removal and capping. Remove to the extent shown or indicated existing process, water, waste and vent, chemical, gas, fuel, and other piping. Remove piping to the nearest solid piping support and provide caps on ends of remaining piping. Where piping to be demolished passes through existing walls to remain, cut off and cap pipe on each side of the wall.

2. Caps, Closures, Blind Flanges, and Plugs:
   a. Provide closure pieces, such as blind flanges and caps, where shown or required to complete the Work.
   b. Where used in this Section, the term “cap” means the appropriate type of closure for the piping or ductwork being closed, including caps, blind flanges, and other closures.

c. Caps shall be compatible with the piping or ductwork to which the cap is attached, fluid-tight and gastight, and appropriate for the fluid or gas conveyed in the pipe or duct.
d. Unless otherwise shown or indicated, caps shall be mechanically fastened, fused, or welded to pipe or duct. Plug piping with means other than specified in this Section only when so shown or indicated in the Contractor Documents or when allowed by Owner.

3. When Underground Facilities are altered or removed, properly cut and cap piping left in place, unless otherwise shown or indicated.

4. Remove waste and vent piping, and ductwork to extent shown and cap as required. Where demolished vent piping, stacks, and ductwork passes through existing roofing, patch the roof with the same or similar materials. Completed patch shall be watertight and comply with roofing manufacturer's recommendations.

5. Modifications to potable water piping and other plumbing and heating system work shall comply with Laws and Regulations. All portions of potable water system that have been modified or opened shall be hydrostatically tested and disinfected in accordance with the Contract Documents, and Laws and Regulations. Hydrostatically test other, normally-pressurized, plumbing piping and heating piping.

C. Equipment Demolition and Removals:

1. To the extent shown or indicated, remove existing process equipment; pumps; storage tanks; hoisting and conveying equipment; heating, ventilating, and air conditioning equipment; generators; and other equipment.

2. Where required, disassemble equipment to avoid imposing excessive loading on supporting walls, floors, framing, facilities, and Underground Facilities. Disassemble equipment as required for access through and egress from building or structure. Disassembly shall comply with Laws and Regulations. Provide required means to remove equipment from building or structure.

3. Remove control panels, operator stations, and instruments associated with equipment being removed, unless shown or indicated otherwise.

4. Remove fuel appurtenances as applicable, including fuel storage tanks. Dispose of tank contents in accordance with Laws and Regulations.

5. Remove equipment supports as applicable, anchorages, base, grout, and piping. Remove anchorage systems in accordance with the “Structural Removals” Article in this Section. Remove small diameter piping back to header unless otherwise indicated.

6. Remove access platforms, ladders, and stairs related to equipment being removed, unless otherwise shown or indicated.

7. Equipment Salvage: Coordinate with the Owner entities which may be interested in salvaging equipment to be removed under the Contract.

1.05 Electrical Removals

A. Electrical demolition Work includes removing existing transformers, distribution switchboards, control panels, motors, starters, conduit and raceways, cabling, poles and overhead cabling, panelboards, lighting fixtures, switches, and miscellaneous electrical equipment, as shown, specified, or required.

B. Remove existing electrical equipment and fixtures to avoid damaging systems to remain, to keep existing systems in operation, and to maintain integrity of grounding systems.

C. Remove or modify motor control centers and switchgear as shown or indicated. Modified openings shall be cut square and dressed smooth to dimensions required for installation of equipment.

D. Disconnect and remove motors, control panels, and other electrical gear where shown or indicated. Motors, microprocessors and electronics, other electrical gear to be reused shall be stored in accordance with Section 01600, Material and Equipment, as applicable.

E. Cables in conduits to be removed shall be removed back to the power source or control panel, unless otherwise shown or indicated. Verify the function of each cable before disconnecting and removing.

F. Conduits, raceways, and cabling shall be removed where shown or indicated. Abandoned conduits concealed in floor, ceiling slabs, or in walls shall be cut flush with the slab or wall (as applicable) at point of entrance, suitably capped, and the area repaired in a flush, smooth manner acceptable to Owner. Exposed conduits, junction boxes, other electrical appurtenances, and their supports shall be

disassembled and removed. Repair all areas of the Work to prevent rusting on exposed surfaces.

G. Conduits in Underground Facilities not scheduled for reuse shall be suitably capped watertight where each enters building or structure to remain.

H. Where shown or indicated, remove direct burial cable. Openings in buildings for entrance of direct burial cable shall be patched with repair mortar or other material approved by Owner for this purpose and made watertight.

I. Existing poles and overhead cables shall be removed or abandoned as shown and specified. Existing substation(s) and poles owned by electric utility will be removed by the electric utility. Completely remove from the Site poles not owned by electric utility and shown or indicated for removal. Make necessary arrangements with electric utility for removal of utility company's transformers and metering equipment after new electrical system has been installed and energized.

J. Lighting fixtures, wall switches, receptacles, starters, and other miscellaneous electrical equipment, not designated as remaining as Owner's property, shall be removed and properly disposed off-Site as required.

1.06 Disposal of Demolition Debris

A. Remove from the Site all debris, waste, rubbish, and material resulting from demolition operations and equipment used in demolition Work. Comply with the General Conditions and Supplementary Conditions

B. Transportation and Disposal:
   1. Non-hazardous Material: Properly transport and dispose of non-hazardous demolition debris at appropriate landfill or other suitable location, in accordance with Laws and Regulations. Non-hazardous material does not contain Asbestos, PCBs, Petroleum, Hazardous Waste, Radioactive Material, or other material designated as hazardous in Laws and Regulations.
   2. Hazardous Material: When handling and disposal of hazardous materials is included in the Work, properly transport and dispose of hazardous materials in accordance with the Contract Documents and Laws and Regulations.

C. Submit to Owner information required in this Section on proposed facility(ies) where demolition material will be recycled. Upon request, the Owner, shall be allowed to visit recycling facility(ies) to verify adequacy and compliance status. During such visits, recycling facility operator shall cooperate and assist the Owner.

END OF SECTION

Part 1 General

1.01 Scope

A. This Specification section prescribes materials and methods to be used in fabricating, erecting, and removing forms for cast-in-place concrete. The CONTRACTOR shall furnish all form design, forms, shoring, ties, form coating, and materials, and all labor, equipment, and other items necessary or convenient to the CONTRACTOR for the fabrication, erection, and removal of formwork.

B. Related Work:

1. 033000 – Cast-in-Place Concrete

1.02 General

A. Forms shall be fabricated, erected, and removed as specified herein, and shall be of a type, size, shape, quality and strength to produce hardened concrete having the shape, lines, and dimensions indicated on the drawings. The forms shall be true to line and grade in accordance with the tolerances as specified in *Section 03 30 00 – Cast-in-Place Concrete*, shall be mortar tight, and sufficiently rigid to resist deflection during concrete placement. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes that would deface the finished surfaces.

B. The responsibility for correctly assessing and analyzing the erection stresses induced upon the structure, its elements and supporting foundations during construction will be the total obligation of the CONTRACTOR. Since the ENGINEER does not dictate or determine the CONTRACTOR'S sequence of operations of construction, the ENGINEER cannot determine erection stresses and therefore assumes no responsibility or obligation to do so. The CONTRACTOR must employ or otherwise provide for adequate professional structural engineering supervision to determine erection stresses and notify the ENGINEER of the results of the study.

C. The responsibility for adequate formwork design for construction of cast-in-place reinforced concrete will be the total obligation of the CONTRACTOR. The CONTRACTOR shall employ competent professional engineering services to design formwork and supervise the erection of all formwork needed for the job.

D. Except as modified herein, form design, fabrication, and erection shall conform to the requirements of ACI 347 and ACI 318 and shall be acceptable to the ENGINEER.

Design criteria for plywood shall conform to APA Form V345.

E. Formwork shall comply with the requirements of ANSI A10.9 and the Occupational Health and Safety Administration (OSHA) Construction Standards, Part 1926, "Subpart Q, Concrete, Concrete Forms, and Shoring."

1.03 Submittals

A. When requested by the ENGINEER, the CONTRACTOR shall submit to the ENGINEER for review shop drawings and design calculations for formwork the CONTRACTOR intends to use in constructing the work. The CONTRACTOR shall furnish said shop drawings and design calculations at no additional cost to the OWNER.

B. Prior to beginning concreting operations, the CONTRACTOR shall submit to the ENGINEER for approval engineering data and manufacturer's literature on all form ties, spreaders, bar supports, form coatings, and prefabricated steel forms intended for use in the work.

1.04 Storage

All form materials and accessories shall be stored above ground on framework or blocking and shall be covered with a suitable waterproof of covering providing adequate air circulation and ventilation.

Part 2 Products

2.01 Forms

A. Forms for surfaces which will be exposed to view when construction is completed shall be prefabricated plywood panel forms, job-built plywood forms, or forms that are lined with plywood or fiberboard.

B. Plywood or lined forms will not be required for surfaces which are normally submerged or not ordinarily exposed to view, such as the insides of manholes or wet-wells. Other types of forms, such as steel or unlined wooden forms, may be used for surfaces which are not restricted to plywood or lined forms, and may be used as backing for form linings. Forms are required above all extended footings.

C. Forms for cast-in-place concrete shall conform with the following requirement:

1. Prefabricated Steel Simplex "Industrial Steel Forms Frame Forms", Symons "Steel Ply", Universal "Uniform", or equal.

2. Plywood Product Standard PSI, waterproof resin-bonded, exterior type Douglas Fir.

a. Normal Face adjacent to concrete Grade B or better.

b. Architectural Face adjacent to concrete Grade B or better with plastic overlay.

3. Lumber – Straight, dressed all sides, uniform thickness, and free from knots, offsets, holes, dents, and other surface defects.

4. Fiberboard Federal Specification LLL-B-810, Type IX, tempered, waterproof, screenback, concrete form hardboard.

5. Chamfer Strips Clear white pine, surface against concrete planed.

D. Reuse of job-built plywood forms shall be permitted only when specifically approved by the ENGINEER. Plywood shall be furnished and placed in forty-eight inch (48”) widths and in uniform lengths of not less than ninety-six inches (96”), except where the dimension of the member is less. Where plywood is attached directly to studs or joists, the panels shall be not less five-eighths inch (5/8”) thick. Studs shall be provided sufficiently sized and spaced to prevent bulging of the plywood sheeting.

E. Where earth is too unstable to serve as a form for sides of footings and foundations, the sides against the earth may be formed with three-fourth inch (3/4”) thick No. 2C Yellow Pine with tight butt joints, securely braced to hold a straight line.

2.02 Form Ties

Form ties shall be approved by the ENGINEER and shall be of the snap cone or she-bolt with cone type as manufactured by a recognized manufacturer of concrete forming accessories. Cones shall leave a hole or depression in the concrete no larger than seven/eighth inch (7/8”) in diameter. Plain snap ties or flat bar ties, unless otherwise approve by the ENGINEER, shall not be used. Ties shall be of a type that will accurately tie, lock, and spread the forms.

Tie spacing shall be designed to withstand concrete pressures without bulging, spreading, or lifting of the forms. The tie shall be of such a design that when forms are removed no metal shall be within two inches (2”) of any surface unless stainless steel ties are used, in which case no metal shall be within one inch (1”) of any surface. Permanently embedded portions of form ties which are not provided with threaded ends shall be constructed so that the removable ends are readily broken off without damage to the concrete.

2.03 Form Coatings

Where specified herein, forms shall be coated with a nonstaining form release agent prior to concrete placement. Form coatings shall be Industrial Lubricants "Nox-Crete Form Coating", L & M "Debond", Prater "Pro-Cote", Richmond "Rich Cote", or equal.

Part 3 Execution

3.01 Fabrication and Erection

A. Forms shall be substantial and sufficiently tight to prevent leakage of mortar. Forms shall be braced or tied to maintain the desired position, shape, and alignment during and after concrete placement. Walers, studs, internal ties, and other form supports shall be sized and spaced so that proper working stresses are not exceeded. Joints in forms shall be bolted tightly and shall bear on solid construction. Forms shall be constructed so they can be removed without hammering, wedging, or prying against the concrete. Form ties in exposed surfaces shall be uniformly spaced and aligned in horizontal and vertical rows. The forms shall produce finished surfaces that are free from off-sets, ridges, waves, and concave or convex areas.

B. Forms to be reused shall be thoroughly cleaned and repaired. Split, frayed, delaminated, or otherwise damaged forms shall not be used.

C. All form panels shall be placed in a neat, symmetrical pattern with horizontal joints level and continuous. The CONTRACTOR shall place special attention on mating forms to previously placed walls so as to minimize steps or rough transitions. Form panels shall be of the largest practical size to minimize joints and to improve rigidity.

D. Beams and slabs supported by concrete columns shall be formed so the column forms may be removed without disturbing the supports for the beams or slabs.

E. Wherever the top of a wall will be exposed to weathering, the forms on at least one

side shall not extend above the top of the wall and shall be brought to true line and grade. At other locations forms for concrete which is to be finished to a specified elevation, slope, or contour, shall be brought to a true line and grade, or a wooden guide strip shall be provided at the proper location on the forms so that the top surface can be finished with a screed or template. At horizontal construction joints in walls the forms on one side shall not extend more than two feet (2') above the joints.

F. Temporary openings shall be provided at the bottom of column and wall forms and at other points where necessary to facilitate cleaning and inspection prior to concrete placement.

G. Unless shown otherwise on the Drawings, all salient corners and edges of beams, columns, walls, slabs, and curbs shall be provided with a three-fourth inch by three-fourth inch (3/4" x 3/4") chamfer formed by a wood or metal chamfer strip.

H. Forms for exposed surfaces and all steel forms shall be coated with nonstaining form release agent which shall be applied just prior to placement of steel reinforcement. After coating, any surplus form release coating on the form surface shall be removed. Wood forms for unexposed surfaces may be thoroughly wetted with water in lieu of coating immediately before concrete placement, except in freezing weather form release coating shall be used.

I. Should misalignment of forms or screeds, excessive deflection of forms, or displacement of reinforcement occur during concrete placement, immediate corrective measure shall be taken to insure acceptable lines and surface to required dimensions and cross sections.

J. If any forms bulge or show excessive deflection, in the opinion of the ENGINEER, the concrete shall be removed and the forms rebuilt and strengthened.

3.02 Form Removal

A. Forms shall not be removed or disturbed until the concrete has attained sufficient strength to safely support all dead and live loads. Shoring beneath beams or slabs shall be left in place and reinforced as necessary to carry any construction equipment or materials placed thereon.

B. No forms shall be removed without the approval of the ENGINEER. In general and under normal conditions, the ENGINEER will approve removal of forms after the following time has elapsed:

ITEM	TIME AFTER PLACEMENT
Elevated Slabs and Beams	14 days
Columns	7 days
Walls	3 days
Other Concrete	2 days

C. When ambient air temperatures during the curing period fall below forty-five degrees Fahrenheit (45° F), form removal will take place based on job-cured test cylinder strength only.

D. Care shall be taken in form removal to avoid surface gouging, corner, or edge breakage, or other damage to the concrete. Immediately after form removal, any damaged or imperfect work shall be repaired as specified in *Section 03 30 00 – Cast-in-Place Concrete* of these Specifications.

END OF SECTION

Part 1 General

1.01 Scope

A. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete accessories.

B. Related Work

1. Section 031100, Concrete Forming.
2. Section 036000, Grouting.
3. Section 079200, Joint Sealants.

1.02 References

A. Standards referenced in this Section are:
1. ACI 301, Standard Specifications for Structural Concrete.
2. ASTM D1752, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
3. CRD-C572, U.S. Army Corps of Engineers Specifications for Polyvinyl-Chloride Waterstop.

1.03 Submittals

A. Action Submittals: Submit the Following:
1. Shop Drawings:
   a. Layout of construction and expansion joint locations. Submit and obtain approval prior to submitting concrete reinforcement Shop Drawings.
   b. For construction and expansion joints that require waterstops, submit layout of locations showing waterstop details. Indicate waterstop type, waterstop joint conditions, and details on how joint conditions will be handled.

2. Samples:
   a. Submit Sample, at least 6 inches long each, of each type of waterstop proposed for use.
   b. Submit Sample of each type of prefabricated PVC waterstop joint.

B. Informational Submittals: Submit the following:

1. Manufacturer's Instructions: Manufacturer's specifications and installation instructions for all materials required.

1.04 Delivery, Storage and Handling

A. Transportation and Handling Products:
   1. Deliver materials to Site to ensure uninterrupted progress of the Work.

B. Storage and Protection:
   1. Store concrete joint materials on platforms or in enclosures or covered to prevent contact with ground and exposure to weather and direct sunlight. Comply with manufacturer's storage and protection requirements.

Part 2 Products

2.01 Waterstops

A. Polyvinyl Chloride (PVC):
   1. Material Requirements:
      a. Waterstops shall be extruded from elastomeric PVC compound containing plasticizers, resins, stabilizers, and other materials necessary to meet requirements of the Contract Documents and requirements of CRD-C572. Do not use reclaimed or scrap material.
      b. Tensile strength of finished waterstop: 1,400 psi, minimum.
      c. Ultimate elongation of finished waterstop: 280 percent, minimum.
      d. Minimum thickness shall be 3/4 -inch over entire width or waterstop.
      e. Provide waterstops with minimum of seven ribs equally spaced at each end on each side. First rib shall be at the edge. Ribs shall be minimum of 1/8-inch in height.
      f. Provide waterstops with hog rings or factory-installed grommets anchored to exterior ribs to facilitate tying waterstop in position.

   2. Split waterstops are not allowed.

   3. Construction Joints: Waterstops shall be flatstrip ribbed type, six-inch minimum width, unless otherwise shown or indicated in the Contract Documents.

   4. Expansion Joints: Waterstops shall be centerbulb ribbed type, nine-inch minimum width, unless otherwise shown or indicated in the Contract Documents. Centerbulb shall have minimum outside diameter of 7/8-inch.

5. Product and Manufacturer: Provide one of the following:

    a. W. R. Meadows, Inc.
    b. Durajoint Concrete Accessories.
    c. Greenstreak Plastic Products Company.
    d. Paul Murphy Plastics Company.
    e. Vinylex Corporation.
    f. Or equal.

2.02 Preformed Expansion Joint Filler

A. Provide preformed expansion joint filler complying with ASTM D1752, Type 1 (sponge rubber) or Type II (cork)

2.03 Concrete Construction Joint Roughener

A. Provide water-soluble non-flammable, surface-retardant roughener.

B. Product and Manufacturer: Provide one of the following for the types of joints specified:
    1. Rugasol-S, by Sika Corporation for horizontal joints only.
    2. Concrete Surface Retarder-Formula S, by Euclid Chemical Company, for horizontal joints only.
    3. Concrete Surface Retarder-Formula F, by Euclid Chemical Company, for vertical joints only.
    4. TK-6100 Concrete Form Surface Retarder, by TK Products.
    5. Or equal.

2.04 Epoxy Bonding Agent

A. Provide water-soluble non-flammable, surface-retardant roughener.

B. Product and Manufacturer: Provide one of the following for the types of joints specified:
    1. Sikadur 32 Hi-Mod LPL, by Sika Corporation
    2. Eucopoxy LPL, by the Euclid Chemical Company.
    3. Resi-Bond J-58, by Dayton Superior.
    4. Or equal.

2.05 Epoxy-Cement Bonding Agent

A. Provide three component epoxy resin-cement blended formulated as bonding agent.

B. Product and Manufacturer: Provide one of the following:
   1. Sika Armatec 110 EpoCem, as manufactured by Sika Corporation.
   2. Duralprep A. C., as manufactured by the Euclid Chemical Company.
   3. Emaco P24, as manufactured by MBT/ChemRex.
   4. Or equal.

2.06 Joint Sealant and Accessories

A. For joint sealants and accessories used on isolation joints, control joints, and expansion joints, refer to Section 079200, Joint Sealants.

2.07 Concrete Bond Breakers

A. Provide asphalt-saturated rag felt building paper, not less in weight than commercially known as 15 pound felt building paper, which weighs 15 pounds per 100 square feet.

B. Chemical Bond Breaker:
   1. Provide medium solids resin solution chemical concrete bond breaker complying with ASTM C309, Type 1, Class B.

Part 3 Execution

3.01 Inspection

A. Contractor and installing Subcontractor, if any, shall examine substrate and conditions under which Work is to be performed and notify Engineer in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.02 Construction Joints

A. Comply with requirements of ACI 301 and the Contract Documents.

B. Locate and install construction joints as shown or indicated on the Drawings. Where not shown or indicated, locate joints to not impair strength of the structure; position

joints at points of minimum shear. Location of joints shall be approved by Engineer. In addition to joints shown or indicated on the Drawings, locate construction joints as follows:

1. In foundation mats, locate joints at spacing of approximately 40 feet. Joints shall be located within middle third of element span, unless otherwise shown or indicated on the Drawings. Element span shall be considered distance between piles or, as determined by Engineer, distance between bearing elements, such as columns, exterior walls and interior walls. Place concrete in strip pattern, unless otherwise shown or indicated on the Drawings.
2. In walls, locate joints at a maximum spacing of 40 feet. Locate joints away from wall intersections a minimum of one-quarter of the clear span distance between wall intersections measured horizontally.
3. In structural slabs and beams, joints shall be located within middle third of element span and shall be located in compliance with ACI 301, unless otherwise shown or indicated on the Drawings.
4. In slabs on grade, locate joints at spacing of approximately 40 feet. Place concrete in strip pattern, unless otherwise shown or indicated on the Drawings.

C. Horizonal Joints:

1. Roughen concrete at interface of construction joints by abrasive blasting, hydro blasting, or using surface retardants and water jets to expose aggregate and remove accumulated concrete on projecting rebar immediately subsequent to form stripping, unless otherwise approved by Engineer. Immediately before placing fresh concrete, thoroughly clean existing contact surface using stiff brush or other tools and stream of pressurized water. Surface shall be clean and wet, and free from pools of water at time of placing fresh concrete.
2. Remove laitance, waste mortar, and other substances that may prevent complete adhesion. Where joint roughening was performed more than seven days prior to concrete placing or where dirt or other bond reducing contaminants are on surface, perform additional light abrasive blasting or hydroblasting to remove laitance and all bond-reducing materials just prior to concrete placement.
3. Provide over contact surface if concrete a six-inch layer of Construction Joint Grout as specified in Section 036000, Grouting. Place fresh concrete before grout has attained its initial set. Placement of grout may be omitted if concrete mix was slump increased to at least six inches by addition of high range water reducer.

D. Vertical Joints:

1. Apply roughener to the form in thin, even film by brush, spray, or roller in accordance with manufacturer's instructions. After roughener is dry, concrete may be placed.
2. When concrete has been placed, remove joint surface forms as early as

necessary to allow for removal of surface retarded concrete. Forms covering member surfaces shall remain in place as required under Section 031100, Concrete Forming. Wash loosened material off with high-pressure water spray to obtain roughened surface subject to approval by Engineer. Alternately, surface shall be roughened by abrasive blasting or hydroblasting to expose aggregate. Outer one inch of each side of joint face shall be masked and protected from blasting to avoid damaging member surface.

3.03 Expansion Joints

A. Comply with requirements of ACI 301 and this Section.

B. Locate and install expansion joints as shown or indicated in the Contract Documents. Install joint filler in accordance with manufacturer's instructions. Install sealants as specified in this Section.

3.04 Control Joints

A. Provide control joints in non-water bearing slabs on grade as shown or indicated on the Drawings. Where control joints are not shown or indicated on the Drawings, space control joints at 24 to 36 times thickness of slab in both directions. Locate control joints only at places approved by Engineer.

B. A groove, with depth of at least 25 percent of the member thickness, shall be tooled, formed, or saw-cut in concrete. Grove shall be filled with joint sealant material in accordance with Section 079200, Joint Sealants.

C. Where control joint is formed by sawcutting, make sawcut in presence of Engineer immediately after concrete has set sufficiently to support the saw and be cut without damage to concrete. Keep concrete continually moist during cutting. Joints shall be approximately 1/8-inch wide.

D. Control joints may be formed with tool or by inserting joint forming strip. After concrete has achieved design strength, remove upper portion of joint forming strip and fill void with sealant.

3.05 Isolation Joints

A. Provide isolation joint where sidewalk or other slab on grade abuts a concrete structure and slab on grade is not shown doweled into that structure. Form isolation

joint by ½-inch joint filler with upper ½-inch of joint filled sealant.

3.06 Waterstops

A. General:

1. Comply with ACI 301 and this Section. Make joints in accordance with manufacturer's instructions. I
2. Provide PVC waterstops, except where otherwise shown or indicated on the Drawings.
3. Provide waterstops in all joints where concrete construction is below grade or intended to retain liquid. Install waterstop to the higher of: at least 12 inches above grade, or 12 inches above overflow liquid level in tanks.
4. Waterstops shall be fully continuous for extent of joint and with waterstops in intersecting joints. Maintain waterstop continuity at transitions between waterstops in joints at different levels and orientations.
5. In vertical joints in walls that are free from the top, waterstops shall extend no closer than 6 inches form top of wall.
6. In placing concrete around horizontal waterstops, with waterstops flat face in horizontal plane, work the concrete under waterstops by hand to avoid forming air and rock pockets.

B. Polyvinyl Chloride Waterstop:

1. Waterstops shall be positively held from displacement during concrete placing. Tie waterstops to reinforcement or other rigid supports at maximum spacing of 18-inches so that waterstop is securely and rigidly supported in proper position during concrete placing. Continuously inspect waterstops during concrete placing to ensure proper positioning.
2. Perform splicing in waterstops by heat sealing adjacent waterstop sections in accordance with manufacturer's printed recommendations. The following is required:
    a. Material shall not be damaged by heat sealing.
    b. Splices shall have tensile strength of not less than 60 percent of unspliced material's tensile strength.
    c. Maintain the continuity of waterstop ribs and of its tubular center axis.
3. Only butt-type joints of ends of two identical waterstop sections shall be made while material is in forms.
4. Prefabricated PVC Waterstop Joint:
    a. Joints with waterstops involving more than two ends to be jointed together, and joints that involve an angle cut, alignment change, or joining of two dissimilar waterstop sections, shall be prefabricated by Contractor or

manufacturer prior to placing in the forms.

b. Prefabricated joints shall have minimum of 2.0 feet of waterstop material beyond joint in each direction.
c. Install prefabricated joint assembly in the forms and butt-weld each two-foot end to a straight-run portion of waterstop in place in the forms.

5. Where centerbulb waterstop intersects and is jointed with non-centerbulb waterstop, seal end of centerbulb using additional PVC material as required.
6. Symmetrical halves of waterstops shall be equally divided between concrete placements at joints and centered within joint width, unless shown or indicated otherwise in the Contract Documents. Place centerbulb waterstops in expansion joints so that centerbulb is centered on joint filled material.
7. When waterstop is installed in the forms or embedded in first concrete placement and waterstop remains exposed to atmosphere for more than four days, implement suitable precautions to shade and protect exposed waterstop from direct rays of sun during entire exposure, until exposed portion of waterstop is embedded in concrete.
8. Protect waterstop placed in joints intended for future concrete placement from direct rays of the sun by temporary means until permanent cover is installed, so that waterstop is not exposed to direct rays of the sun for more than four days total.

3.07 Bonding Agent

A. Use epoxy bonding agent for bonding fresh concrete to concrete that has been in place for at least 60 days, and for bonding to existing concrete.

B. Use epoxy-cement bonding agent for the following:
   a. Bonding toppings and concrete fill to concrete that has been in place for at least 60 days, and for bonding to existing concrete.
   b. For locations where bonding agent is required and concrete cannot be placed within open time period of epoxy bonding agent.

C. Use cement-water slurry as bonding agent for toppings and concrete fill to new concrete. Cement water slurry shall be worked into surface with stiff bristle broom and place the concrete before cement-water slurry dries.

D. Handle and store bonding agent in accordance with manufacturer’s printed instructions and safety precautions.

E. Mix bonding agent in accordance with manufacturer’s instructions.

F. Before placing fresh concrete, thoroughly roughen and clean hardened concrete surfaces and coat with bonding agent not less than 1/16-inch thick. Place fresh concrete while bonding agent is still tacky (within its open time), without removing in-place bonding agent coat, and as directed by manufacturer.

3.08 Bearing Pad Installation

A. Neoprene Bearing Pad: Install with water insensitive adhesive in accordance with manufacturer's instructions.

END OF SECTION

Part 1 General

1.01 Scope

A. Furnish and install the concrete reinforcement as shown and indicated on the Drawings and specified in this Section, complete in place.

B. Related Work:

1. Section 033000 – Cast-in-Place Concrete

1.02 Submittals

A. Shop Drawings

1. All shop drawings shall be of the same size. Reproductions of the Drawings for use as shop drawings are not permitted. Shop drawings shall include placing drawings, bending details, and bar lists with bar marks. All details and notes appearing on the Drawings, giving information for the placing of reinforcing steel, shall be shown on the shop drawings. Shop drawings will not be reviewed without such information.

2. Wall reinforcing shall be shown in elevation.

3. Show location and size of all penetrations greater than six inches (6”) in diameter or across the opening with the corresponding added reinforcing around the penetrations.

4. Submittals shall be complete for each structure. Partial submittals are not permitted and will be returned unmarked. Each submittal shall clearly indicate the structure and Drawing numbers that the work is for. The identifying numbers of the shop drawings for each structure shall be in numerical order.

5. Location and arrangement of accessories shall be clearly indicated.

6. All shop drawings shall be checked by the fabricator and CONTRACTOR before being submitted to the ENGINEER.

B. Mill tests of reinforcing steel shall be submitted prior to use for each fifteen (15) tons or less shipped to the site. Tests shall be conducted in conformance with ASTM A

615, and methods prescribed therein.

1. Cost of mill tests shall be borne by CONTRACTOR.

2. Three (3) copies of each test report stating whether the material meets the requirements of the ASTM specifications shall be submitted to the ENGINEER.

3. Certified copies of the mill tests may be considered evidence of compliance provided such tests are regularly conducted by the reinforcement supplier by experienced, competent personnel using adequate testing equipment. In case of doubt as to the adequacy or accuracy of the mill tests, the ENGINEER may require the CONTRACTOR to furnish, at no additional cost to the OWNER, test results from an independent testing laboratory acceptable to the ENGINEER on mill samples or delivered steel reinforcement.

Part 2 Products

2.01 Reinforcing Bars

A. Bar reinforcement shall be deformed-type bars conforming to ASTM A 615. Reinforcement shall be manufactured from new billet steel of American manufacture, Grade 60.

B. Uncoated, “black”, reinforcing steel shall be provided for cast-in-place concrete **not** subject to corrosion resistant environments. Epoxy coated, “Green”, reinforcing steel shall be provided in corrosive environments such as bridges, parking structures, and concrete pavement due to application of icing salts during the surface life of the concrete.

C. Reinforcing steel shall be shop fabricated to shapes and dimensions indicated on the Drawings and in compliance with applicable provisions of ACI 315 and ACI 318.

D. Bars shall be bent cold. Bars shall be pre-fabricated to detail and delivered on the job plainly tagged and ready to set.

2.02 Welded Wire Fabric

Welded wire fabric shall be in flat sheets conforming to ASTM A 185 with wire conforming to ASTM A 82.

2.03 Accessories

A. All chairs and bolsters shall have plastic-covered or galvanized steel legs at formed slabs and beams. For slabs on grade, bare metal is acceptable.

B. For slabs on grade ten inches (10”) or less, all reinforcing shall be supported on chairs and/or bolsters as required to properly position the bars or welded wire fabric. The chairs and/or bolsters shall be supported on precast concrete pads bearing on the subgrade. The concrete pads shall be at least six inches by six inches (6” x 6”) and be no more than 1-1/2-inches thick. Pads shall be cast from Class "A" concrete or from mortar made up of one (1) part cement and two (2) parts sand, with tie wires embedded.

C. For slabs on grade greater than ten inches (10”), reinforcing shall be supported directly on concrete brick bearing on the subgrade or the system noted above for slabs eight inches (8”) or less.

Part 3 Execution

3.01 Storage of Materials

Reinforcing steel delivered to the site, not immediately placed in forms, shall be protected from mud and excessive rust-producing conditions by storing in a well-drained area and supported off the ground. All reinforcing shall be properly tagged with their bar marks and location in the structure clearly noted.

3.02 Tolerances

A. Allowable tolerances for fabricating steel reinforcement shall be as follows:

Item	**Maximum Tolerance (Inches)**	
Sheared Length of Bars	+1	-1
Depth of Truss Bars	+0.0	-1/2
Outside Dimensions of Stirrups, Ties and Spirals	+1/2	-1/2
Location of Bends	+1	-1

B. Allowable tolerances for placing steel reinforcement shall be as follows:

Item	Maximum Tolerance (Inches)	
Concrete Cover from Outside of Bar to Finished Surface	+1/4	-0.0
Lateral Spacing of Bars in Plane of Reinforcement in Beams and Joists	+1/4	-0.0
Lateral Spacing of Bars in Plane of Reinforcement in Slabs and Walls	+1	-1
Spacing of Stirrups, Ties and Spirals Along Longitudinal Axis of Member	+1/2	-1/4
Height of Bottom Bars in Slabs, Beams and Joists	+1/4	-1/4
Height of Top Bars in Slabs, Beams and Joists		
Depth 8” and Less	+1/4	-1/4
Depth 9" – 24”	+1/2	-1/2
Depths 25” & Greater	+1	-1

3.03 Field Fabrication

Field fabrication of reinforcing steel is not permitted.

3.04 Placement and Anchorage

A. Space metal chairs, bolsters, spacers, and hangers in accordance with ACI 315.

B. Reinforcement, at the time concrete is placed, shall be free from rust scale or other coatings that will destroy or reduce bond. Bars with kinks or bends not shown on the plans shall not be used.

C. Reinforcement shall be accurately placed in accordance with the Drawings and shall be adequately secured in position with not less than 16-gauge annealed wire or suitable clips at intersections. Reinforcement shall be held securely at the required distance from the forms. Nails shall not be driven into outside forms to support reinforcement.

D. Install welded wire fabric reinforcement for concrete slabs on ground and as otherwise indicated. Lap all joints six inches (6”) and wire securely. Extend mesh to within two inches (2”) of sides and ends of slabs. Sheets that do not lay flat when in

their intended position will be rejected. Tags designating the wire size and spacing shall be left on each sheet until ready for use. Tuck ends of welded mesh well down into edge of beams or walls. Do not leave unreinforced border strips. Welded wire fabric shall not contain loose rust. All welded wire fabric shall be supported and tied in its proper location.

E. Conduits: Where conduits are permitted in slabs, low conduit shall be wired to the upper side of bottom reinforcing and top conduit shall be wired to lower side of top steel. Where parallel conduits occur, they shall be separated by at least two inches (2") clear.

3.05 Concrete Cover

A. Unless otherwise shown on the Drawings, the following concrete cover shall be provided for reinforcement:

Item	**Cover (Inches)**
Bottom and Sides of Footing	3
Walls	2
Slabs (Framed)	
Bottom	3/4
Top	1
Beams (Stirrups)	
Bottom and Sides	1-1/2
Top	2
Columns (Ties, Spirals)	2
Slabs on Grade – Liquid Containment Structures	
Bottom and Sides	3
Top	3
Slabs on Grade – Other Structures	3

3.06 Splicing

A. Splicing of reinforcement shall be as shown and indicated on the Drawings. Splices not shown on the Drawings shall be Class "B" splice, in accordance with ACI 318. Any changes to the location and type of splices desired by the CONTRACTOR must be specifically requested and must meet with the acceptance of the ENGINEER before they can be used.

B. Splices shall not be made at point of maximum stress and shall provide sufficient lap to transfer stress between bars by bond.

C. Mechanical splices may be used instead of lap splices, provided that their location and type meets with the acceptance of the ENGINEER.

3.07 Inspection

Inspect all the work in accordance with *Section 033000 – Cast-in-Place Concrete* of these Specifications.

END OF SECTION

Part 1 General

1.01 Scope

A. This specification section covers all materials, equipment, and methods to be used by the CONTRACTOR in mixing, placing, testing, finishing, and curing cast-in-place concrete. The CONTRACTOR shall furnish all cement, aggregate, water, admixtures, and other materials, and all labor, equipment, and supplies necessary or convenient to him for completing the work described in these Contract documents. Cast-in-place concrete reinforcement and form work shall be as specified in the sections entitled "Concrete Reinforcing" and "Concrete Forming" respectively of these Specifications.

B. Related Work:

1. 013000 – Administrative Requirements

1.02 Classification of Concrete

Concrete shall be either Class A or Class B, as indicated on the Drawings or specified in these Specifications. If the class is not otherwise specified, the CONTRACTOR shall furnish Class A concrete. In general, Class A concrete shall be used for reinforced concrete cast-in-place in forms for slabs, footings, foundations, manholes, catch basins, drop inlets, headwalls, endwalls, and similar reinforced concrete structures coming under the scope of ACI 318. Class B concrete shall be plain concrete and shall be used for pipe cradles, pipe and conduit encasement, bedding, grade correction, anchors, collars, thrust blocks, massive sections, and other non-reinforced concrete.

1.03 General Requirements

All cast-in-place concrete shall be accurately formed and properly placed and finished as shown on the Drawings and specified herein. The materials, aggregate grading, cement content, and placement methods specified herein are intended to provide a concrete that satisfies the minimum strength requirements, exhibits sufficient plasticity and cohesiveness to facilitate placement and reduce honeycombing and porosity, and incorporate a minimum water-to-cement ratio to minimize bleeding and shrinkage and to provide maximum water tightness. However, the CONTRACTOR may submit to the ENGINEER for review and approval alternate material requirements and placement techniques for achieving the desired results. All Class A cast-in-place concrete shall be designed in accordance with the applicable requirements of ACI 318, latest edition.

1.04 Preliminary Mix Design

A. Before starting any concreting operations, the CONTRACTOR shall submit to the ENGINEER for approval a preliminary mix design for each class of concrete and for each size and gradation of aggregate and each consistency within a given class of concrete intended for use in the work. The preliminary mix design submittals shall contain the following information for each (including those items listed in the latest ASTM designations, if different from those specified). Submit written report for each proposed concrete mix design to Engineer at least 15 days prior to start of concrete work. Do not begin concrete production until all concrete mix designs have been reviewed by and are acceptable to ENGINEER.

B. FINE AGGREGATE (Sample per ASTM D 75)

1. Source and type

2. Sieve analysis per ASTM C 136

3. Magnesium Sulfate soundness per ASTM C 88

4. Deleterious substance per ASTM C 117, C 123, and C 142

5. Saturated surface dry weight per cubic yard of concrete

6. Bulk specific gravity per ASTM 127

7. Fineness modulus as defined in ASTM C 125

C. COARSE AGGREGATE (Sampled per ASTM D 75)

1. Source and type

2. Sieve analysis per ASTM C 136

3. Abrasion loss per ASTM C 535

4. Magnesium Sulfate soundness per ASTM C 88

5. Deleterious substances per ASTM C 117, C 123, AND C 142

6. Saturated surface dry weight per cubic yard of concrete

7. Bulk specific gravity per ASTM 128

D. CEMENT (Sampled per ASTM C 183)

1. Manufacturer, type, and ASTM designation

2. Sacks per cubic yard of concrete

3. Total gallons of water per sack (or cubic foot) of cement

4. Compressive strength at seven (7) days per ASTM C 109

5. Chemical analysis per ASTM C 114

E. SLUMP per ASTM C 143

F. AIR CONTENT per ASTM C 231

G. UNIT WEIGHT per ASTM C 138

H. TIME TO INITIAL SET at 70 Degrees F. per ASTM C 403

I. COMPRESSIVE STRENGTH at seven (7), fourteen (14), and twenty-eight (28) days ages per ASTM C 192, and C 39. A total of nine (9) standard test cylinders shall be prepared and cured in the laboratory for each preliminary mix design, three (3) of which shall be tested each at seven (7), fourteen (14), and twenty-eight (28) day ages.

J. ADMIXTURES

1. Manufacturer, type, and ASTM designation

2. Dosage and point of introduction into the mix.

K. A preliminary mix design shall not be considered acceptable if the concrete resulting from that mix design does not produce an average twenty-eight (28) day compressive strength at least one-thousand-two-hundred pounds-per-square-inch (1,200 psi) higher than that required, unless a standard deviation for compressive strength testing has been established for the concrete supplier using the methods described

in ACI 214.

L. If a standard deviation has been established, the strength used as a basis for selecting concrete proportions shall exceed the required twenty-eight (28) day strength by the amounts given in ACI 318, Section 4.2.2.1, based on the appropriate value of the standard deviation. If a standard deviation is utilized, the CONTRACTOR or concrete supplier shall furnish written evidence to the ENGINEER that the standard deviation has been determined in accordance with the methods described in ACI 214. A written statement from an independent testing laboratory may be considered satisfactory evidence of compliance.

M. Tests for compressive strength and all sampling and testing of aggregate and cement shall be conducted in accordance with the specified ASTM standards by an independent testing laboratory acceptable to the ENGINEER. Alternately, when approved by the ENGINEER, testing of cement and aggregate may be conducted at the point of manufacture by reputable cement and aggregate suppliers who regularly provide such testing services by experienced, competent personnel.

N. Tests for slump, air content, unit weight, and time to initial set may be conducted by the concrete supplier, providing such tests are performed in accordance with the specified ASTM standards by experienced, competent personnel using proper equipment.

O. The CONTRACTOR shall submit with each preliminary mix design four (4) copies of certified laboratory or mill test reports on all aggregate and cement incorporated in the preliminary mix design and four (4) copies of certified laboratory test reports on the compressive strength of the resulting concrete. Test reports on aggregate and cement shall contain written evidence that clearly indicates that all cement and aggregate covered by the test reports conform in all respects to the applicable material requirements of this specification section.

P. Review of the preliminary mix designs shall in no way be interpreted to relieve the CONTRACTOR of any responsibilities, duties, or obligations for providing concrete conform in to the requirements of this specification section. If, during the course of concreting operations, the CONTRACTOR desires to use an alternate mix design differing from the approved mix design in order to obtain a desired workability, density, strength, or uniformity, he shall submit to the ENGINEER for approval the information specified herein on the proposed alternate mix design prior to its use.

Q. If, based on the result of laboratory or field tests conducted during concreting operations, concrete prepared according to an approved mix design fails to satisfy

the requirements of this specification section, the ENGINEER shall have the right to require that the CONTRACTOR develop and submit in the manner specified an alternate mix design that will provide concrete conforming to the requirements of this section.

R. The need for a change in mix design will be based on the ENGINEER'S statistical analysis and interpretation of laboratory and field tests conducted during concreting operations. Statistical methods and interpretation of test results will be as described in ACI 214, and ACI 318, latest edition. Any increased material costs resulting from changes in mix designs during construction shall be paid for by the CONTRACTOR and no separate payment will be made.

S. The cost of all materials, labor, equipment and all sampling and testing services required for the preliminary mix designs or for alternate mix designs during construction shall be paid for by the CONTRACTOR and no separate payment will be made.

1.05 Quality Control During Construction

A. CERTIFICATION OF MATERIAL COMPLIANCE – During concreting operations, the CONTRACTOR shall furnish the ENGINEER written evidence that clearly indicates that the cement and aggregate used in each batch of concrete delivered to or mixed at the job site conforms in all respects to the applicable material requirements of this specification section. Satisfactory certified mill test reports from the cement or aggregate supplier may be considered as evidence of compliance provided that such testing is performed in accordance with the specified ASTM standards by experienced, competent personnel on a regular basis.

B. In case of doubt as to the adequacy or accuracy of mill tests, the ENGINEER may require that the CONTRACTOR furnish, at no additional cost to the OWNER, test reports on the cement and aggregate from an independent testing laboratory acceptable to the ENGINEER. Certified reports or certificates indicating compliance of cement and aggregate shall be submitted to the ENGINEER before such materials are incorporated into the work. The CONTRACTOR shall be responsible for any delays in the progress of the work due to delays in testing and reporting.

C. Certified reports submitted to the ENGINEER for laboratory or mill tests on cement and aggregate shall be based on tests conducted not earlier than ninety (90) days prior to incorporation of these materials into the work. The cost of all sampling and testing of cement and aggregate necessary to furnish satisfactory evidence of

compliance shall be borne by the CONTRACTOR and no separate payment will be made.

D. FIELD SAMPLING AND TESTING - During concreting operations, the ENGINEER will periodically require additional field inspection, sampling, and testing of cement, aggregate, and/or concrete by an independent testing laboratory in order to determine if the requirements of this specification section are being satisfied. Field sampling and testing of cement, aggregate, and concrete will be performed according to the following latest ASTM Standards at a frequency determined by the ENGINEER.

1. AGGREGATE

    a. Sampling - ASTM D 75

    b. Testing - Any test specified in ASTM C 33

2. CEMENT

    a. Sampling - ASTM C 183

    b. Testing - Any test specified in ASTM C 150

3. CONCRETE

    a. Sampling - ASTM C 172

    b. Slump Test - ASTM C 143

    c. Air Content Test - ASTM C 231

    d. Making and Curing Test Cylinders - ASTM C 31

    e. Compression Strength Tests - ASTM C 39

E. Compressive strength testing will consist of making, curing, and testing cylinders of concrete. A total of four (4) test cylinders will be prepared from each sample of concrete to be tested. Two (2) test cylinders will be broken at an age of seven (7) days; two (2) test cylinders will be broken at an age of twenty-eight (28) days. The minimum number of samples and test cylinders to be taken is as follows:

Concrete Class	Total Size of Pour	Number of Samples	Number of Cylinders
Class A	1 to 4 cu. yds.	1	4
Class A or B	4 to 100 cu. yds.	1	4
Class A or B	101 to 200 cu. yds.	2	8
Class A or B	201 to 300 cu. yds.	3	12
Class A or B	Over 300 cu. yds.	1/100 cu. yd.	4/100 cu. yd.

F. Test cylinders will normally be laboratory-cured. However, the ENGINEER may require tests on field-cured specimens to check the adequacy of curing operations. A slump test and an air content test will be performed on each sample of concrete tested for compressive strength.

G. Cement and aggregate will be subject to inspection, sampling, and field testing at the batching plant. Concrete will be subject to inspection, sampling, and field testing at the place of concrete placement. All field sampling, field testing, making, and curing of field test cylinders, and laboratory testing performed during concreting operations for the purpose of determining if the requirements of this specification section are being satisfied shall be conducted by an independent testing laboratory selected by the OWNER and paid for directly by the OWNER and not as a part of this Contract.

H. The CONTRACTOR shall furnish the testing laboratory representative satisfactory samples of cement, aggregate, and concrete for inspection and testing purposes. The CONTRACTOR shall furnish any barrows, shovels, mixing boards, shaded area for preparing test cylinders, and similar equipment required by the testing laboratory representative for securing samples, making test cylinders, and conducting field tests. No materials or concrete which fail to conform to the requirements of this specification section shall be incorporated into the work.

1.06 Shop Drawings and Engineering Data

Complete ENGINEERING and product data shall be submitted to the ENGINEER on all admixtures, curing compounds, hardeners, sealers, and waterstops in accordance with the requirements of *Section 013000 – Administrative Requirements* of these Specifications.

Part 2 Products

2.01 General

Concrete shall be composed of Portland Cement, fine aggregate, coarse aggregate, admixtures as specified herein, and water, so proportioned and mixed as to produce a plastic, workable mixture meeting the requirements of this specification section. Materials and concrete not conforming to the requirements specified herein shall not be incorporated in the work.

2.02 Materials

A. Cement shall be standard Portland Cement, of American manufacture, conforming to ASTM C 150, Type I. Only one brand of commercial Portland cement shall be used in the exposed concrete of the structure. Cement reclaimed by cleaning bags or from leaking containers shall not be used in this work. Each bag shall weigh approximately ninety-four pounds (94 lbs) and contain one cubic foot (1 ft^3).

B. Fine aggregate shall be natural siliceous river sand, consisting of hard, clean, sharp, strong, durable, and uncoated particles, conforming to the requirements of ASTM C 33. The mortar strength developed in such test shall be ninety percent (90%) of that developed by standard Ottawa sand tested under identical conditions. Fine aggregate shall be graded in conformance with the requirements of ASTM C 33, except that it shall have a fineness modulus of 2.40 minimum and 3.00 maximum and the material passing the No. 200 sieve shall not exceed 3.0 percent by weight of the total sample.

C. Coal and lignite shall not exceed 0.5 percent by weight of the total sample for all concrete. The fineness modulus of fine aggregate incorporated in the work shall not vary more than 0.10 plus or minus from the fineness modulus of the fine aggregate in the appropriate preliminary mix design approved by the ENGINEER. If the locally available sources of fine aggregate will not yield the required grading, the ENGINEER may approve alternate gradations if such deviations do not adversely affect the work. However, the amount retained on any individual sieve size shall not exceed thirty-five percent (35%) of the sample and the amount passing the No. 50 sieve shall not be less than fifteen percent (15%) of the sample.

D. Coarse aggregate shall consist of clean, natural, washed gravel or crushed stone, suitably processed and conforming to the requirements of ASTM C 33, Class Designation 3S. Coarse aggregate as delivered to the mixing plant shall be graded,

or individual sizes shall be so combined as to fall within the grading requirements corresponding to the following grading size numbers, as contained in Table 2 of ASTM C 33:

Maximum Aggregate Size (Inches)	**Grading Size No.**
3/4	67
1	57
1 - 1/2	467
2	357

E. The maximum size of aggregate shall be no larger than one-fifth (1/5) of the narrowest dimension between sides of forms within which concrete is to be cast nor larger than three-fourths of the minimum clear spacing between reinforcing bars, or between bars and forms. Coarse aggregate shall be limited to three-fourth inch (3/4") maximum size for pumped concrete.

F. Water used in mixing concrete shall be fresh, clean, potable water free from injurious amounts of oil, acid, alkali, vegetable, sewage, and/or organic matter. Water shall be considered as weighing 8.36 pounds per gallon.

G. Admixtures – All concrete shall contain an air entraining admixture conforming to ASTM C 260 in order to provide an entrained air content of five percent (5%) plus one percent (1%) by volume. Air entraining admixtures shall be W. R. Grace "Darex AEA", Master Builders "MB-VR", Protex "AES", Sika "AEA", or equal.

H. All concrete shall contain a chloride-free, water reducing admixture or plasticizer conforming to ASTM C 494, Type A. Water reducing admixtures shall be W. R. Grace "WRDA-HC", Sika "Plastocrete", Gifford-Hill "PSI Normal", Master Builders "Pozzolith Normal", Chem-Masters "WR-77", or equal.

I. Accelerators and retarders may be used under adverse placement conditions when authorized in writing by the ENGINEER. Accelerators shall be Calcium Chloride conforming to ASTM D 98, dispensed as a solution. Calcium Chloride content shall not exceed one percent (1%) of the cement content by weight. Retarders shall be Chloride-free water reducing and retarding admixtures conforming to ASTM C 494, Type D. Retarders shall be W. R. Grace "Daratard-HC", Sika "Plastiment", Protex "Protard", Gifford-Hill "PSI Retarder", Master Builders "Pozzolith Retarder", or equal.

J. The admixture content, batching method, and time of introduction into the mix shall be in strict accordance with the manufacturer's recommendations.

2.03 Membrane Curing Compound

Membrane curing compound shall have a one-hundred percent (100%) resin base and shall be of the colorless type with a fugitive dye added conforming to ASTM C 309, Type I, Class B. The membrane curing compound shall contain sufficient dye to produce a definite, distinguishing color. Curing compound shall be compatible with liquid hardeners and epoxy sealers. Membrane curing compound shall be Protex "LR-151", Sonneborn "Hydrocide-309", W. R. Grace "Horncure 30D", Chem-Masters "Kurex 3", or equal.

2.04 Polyethylene Film

Polyethylene film shall conform to Product Standard PS 17 and, unless otherwise specified or shown on the Drawings, shall have a thickness of six (6) mils.

2.05 Epoxy Bonding Agent

Epoxy bonding agents shall be specially formulated to bond fresh concrete to existing concrete. Epoxy bonding agents shall be two (2) component polysulfide or polyamide epoxies containing one-hundred percent (100%) solids. Epoxy bonding agents shall be insensitive to moisture during cure. When cured at a temperature of sixty-three degrees Fahrenheit (63° F), neat epoxy bonding agent shall have a one (1) day compressive strength of not less than five-thousand pounds-per-square-inch (5,000 psi) and a twenty-eight (28) day compressive strength of not less than twelve-thousand pounds-per-square-inch (12,000 psi), when tested in accordance with ASTM D 695, and shall have a twenty-eight (28) day tensile strength of not less than three-thousand-five-hundred pounds-per-square-inch (3,500 psi), when tested in accordance with ASTM D 638.

2.06 Waterstops

Waterstops shall be manufactured of polyvinyl chloride (PVC) and shall be of the ribbed type with center bulb. Waterstops shall have a nominal width of six inches (6”) and shall be as manufactured by W. R. Meadows, Vulcan Metal Products, W. R. Grace, or equal. Waterstops placed in concrete shall be continuous. Lapped joints shall not be permitted.

2.07 Chemical Hardener

Unless otherwise specified, all interior concrete floors of shops, garages, and vehicle service areas shall be treated with a liquid hardener composed of Magnesium and Zinc fluorosilicates, combined with an anionic surfactant for improved wetting penetration. Liquid hardener shall be colorless, nontoxic, nonflammable, and compatible with and providing good adhesion for subsequent toppings and/or coatings. Liquid hardener shall be suitable for use on new or old concrete floors and shall comply with Corps of Engineer Specification 204. Liquid hardener shall be Sonneborn "Lapidolith", Protex "Lithoplate", L & M "Fluo Hard", or equal.

2.08 Epoxy Floor Sealer

Epoxy floor sealer shall be a two (2) component, one-hundred percent (100%) solids, epoxy coating that provides a smooth, tough, flexible, wear abrasion, and chemical resistant surface. Epoxy floor sealer shall be applied only where shown on the Drawings. Sealer shall be U.S.D.A. approved for use in food processing plants. Unless otherwise specified, sealer shall be colored gray. Epoxy sealer shall be Chem-Masters "Durakote", Sonneborn "Sonoplex", L&M "Dynaflor", or equal.

2.09 Wet-well and Rectangular Concrete Chamber Interior Coatings

Unless otherwise specified, all interior concrete shall be coated with Sherwin-Williams Hi-Solid Catalyzed Epoxy – white B62W01 epoxy system, or equal, and shall be applied according to Manufacturer's recommendations.

2.10 Vapor Barrier

Unless otherwise specified, all interior concrete slabs on grade in buildings shall be furnished with an FHA approved vapor barrier under the concrete slab. Vapor barrier shall be constructed of a multi-ply lamination of polyethylene film and glass scrim reinforced paper to form a moisture, scuff, and puncture resistant membrane. Moisture permanence shall not exceed 0.10 perms in accordance with ASTM E96, Procedure A. Vapor barrier shall be St. Regis Paper Company "Moistop", Glas-Kraft "Plybar", or equal.

2.11 Strength

A. Concrete ingredients shall be selected, proportioned, and mixed in such a manner as will produce a watertight durable concrete that will develop the following minimum

compressive strengths at an age of twenty-eight (28) days when sampled, cured, and tested in accordance with the procedures specified in ASTM C 31 and C 39:

Concrete Class	Age	Average of Three Consecutive Samples	Minimum Any One Specimen
Class A	28 days	4,000 psi	3,500 psi
Class B	28 days	2,500 psi	2,000 psi

B. Should the average compressive strength of three (3) consecutive specimens or the compressive strength of any single specimen fall below the minimum strengths specified above, the ENGINEER shall have the right to order a change in the mix design for the remaining portion of the work. The ENGINEER shall also have the right to order additional curing of the affected concrete followed by cores taken in accordance with ASTM C 42 and ACI 318, all at the expense of the CONTRACTOR.

C. If the additional curing does not bring the average compressive strength of three (3) cores taken in the affected area to at least the minimum strength specified, the ENGINEER may require that the CONTRACTOR strengthen the structure by means of additional concrete and steel or he may require that the CONTRACTOR replace the affected portions. The cost of all such changes in mix designs and any modifications to or replacement of deficient concrete shall be borne by the CONTRACTOR at no additional cost to the OWNER.

2.12 Consistency

A. Concrete shall be of such consistency and composition that it can be worked readily into the corners and angles of the forms and around the reinforcement without excessive spading and without permitting the materials to segregate or free water to collect on the surface. When dropped from the discharge chute, the concrete mass should flatten out at the center and spread out slowly at the edges.

B. The proportions shall be adjusted to secure the lowest water-cement ratio which is consistent with good workability, a plastic cohesive mixture, and one which is within the following slump range as determined in accordance with ASTM C143:

Concrete Use	Slump in Inches
Wall	2-1/2 to 4
Floors and Slab	2 to 3

Beams	2 to 3
Blocks and Footings	2 to 4

C. Concrete having a slump greater than one inch (1”) over the specified maximum shall be rejected. In pumped concrete, the maximum slump of the concrete at the suction of the pump may be increased above the maximum specified slump by the amount of slump loss in the pumping system up to a maximum of one inch (1”). The amount of slump loss shall be the difference between slump tests made at both ends of pumping system, and shall be limited to a total loss of one inch (1”).

D. If tests indicate a loss greater than one inch (1”), the CONTRACTOR shall take corrective measures acceptable to the ENGINEER. For thin sections and construction with limited clearance between reinforcing steel and when placement conditions preclude the use of vibrators, the ENGINEER may authorize the use of concrete having a slump of five inches (5”).

Part 3 Execution

3.01 Storage of Materials

A. Cement shall be shipped to the site of the mixer plant in bulk or in paper or cloth bags, at the option of the CONTRACTOR. Upon arrival, it shall be stored immediately in a thoroughly dry, weather-tight, and properly ventilated building or enclosure with adequate provisions for the prevention of absorption of moisture. It shall be stored in a manner that will permit easy access for inspection and identification of each shipment. If cement is to be stored at the job site, storage facilities shall be provided by and at the expense of the CONTRACTOR and approved by the ENGINEER, prior to arrival of the first shipment. Cement which has become caked or lumpy shall not be used.

B. Sand and coarse aggregates shall be stored in separate stockpiles at points selected to provide maximum drainage and to prevent the inclusion of a foreign material during re-handling. Stockpiles of coarse aggregates shall be built in horizontal layers to avoid segregation and breakage. Where concrete volumes require batching of various aggregate sizes, a separate stockpile for each size shall be maintained. The bottom six inches (6”) of aggregate piles shall not be used.

3.02 Proportioning

A. Concrete materials shall be accurately proportioned and mixed to produce a homogeneous and workable mixture having the consistency and minimum compressive strength specified herein. Concrete materials shall be proportioned by weight. The types of equipment and methods used for measuring ingredients shall be acceptable to the ENGINEER. The amount of water and cement used shall be the minimum amount necessary to produce a concrete mixture of the required strength and consistency, but in no case shall the water-to-cement ratio exceed that specified herein nor shall the cement content be less than that specified herein.

B. Compressive strength may not necessarily be the most critical factor in proportioning concrete mixes since other factors, such as durability and water tightness, may impose lower water-cement ratios than are required to meet strength requirements. In such cases compressive strength will, of necessity, be in excess of that specified. Minimum cement contents and maximum water-to-cement ratios shall be as follows:

Factor	**Class of Concrete**	**Maximum Aggregate Size**			
		2”	**1-1/2”**	**1”**	**3/4"**
Minimum Cement Factor, Sacks /cu yd	A	5.3	5.8	6.2	6.6
	B	5.0	5.5	5.9	6.3
Maximum Water-to-Cement Ratio, lb/lb	A	0.49	0.49	0.49	0.49
	B	0.62	0.62	0.62	0.62
Maximum Water-to-Cement Ratio, gal/sack	A	5.5	5.5	5.5	5.5
	B	7.0	7.0	7.0	7.0

C. The water content of the mix shall be based on the total amount of water in the mixture, including any free water in the aggregate or adhering to the surface of the aggregate, but not including water absorbed by the aggregate. The total volume of aggregate to be used in each cubic yard of concrete shall be determined by recognized standards for designing concrete mixes, utilizing the actual screen analysis of the aggregates. The proportion of fine and course aggregate shall be such that the ratio of the course to the fine based on weight shall not be less than 1.0 nor more than 2.0, nor shall the amount of coarse material be such as to produce harshness in placing or honeycombing in the structure.

D. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. Any adjustment shall produce the lowest water-cement ratio which is consistent with good workability and produces a plastic cohesive mixture. Do not use revised mix designs until all revisions have been reviewed by and are acceptable to Engineer.

E. Use air-entraining admixtures in all concrete. Provide not less than four percent (4%) nor more than eight percent (8%) entrained air for all concrete exposed to freezing and thawing conditions; and, from two percent (2%) to four percent (4%) for all other concrete.

3.03 Mixing Concrete

A. The mixing equipment used by the CONTRACTOR shall be capable of combining the aggregates, cement, admixtures, and water within the time specified into a thoroughly mixed and uniform mass. Concrete shall be mixed by one of the three following methods: (1) by the operation of one or more batch-type mixing plants, each with a rated capacity of one-half cubic yard (1/2 CY) or more, installed at the site of the work; (2) by the operation of a proportioning plant installed in the vicinity of the work and the use of transit mixers for mixing concrete and transporting it to the forms; or (3) by the use of ready-mixed concrete from a central mixing and proportioning plant.

B. The method selected by the CONTRACTOR shall be subject to the approval of the ENGINEER. The mixing and proportioning plants shall be provided with adequate equipment and facilities for accurate measurement and control of the quantities of material and water used in the concrete and for readily changing the proportions to conform to the varying conditions and requirements of the work.

C. Stationary Mixed Concrete

Stationary mixing shall be done in a batch mixer of approved type which will ensure a uniform distribution of the materials throughout the mass. The equipment at the mixing plant shall be so constructed that all materials including the water entering the drum can be accurately proportioned and be under control.

1. The cement and aggregate shall be proportioned by weight. No volumetric batch shall be allowed.

2. The mixer shall be equipped with an automatic timing device made to lock the discharge level before aggregate and cement enter the drum, and to

release such level only after the specified mixing time has elapsed. Stationary mixers shall be in accordance with the "Concrete Mixer Standards" adopted by the Mixer Manufacturer's of the Associated General CONTRACTORS of America and shall bear a plate giving the manufacturer's rated capacity of the mixer.

3. The entire batch shall be discharged before recharging. The volume of the mixed material per batch shall not exceed the manufacturer's rated capacity of the mixer. Mixing of each batch shall continue for the period indicated herein, during which time the drum shall rotate at a peripheral speed as recommended by the manufacturer.

4. The mixing time shall be as follows:

Capacity of Mixer	Mixing Time in Minutes
1/2 cubic yards	1-1/4
3/4 to 1-1/2 cubic yards	1-1/2
Larger than 1-1/2 cubic yards	2

5. The mixing time shall be measured from the time that all cement and aggregates and most of the water are in the mixer. Excessive over mixing, requiring additional water to preserve the required consistency will not be permitted. All of the mixing water shall be introduced before one-fourth (1/4) of the total mixing time has elapsed.

D. Transit Mixed Concrete

1. The type, capacity, and manner of operation of the mixing and transporting equipment for transit ready-mixed concrete shall conform to the current "Standards for Operation of Truck Mixers and Agitators of the National Ready-Mixed Concrete Association," the "Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers Bureau," and ASTM C94.

2. Transit mix concrete trucks shall be equipped with an automatic device for recording the number of revolutions of the drum during the mixing period. Each mixer and agitator shall have attached thereto in a prominent place, a metal plate or plates, installed by the manufacturer, on which is plainly marked the capacity of the drum in terms of the volume of mixed concrete and the speed of rotation for the agitating and mixing speeds of the mixing

drum or blades. Each mixer shall have identification number painted on the truck in such a location that it can be easily read from the batching platform.

3. The total volume of materials introduced into the mixer shall not exceed the manufacturer's guaranteed mixing capacity. If the concrete so mixed does not meet the uniformity requirements of this subsection, the amount of materials charged into the mixer shall be reduced. The drum of the mixer shall be completely emptied of any previously mixed load. The proper proportions of aggregate, cement, and water for each load of concrete shall be placed in the mixer and shall be mixed therein for not less than seventy (70) nor more than one-hundred (100) revolutions of the drum or blades at the speed designated by the manufacturer of the equipment as the mixing speed. Additional revolutions of the drum shall be at the speed designated by the manufacturer of the equipment as the agitating speed; however, immediately prior to discharging the concrete, the drum shall be revolved at the mixing speed for a minimum of three (3) minutes.

4. The revolving of the drum shall be continuous until the concrete is completely emptied from the drum. When Class A concrete is being placed, all wash water shall be emptied from the mixer before any portion of the succeeding load is placed therein. For Class B concrete the mixer shall be empty or may carry no more than ten (10) gallons of water in the drum. Water added at the point of discharge shall only take place with the approval and in the presence of the ENGINEER. Water so added shall be mixed into the load for a minimum mixing time of three (3) minutes.

5. Water shall not be added to the load during the transit. The total elapsed time between the addition of water to the cement and aggregate or the addition of cement to the water and aggregate and the placement of the concrete in the forms shall not exceed ninety (90) minutes. During hot weather or conditions contributing to quick setting, the total elapsed time permitted may be reduced at the direction of the ENGINEER to forty-five (45) minutes. When the concrete cannot be delivered to the forms within the time period specified, a water-reducing and retarding admixture may be used subject to the approval of the ENGINEER. Such use of a water reducing retarder will be permitted only as necessary to supplement (not to replace) other acceptable hot weather procedures.

6. The retarding admixture used shall not interfere with strength development and other properties of the concrete and its use shall be carefully controlled by the concrete supplier. Before any such admixture is permitted, it shall be

tested with job site materials under job conditions to determine its compatibility with the other materials and its ability under these conditions to produce the desired properties.

7. Addition of water at the job site to offset evaporation of mixing water shall be done with the ENGINEER'S approval and in his presence using water in the form of a cement paste having the same water-to-cement ratio as the batch in the transit mixer. Following addition of the cement paste, the mixer drum or blades shall be rotated a minimum of seventy (70) revolutions. Addition of water during transit to offset evaporation losses shall not be permitted.

8. Prolonged mixing, even at agitating speed, shall be avoided where feasible by stopping the mixer and then agitating intermittently. A legible certified weigh master's certificate shall be prepared for each load of ready-mixed concrete. A legible copy of the certified weigh master's certificate shall be submitted to the ENGINEER by the truck operator at the time of delivery. The weigh master's certificate shall contain the following information:

    a. Name of Vendor

    b. Name of CONTRACTOR

    c. Number of cubic yards in the load

    d. Actual weights of cement and of each size of aggregate in the load

    e. Amount of water added at the plant

    f. Amount of free water in the aggregate

    g. Brand and type of cement

    h. Brand and amount of admixture

    i. Time and date of batching

E. When mix proportions have been approved for a project and are identified by a mix number, the ENGINEER may waive the foregoing and accept a legible certified weigh master's certificate which shall contain the following information:

    1. Name of Vendor

2. Name of CONTRACTOR

3. Number of cubic yards in the load

4. Mix designation number

5. Amount of water added at the plant (including free water in aggregate)

6. Time and date of batching.

F. Space shall be provided on the certificate so that amount of water and cement added on the job may be indicated.

3.04 Conveying Concrete

A. Concrete shall be conveyed from mixer to place of final placement by methods which will prevent separation or loss of the material.

B. If the concrete is to be transported more than fifty feet (50') in carts or buggies, they shall be equipped with pneumatic tires.

C. Concrete delivered to the carts, buggies or conveyors from spouts, troughs, or mixer trucks shall not have a free fall of more than three feet (3'). Separation or loss of ingredients shall be prevented while transporting the concrete.

D. Delivery carts, buggies, conveyor trucks or barrows shall be kept on temporary runways built over the floor system. Runway supports shall not bear upon reinforcing steel or fresh concrete.

3.05 Placing Concrete

A. GENERAL – Prior to placing concrete, the CONTRACTOR shall ensure that all reinforcement is securely and properly fastened in position and protected against displacement, that all items to be embedded in the concrete are in place and securely anchored in position, that all forms have been thoroughly coated or wetted, that all form ties at construction joints have been retightened, that concrete surfaces to be covered have had all free water, form coating, loose concrete, and debris removed, and that all conveyances, buggies, and barrows are clean and wetted.

B. The CONTRACTOR shall inform the ENGINEER at least twenty-four (24) hours in advance of the times and places at which he intends to place concrete. The ENGINEER will make a final inspection of forms, reinforcing steel, screeds, construction joints, openings, anchors, pipe sleeves, conduit, and inserts. No concrete pour shall be started until the condition of the forms and place of pouring has been inspected and approved by the ENGINEER.

1. Accurately position, support and secure reinforcing against displacement. Support reinforcing with non-corrosive or plastic coated metal chairs, runners, bolsters, spacers and hangers located at sufficient frequency to limit reinforcing deflection between supports to a maximum of three-eighth inches (3/8").

2. Install welded wire fabric in as long lengths as practicable, lapping at least eight inches (8") with transverse wires overlapping by at least two inches (2").

3. Concrete shall not be placed when the sun, wind, heat, or humidity prevents proper placement and consolidation. No water or cement shall be added to the mix without the ENGINEER'S approval or in his absence. No partially hardened concrete shall be deposited.

C. PLACING CONCRETE – Comply with ACI 318, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.

1. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, in continuous vertical motions, so that concrete is worked around reinforcing and other embedded items and into forms.

2. Do not transport any concrete within forms by using vibration equipment. Transport of concrete within forms shall be performed only by hand spading as necessary.

3. Protect concrete from physical damage or reduced strength due to hot or cold weather extremes during mixing, placement and curing.

4. Unless otherwise specified, all concrete shall be placed upon clean, damp surfaces, free from water, and never upon soft mud, dry absorbent earth or rock, or upon fills that have not been subjected to approved tamping to provide ultimate settlement. Groundwater shall be kept below subgrade until the concrete has set. When subgrade is dry earth, it shall be thoroughly

dampened with water to ensure that no moisture will be absorbed from fresh concrete.

5. Where concrete is placed against gravel or crushed rock which does not contain at least twenty-five percent (25%) of the material passing a No. 4 sieve or where shown on the Drawings or directed by the ENGINEER, surfaces against which concrete is cast shall be covered with polyethylene film to protect the concrete from loss of water. Joints in the film shall be lapped at least twelve inches (12”) and taped. The polyethylene film shall be protected against puncture from the underlying crushed rock by a cushion of natural or imported sand meeting the requirements of ASTM D 1073 placed on top of the crushed rock. Where concrete is placed against rock, all loose pieces of rock shall be removed and the exposed surface cleaned with a high pressure hose.

6. Place vapor barrier under designated interior concrete slabs on grade. Sheeting shall extend the full area of the slab and shall be turned up or down to footings as indicated. Lap all seams at least twelve inches (12”) and seal per manufacturer's instructions. Install reinforcement with care so as not to puncture vapor barrier. Tape all cuts, tears, punctures, and pipe penetrations before pouring concrete.

7. To prevent segregation of the mix, concrete shall be deposited in its final position in batches without being moved laterally in the forms more than five feet (5’). A crane and a bottom dump concrete bucket shall be used wherever possible. Unless authorized by the ENGINEER, no concrete shall be dropped freely into place from a height of greater than five feet (5’). Concrete shall be deposited in walls by means of prefabricated, rectangular tremies, constructed in short sections and spaced laterally not over five feet (5’) apart.

8. Special care shall be observed to avoid slopping concrete over forms when placing. The limits of each concrete pour shall be predetermined by the CONTRACTOR and shall be acceptable to the ENGINEER. All concrete within such limits shall be placed in one continuous operation. After the concrete has been deposited, it shall be distributed over the entire area within the forms in approximately horizontal layers of not more than eighteen inches (18”) in depth and shall be brought up evenly in all parts of the form.

9. Each layer of concrete shall be plastic when covered with the following layer and the forms shall be filled at a rate of vertical rise of not less than two feet per hour (2’/hr.) nor more than six feet per hour (6’/hr.). Should a layer of

concrete reach its initial set before the next lift can be placed or should more than sixty (60) minutes elapse between placement of successive concrete lifts, the CONTRACTOR shall cease placement of concrete until the surface of the previous lift is prepared in accordance with the procedures specified in Part 3.08, Construction Joints, of this specification section.

10. Workmen shall not walk on concrete during placing or finishing with any earth or foreign matter on footgear. Hand spreading shall be done with forks and shovels, not rakes. Concrete shall be placed and compacted in wall or column forms before any reinforcing steel is placed in the structural system to be supported by such walls or columns. The portion of any wall or column placed monolithically with a floor or roof slab shall not exceed six feet (6') of vertical height. Concrete in walls or columns shall set at least two (2) hours before concrete is placed in the structural systems to be supported by such walls or columns. Brackets, haunches and fillets shall be poured monolithic with the floor or roof slab system.

D. COMPACTION - During and immediately after placement, concrete shall be thoroughly compacted and worked into all corners and angles, and around reinforcement and embedded fixtures in a manner to fill all voids, prevent honeycombing against the forms and avoid segregation of coarse aggregate. This operation shall be performed by the use of spades or forks and internal vibrators. Vibration shall be transmitted directly to the concrete and in no case shall it be transmitted through the forms. Vibrator driving mechanisms shall revolve at not less than seven-thousand revolutions-per-minute (7,000 rpm).

1. The vibration shall be sufficiently intense to cause the concrete to flow and settle readily into place and to visibly affect the concrete over a radius of at least eighteen inches (18"). Vibration shall be supplemented by manual forking or spading adjacent to the forms on exposed faces in order to secure smooth, dense surfaces. Special care shall be taken to ensure consolidation around reinforcement, pipes and other shapes built into the work. Vibrators shall be kept in motion at all times to prevent excessive vibration in one spot. The operation shall be continuous and all concrete shall be in final position before initial set has started. In addition to the vibrators in actual use while concrete is being placed, the CONTRACTOR shall have on hand at least one operable vibrator as a spare in case of equipment failure.

2. No concrete shall be placed until all vibrating equipment, including spares, is at the placement site. Concrete shall be thoroughly compacted prior to top finishing. All laitance, debris, and surplus water shall be removed from

concrete surfaces at tops of forms by screeding, scraping, or other effective means. Wherever the top of a wall will be exposed to weathering, the forms shall be overfilled and after the concrete has been compacted, the excess shall be screeded off.

E. PLACEMENT SEQUENCE - Unless otherwise indicated on the Drawings or directed by the ENGINEER, the following placement sequence shall be followed to reduce the effect of shrinkage in producing cracking:

1. BOTTOM SLAB - A center section (as outlined by the construction joints shown on the Drawings) shall be placed first. Not less than seventy-two (72) hours after the center section has been placed, the Contractor may proceed with the placement of an adjoining section. Sections shall be placed alternately, first on one side and then on the other side of previously placed sections. Pours shall be scheduled so that two (2) adjacent sides of each section are free, except at closures.

2. WALLS - Walls shall be divided into sections by the construction joints shown on the Drawings. A section near the center of each wall shall be placed first. Sections shall be placed alternately, first on one side and then on the other side of the previously placed section. Pours shall be schedule so that one (1) end of each section is free, except at corner closures.

3. FOOTINGS - Footings, except for wall footings, shall be poured in one operation with no joints.

F. REQUIREMENTS DUE TO ADVERSE WEATHER CONDITIONS – No concrete shall be placed during rain. No concrete shall be placed if rain is forecast unless there is sufficient time to complete the placement and finishing. All concrete placed prior to rain shall be protected by whatever means necessary to prevent damage to finish or water entering the mix. Protection equipment and materials shall be on hand prior to placement operations.

1. Freshly placed concrete shall be protected from scour by flowing water and from mud deposits or other injurious conditions. Except as modified herein, cold weather concreting shall comply with ACI 306. The temperature of concrete at the time of placing shall be not less than shown in the following table for the corresponding ambient outdoor air temperature (in shade) existing at the time of placement:

Ambient Outdoor Air Temperature	Minimum Concrete Temperature
Below 35 Degrees F.	70 Degrees F.
Between 35 and 45 Degrees F.	60 Degrees F.
Above 45 Degrees F.	45 Degrees F.

2. Placing of concrete when the ambient air temperature at the time of placement is forty-five degrees Fahrenheit (45° F) or less shall be done only when specifically authorized by the ENGINEER using concrete heated in a manner acceptable to the ENGINEER. If the use of heated concrete is authorized, the temperature of the concrete at the time of placement shall not exceed eighty degrees Fahrenheit (80° F). Adequate means shall be provided for maintaining the temperature of the air surrounding the concrete at seventy degrees Fahrenheit (70º F) for three (3) days, or fifty degrees Fahrenheit (50º F) for five (5) days, or for as long as is necessary to ensure proper curing of the concrete.

3. Rapid cooling of the concrete shall be prevented. Housing or covering or other protection used in connection with heating shall remain in place and intact at least twenty-four (24) hours after the artificial heat is discontinued. The use of Calcium Chloride or other chemicals to prevent freezing shall not be permitted. Except as modified herein, hot weather concreting shall comply with the requirements of ACI 305. Hot weather precautions shall be taken whenever the maximum ambient outdoor air temperature (in shade) during the day exceeds eighty-five degrees Fahrenheit (85° F).

4. When rapid mixing water evaporation in transit causes the concrete to be delivered in an unworkable condition, initial correction may be made at the job site, provided that water added is in the form of cement paste having the same water-to-cement ratio as the batch in the truck, and provided that the drum or mixer blades be operated at mixing speed for at least seventy (70) revolutions after the paste addition. Once need for water has been observed, subsequent additions shall be at the batching plant until the need has passed.

5. Correction shall consist of a simultaneous and proportionate increase of water and cement, up to ten percent (10%) of the stated quantity of each material in the bath. Such increases in cement shall not constitute grounds for an increase in the Contract Price. The temperature of concrete at the time of placement shall not exceed eighty-five degrees Fahrenheit (85° F).

6. During hot weather, extra caution shall be taken to prevent rapid evaporation of water. Forms shall be kept cool by frequent wettings. Flat work shall be protected from drying winds, direct sun, and high temperatures whenever conditions of temperature and humidity are such as to cause plastic shrinkage cracking. In order to prevent plastic shrinkage cracking due to rapid evaporation of moisture, no concrete shall be placed when the rate of evaporation, determined by using Figure 2.1.4 in ACI 305, equals or exceeds 0.2 pounds per square foot per hour (0.2 lbs/ft^2/hr).

3.06 Finishing

A. FINISHING FORMED SURFACES – All permanently exposed surfaces shall be expected to be smooth and of uniform texture and appearance. Surfaces to be rubbed shall include all submerged concrete surfaces that can be seen when water is drained. Rubbing may be omitted for minor blemishes on buried surfaces or on exposed surfaces that cannot normally be seen, such as inside covered tanks. Final determination for which surfaces are to be rubbed is to be the decision of the ENGINEER.

1. All holes, pits, or imperfections in the surface of the concrete shall be cleaned with a wire brush, thoroughly wetted and completely filled with damp cement mortar composed of (one) 1 part Portland Cement to two (2) parts fine aggregate. The entire surface shall be left smooth and all lines or markings shall be smoothed over to obtain uniform appearance.

2. In the event the CONTRACTOR fails to obtain a satisfactory appearance of the concrete in the opinion of the ENGINEER, the entire surface shall be thoroughly wetted down, kept wet continuously, and rubbed with a No. 20 Carborundum stone until all lines, markings, and surplus materials have been removed from the surface, and until the surface shows a uniform smooth finish. After rubbing is completed, the concrete surface shall be washed clean with water. Rubbing may be done either by hand or with power tools.

B. FINISHING UNFORMED SURFACES – No surface treatment will be required for buried or permanently submerged concrete not forming an integral part of a structure, except that required to obtain the surface elevations or contours and surfaces free of laitance. The unformed surfaces of all other concrete shall be screeded and given an initial float finish followed by additional floating followed by troweling where required. Care shall be taken that no excess water is present when the finish is made. No special concrete or cement mortar topping course shall be used unless so shown on

the Drawing.

1. SCREEDING – All slabs shall be screeded to an even surface by the use of a straight edge and screeding strips accurately and securely set to the proper level. Screeds shall be such type and so arranged so as not to interfere with the top bar reinforcement. Screeding shall provide a concrete surface conforming to the proper elevation and contour with all aggregates completely embedded in mortar. All screeded surfaces shall be free of surface irregularities with a height or depth in excess of one-fourth inch (1/4") as measured from a ten-foot (10') straight edge.

2. FLOATING – Screeded surfaces shall be given an initial float finish as soon as the concrete has stiffened sufficiently for proper working.

    a. Any piece of coarse aggregate which is disturbed by the float or which causes a surface irregularity shall be removed and replaced with mortar. Initial floating shall produce a surface of uniform texture and appearance with no unnecessary working of the surface.

    b. Initial floating shall be followed by a second floating at the time of initial set. The second floating shall produce a finish of uniform texture and color. Unless additional finishing is specifically required, the completed finish for unformed surfaces shall be the float finish produced by the second floating. Floating shall be performed with hand floats or suitable mechanical compactor floats.

3. BROOMING – Surfaces of equipment bases and curbs and sidewalks shall be given a light broom finish providing a nonslip surface. Brooming shall be done after the second floating and for traffic areas shall be at right angles to the normal traffic direction.

4. TROWELING Surfaces to be covered with resilient floor coverings and other surfaces designated on the Drawings to be troweled shall be steel trowel finished. Trowel finishing will not be required for floors which are normally submerged. Troweling shall be performed after the second floating when the surface has hardened sufficiently to prevent an excess of fines being drawn to the surface. Troweling shall produce a dense, smooth, uniform surface free from blemishes and trowel marks.

5. EDGING – All permanently exposed edges of unformed surfaces shall be chamfered with a three-fourth inch (3/4") approved edging tool unless other

edge treatment is indicated on the Drawings.

3.07 Curing

A. All concrete shall be protected from loss of moisture by curing for at least fourteen (14) days following placement.

1. Curing operations shall take place immediately after concrete finishing is complete or forms are removed. Breaking of form ties or otherwise breaking the seal between the concrete surface and the form shall be considered form removal.

2. Curing shall be accomplished by water curing, membrane curing, film curing, or any other curing method acceptable to the ENGINEER which does not injure or discolor exposed surfaces nor destroy the bond on surfaces to receive subsequent concrete pours or protective coatings.

B. WATER CURING – Concrete surfaces being water-cured shall be kept constantly and visibly wet for a period of not less than fourteen (14) days.

1. Water saturation of concrete surfaces shall begin as quickly as possible after the initial set of the concrete. The rate of water application shall be regulated to provide complete surface saturation with a minimum of runoff.

2. Slabs poured on grade and decks may be water-cured by ponding or by covering with wet burlap sacks, sand, or sawdust and keeping this covering continually and visibly wet during this period. Standard canvas seep hose placed in parallel runs on eight-foot (8’) centers is recommended for ponding. Walls may be cured by leaving the forms tied in place and keeping the forms and all exposed surfaces of the concrete continually and visibly wet for the duration of the curing period.

C. MEMBRANE CURING – Membrane-curing compound may be used in lieu of water curing on Class B concrete and on concrete which will not be covered later with mortar, liquid hardener, or additional concrete.

1. Except as modified herein, membrane-curing compounds shall be applied in strict accordance with the manufacturer's recommendations. Membrane-curing compounds shall conform to the requirements of Part 2.04, Membrane Curing Compound, of this specification section.

2. Membrane-curing compound shall be spray applied in two (2) separate coats, each having a surface coverage of not more than three-hundred square feet per gallon (300 ft^2/gal). Unformed surfaces shall be covered with curing compound within thirty (30) minutes after final finishing. If forms are removed before the end of the specified curing period, curing compound shall be immediately applied to the formed surface before they dry out.

3. Curing compound shall be suitably protected against abrasion during the curing period. Whenever the membrane will be subject to damage from traffic or other cause, it shall be protected after drying for twenty-four (24) hours by a layer of sand or fine earth not less than one inch (1") thick or by other means acceptable to the ENGINEER. Compound applied improperly or compound applied without sufficient dye to produce a distinguishing color shall be reapplied to the satisfaction of the ENGINEER.

C. FILM CURING – Film curing with polyethylene sheeting may be used in lieu of water curing on concrete which will be covered later with mortar or additional concrete or will otherwise be covered or hidden from view. Film curing shall begin as quickly as possible after initial set of the concrete. Polyethylene sheeting shall completely cover the surfaces. Sheeting shall overlap the edges sufficiently for proper sealing and anchorage. Joints between sheets shall be overlapped a minimum of twelve inches (12") and sealed. All tears, holes, and other damage shall be promptly repaired. Covering shall be anchored continuously at edges and shall be anchored on the surface as necessary to prevent billowing.

3.08 Construction Joints

A. Construction joints shall be made only at locations indicated on the Drawings or specified herein. Construction joints shall not be made at other locations without the concurrence of the ENGINEER. No vertical construction joints shall be used in walls unless specifically approved by the ENGINEER. The work shall be laid out and conducted so as to minimize the number of construction joints.

B. All construction joints shall be keyed. Keys shall be continuous and shall have a width equal to one-third (1/3) of the thickness of the wall and a depth equal to one-sixth (1/6) of the thickness of the wall. Unless indicated otherwise on the Drawings, no keys smaller than three inches (3") in width and 1-1/2 inches in depth shall be used.

C. Waterstops of the type specified shall be installed where indicated on the Drawings

and in all construction joints in concrete walls and slabs having one face exposed in a dry pit or room and having the other face in contact with backfill, sub grade, groundwater, or other liquid. A jet of air and water shall be applied to the surface of horizontal construction joints to remove all laitance when the concrete has set sufficiently for the jet to expose the coarse aggregate without loosening same.

D. Immediately prior to placing another lift, the surface shall be thoroughly cleaned and washed by water jet followed by air jet to remove standing water. The surface of the concrete shall then be covered by a uniform, evenly distributed layer of cement-sand mortar to a thickness of one inch (1”). The cement-sand mortar shall be composed of a mixture of 1.3 parts by volume Portland Cement and one (1) part by volume fine aggregate, and shall have a water-to-cement ratio equal to that of the concrete to follow.

3.09 Expansion Joints

Expansion joints shall be provided as shown on the Drawings. Details of the expansion joints and materials of construction shall be as shown on the Drawings and specified in these Contract Documents. If not shown on the Drawings, expansion joints shall consist of full-depth, pre-formed, one-half inch (1/2”) asphalt plank material conforming to ASTM D 994.

3.10 Bonding New Concrete to Existing Concrete

A. Where new concrete is to be cast against and permanently bonded to an existing concrete surface, the existing concrete shall be chipped or cut back from the surface a minimum distance of 1-1/2 inches or as necessary to expose sound concrete, remove loose or weathered concrete, and provide a roughened surface for bonding to the new concrete. Edges shall be cut square and feathered edges will not be permitted. All loose material remaining after chipping or cutting operations shall be removed by sandblasting and/or stiff wire brushing.

B. Where chipping back of existing concrete is not possible and where approved by the ENGINEER, the surface of existing concrete may be prepared by sandblasting or acid etching. If sandblasting or etching is used, the surface of the existing concrete shall be bare, clean, dry, and structurally sound. All grease, oil, wax, or other residue shall be removed by scraping, followed by washing with a nonionic detergent or a suitable solvent compatible with the epoxy bonding agent to be used. Animal fats may be removed by scrubbing with a ten percent (10%) solution of caustic soda to saponify them.

C. After all loose material, grease, etc., have been removed, the surface of the existing concrete shall be etched by either sandblasting or scrubbing with a ten to twenty percent (10% to 20%) solution of hydrochloric acid in water applied at a rate of one quart per square yard (1 qt/yd^2) followed by a thorough rinsing with clean water. The surface shall then be allowed to dry completely before application of the epoxy bonding agent. Goggles, rubber boots, and rubber gloves shall be worn by workmen when applying caustic soda or acids.

D. When the surface is dry and just prior to placing the new concrete, an epoxy bonding agent shall be applied to the surface of the existing concrete with a whitewash brush or stiff broom. The epoxy bonding agent shall be spread evenly over the surface to be bonded, avoiding skips and holidays, to wet film thickness of forty (40) to sixty (60) mils. The new concrete shall be placed as soon as the epoxy bonding agent becomes tacky.

E. In the event that the epoxy bonding agent is allowed to dry before placement of the new concrete, the surface shall be recoated with epoxy. The epoxy bonding agent shall comply with the material requirements of Part 2.06, Epoxy Bonding Agents, of this specification section and shall be applied in strict conformance to the manufacturer's recommendations. Adequate safety precautions shall be taken during the handling and use of the epoxy bonding agent.

3.11 Embedded Items

A. Wherever steel, wrought or cast iron piping, fittings, valves, collars, sleeves, structural steel, electrical conduits, appurtenances and fixtures, equipment, anchorages, or castings are shown for embedment in the concrete, such items must be on hand before concrete is poured. They shall be set in place accurately and firmly braced before concrete is poured around them. No cutouts for future installation of these items shall be permitted.

1. Before placing concrete, the CONTRACTOR shall see that all embedded parts are accurately positioned and firmly and securely fastened in place. They shall be thoroughly clean and free from any coating, rust, scale, oil, or other foreign matter. The embedding of wood in concrete shall be avoided whenever possible. If wood is to be embedded, it shall be thoroughly wetted before the concrete is placed. After placement, surfaces not in contact with concrete shall be cleaned of concrete spatter and other foreign substances.

2. Conduit shall be installed between the reinforcing steel in walls or slabs which

have reinforcement in both faces. In slabs which have only a single layer of reinforcing steel, conduit shall be placed under the reinforcement. Unless installed in pipe sleeves, anchor bolts shall have sufficient threads to permit a nut and washer to be installed on the concrete side of the form or template. A second nut and washer shall be installed on the other side of the form or template and the two nuts shall be adjusted so that the bolt will be held rigidly in proper position.

3. The CONTRACTOR shall be responsible for coordinating all work and ensuring that all embedded items or openings to be built into the concrete are placed in the forms before concrete is placed. The contractor shall be responsible for conferring with his subcontractors and suppliers regarding their requirements for embedments and openings. Forms, sleeves, and inserts shall be set, and concrete shall be cast to the lines and grades indicated on the Drawings and as detailed in these Contract Documents. The maximum deviation from true line and grade shall not exceed the tolerance listed below. Deviation in alignment of slabs or wall shall not exceed a rate of one-eighth inch (1/8”) in ten feet (10’) within the tolerances specified.

Item	**Maximum Tolerances**	
Sleeves and Inserts	+1/8”	-1/8”
Projected ends of anchor bolts	+1/4”	-0.0”
Anchor bolt setting	+1/16”	-1/16”
Concrete Forms	+1/8”	-1/8”

B. All slabs shall be carefully finished true to grade such that the surface is free draining and contains no depressions which can hold or collect water.

C. Regardless of the tolerances listed herein, it shall be the responsibly of the CONTRACTOR to limit deviations in line and grade to tolerance which will permit proper installation and operation of mechanical equipment and piping.

3.12 Water Tightness

A. It is the intention of this specification section to provide impervious concrete. All pits below groundwater level and all structures for holding or carrying water shall be watertight. A loss of not more than one-fourth inch (1/4”) depth in twenty-four (24) hours will be permitted when water-holding structures are filled. All exposed surfaces

of water-holding structures and interior surfaces of pits below groundwater level shall be free from visible damp spots or seepage before acceptance.

B. Repeated tests and repairs may be required by the ENGINEER to obtain watertight structures. All structure shall be drained at the completion of tests unless otherwise directed by the ENGINEER. The cost and expense of all testing for water tightness and of providing a watertight structure shall be borne by the CONTRACTOR. Methods of repair shall be acceptable to the ENGINEER. The use of special admixtures or integral waterproofing compounds in concrete required to be watertight is not required but may be permitted, provided the materials and methods are approved in writing by the ENGINEER.

3.13 Concrete Embedment and Encasement of Pipe

A. Concrete for embedment and encasement shall be installed where and as indicated on the Drawings and at such locations where installation conditions require such pipe reinforcement because of unforeseen conditions encountered in the work, as determined by the ENGINEER. Embedment and encasement of pipe shall be preceded by the following preliminary steps:

1. All loose material shall be removed from the trench prior to placing concrete. All concrete shall have a continuous contact with undisturbed soil on sides and bottom of trench.

2. A base course of concrete shall be accurately screeded to such grade and elevation that the pipe will be at specified grade when pipe bells are supported on, and in contact with, the top surface of such base course.

3. Each length of pipe shall be rigidly held in alignment and anchored, to prevent flotation, in a manner acceptable to the ENGINEER.

3.14 Pile Driving and Concrete Work

The Contractor shall not drive foundation piling which may damage freshly placed or existing concrete structures. Minimum distance between concrete less than seven (7) days old and pile driving operations shall be one-hundred feet (100’). Any damage made to concrete structures from pile driving operations shall be repaired by the Contractor at his expense.

3.15 Defective Work and Methods of Repair

A. All defective or damaged work shall be removed and replaced or repaired as directed by the ENGINEER. Any work which has not been constructed in accordance with these Contract Documents shall be considered defective. No defective or damaged work shall be patched, repaired, or covered without prior inspection and approval of the ENGINEER. Defects in formed concrete surfaces shall be repaired within twenty-four (24) hours of placement, to the satisfaction of the ENGINEER, and defective concrete shall be replaced within forty-eight (48) hours after the adjacent forms have been removed.

B. All concrete which is honeycombed or otherwise defective shall be cut out and removed to sound concrete, with edges square cut to avoid feathering. Except as modified herein, concrete repair work shall conform to Chapter 9 of ACI 301 and shall be performed in a manner that will not interfere with thorough curing of surrounding concrete. All repair work shall be adequately cured. Where authorized by the ENGINEER, repair may be accomplished by patching conducted as specified herein. However, permission to patch shall not waive the ENGINEER's right to have the defective work completely removed if the patch or repairs do not, in the ENGINEER's opinion; satisfactorily restore the quality and appearance of the work. Patching shall be conducted as follows:

1. Chip away defective areas at least one-and-one-half inches (1-½”) deep perpendicular to the surface, wet the area and six inches (6”) around it to prevent absorption of water from patching mortar, and brush a sand-cement grout consisting of one part fine aggregate to one part Portland Cement into the surface, following with patching mortar.

2. Patching mortar shall be no richer than one (1) part Portland Cement to three (3) parts fine aggregate using white Portland Cement to replace a portion of the gray cement as determined by a trial patch and shall contain only the minimum mixing water required for placing. Re-temper the mortar if necessary, without the addition of water by allowing it to stand for one hour during which time it shall be mixed with a trowel to prevent setting.

3. Mortar shall be compacted into place and screeded to leave the patch higher than the surrounding surface, then left undisturbed for one or two hours to permit initial shrinkage before being finally finished to match the adjoining surface. Cure patch in accordance with the requirements of Part 3.07, Curing, of this specification section.

3.16 Loads Applied to New Concrete

A. Loads including, but not limited to, earth loads, loads exerted from bracing or shoring, wind loads, hydrostatic or hydraulic loads, equipment or vehicle loads, or loads exerted by stacked materials, shall not be permitted until the concrete has reached its specified twenty-eight (28) day strength. Concrete which has cracked due to overloading, loading before required strength has developed, or otherwise damaged shall be repaired or replaced as determined by the ENGINEER.

3.17 Testing Laboratory

A. The testing laboratory shall have access to all places where concrete materials and concretes are manufactured, stored, proportioned, mixed, placed, and tested. Duties shall include, but not necessarily be limited to the following:

1. Make, store, transport, cure, and test compression specimens made during placing of concrete. Compression test specimens shall be tested in accordance with ASTM C 39. Test reports shall show all pertinent data, such as class of concrete, exact location of pour, air temperature, date of pour, time of pour, truck number for ready-mixed concrete, date on which specimen was broken, age of specimen, compressive strength of specimen, concrete slump test results and air content of concrete from which the specimen was made. One (1) copy each of all tests shall be sent to the Contractor and two (2) copies each to the Engineer.

2. Each strength test requires four (4) standard test cylinders.

3. Samples for strength tests of each class of concrete placed each day shall be taken not less than one (1) time per day, nor less than one (1) time for each one-hundred cubic yards (100 CY) of concrete, nor less than once for each five-thousand square feet (5,000 ft^2) of surface area for slabs or walls.

4. Each class of concrete shall be tested with at least five (5) strength tests.

5. From each set of four (4) cylinders, two (2) shall be tested at twenty-eight (28) days and shall comprise a strength test under the definition of these Specifications. One cylinder shall be broken at seven (7) days and will be used as an aid in determining the early strength of the concrete and the twenty-eight (28) day strength, and one (1) cylinder retained in reserve for later testing if required.

6. Test for unit weight of concrete when the first load of each class of concrete is delivered and thereafter at the discretion of the testing laboratory.

B. Periodically inspect the batching plant and file a report with the Engineer stating whether the supplier's equipment and methods meet the requirements of these Specifications.

C. Temperature and Placing Record: Temperature record shall be made each day during the concreting operations. Records shall also include location, quantity, and starting and finishing time of placement for all concrete work. Copy distribution shall be as specified above for test reports.

END OF SECTION

CONCRETE PREPLACEMENT SIGN-OFF CARD

Project:_____

Inspection Date:_____ Concrete Placement Date:_____

Expected Time of Concrete Placement:_____

Estimated Quantity:_____

Mix Design Strength:_____

Location of Structure:_____

Member (walls, beams, etc.):_____

Weather Conditions:_____

Method of Pour: Chute_____ Bucket_____ Pump_____

Conveyor_____ Other_____

Work	Status		Signature	Date
Formwork				
Reinforcing				
Mechanical				
Electrical				
Instrumentation				
Plumbing				
Process				
Metal Embeds				
Miscellaneous Specialties				
Clean-Up/OK to Place				

The Contractor certifies that the above work to be cast is prepared in accordance with the Contract Documents.

Contractor (Superintendent): _____
Date:_____
Resident Inspector:_____
Date:_____

Part 1 General

1.01 Description

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install grout and perform grouting Work.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before grouting Work.

C. Related Sections

1. Section 033000, Cast-In-Place Concrete.
2. Section 033053 Miscellaneous Concrete.

D. Application and Grout Material:

1. The following is a listing of grouting applications and the corresponding type of grout material to be provided for the associated application. Unless shown or indicated otherwise in the Contract Documents, provide grout in accordance with the following:

TABLE 036000-A, GROUT APPLICATIONS AND MATERIAL TYPES

Application	Required Grout Material Type
Beam and column (one- or two-story height) base plates and precast concrete bearing less than 16 inches in the least dimension	Class II Non-Shrink
Column base plates and precast concrete bearing (greater than two-story height or larger than 16 inches in the least dimension)	Class I Non-Shrink
Base plates for storage tanks and other non-motorized equipment, and motorized equipment or machinery less than 50 horsepower	Class I Non-Shrink (unless otherwise recommended by equipment manufacturer)
Motorized equipment or machinery equal to and greater than 50 horsepower, and motorized equipment or machinery	Class III Non-Shrink Epoxy (unless otherwise recommended by equipment manufacturer)

Application	Required Grout Material Type
equipment less than 50 horsepower subject to severe shock loads or high vibration	
Filling blockout spaces for embedded items such as railing posts, pipe, sleeves, guide frames for hydraulic gates, and similar applications	Class II Non-Shrink (Class I where placement time exceeds 15 minutes)
Grout fill or grout toppings less than four inches thick	Grout Fill
Grout fill greater than four inches thick	Class "B" Concrete in accordance with Section 03 30 00, Cast-In-Place Concrete
Grout for setting filter underdrain blocks, and for filling voids between filter underdrain blocks, and for filling voids between filter underdrain blocks and walls	Filter Underdrain Blocks Grout
Applications not listed above, where grout is indicated on the Drawings	Class I Non-Shrink, unless shown or indicated otherwise

1.02 References

A. Standards referenced in this Section are:

1. ACI 211.1, Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

2. ACI 301, Structural Concrete for Buildings.

3. ASTM C33/C33M, Specification for Concrete Aggregates.

4. ASTM C109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).

5. ASTM C230/C230M, Specification for Flow Table for Use in Tests of Hydraulic Cement.

6. ASTM C531, Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.

7. ASTM C579, Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.

8. ASTM C827, Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.

9. ASTM C882/C882M, Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.

10. ASTM C939, Text Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).

11. ASTM C1107/C1107M, Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).

12. ASTM C1181, Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.

13. NSF/ANSI 61, Drinking Water System Components - Health Effects.

1.03 Quality Assurance

A. Qualifications:

1. Grout Testing Laboratory:

a. Independent testing laboratory employed for design and testing of grout materials and mixes shall comply with testing laboratory requirements in Section 033000, Cast-in-Place Concrete, and other applicable requirements in the Contract Documents.

2. Manufacturer: Shall have a minimum of 5 years of experience producing products substantially similar to that required and shall be able to submit documentation of at least five satisfactory installations that have been in successful operation for at least 5 years each.

3. Manufacturer's Field Service Technician: When required, provide services of manufacturer's full-time employee, factory-trained in handling, use, and installing the products required, with at least 5 years of experience in field applications of the products required.

B. Trial Batch:

1. Each grout fill and construction joint grout mix proportion and design shall be verified by laboratory trial batch or field experience methods. Comply with ACI 211.1 and submit to Engineer a report with the following data:

a. Complete identification of aggregate source of supply.

b. Tests of aggregates for compliance with specified requirements.

c. Scale weight of each aggregate.

d. Absorbed water in each aggregate.

e. Brand, type, and composition of cement.

f. Brand, type, and amount of each admixture.

g. Amounts of water used in trial mixes.

h. Proportions of each material per cubic yard.

i. Unit weight and yield per cubic yard of trial mixtures.

j. Measured slump.

k. Measured air content.

l. Compressive strength developed at seven days and 28 days, from not less than three test specimens cast for each seven-day and 28-day test, and for each design mix.

2. Laboratory Trial Batches: When laboratory trial batches are used to select grout proportions, prepare test specimens and conduct strength tests as specified in ACI 301.

3. Field Experience Method: When field experience methods are used to select grout proportions, establish proportions as specified in ACI 301.

1.04 Submittals

A. Action Submittals: Submit the following:

1. Shop Drawings:

a. Schedule of Project-specific grout applications, installation locations, and the grout type proposed for each.

b. List of grout materials and proportions for the proposed mix designs. Include data sheets, test results, certifications, and mill reports to qualify the materials proposed for use in the mix designs. Do not start laboratory trial batch testing until submittal is approved by Engineer.

c. Trial Batch Reports: Submit laboratory test reports for grout materials and mix design tests.

2. Product Data:

a. Data sheets, certifications, and manufacturer's specifications for all materials proposed for use.

B. Informational Submittals: Submit the following:

1. Manufacturer’s Instructions:

a. Special instructions for shipping, storing, protecting, and handling.

b. Installation instructions for the materials.

2. Field Quality Control Submittals:

a. Report field testing results for each required time period. (e.g., seven-day tests, 28-day tests). Submit within 24 hours after completion of associated test. Each test report shall include results of all testing required at time of sampling.

3. Supplier Reports:

a. Submit written report of results of each visit to Site by Supplier's field service technician, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.

4. Qualifications Statements:

a. Testing laboratory, when not submitted under other Sections.

b. Manufacturer, when submittal of qualifications is required by Engineer.

c. Manufacturer's field service technician when submittal of qualifications is required by Engineer.

1.05 Product Delivery, Storage, and Handling

A. Storage of Materials: Store grout materials in a dry location, protected from weather and protected from moisture.

Part 2 Product

2.01 General

A. All grout materials, admixtures, cementitious materials, and other materials used in grout that contact potable water or water that will be treated to become potable shall be listed in NSF/ANSI 61.

2.02 Non-Shrink Grout Materials

A. General: Non-shrink grout shall be a prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or container in which the materials are packaged. Specific formulation for each type or class of non-shrink grout specified in this Section shall be that recommended by the grout manufacturer for the particular application.

B. Class I Non-Shrink Grout:

1. Class I non-shrink grouts shall have a minimum 28-day compressive strength of 7,000 psi. Use grout for precision grouting and where water-tightness and non-shrink reliability in both plastic and hardened states is critical, in accordance with Table 036000-A in this Section.

2. Products and Manufacturer: Provide one of the following:

   a. Masterflow 928, by Master Builders, Inc.

   b. Five Star Grout, by Five Star Products, Inc.

   c. Hi-Flow Grout, by Euclid Chemical Company.

   d. Or equal.

3. Comply with ASTM C1107/C1107M, Grade C and B (as modified below) when tested using amount of water required to achieve the following properties:

   a. Fluid consistency (20 to 30 seconds) shall be in accordance with ASTM C939.

   b. At temperatures of 45, 73.4, and 95 degrees F.

4. Length change from placing to time of final set shall not have shrinkage greater than the expansion measured at three or fourteen days. Expansion at three or fourteen days shall not exceed the 28-day expansion.

5. Non-shrink property shall not be based on chemically-generated gas or gypsum expansion.

6. Fluid grout shall pass through the flow cone, with continuous flow, one hour after mixing.

C. Class II Non-Shrink Grout:

1. Class II non-shrink grouts shall have minimum 28-day compressive strength of 7,000 psi. Use grout for general-purpose grouting applications in accordance with Table 03 60 00-A in this Section.

2. Products and Manufacturer: Provide one of the following:

   a. Construction Grout, by Master Builders, Inc.

   b. FSP Construction Grout, by Five Star Products, Inc.

   c. NS Grout, by Euclid Chemical Company.

   d. Or equal.

3. Comply with ASTM C1107/C1107M and the following when tested using the quantity of water required to achieve the following properties:

    a. Flowable consistency (140 percent flow in accordance with ASTM C230/C230M, five drops in 30 seconds).

    b. Fluid working time of at least 15 minutes.

    c. Flowable for at least 30 minutes.

4. When tested, grout shall not bleed at maximum allowed water.

5. Non-shrink property shall not be based on chemically-generated gas or gypsum expansion.

D. Class III Non-Shrink Epoxy Grout:

1. Epoxy grout shall be a pourable, non-shrink, 100-percent solids system.

2. Products and Manufacturer: Provide one of the following:

    a. E3G, by Euclid Chemical Company.

    b. Sikadur 42 Grout Pak, by Sika Corporation.

    c. HP Epoxy Grout, by Five Star Products, Inc.

    d. Or equal.

3. Epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all pre-measured and prepackaged. Resin component shall not contain non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are unacceptable. Variation of component ratios is not allowed without specific recommendation by manufacturer. Manufacturer's instructions shall be printed on each container in which products are packaged.

4. The following properties shall be attained with the minimum quantity of aggregate allowed by epoxy grout manufacturer.

    a. Vertical volume change at all times before hardening shall be between zero percent shrinkage and 4.0 percent expansion when measured in accordance with ASTM C827 (modified for epoxy grouts by using an indicator ball with specific gravity between 0.9 and 1.1).

    b. Length change after hardening shall be less than 0.0006-inch per inch and coefficient of thermal expansion shall be less than 0.00003-inch per inch per degree F when tested in accordance with ASTM C531.

c. Compressive creep at one year shall be less than 0.001-inch per inch when tested under a 400-psi constant load at 140 degrees F in accordance with ASTM C1181.

d. Minimum seven-day compressive strength shall be 14,000 psi when tested in accordance with ASTM C579

e. Grout shall be capable of maintaining at least a flowable consistency for minimum of 30 minutes at 70 degrees F.

f. Shear bond strength to portland cement concrete shall be greater than shear strength of concrete when tested in accordance with ASTM C882/C882M.

g. Minimum effective bearing area shall be 95 percent.

2.03 Grout Materials Other than Non-Shrink Grout

A. General: Materials for grouts (other than non-shrink grouts) shall be in accordance with Section 033000, Cast-In-Place Concrete, except as otherwise specified in this Section.

B. Grout Fill:

1. Grout fill shall be comprised of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and mixed in accordance with this Section.

a. Minimum Compressive Strength: 4,000 psi at 28 days.

b. Maximum Water-Cement Ratio: 0.45 by weight.

c. Coarse Aggregate: ASTM C33/C33M, No. 8 size.

d. Fine Aggregate: ASTM C33/C33M, approximately 60 percent by weight of total aggregate.

e. Air Content: Seven percent (plus or minus one percent).

f. Minimum Cement Content: 564 pounds per cubic yard.

g. Slump for grout fill shall be adjusted to match placing and finishing conditions, and shall not exceed four inches.

C. Construction Joint Grout:

1. Construction joint grout shall be comprised of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned with similar cementitious characteristics as Class “A” concrete specified in Section 033000, Cast-In-Place Concrete. Mix design shall result in grout that is flowable with high mortar content. Mix requirements are:

a. Minimum Compressive Strength: 4,500 psi at 28 days.

b. Maximum Water-Cement Ratio: 0.42 by weight.

c. Coarse Aggregate: ASTM C33/C33M, No. 8 size.

d. Fine Aggregate: ASTM C33/C33M, approximately 60 percent by weight of total aggregate.

e. Air Content: Seven percent (plus or minus one percent).

f. Minimum Cement Content: 752 pounds per cubic yard.

g. Slump for Construction Joint Grout: Seven inches (plus or minute one inch).

D. Filter Underdrain Blocks Grout:

1. Grout shall comply with Article 2.1 of this Section. Grout shall consist of one part cement to two parts sand with shrinkage-reducing admixture. Class I or Class II non-shrink grout may be used in lieu of filter underdrain blocks grout.

a. Minimum Compressive Strength: 4,000 psi at 28 days.

b. Maximum Water-Cement Ratio: 0.45 by weight.

2.04 Curing Materials

A. Curing materials shall comply with Section 033000, Cast-in-Place Concrete, and shall be as recommended by the manufacturer of prepackaged grouts.

Part 3 Execution

3.01 Inspection

Examine substrate and conditions under which grouting will be performed and notify Engineer in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.02 Installation

A. General:

1. Place grout as shown and indicated, and in accordance with Laws and Regulations and grout manufacturer's instructions. If manufacturer's instructions conflict with the Contract Documents, obtain clarification or interpretation from Engineer before proceeding.

2. Consistency of non-shrink grouts shall be as required to completely fill the space to be grouted for the particular application. Do not install grout for dry-packing without approval of Engineer. When dry-packing is approved by Engineer, dry-pack consistency shall be such that grout has sufficient water to ensure hydration and grout strength development, and remains plastic, moldable, and that does not flow.

3. Grouting shall comply with temperature and weather limitations in Section 03 30 00, Cast-In-Place Concrete.

4. Cure grout in accordance with grout manufacturer's instructions for prepackaged grout and Section 033000, Cast-In-Place Concrete, for grout fill.

B. Columns and Beams:

1. After shimming columns and beams to proper elevation, securely tighten anchors. Properly form around base plates allowing sufficient room around edges for placing grout. Provide adequate depth between bottom of base plate and top of concrete base to assure that void is completely filled with non-shrink grout.

C. Equipment Bases:

1. Install equipment in accordance with manufacturer's recommendations, Laws, and Regulations, and the Contract Documents. After shimming equipment to proper elevation, securely tighten anchors. Properly form around base plates, allowing sufficient room around edges for placing grout. Provide adequate depth between bottom of equipment base and top of concrete base to ensure that voids are completely filled with non-shrink grout.

D. Handrail Posts:

1. After posts have been properly inserted into holes or sleeves, fill annular space between posts and sleeve with non-shrink grout. Bevel grout at juncture with post so that water will flow away from post.

E. Construction Joints:

1. Place a six-inch minimum thick layer of construction joint grout over contact surface of concrete at interface of horizontal construction joints in accordance with Section 03 15 00, Concrete Accessories, and Section

033000, Cast-In-Place Concrete.

F. Grout Fill:

1. All mechanical, electrical, and finish work shall be completed prior to placing grout fill. Base slab shall be provided with a scratched finish in accordance with Section 033000, Cast-In-Place Concrete. Roughen existing slabs shall by abrasive blasting or hydro-blasting exposing aggregates to ensure bonding to base slab.

2. Minimum thickness of grout fill shall be one-inch. Where finished surface of grout fill is to form an intersecting angle of less than 45 degrees with concrete surface against which grout will be placed, form a key in the concrete surface at the intersection point. Key shall be a minimum of 3.5 inches wide by 1.5 inches deep.

3. Thoroughly clean and wet base slab prior to placing grout fill. Do not place grout fill until slab is completely free of standing water. A thin coat of neat Type II cement slurry shall be broomed into surface of slab. Place grout fill while slurry is wet. Grout fill shall be compacted by rolling or tamping, brought to elevation, and floated. In tanks and basins where scraping-type equipment will be installed, grout fill shall be screeded by blades attached to revolving mechanism of equipment in accordance with procedures recommended by equipment manufacturer after grout is brought to elevation.

4. Grout fill placed on sloping slabs shall be installed uniformly from bottom of slab to top, for full width of placement.

5. Test grout fill surface with a straight edge to detect high and low spots; immediately correct high and low spots in grout fill. When grout fill has hardened sufficiently, grout fill shall be steel troweled to provide a smooth surface free of bug holes and other imperfections. While an acceptable type of mechanical trowel may be used in this operation, the last pass over the grout fill surface shall be by hand-troweling. During finishing, do not apply the following to the grout fill surface: water, dry cement, or mixture of dry cement and sand.

6. Cure and protect grout fill in accordance with Section 033000, Cast-In-Place-Concrete.

3.03 Field Quality Control

A. Field Testing Services:

1. Owner will employ testing laboratory to perform field quality control testing for grout. Engineer will direct the testing requirements.

2. Contractor shall provide all curing and necessary cube storage as needed.

B. Quality Control Testing During Construction:

1. Grout Fill: Perform sampling and testing for field quality control during grout fill placing as follows:

a. Sampling Fresh Grout Fill: ASTM C172.

b. Slump: ASTM C143; one test for each load of grout at point of discharge.

c. Air Content: ASTM C231; one sample for every two grout loads at point of discharge, and when a change in the grout is observed.

d. Compression Test Specimens:

1) In accordance with ASTM C109/C109M; make one set of compression cubes for each 50 cubic yards of grout, or fraction thereof, of each mix design placed each day. Each set shall be four standard cubes, unless otherwise directed by Engineer.

2. Non-shrink Grout: Perform sampling and testing for field quality control during non-shrink grout placing as follows:

a. Perform compression testing of non-shrink grout in accordance to ASTM C109/C109M at intervals during construction as selected by Engineer. Make a set of four specimens for testing compressive strength at a period of time selected by the Engineer.

b. Perform compression tests on epoxy grout and fabricate specimens for epoxy grout testing in accordance with ASTM C579, Method B, at intervals during construction as selected by the Engineer. Make a set of four specimens for testing compressive strength at a period of time selected by Engineer.

C. Evaluation of Field Quality Control Tests:

1. Do not use grout, delivered to final point of placement, having slump or total air content that does not comply with the Contract Documents.

2. Compressive strength tests for laboratory-cured cubes will be acceptable if averages of all sets of three consecutive compressive strength test results equal or exceed the required 28-day design compressive strength of the associated type of grout.

3. If the compressive strength tests do not comply with the requirements in the Contract Documents, the grout represented by such tests will be considered defective and shall be removed and replaced, or subject to other action required by Engineer, at Contractor's expense.

D. Manufacturer's Services:

1. Manufacturers of proprietary materials shall make available upon 72 hours notification the services of qualified, full-time employee, experienced in serving as a field service technician for the products required, to aid in assuring proper use of products under the actual conditions at the Site.

END OF SECTION

Part 1 General

1.01 Scope

A. Scope:

1. Contractor shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install concrete accessories.

2. Extent of each type of caulking and sealant is shown or indicated and included the following:
    a. Interior and exterior joints in equipment and construction systems not filled by another material, and that are not required to be open for operation.

B. Coordination:

1. Review installation procedures under other Sections and coordinate installations of items to be installed with or before joint sealants.
2. Coordinate final selection of joint sealants so that materials are compatible with all caulking and sealant substrates specified.

C. Related Sections:

1. Section 031500 Concrete Accessories.

1.02 References

1. Standards referenced in this Section are:
    1. ASTM C510, Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
    2. ASTM C661, Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
    3. ASTM C793, Test Method for Effects of Accelerated Weathering on Elastomeric Joint Sealants.
    4. ASTM C794, Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
    5. ASTM C920, Specification for Elastomeric Joint Sealants.
    6. ASTM C1021, Practice for Laboratories Engaged in Testing Building Sealants.
    7. ASTM C1087, Test method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
    8. ASTM C1193, Guide for Use of Joint Sealants.
    9. ASTM C1247, Practice for Durability of Sealants Exposed to Continuous Immersion in Liquids.
    10. BAAQMD Regulation 8, Rule 51.
    11. FS TT-S-00227, Sealing Compound: Elastomeric Type, Multi-component (for Caulking, Sealing, and Glazing in Buildings and Other Structures).

12. FS TT-S-00230 Sealing Compound: Elastomeric Type, Single Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures).
13. NSF/ANSI Standard 61, Drinking Water System Components - Health Effects.
14. SCAQMD Rule 1168.

1.03 Quality Assurance

A. Qualifications:
1. Installer:
a. Engage a single installer, approved by product manufacturer, regularly engaged in caulking and sealant installation and with successful experience in applying types of products required, and who employs only tradesmen with specific skill and successful experience in the type of Work required.
2. Testing Laboratory:
a. Furnish services of independent testing laboratory qualified according to ASTM C1021, for conducting testing required.

B. Component Supply and Compatibility
1. Obtain materials only from manufacturers who will, if required:
a. Test joint sealants for compatibility with substrates for conformance with FS- TT-S-00227, and recommend remedial procedures as required.
2. Before purchasing each sealant, investigate its compatibility with joint surfaces, joint fillers, and other materials in joint system. Provide products that are fully compatible with actual installation condition, verified by manufacturer's published data or certification, and as shown on approved Shop Drawings and other approved submittals.

C. Product Testing:
Provide test results of laboratory pre-construction compatibility and adhesion testing, as specified in Article 3.1 of this Section, by qualified testing laboratory, based on testing of current sealant formulations within a 36-month period preceding the Notice to Proceed for the Work.
1. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920 and where applicable, to other standard test methods.
2. Test other joint sealants for compliance using specified psot construction field adhesion test.

1.04 Submittals

A. Action Submittals: Submit the following:

1. Shop Drawings:
    a. Schedule of joint sealants installation, indication each specific surface where caulking or sealants are to be provided and the material proposed for each application.

2. Product Data:
    a. Copies of manufacturer's data sheets including color charts, specifications, recommendations, and installation instructions for each type of sealant, caulking compound, and associated miscellaneous material required. Include manufacturer's published data, indicating that each product complies with the Contract Documents and is intended for the applications shown or indicated.
    b. Product test reports.

3. Samples:
    a. Each type of actual cured material of each caulking and sealant specified in each of manufacturer's standard colors.
    b. Samples will be reviewed by Engineer for color and texture only Compliance with other requirements is responsibility of Contractor.

B. Informational Submittals: Submit the following::
    1. Certificates:
        a. Certify that materials are suitable for intended use and ,materials meet or exceed requirements of the Contract Documents.
        b. Certification from manufacturer that products furnished are appropriate for surfaces and conditions to which they will be applied.
        c. Certify that applicator is approved by manufacturer.

    2. Field Quality Control Submittals:
        a. Results of tests on job mock ups.
        b. Pre-construction and post construction field test reports.
        c. Compatibility and adhesion test reports.
        d. Contractor's Field Test Report Logs:
            i. Indicate time present at the Site
            ii. Include observations and results of field tests and document compliance with manufacturer's installation instructions and supplemental instructions provided to installers.

    3. Qualifications: Submit qualifications for:
        a. Installer
        b. Testing laboratory

C. Closeout Submittals: Submit the following:
   1. Maintenance Data:
      a. Inspection intervals
      b. For repairing and replacing failed sealant joints.

   2. Warranty: Submit written warranties as specified in this Section.

1.05 Delivery, Storage and Handling

A. Comply with the following:
   1. Delivery of Products:
      a. Deliver products in caulking and sealant manufacturer's originl unopened, undamaged containers, indicating compliance with approved Shop Drawings and approved Sample color selections.
      b. Include the following information on label:
         i. Name of material and Supplier
         ii. Formula or Specification Section number, lot number, color and date of manufacture.
         iii. Mixing instructions, shelf life, curing time, when applicable.

   2. Storage of Products:
      a. Do not store or expose materials to temperature above 90 degrees F or store in direct sunlight.
      b. Do not use materials that are out dated as indicated by shelf life.
      c. Store sealant tape in manner that will not deform tape.
      d. In cool or cold weather, store containers for sixteen hours before using in temperature of approximately 75 degrees F.
      e. When high temperatures prevail, store mixed sealants in a cool place.

   3. Handling:
      a. Do not open containers or mix components until necessary preparatory Work and priming are complete.

1.06 Job Conditions

A. Environmental Conditions:
   1. Do not install joint sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
   2. Proceed with the Work when forecasted weather conditions are favorable for

proper cure and development of high-early bond strength.

3. Where joint width is affected by ambient temperature variations, install elastomeric sealants when temperatures are in the lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.
4. When high temperatures prevail, avoid mixing sealants in direct sunlight.
5. Supplemental heat sources required to maintain both ambient and surface temperatures within the range recommended by manufacturer for material applications are not available at the Site.
6. Provide supplemental heat and energy sources, power, equipment, and operating, maintenance, and temperature monitoring personnel.
7. Do not use heat sources that emit carbon dioxide or carbon monoxide into areas of caulking, sealants, and painting Work, and areas where Owner's personnel or construction personnel may work. Properly locate and vent such heat sources to outdoors so that joint sealants and other Work are unaffected by exhaust.

1.07 Warranty

A. Provide written warranty, signed by manufacturer and Contractor, agreeing to repair or replace sealants that fail to perform as air-tight and watertight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance , stain resistance, or general durability: or appear to deteriorate in any other manner not clearly specified in approved Shop Drawings and other submittals, as an inherent quality of material for exposure indicated.
   1. Provide manufacturer warranty for period of one year from date of Substantial Completion of joint sealants Work.
   2. Provide installer warranty for period of two years from date of Substantial Completion of joint sealants Work.

Part 2 Products

2.01 System Performance

A. Provide elastomeric joint sealants for interior and exterior joint applications that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. VOC Performance Criteria:
   1. VOC content of sealants used shall comply with current VOC content limits of

SCAQMD Rule 1168. Sealants used as fillers shall comply with or exceed requirements of BAAQMD Regulation 8, Rule 51.

a. Sealants: 250 g/L.
b. Sealant Primers for Non Porous Substrates: 250 g/L.
c. Sealant Primers for Porous Substrates: 775 g/L.

C. Provide colors selected by Engineer from caulking and sealant manufacturer's standard and custom color charts. "Or equal" manufacturers shall provide same generic products and colors as available from manufacturers specified.

D. Exterior and Interior Horizontal and Vertical Joints; Submerged and Intermittently Submerged in Potable Water or Water That Will be Treated to Become Potable:

1. One-component Polyurethane Sealant

a. Products and Manufacturers: Provide one of the following:
    i. Sikaflex-1a by Sika Corporation
    ii. Or equal

b. One-component, moisture cured, gun grade, polyurethane sealant, complying with:
    i. FS TT-S-00230C, Type II, Class A, ASTM C920, Type S, Grade NS, Class 25.
    ii. Adhesion-in-Peel, FS TT-S-00230C, ASTM C794 (minimum five pounds.): Glass, minimum 20 pounds per linear inch; Aluminum, minimum 20 pounds per linear inch; Concrete, minimum 20 pounds per linear inch.
    iii. Hardness (Standard Conditions), ASTM D2240: 20 to 25 (Shore A).
    iv. Stain and Color Change, FS TT-S-00227E and ASTM C510: No discoloration or stain.
    v. Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.
    vi. Rheological Vertical Displacement at 120 degrees F, FS TT-S-00227E: No sag.
    vii. VOC Content: 100 g/L, maximum.
    viii. Listed in NSF/ANSI 61.

2. Two-component Polyurethane Sealant

a. Products and Manufacturers: Provide one of the following:
    i. Sikaflex-2c NS by Sika Corporation
    ii. Or equal

b. Two-component, moisture cured, gun grade, polyurethane sealant, complying with:
    i. FS TT-S-00227E, Type II, Class A; ASTM C920, Type M, Grade NS, Class 25.

ii. Adhesion-in-Peel, FS TT-S-00227E, ASTM C794 (Minimum five pounds per linear inch with no adhesion failure): 18 pounds.
iii. Hardness (Standard Conditions), ASTM C661: 25 (Shore A).
iv. Stain and Color Change, FS TT-S-00227E and ASTM C510: No discoloration or stain.
v. Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.
vi. Rheological Vertical Displacement at 120 degrees F, FS TT-S-00227E: No sag.
vii. Content: 220 g/L, maximum.
viii. Listed in NSF/ANSI 61.

E. Exterior and Interior Horizontal and Vertical Joints; Submerged and Intermittently Submerged in Wastewater:

2.02 Two-Component Polyurethane Sealant

A. Products and Manufacturers: Provide one of the following:
1. Sikaflex-2c NS by Sika Corporation.
2. Vulkem 227 by Tremco Sealant/Waterproofing Division of RPM International, Inc.
3. Or equal.

B. Polyurethane based, two component elastomeric sealant complying with:
1. FS TT-S-00227E: Type II (non-sag) Class A and ASTM C920, Type M, Grade NS, Class 25
2. Adhesion-in-Peel, FS TT-S-00227E and ASTM C794: Minimum five pounds per linear inch with no adhesion failure): 18 lbs.
3. Hardness (Standard Conditions), ASTM C661: 25 (Shore A).
4. Stain and color change, FS TT-S-00227E and ASTM C510: No discoloration or stain.
5. Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.
6. Rheological Vertical Displacement at 120 degrees F, FS TT-S-00227E: No sag.
7. Content: 220 grams per liter, maximum.

C. Exterior and Interior Vertical Joints; Non-submerged:
1. Two-component Polyurethane Sealant:
a. Products and Manufacturers: Provide one of the following:
i. Sikaflex- 2c NS by Sika Corporation
ii. Dymeric 240 FC by Tremco Sealant/Waterproofing Division of RPM International, Inc.

iii. Or equal.

b. Polyurethane based, two-component elastomeric sealant complying with:

i. FS TT-S-00227E: Type II (non-sag) Class A and ASTM C920, Type M, Grade NS, Class 25.

ii. Adhesion-in-Peel, FS TT-S-00227E and ASTM C794: (Minimum five pounds per linear inch with no adhesion failure): 10 pounds.

iii. Hardness (Standard Conditions), ASTM C661: 25 to 35 (Shore A).

iv. Stain and color change, FS TT-S-00227E and ASTM C510: No discoloration or stain.

v. Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.

vi. Rheological Vertical Displacement at 120 degrees F, FS TT-S-00227E: No sag.

vii. Content: 100 g/L, maximum.

D. Exterior and Interior Horizontal Joints; Non-submerged:

1. Two-component Polyurethane Sealant:

b. Products and Manufacturers: Provide one of the following:

i. Sikaflex- 2c SL by Sika Corporation

ii. THC/900 by Tremco Sealant/Waterproofing Division of RPM International, Inc.

iii. Or equal.

b. Polyurethane based, two-component elastomeric, self-leveling sealant complying with the following:

i. FS TT-S-00227E: Type I (self-leveling) Class A and ASTM C920, Type M, Grade P, Class 25.

ii. Water Immersion Bond, FS TT-S-00227E: Elongation of 50 percent with no adhesive failure.

iii. Hardness (Standard Conditions), ASTM C661: 35 to 45.

iv. Stain and color change, FS TT-S-00227E and ASTM C510: No discoloration or stain.

v. Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.

vi. Rheological Vertical Displacement at 120 degrees F, FS TT-S-00227E: No sag.

vii. Content: 165 g/L, maximum.

E. Miscellaneous Materials:

1. Joint Cleaner: As recommended by caulking and sealant manufacturer.
2. Joint Primer and Sealer: As recommended for compatibility with caulking and sealant by caulking and sealant manufacturer.

3. Bond Breaker Type: Polyethylene tape or other plastic tape as recommended for compatibility with caulking and sealant by caulking and sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for performance of caulking and sealant. Provide self-adhesive tape where applicable.
4. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable nonabsorptive material as recommended for compatibility with caulking and sealant by caulking and sealant manufacturer. Provide size and shape of rod that will control joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide highly compressible backer to minimize possibility of sealant extrusion when joint is compressed.
5. Low-temperature Catalyst: As recommended by caulking and sealant manufacturer.

Part 3 Execution

3.01 Inspection

A. Examine joint surfaces, substrates, backing and anchorage of units forming sealant rabbet, and conditions under which caulking and sealant Work will be performed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work and performance of sealants. Do not proceed with caulking and sealant Work until unsatisfactory conditions are corrected.

3.02 Preparation

A. Protection: Do not allow joint sealants to overflow or spill onto adjoining surfaces, to migrate into voids of adjoining surfaces including rough textured materials. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or caulking and sealant materials.

B. Joint Surface Preparation:

1. Clean joint surfaces immediately before installing sealant compound. Remove dirt, weakly adhering coatings, moisture and other substances that would interfere with bonds of sealant compound as recommended in sealant manufacturer’s written instructions as shown on approved Shop Drawings.
2. If necessary, clean porous materials by grinding, sandblasting, or mechanical abrading. Blow out joints with oil-free compressed air or by vacuuming joints prior

to applying primer or sealant.

3. Roughen joint surfaces on vitreous coated and similar non-porous materials, when sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub fine abrasive cloth or steel wool to produce a dull sheen.
4. Concrete Joint Preparation: Refer to Section 031500, Concrete Accessories.

C. Mixing:

1. Comply with sealant manufacturer's written instructions for mixing multi-component sealants.
2. Thoroughly mix components before use.
3. Add entire contents of activator can to base container. Do not mix partial units.
4. Mix contents for minimum of five minutes or as recommended by sealant manufacturer, until color and consistency are uniform.

3.03 Installation

A. Install joint sealant after adjacent areas have been cleaned and before joint has been cleaned and primed, to ensure caulking and sealant joints will not be soiled. Replace caulking and sealant joints soiled after installation.

B. Comply with sealant manufacturer's written instructions except where more stringent requirements are shown or indicated in the Contract Documents, and except where manufacturer's technical representative directs otherwise, only as acceptable to Engineer.

C. Prime or seal joint surfaces as shown on approved Shop Drawings and approved other submittals. Do not allow primer or sealer to spill or migrate onto adjoining surfaces. Allow primer to dry prior to applying sealants.

D. Apply masking tape before installing primer, in continuous strips in alignment with joint edge to produce sharp, clean interface with adjoining materials. Remove tape immediately after joints have been sealed and tooled as directed.

E. Confirm that compressible fillers is installed before installing sealants.

F. Do not install sealants without backer rods and bond breaker tape..

G. Roll back-up rod stock into joint to avoid lengthwise stretching. Do not twist, braid, puncture, or prime backer rods.

H. Employ only proven installation techniques that will ensure that sealants are

deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to forma slight cove, so that joint will not trap moisture and dirt.

I. Install sealants to depths recommended by sealant manufacturer but within the following general limitations, measured at the center (thin) section of bead.
   1. For horizontal joints in sidewalks, pavements, similar locations sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to depth equal to 75 percent of joint width, but not more than 5/8-inch deep or less than 3/8-inch deep.
   2. For vertical joints subjected to normal movement and sealed with elastomeric sealants and not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2-inch deep or less than 1/4-inch deep.

J. Remove excess spillage of compounds promptly as the Work progresses.

K. Cure caulking and sealant compounds in compliance with manufacturer's instructions and recommendations, to obtain high-early bond strength, internal cohesive strength, and surface durability.

3.04 Existing Joints

A. Mechanically remove exiting sealant and backer rod.

B. Clean joint surfaces of residual sealant and other contaminates capable of affecting sealant bond to joint surface.

C. Conducts laboratory pre-construction compatibility and adhesion testing on joint surfaces in accordance with Paragraph 1.3.B of this Section.

D. Allow joint surfaces to dry before installing new sealants.

3.05 Field Quality Control

A. Water Leak Testing: Field test for water leaks as follows:
   1. Flood the joint exposure with water directed from a 3/4-inch diameter garden hose, without nozzle, held perpendicular to wall face, two feet from joint and connected to water system with 30 psi minimum normal water pressure. Move stream of water along joint at an approximate rate of 20 feet per minute.

2. Test approximately five percent of total joint system, in locations that are typical of every joint condition, and that can be inspected easily for leakage on opposite face. Conduct test in presence of Engineer, who will determine actual percentage of joints to be tested and actual period of exposure to water from hose, based on extent of observed leakage or lack of observed leakage.
3. Where nature of observed leaks indicates potential of inadequate joint bond strength, Engineer may direct that additional testing to be performed at a time when joints are fully cured, and before Substantial Completion.

3.06 Adjusting and Cleaning

A. Where leaks and lack of adhesion are evident, replace sealant.

B. Clean adjacent surfaces of sealant and soiling resulting from the Work. Use solvent or cleaning agent recommended by sealant manufacturer. Leave all finish Work in neat, clean condition.

C. Protect sealants during construction so that they will be without deterioration, soiling, or damage at time of readiness for final payment of the Contract.

3.07 Protection

A. During and after curing period, protect joint sealants from contact with contaminating substances and from damage resulting from construction operations or other causes, so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original Work.

END OF SECTION

Part 1 - General

1.1 Summary

A. Section Includes:

1. Subsoil materials.
2. Topsoil materials.

B. Related Sections:

1. Section 014529 – Testing Laboratory Services
2. Section 312000 – Excavation and Fill (Trenching)
3. Section 312300 – Excavation and Fill (Grading)
4. Section 321000 – Bases, Ballasts, and Paving
5. Section 329219 - Seeding

1.2 References

A. Tennessee Department of Transportation (TDOT)

1. 2021 Standard Specifications for Road and Bridge Construction, latest edition, as amended.

B. American Association of State Highway and Transportation Officials:

1. AASHTO T89 - Standard Method of Test for Determining the Liquid Limit of Soils.

2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

3. AASHTO T194 - Standard Method of Test for Determination of Organic Matter in Soils by Wet Combustion.

C. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3).
3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
4. ASTM D7263 - Standard Test Methods for Laboratory Determination of Density and Unit Weight of Soil Specimens

1.3 Quality Assurance

A. Furnish each soil material from a single source throughout the Work.
B. Perform Work in accordance with the Authority Having Jurisdiction (AHJ).

Part 2 - Products

2.1 Subsoil Materials

A. Suitable Backfill and Embankment Material: Material of maximum size that can be readily placed in loose, 8-inch layers; conforming to the requirements below. Frozen material shall not be utilized.

1. Soil. Includes earth material with the following physical characteristics:
    a. Gradation—More than 35% passing No. 200 sieve.
    b. Minimum dry mass density—95 pounds per cubic foot determined according to ASTM D7263, Method B.
    c. Maximum liquid limit—65, determined according to AASHTO T 89.
    d. Plasticity index—Not less than liquid limit minus 30, determined according to AASHTO T 90 for soils with liquid limits of 41 to 65.
2. Granular Material. Includes natural or synthetic mineral aggregates having 35% or less passing the No. 200 sieve.
3. Shale. Includes rock-like material formed by natural consolidation of mud, clay, silt, and fine sand; usually thinly laminated, comparatively soft, and easily split.
4. Rock. Includes natural material that cannot be excavated without blasting or using rippers; also boulders and detached stones of a size that cannot be readily placed and compacted in loose, 8-inch layers and having insufficient soil to fill the voids in each layer.
5. Random Material. Includes any accepted combination of the above classifications and may include concrete, brick, stone, or masonry units from demolition.
6. Suitable Material. Reasonably free of organic matter, coal or coal blossom, or other objectionable matter. Wet, dry, or frozen material may be suitable when dried, wetted, or thawed, respectively.

B. Clean Fill: Fill material consisting of soil, rock, stone, dredged material, used asphalt, and brick, block or concrete from construction and demolition activities.

2.2 Topsoil Materials

A. Topsoil

1. Excavated and reused material.
2. Graded.
3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.

4. Screening: Single screened.

2.3 Source Quality Control

A. Section 01 45 29 – Testing Laboratory Services.
B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D1557.
C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D1557.
D. When tests indicate materials do not meet specified requirements, change material and retest.
E. Furnish materials of each type from same source throughout the Work.

Part 3 – Execution

3.1 Excavation

A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.
B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.
C. Remove excess excavated materials not intended for reuse, from site.
D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 Stockpiling

A. Stockpile materials in windrow alongside trench or other locations as designated by the Engineer.
B. Stockpile in sufficient quantities to meet Project schedule and requirements.
C. Separate differing materials with dividers or stockpile apart to prevent mixing.
D. Stockpile topsoil four (4) feet high maximum.
E. Prevent intermixing of soil types or contamination.
F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
G. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 Stockpile Cleanup

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

Part 1 General

1.01 Scope

A. Clearing and grubbing includes, but is not limited to, removing from the project site, trees, stumps, roots, brush, structures, abandoned utilities, trash, debris, and all other materials found on or near the surface of the ground in the construction area, and understood by generally accepted engineering practice not to be suitable for construction of the type contemplated. Precautionary measures that prevent damage to existing features to remain are part of the work.

B. Clearing and grubbing operations shall be coordinated with temporary and permanent erosion and sedimentation control procedures.

C. All earthwork operations shall comply with the requirements of Occupational Safety and Health Administration (OSHA) Construction Standards, Part 1926, Subpart P, Excavations, Trenching, and Shoring, and Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations.

1.02 Quality Assurance

A. The CONTRACTOR shall comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state, or federal authorities having jurisdiction over the Project. All required permits of a temporary nature shall be obtained for construction operations by the CONTRACTOR.

B. Open burning is not allowed.

Part 2 Products

2.01 Equipment

The CONTRACTOR shall furnish equipment of the type normally used in clearing and grubbing operations including, but not limited to, tractors, trucks, and loaders.

Part 3 Execution

3.01 Scheduling of Clearing

A. For site development projects, the CONTRACTOR shall clear at the construction site at locations needed for the installation of the facilities to be installed. This area shall be determined from the Drawings within right-of-way, permanent easement, construction easement, or on private property where clearing has been authorized to commence. The area to be cleared should be limited to where construction will be immediately performed within the construction limits as indicated by the site-specific Stormwater Pollution Prevention Plan (SWPPP) or the Erosion Prevention and Sediment Control (EPSC) developed for the project. No clearing will be allowed until all initial erosion and sediment control measures have been implemented.

B. For linear underground utility installations, the CONTRACTOR shall clear at each construction site only that length of the right-of-way, permanent easement, construction easement, or private property where clearing has been allowed which would be the equivalent of one (1) month's pipe laying. This length shall be determined from the CONTRACTOR's Progress Schedule.

C. For linear underground utility installations, the ENGINEER may permit clearing for additional lengths of the pipeline, provided that temporary erosion and sedimentation controls are in place and a satisfactory stand of temporary grass is established. Should a satisfactory stand of grass not be possible, no additional clearing shall be permitted beyond that specified above.

3.02 Clearing and Grubbing

A. Clear and grub, as required, on within the construction limits before excavating or in advance of any excavation and embankment operations. Remove all trees, growth, debris, stumps, and other objectionable matter. Clear the construction easement or road right-of-way only if necessary.

B. Before beginning construction activities, clearly mark the limits of disturbance (clearing limits) with stakes or other acceptable visible markers. Also mark all environmentally sensitive areas, such as streams, wetlands, buffers, and ARAP boundaries, included in the Project limits with markers that are readily visible to project personnel, including equipment operators.

C. Materials to be cleared, grubbed, and removed from the Project site include, but are not limited to, all trees, stumps, roots, brush, trash, organic matter, paving, miscellaneous structures, houses, debris, and abandoned utilities.

D. Grubbing shall consist of completely removing roots, stumps, trash, and other debris from all graded areas so that topsoil is free of roots and debris. Topsoil is to be left

sufficiently clean so that further picking and raking will not be required.

E. All stumps, roots, foundations, and planking embedded in the ground shall be removed and disposed of. Piling and butts of utility poles shall be removed to a minimum depth of two feet (2') below the limits of excavation for structures, trenches, and roadways, or two feet (2') below finish grade, whichever is lower.

F. Landscaping features shall include, but are not necessarily limited to, fences, mailboxes, cultivated trees, cultivated shrubbery, property corners, man-made improvements, and subdivision and other signs which are within the right-of-way and easement. The CONTRACTOR shall take extreme care in moving landscape features and promptly re-establishing these features if required by drawings.

G. Surface rocks and boulders shall be grubbed from the soil and removed from the site if not suitable as backfill or fill material.

H. Where the tree limbs interfere with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility.

I. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.

J. All fences adjoining any excavation or embankment that is not scheduled to be removed, in the CONTRACTOR's opinion, may be damaged or impacted, shall be carefully removed, stored, and replaced. Any fencing that, in the ENGINEER's opinion, is significantly damaged shall be replaced with new fence material.

K. The CONTRACTOR shall exercise special precautions for the protection and preservation of trees, cultivated shrubs, sod, fences, etc., situated within the limits of the construction area, but not directly within excavation and/or fill limits. The CONTRACTOR shall be held liable for any damage the CONTRACTOR's operations have inflicted on such property.

L. Avoid clearing and grubbing operations in areas designated to remain undisturbed in the Project's SWPPP and applicable environmental permits.

M. Avoid clearing and grubbing operations during times where endangered species have been identified by the ENGINEER and construction schedule restrictions are in place to mitigate impacts to the habitat.

N. Avoid clearing and grubbing operations if endangered plants have been identified by the ENGINEER and all affected plants have been transplanted from the area.

O. Smaller trees and branches that have been chipped during clearing may be used as temporary mulching if prepared and spread in accordance with stabilization practices as outlined in the current edition of *TDEC Erosion and Sediment Control Handbook*'s best management practices for "*Stabilization with Other Mulches"*.

P. The CONTRACTOR shall be solely responsible for all damages to existing improvements resulting from CONTRACTOR's operations.

3.03 Disposal of Debris

The debris resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the CONTRACTOR and shall be disposed of in accordance with all requirements of federal, state, county, and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property, except with written consent of the property owner. In no case shall any material or debris be left on the Project, shoved onto abutting private properties, or buried on the Project.

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section consists of furnishing all labor, equipment, and materials, and performing all operations in connection with the trench excavation and backfill required to install the project as specified in the plans.

B. This specification section includes earthwork and related operations, including, but not limited to, dewatering, excavating all classes of material encountered, pumping, draining and handling of water encountered in the excavations, handling, storage, transportation, and disposal of all excavated and unsuitable material, construction of fills and embankments, backfilling around structures and pipe, backfilling all trenches and pits, compacting, all sheeting, shoring and bracing, preparation of subgrades, surfacing and grading, and any other similar, incidental, or appurtenant earthwork operation which may be necessary to properly complete the work.

C. The CONTRACTOR shall provide all services, labor, materials and equipment required for all earthwork and related operations necessary or convenient to the CONTRACTOR for furnishing a complete work as shown on the Drawings or specified in these Contract Documents.

D. Excavation shall include the removal of any trees, stumps, brush, debris, or other obstacles which remain after the clearing and grubbing operations, which may obstruct the work, and the excavation and removal of all earth, rock, or other materials to the extent necessary to install the pipe and appurtenances in conformance with the lines and grades shown in the specified plans.

E. Backfill shall include the refilling and compaction of the fill in the trenches and excavations up to the surrounding ground surface or road grade at crossing.

F. The trench is divided into five (5) specific areas:

1. Foundation: The area beneath the bedding, sometimes also referenced as trench stabilization.

2. Bedding: The area above the trench bottom (or foundation) and below the bottom of the barrel of the pipe.

3. Haunching: The area above the bottom of the barrel of the pipe up to a specified height above the bottom of the barrel of the pipe.

4. Initial Backfill: The area above the haunching material and below a plane eighteen inches (18”) above the top of the barrel of the pipe.

5. Final Backfill: The area above a plane eighteen inches (18”) above the top of the barrel of the pipe.

G. The choice of method, means, techniques, and equipment rests with the CONTRACTOR. The CONTRACTOR shall select the method and equipment for trench excavation and backfill depending upon the type of material to be excavated and backfilled, the depth of excavation, the amount of space available for operation of equipment, storage of excavated material, proximity of man-made improvements to be protected, available easement or right-of-way, and prevailing practice in the area.

1.02 Quality Assurance

A. Density: All references to “maximum dry density” shall mean the maximum dry density defined by the “Maximum Density Optimum- Moisture Test”, ASTM D 698. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet with the requirements of ASTM D 1556, “Standard Test Method for Density and Unit weight of Soil In Place by the Sand Cone Method”, ASTM D 2937, “Density of Soil In Place by the Drive Cylinder Method” or ASTM D 2922, “Density of Soil and –Soil Aggregate- In Place by Nuclear Methods (Shallow Depth)”.

B. Sources and Evaluation Testing: Testing of materials to certify conformance with the Specifications shall be performed by an independent testing laboratory at no cost to the OWNER. The CONTRACTOR’S testing laboratory shall perform tests, at no cost to the OWNER, upon change of source and at sufficient intervals during the work to certify conformance of all select material furnished for use on this Project.

1.03 Safety

Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The CONTRACTOR shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P “Excavation, Trenching & Shoring” as described in Occupational Safety and Health Administration (OSHA) publication 2226. All trench safety is the responsibility of the CONTRACTOR.

Part 2 Products

2.01 Trench Foundation Materials

A. Crushed stone or surge stone shall be utilized for trench foundation (trench stabilization).

B. Crushed stone shall be crushed limestone. Stone size shall be between No. 57 and No. 4, inclusive, as determined by ASTM C 33.

C. Surge stone shall be crushed limestone. Stone size shall be No. 1, inclusive, as determined by ASTM C 33.

2.02 Bedding and Haunching Materials

A. Bedding, haunching, and backfill materials shall be crushed stone under all pavement areas or if the trench is within three feet (3') of the pavement edge. Otherwise, bedding and haunching materials shall be crushed stone or earth materials as specified below.

B. Crushed stone utilized for bedding and haunching. Stone size shall be No. 57, as determined by ASTM C 33.

C. Earth materials utilized for bedding and haunching shall be suitable materials selected from materials excavated from the trench. Suitable materials shall be clean and free of rock larger than two inches (2") at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials. Should the material excavated from the trench be saturated, the saturated material may be used as earth material, provided it is allowed to dry properly and it is capable of meeting the specified compaction requirements. When necessary, earth bedding and haunching materials shall be moistened to facilitate compaction by tamping. If materials excavated from the trench are not suitable for use as bedding or haunching material, provide select material conforming to the requirements of this Section at no additional cost to the Owner.

D. Filter Fabric

1. Filter fabric associated with bedding shall be a polypropylene woven fabric. The fabric shall be a high modulus type with good separation capabilities. The

fabric shall be inert to biological degradation and naturally occurring chemicals, alkalis, and acids.

2. The fabric shall have an equivalent opening size (EOS or AOS) of 20 to 45. The fabric shall also conform to the minimum property values listed in the following table:

Fabric Property	Unit	Test Method	Minimum Value
Grab Tensile Strength	lbs.	ASTM D 4632	200
Grab Tensile Elongation	%	ASTM D 4632	30 (max.)
Mullen Burst Strength	psi	ASTM D 3786	400
Trapezoid Tear Strength	lbs.	ASTM D 4533	75
Puncture Strength	lbs.	ASTM D 3787	75

3. If ordered by the ENGINEER, the filter fabric manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe. This service will be furnished for a minimum of ten (10) days during initial pipe installation.

4. Filter fabric shall be Propex Geotex 104F, Mirafi 500X, Amoco 2002 or Exxon GTF-200.

2.03 Initial Backfill

Unless shown on Drawings or specified otherwise, initial backfill material shall be crushed stone as specified for bedding and haunching materials.

2.04 Final Backfill

Final backfill material shall be general excavated earth materials, shall not contain rock larger than three inches (3”) at its greatest diameter, cinders, stumps, limbs, man-made wastes, and other unsuitable materials. If materials excavated from the trench are not suitable for use as final backfill material, provide select material conforming to the requirements of this Section.

2.05 Select Backfill

Select backfill shall be materials which meet the requirements as specified for bedding, haunching, initial backfill or final backfill materials, including compaction requirements.

2.06 Concrete

Concrete for bedding, haunching, initial backfill, or encasement shall have a compressive strength of not less than three thousand pounds-per-square-inch (3,000 psi), with not less than 5.5 bags of cement per cubic yard (CY) and a slump between three inches (3") and five inches (5"). Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

2.07 Controlled Low Strength Material (Flowable Fill)

A. Controlled Low Strength Material (CLSM), flowable fill, may be required at locations as depicted in the plans.

B. CLSM identified as "Excavatable Flowable Fill", as depicted in the drawings, shall not have a compressive strength exceeding one-hundred-fifty pounds-per-square-inch (150 psi).

C. CLSM identified as "General Flowable Fill" shall have a compressive strength of two-hundred pound-per-square-inch (250 psi).

D. All flowable fill will be considered General Flowable Fill, unless otherwise depicted in the Drawings.

E. A design mix meeting Specification 31 23 23.33, Flowable Fill, if provided, **OR** current TDOT Specification (Section 204.06, Paragraph B) for the compressive strength of flowable fill required will be submitted to Engineer for approval prior to using.

F. Flowable Fill shall be mixed and transported in accordance with ASTM C 94.

Part 3 Execution

3.01 Trench Excavation

A. Topsoil and grass shall be stripped a minimum of six inches (6") over the trench excavation site and stockpiled separately for replacement over the finished grading areas. No topsoil shall be removed from the site. It is the property of the owner.

B. Trenches shall be excavated to the lines and grades shown in the plans, with the

centerlines of the trenches on the centerlines of the pipes and to the dimensions which provide the proper support and protection of the pipe and other structures and accessories.

C. Trench Width for Pipelines

1. The sides of all trenches shall be vertical to a minimum of one foot (1') above the top of the pipe. Unless otherwise indicated in the plans, the minimum trench width shall be equal to the sum of the outside diameter of the pipe plus two feet (2'), or the minimum width required for proper trenching and shoring.

2. Excavate the top portion of the trench to any width within the construction easement or right-of-way which will not cause unnecessary damage to adjoining structures, roadways, pavement, utilities, trees or private property. Where necessary to accomplish this, provide sheeting and shoring.

3. Where rock is encountered in trenches, excavate to remove boulders and stones to provide a minimum of twelve inches (12") clearance between the rock and the side of the pipe barrel or manhole.

4. Wherever the prescribed maximum trench width is exceeded, the CONTRACTOR shall use the next higher Class or Type of bedding and haunching as shown in the plans for the full trench width as actually cut. The excessive trench width may be due to unstable trench walls, inadequate or improperly placed bracing and sheeting which caused sloughing, accidental over-excavation, intentional over-excavation necessitated by the size of the CONTRACTOR'S tamping and compaction equipment, intentional over-excavation due to the size of the CONTRACTOR'S excavation equipment, or other reasons beyond the control of the ENGINEER or OWNER.

D. Depth

1. The trenches shall be excavated to the required depth or elevation which allow for the placement of the pipe and bedding to the dimensions shown in the plans.

2. Water Mains, Force Mains, and Low Pressure Mains

a. Depth of Trenches: Excavate trenches to provide depths as shown on the Drawings. The depth of cover shall not exceed that as shown on the Drawings by more than one foot (1'), without approval of the

Engineer.

b. Excavate trenches to provide a minimum cover not less than three feet (3'). Within the right-of-way of highways, streets, or roadways, excavate to place the top of the pipe a minimum of forty inches (40") below the nearest pavement edge or drainage ditch.

c. Increase the depth of cover where specifically shown on the Drawings and where necessary to avoid interference with underground utilities and obstructions.

d. Depth of cover shall not exceed five feet (5') unless indicated on the Drawings.

3. Where rock is encountered in trenches for pipelines, provide a minimum of six inches (6") clearance between the bottom of the trench and the bottom of the pipe or accessory for pipe twenty-one inches (21") in diameter and smaller and twelve inches (12") for larger pipe, and manholes.

E. Excavated Materials

1. Excavated materials shall be placed adjacent to the work to be used for backfilling as required. Top soil shall be carefully separated and lastly placed in its original location.

2. Excavated material shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and not cause any drainage problems. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements.

3.02 Sheeting, Bracing, and Shoring

A. Sheeting, bracing, and shoring shall be performed in the following instances:

1. Where sloping of the trench wall does not adequately protect persons within the trench from slides or cave-ins.

2. In caving ground.

3. In wet, saturated, flowing or otherwise unstable materials. The sides of all trenches and excavations shall be adequately sheeted, braced, and shored.

4. Where necessary to prevent damage to adjoining buildings, structures, roadways, pavement, utilities, trees, or private properties which are required to remain.

5. Where necessary to maintain the top of the trench within the available construction easement or right-of-way.

B. In all cases, excavation protection shall strictly conform to the requirements of the Occupational Safety and Health Act (OSHA) of 1970, as amended.

C. Timber: Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good, serviceable condition. Size and spacing shall be in accordance with OSHA regulations.

D. Steel Sheeting and Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth, and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and live loads. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The CONTRACTOR shall provide closure and sealing between sheet piling and existing facilities.

E. Trench Shield: A trench shield or box may be used to support the trench walls. The use of a trench shield does not necessarily preclude the additional use of bracing and sheeting. When trench shields are used, care must be taken to avoid disturbing the alignment and grade of the pipe or disrupting the haunching of the pipe as the shield is moved. When the bottom of the trench shield extends below the top of the pipe, the trench shield will be raised in six inch (6”) increments with specified backfilling occurring simultaneously. At no time shall the trench shield be “dragged” with the bottom of the shield extending below the top of the pipe or utility.

F. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. Leave sheeting in place when in the opinion of the ENGINEER it cannot be safely removed or is within three feet (3’) of an existing structure, utility, or pipeline. Cut off any sheeting left in place at least two feet (2’) below the surface.

G. The sides of all excavations shall be sufficiently sheeted, shored, and braced as

necessary to prevent slides, cave-ins, settlement or movement of the banks, to maintain the excavation clear of all obstructions, and to provide safe working conditions. Wood or steel sheeting of approved design and type shall be used in wet, saturated or flowing ground. All sheeting, shoring, and bracing shall have sufficient strength and rigidity to withstand the pressure exerted and to maintain shape and position under all circumstances.

H. The responsibility for correctly assessing the need for sheeting and analyzing the stresses induced shall be the total responsibility of the CONTRACTOR. Since the ENGINEER does not dictate or determine the CONTRACTOR'S sequence or limits of excavation, the ENGINEER assumes no responsibility for sheeting and shoring. The CONTRACTOR must employ or otherwise provide for adequate professional structural and geotechnical engineering supervision to assess the need for sheeting and shoring and design same. Results of sheeting and shoring analysis and design shall be submitted to the ENGINEER on request.

I. Excavations adjacent to existing or proposed buildings and structures or in paved streets or alleys shall be sheeted, shored, and braced adequately to prevent undermining beneath or subsequent settlement of such structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition. Any damage to structures or pavements occurring through settlements, water or earth pressures, slides, caves, or other causes; due to failure or lack of sheeting or bracing, or due to improper bracing; or occurring through negligence or fault of the CONTRACTOR in any other manner shall be repaired by the CONTRACTOR at his own expense.

J. Sheeting, shoring, or bracing materials shall not be left in place unless otherwise specified or shown on the Drawings or ordered by the ENGINEER in writing. Such materials shall be removed in such manner that no danger or damage will occur to new or existing structures or property, public or private, and so that cave-ins or slides will not take place. Trench sheeting shall be left in place until backfill has been brought to a level twelve inches (12”) above the top of the pipe. It shall then be cut off and the upper portion removed. Sheeting for structures shall be left in place until backfill has been brought to a level of twelve inches (12”) above the top of the bottom footing. It shall then be cut off and the upper portion removed.

K. All holes and voids left in the work by the removal of sheeting, shoring, or bracing shall be filled and thoroughly compacted.

3.03 Rock Excavation

A. Definition of Rock: Any material which cannot be excavated with conventional excavating equipment, is removed by drilling and blasting, and occupies an original volume of at least one-half cubic yard (½ CY).

B. When rock is encountered near existing concrete or other structures, excavation methods that protect the existing structures should be performed to ensure the structure's integrity is maintained throughout all construction.

C. Blasting: Provide licensed, experienced workmen to perform blasting. Conduct blasting operations in accordance with all existing ordinances, laws, and regulations. Protect all buildings and structures from the effects of the blast. Repair any resulting damage. If the CONTRACTOR repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the ENGINEER may direct the CONTRACTOR to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge.

D. Drilling and blasting operations shall be conducted with due regard for the safety of persons and property in the vicinity and in strict conformity with requirements of all ordinances, laws and regulations governing blasting and the use of explosives. Rock excavation near existing pipelines or other structures shall be conducted with the utmost care to avoid damage. Injury or damage to other structures and properties shall be promptly repaired to the satisfaction of the OWNER by the CONTRACTOR at his own expense.

E. Removal of Rock: Dispose of rock off site that is surplus or not suitable for use as riprap or backfill.

F. The CONTRACTOR shall notify the ENGINEER prior to any blasting. Additionally, the CONTRACTOR shall notify the ENGINEER before any charge is set.

G. Following review by the ENGINEER regarding the proximity of permanent buildings and structures to the blasting site, the ENGINEER may direct the CONTRACTOR to employ an independent, qualified specialty sub-contractor, approved by the ENGINEER, to monitor the blasting by use of seismograph, identify the areas where light charges must be used, conduct pre-blast and post-blast inspections of structures, including photographs or videos, and maintain a detailed written log.

3.04 Dewatering Excavations

A. The CONTRACTOR, at his own expense, shall provide and maintain at all times during construction ample means and devices with which to promptly remove and

properly dispose of all water from any source entering the excavations or other parts of the work. Dewatering shall be accomplished by methods which will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. Methods of dewatering may include sump pumps, well points, deep wells, or other suitable methods which do not damage or weaken structures, foundations, or sub-grades.

B. Shallow excavations may be dewatered using open ditches provided such ditches are kept open and free-draining at all times. The actual dewatering methods used shall be acceptable to the ENGINEER. Dewater the excavation continuously to maintain a water level two feet (2') below the bottom of the trench.

C. Control drainage in the vicinity of excavation so the ground surface is properly pitched to prevent water running into the excavation.

D. There shall be sufficient pumping equipment, in good working order, available at all times, to remove any water that accumulates in excavations. Where the utility crosses natural drainage channels, the work shall be conducted in such a manner that unnecessary damage or delays in the prosecution of the work will be prevented. Provision shall be made for the satisfactory disposal of surface water to prevent damage to public or private property.

E. In all cases, accumulated water in the trench shall be removed before placing bedding or haunching, laying pipe, placing concrete or backfilling.

F. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used as the medium for conducting the water to the sump. Sump depth shall be at least two feet (2') below the bottom of the trench. Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump two feet (2') below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged.

G. A minimum of one (1) standby pump shall be required in the event the operating pump or pumps clog or otherwise stop operation. A standby unit (a minimum of one [1] for each ten [10], in the event well points are used), shall be available for immediate installation should any pumping unit fail. The design and installation of well points or deep wells shall be suitable for the accomplishment of the work. Drawings or diagrams on proposed well point or deep well dewatering systems shall be submitted to the ENGINEER for review.

H. Dewater by use of a well point system when pumping from sumps does not lower the

water level two feet (2') below the trench bottom. Where soil conditions dictate, the CONTRACTOR shall construct well points cased in sand wicks. The casing, six inches (6") to ten inches (10") in diameter, shall be jetted into the ground, followed by the installation of the well point, filling casing with sand and withdrawing the casing.

3.05 Trench Foundation and Stabilization

A. The bottom of the trench shall provide a foundation to support the pipe and its specified bedding. The trench bottom shall be graded to support the pipe and bedding uniformly throughout its length and width.

B. If, after dewatering as specified above, the trench bottom is spongy, or if the trench bottom does not provide firm, stable footing and the material at the bottom of the trench will still not adequately support the pipe, the trench will be determined to be unsuitable and the ENGINEER shall then authorize payment for trench stabilization.

C. Should the undisturbed material encountered at the trench bottom constitute, in the opinion of the ENGINEER, an unstable foundation for the pipe, the CONTRACTOR shall be required to remove such unstable material and fill the trench to the proper subgrade with crushed stone or class "C" concrete as directed by the ENGINEER.

D. Where the replacement of unsuitable material with crushed stone does not provide an adequate trench foundation, the trench bottom shall be excavated to a depth of at least two feet below the specified trench bottom. Place filter fabric in the bottom of the trench and support the fabric along the trench walls until the trench stabilization, bedding, haunching, and pipe have been placed at the proper grade. The ends of the filter fabric shall be overlapped above the pipe.

E. Where trench stabilization is provided, the trench stabilization material shall be compacted to at least 90 percent of the maximum dry density, unless shown or specified otherwise.

3.06 Bedding and Haunching

A. Prior to placement of bedding material, the trench bottom shall be free of any water, loose rocks, boulders, or large dirt clods.

B. Bedding material shall be placed to provide uniform support along the bottom of the pipe and to place and maintain the pipe at the proper elevation.

1. The initial layer of bedding placed to receive the pipe shall be brought to the grade and dimensions indicated in the plans. All bedding shall extend the full width of the trench bottom. The pipe shall be placed and brought to grade by tamping the bedding material or by removal of the excess amount of the bedding material under the pipe.

2. Adjustment to grade line shall be made by scraping away or filling with bedding material. Wedging or blocking up of pipe shall not be permitted. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted. Each pipe section shall have a uniform bearing on the bedding for the length of the pipe, except immediately at the joint.

C. At each joint, excavate bell holes of ample depth and width to permit the joint to be assembled properly and to relieve the pipe bell of any load.

D. After the pipe section is properly placed, add the haunching material to the specified depth. The haunching material shall be shovel sliced, tamped, vigorously chinked, or otherwise consolidated to provide uniform support for the pipe barrel and to fill completely the voids under the pipe, including the bell hole. Prior to placement of the haunching material, the bedding shall be clean and free of any water, loose rocks, boulders or dirt clods.

E. Gravity Sewers and Accessories: Lay polyvinyl chloride (PVC) pipe with minimum Class “B” bedding. Lay all other pipe with Class “C” bedding, unless shown or specified otherwise.

1. Class “A” (Bedding Factor – 2.8): Excavate the bottom of the trench flat at a minimum depth as shown in plans, below the bottom of the pipe barrel. Lay pipe to line and grade on concrete block. Place concrete to the full width of the trench and to a height of one-fourth (1/4) of the outside diameter (O.D.) of the pipe above the invert.

2. Class “B” (Bedding Factor – 1.9): Excavate the bottom of the trench flat at a minimum depth as shown in plans, below the bottom of the pipe barrel. Place and compact bedding material to the proper grade. Haunching material shall then be carefully placed by hand and compacted to provide full support under and up to the centerline of the pipe.

3. Class “C” (Bedding Factor – 1.5): Excavate the bottom of the trench flat at a minimum depth as shown in the plans, below the bottom of the pipe barrel.

Place and compact bedding material to the proper grade. Haunching material shall then be carefully placed by hand and compacted to provide full support under and up to a height of one-fourth the outside diameter of the pipe above the bottom of the pipe barrel.

F. Manholes: Excavate to a minimum of twelve inches (12") below the planned elevation of the base of the manhole. Place and compact crushed stone bedding material to the required grade before constructing the manhole.

G. Water Mains

1. Ductile Iron Pipe

a. Unless otherwise shown on the Drawings or specified, bedding and haunching shall utilize earth materials and meet the requirements for Type 2 Pipe Bedding where rock is not encountered.

b. In areas where rock is encountered, bedding and haunching material shall be crushed stone. Crushed stone bedding shall extend a minimum of six inches (6") below the pipe.

c. Where the depth of cover over the piping exceeds fifteen feet (15') , the pipe bedding shall meet the requirements of Type 4 Pipe Bedding. Where the depth of cover over the piping exceeds eighteen feet (18'), the pipe bedding shall meet the requirements of Type 5 Pipe Bedding.

d. Type 4 or Type 5 Pipe Bedding called for on the Drawings, specified or ordered by the Engineer, shall meet requirements for Type 4 or Type 5 Pipe Bedding, utilizing crushed stone bedding and haunching material

H. Excessive Width and Depth

1. Gravity Sewers: If the trench is excavated to excess width, provide the bedding class with the next higher bedding factor. Crushed stone haunching and initial backfill may be used in lieu of Class "A" bedding, where Class "A" bedding is necessitated by excessive trench width.

2. Water Mains: If the trench is excavated to excess width, provide the next higher type or class of pipe bedding, but a minimum of Type 4, as detailed on the Drawings

3. If the trench is excavated to excessive depth, provide crushed stone to place the bedding at the proper elevation or grade.

I. Compaction: Bedding and haunching materials under pipe, manholes and accessories shall be compacted to a minimum of ninety percent (90%) of the maximum dry density, unless shown or specified otherwise.

3.07 Initial Backfill

A. Initial backfill shall be placed to anchor the pipe, protect the pipe from damage by subsequent backfill, and ensure the uniform distribution of the loads over the top of the pipe.

B. Place initial backfill material carefully around the pipe in uniform layers to a depth of at least eighteen inches (18”) above the pipe barrel. Layer depths shall be a maximum of six inches (6”) for pipe eighteen inches (18”) in diameter and smaller and a maximum of twelve inches (12”) for pipe larger than eighteen inches (18”) in diameter.

C. Backfill on both sides of the pipe simultaneously to prevent side pressures.

D. Compact each layer thoroughly with suitable hand tools or tamping equipment.

E. Initial backfill shall be compacted to a minimum ninety percent (90%) of the maximum dry density, unless shown or specified otherwise.

F. In areas where the trench is cut into rock or where suitable backfill is unavailable, crushed stone shall be used for initial backfill up to twelve inches (12”) above the pipe barrel.

G. Crushed stone shall be used for initial backfill up to twelve inches (12”) above the pipe barrel for all pipe material for gravity sewers.

3.08 Concrete Encasement for Pipelines and Casings

Where concrete encasement is shown in the plans for pipelines, excavate the trench to provide a minimum of six inches (6”) clearance from the bell of the pipe. Lay the pipe to line and grade on concrete blocks. In lieu of bedding, haunching and initial backfill, place concrete to the full width of the trench and to a height of not less than six inches (6”) above the pipe bell. Do not backfill the trench for a period of at least twenty-four (24) hours after concrete is

placed.

3.09 Final Backfill

A. Backfill carefully to restore the ground surface to its original condition.

B. For unpaved areas, the top six inches (6") shall be topsoil obtained as specified in "Trench Excavation" of this Section.

C. Excavated material, which is unsuitable for backfilling and excess material, shall be disposed of, at no additional cost to the OWNER, in a manner approved by the ENGINEER. Surplus soil may be distributed and spread over the site if approved by the ENGINEER. If such spreading is allowed, the site shall be left in a clean and sightly condition and shall not affect pre-construction drainage patterns. Surplus rock from the trenching operations shall be removed from the site.

D. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section.

E. After initial backfill, material has been placed and compacted, backfill with final backfill material. Place backfill material in uniform layers, compacting each layer thoroughly as follows:

1. In six inch (6") layers, if using light power tamping equipment, such as a "jumping jack".

2. In twelve inch (12") layers, if using heavy tamping equipment, such as hammer with tamping feet.

3. In twenty-four inch (24") layers, if using a hydra-hammer.

F. Settlement: If trench settles, re-fill and grade the surface to conform to the adjacent surfaces.

G. Final backfill shall be compacted to a minimum ninety percent (90%) of the maximum dry density, unless specified otherwise.

3.10 Backfill Under Roads

A. Crushed stone shall be used as bedding, haunching and initial backfill for all pipe

materials. Flowable Fill shall be used as final backfill within three inches (3") to the surface of existing asphalt or concrete pavement as per OWNER specifications. Steel plate shall cover the patch until the fill has cured. Once the Flowable Fill has cured, the required thickness can be removed and appropriate materials can be used to repair the road.

B. When required by OWNER one-half (1/2) of the road crossing shall be excavated, then temporary bridges consisting of steel plate shall be placed over the excavation for use by the traveling public; then the remainder of the excavation can be carried out.

3.11 Backfill Within Tennessee DOT Right-of-Way

Backfill within the Tennessee Department of Transportation (TDOT) right-of-way shall meet all requirements, standards, and specifications stipulated by TDOT.

3.12 Detection Wire

Provide detection wire for all water mains, either polyvinyl chloride (PVC) pipe or ductile iron pipe (DIP). The wire shall have a minimum cover of twelve inches (12") and be laid approximately twelve inches (12") above the pipe. Detection wire shall be connected together with a brass curney, then taped each direction an additional three inches (3"). Surface access to wire shall be accomplished at each valve and air release valve location for water mains and service lines. Distance shall not to exceed one-thousand feet (1,000') between surface access locations. In cases where no features are present within the specified length, a meter box with valve marker labeled "water" shall be installed to provide access to the wire. All wire must be tested for location prior to acceptance.

3.13 Testing and Inspection

A. The soils testing laboratory is responsible for the following:

1. Compaction tests in accordance with Article 1.02 of this Section.

2. Field density tests for each two feet (2') of lift, one (1) test for each two-thousand feet (2,000') of pipe installed, or more frequently if ordered by the ENGINEER.

3. Inspecting and testing stripped site, subgrades and proposed fill materials.

B. The CONTRACTOR'S duties relative to testing include:

1. Notifying laboratory of conditions requiring testing.

2. Coordinating with laboratory for field testing.

3. Paying costs for additional testing performed beyond the scope of that required and for re-testing where initial tests reveal non-conformance with specified requirements.

4. Providing excavation as necessary for laboratory personnel to conduct tests.

C. Inspection

1. Earthwork operations, acceptability of excavated materials for bedding or backfill, and placing and compaction of bedding and backfill is subject to inspection by the ENGINEER.

2. Foundations and shallow spread footing foundations are required to be inspected by a geotechnical engineer, who shall verify suitable bearing and construction.

D. Comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state, or federal authorities having jurisdiction.

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section consists of furnishing all labor, equipment, and materials, and performing all operations in connection with grading and site development including excavation and backfill required to install the project as specified in the Drawings.

B. This Section includes earthwork and related operations, including, but not limited to, clearing and grubbing the construction site, dewatering, excavating all classes of material encountered, pumping, draining and handling of water encountered in the excavations, handling, storage, transportation and disposal of all excavated and unsuitable material, construction of fills and embankments, backfilling around structures and pipe, backfilling pits, compacting, all sheeting, shoring and bracing, preparation of subgrades, surfacing and grading, and any other similar, incidental, or appurtenant earthwork operation which may be necessary to properly complete the construction of the Pump Station as depicted in the Drawings.

C. The CONTRACTOR shall provide all services, labor, materials, and equipment required for all earthwork and related operations necessary or convenient to the CONTRACTOR for furnishing a complete work as shown on the Drawings or specified in these Contract Documents.

D. Excavation shall include the removal of any trees, stumps, brush, debris, or other obstacles which remain after the clearing and grubbing operations, which may obstruct the work, and the excavation and removal of all earth, rock, or other materials to the extent necessary to install the pipe and appurtenances in conformance with the lines and grades shown in the specified plans.

E. The choice of method, means, techniques, and equipment the responsibility of the CONTRACTOR. The CONTRACTOR shall select the method and equipment for excavation and backfill depending upon the type of material to be encountered, the amount of space available for operation of equipment, storage of excavated material, proximity of man-made improvements to be protected, available easement or right-of-way, and prevailing practice in the area.

1.02 General

A. The elevations shown on the Drawings as existing are taken from the best existing data and are intended to give reasonably accurate information about the existing

elevations. They are not precise, and the Contractor shall become satisfied as to the exact quantities of excavation and fill required.

B. Earthwork operations shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards.

C. All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments and channels shall be always maintained by the Contractor remain in good condition until final acceptance by the Owner. All damage caused by erosion or other construction operations shall be repaired by the Contractor using material of the same type as the damaged material at no additional cost incurred by the Owner.

D. Earthwork within the rights-of-way of the Department of Transportation, the County Road Department and the respective City having authority shall be done in accordance with requirements and provisions of the permits issued by those agencies for the construction within their respective rights-of-way. Such requirements and provisions, where applicable, shall take precedence and supersede the provisions of these Specifications.

E. The Contractor shall control grading in a manner to prevent surface water from running into excavations. Obstruction of surface drainage shall be avoided, and means shall be provided whereby storm water can be uninterrupted in existing gutters, other surface drains or temporary drains.

F. Excavation work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the work, regardless of the type, character, composition, or condition thereof.

G. Tests for compaction and density shall be conducted by the Engineer or by an independent testing laboratory selected by the Engineer. Costs of compaction tests performed by an independent testing laboratory shall the be paid for as a Cash Allowance for Soils and Concrete Testing. The Contractor shall make all necessary excavations and shall supply any samples of materials necessary for conducting compaction and density tests. The cost of all retests made necessary by the failure of materials to conform to the requirements of these Contract Documents shall be paid by the Contractor.

H. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching, and Shoring, and Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations, and

shall be conducted in a manner acceptable to the Engineer.

I. Prior to bidding the Contractor shall make a thorough investigation of the surface and subsurface conditions of the site and any special construction issues which might arise as a result of nearby watercourses and floodplains, particularly in areas where construction activities may encounter water-bearing sands and gravels or limestone solution channels.

J. The Contractor shall be responsible for providing all services, labor, equipment, and materials necessary or convenient to the Contractor for completing the work within the time specified in these Contract Documents.

1.02 Quality Assurance

A. Density: All references to “maximum dry density” shall mean the maximum dry density defined by the “Maximum Density Optimum- Moisture Test”, ASTM D 698. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet with the requirements of ASTM D 1556, “Standard Test Method for Density and Unit weight of Soil In Place by the Sand Cone Method”, ASTM D 2937, “Density of Soil In Place by the Drive Cylinder Method” or ASTM D 2922, “Density of Soil and –Soil Aggregate- In Place by Nuclear Methods (Shallow Depth)”.

B. Sources and Evaluation Testing: Testing of materials to certify conformance with the Specifications shall be performed by an independent testing laboratory at no cost to the OWNER. The CONTRACTOR’S testing laboratory shall perform tests, at no cost to the OWNER, upon change of source and at sufficient intervals during the work to certify conformance of all select material furnished for use on this Project.

1.03 Safety

Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The CONTRACTOR shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P “Excavation, Trenching & Shoring” as described in Occupational Safety and Health Administration (OSHA) publication 2226. All trench safety is the responsibility of the CONTRACTOR.

Part 2 Products

2.01 Material and Construction

A. Earthwork Materials

1. Fill Material, General

a. Approval Required: All fill material shall be subject to the approval of the Engineer.

b. Notification: For approval of imported fill material, notify the Engineer at least one week in advance of intention to import material, designate the proposed borrow area and permit the Engineer to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

2. On-Site Fill Material: All on-site fill material shall be soil exclusive of organic matter, frozen lumps, or other deleterious substances. On-site fill material shall contain no rocks or lumps over 3-inches maximum in dimension.

3. Imported Fill Materials: All imported fill material shall meet the requirements of on-site fill material.

4. Topsoil: Dark organic weed free loam, free of muck.

B. Sheeting, Bracing and Timbering: The Contractor shall furnish, place, and maintain all sheeting, bracing and timbering required to properly support trenches and other excavations in open cut and to prevent all movement of the soil, pavement, structures, or utilities outside of the trench or pit.

1. General

a. Cofferdams and bracing design, including computations, shall be prepared before commencing construction operations. Drawings and design computations shall be signed and sealed by a professional engineer registered in the State of Tennessee. The Drawings and design computations shall be submitted to the Engineer.

b. Sheeting, bracing and timbering shall be so placed as to allow the work to be constructed to the lines and grades shown on the Drawings and as ordered by the Engineer.

c. If at any time the method being used by the Contractor for supporting any material or structure in or adjacent to any excavation is not reasonably safe, the Contractor shall provide additional bracing and support necessary to furnish the added degree of safety.

d. All sheeting in contact with the concrete or masonry shall be cut off as directed by the Engineer and left in place.

2. Timber: Timber may be substituted for steel sheet piling when approved by the Engineer. Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good condition. Size and spacing shall be in accordance with OSHA regulations.

3. Steel Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and/or live loads. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be always protected against lateral movement. The Contractor shall provide closure and sealing between sheet piling and existing facilities. Steel piling within three feet of an existing building, structure or pipeline shall remain in place, unless otherwise directed by the Engineer.

4. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the structures and adjacent property. Leave sheeting in place when in the opinion of the Engineer it cannot be safely removed. Cut off sheeting left in place at least two feet below the surface.

C. Other Materials: All other materials not specifically described but required for proper completion of the work of this Section, shall be as selected by the Contractor subject to the approval of the Engineer.

Part 3 Execution

3.01 General

A. Safety: Comply with local regulations and with the provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc., Occupational Safety and Health Act and all other applicable safety regulations.

B. Topsoil

1. Remove all topsoil to a depth at which subsoil is encountered, from all areas under buildings, pavements, and from all areas which are to be cut to lower grades or filled.

2. With the Engineers approval, topsoil to be used for finish grading may be stored on the site.

3. Other topsoil may be used as fill in non-critical areas with approval of the Engineer.

4. Properly dispose of all excess topsoil off site at no additional cost to the Owner.

C. Bracing and Sheeting

1. Furnish, put in place, and maintain all sheeting, bracing, and shoring as may be required to properly support the sides of all excavations and to prevent all movement of earth which could in any way injure the work, adjacent property, or workers.

2. Properly support all excavations in locations indicated on the Drawings and where necessary to conform to all pertinent rules and regulations and these Specifications, even though such locations are not indicated on the Drawings.

3. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the work and adjacent property.

4. Do not leave any sheeting or bracing in the trench or excavation after completion of the work, unless approved by the Engineer.

D. Obstructions

1. Remove and dispose of all trees, stumps, roots, boulders, sidewalks, driveways, pavement, pipes and the like, as required for the performance of the work.

2. Exercise care in excavating around catch basins, inlets and manholes so as not to disturb or damage these structures.

3. Avoid removing or loosening castings or pushing dirt into catch basins, inlets and manholes.

4. Damaged or displaced structures or casting shall be repaired, replaced and dirt entering the structures during the performance of the work shall be removed at no additional cost to the Owner.

E. Extra Earth Excavation

1. In case soft or excessively wet material which, in the opinion of the Engineer, is not suitable, is encountered below the final subgrade elevation of an excavation or underneath a structure, the Engineer may order the removal of this material and its replacement with crushed stone or other suitable material in order to make a suitable foundation for the construction of the structure.

2. All extra excavation replacement with suitable material will be paid as Additional Work if Ordered by Engineer for Foundation Stabilization and will be paid for on the basis of the actual cubic yards (CY) of the material excavated and replaced as approved by the Engineer by the appropriate excavation bid form line items. No measurement for payment shall be made until all dewatering as specified in Section 312319, Dewatering (Large Scale Excavation) has been successfully accomplished.

3.02 Excavation

A. Method

1. All excavation shall be by open cut from the surface except as indicated on the Drawings.

2. All excavations for pipe appurtenances and structures shall be made in such manner and to such depth and width as will give ample room for building the structures and for bracing, sheeting, and supporting the sides of the excavation, for pumping and draining groundwater and wastewater which may be encountered, and for the removal from the excavation of all materials excavated.

3. Take special care so that the soil below the bottom of the structure to be built is left undisturbed.

B. Grades

1. Excavate to grades indicated on the Drawings.

2. Where excavation grades are not indicated on the Drawings, excavate as required to accommodate installation.

C. Disposal of Excavated Material

1. Remove and properly dispose of all excavated material not needed to complete filling, backfilling and grading.

2. Dispose of excavated material off site at locations secured by the Contractor and in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or on any street or alley. No debris shall be deposited on any private property except by written consent of the property owner. In no case shall any material be left on the Project, encroached onto adjacent private properties, or be buried in embankments or trenches on the Project.

3.03 Excavating for Structures

A. Earth Excavation

1. Earth excavation shall include all substances to be excavated other than rock. Earth excavation for structures shall be to limits not less than three (3) feet outside wall lines, to allow for formwork and inspection, and further as necessary to permit the trades to install their work. All materials loosened or disturbed by excavation shall be removed from surfaces to receive concrete or crushed stone.

2. No separate payment will be made for earth excavation. The cost of such work and all costs be incidental thereto shall be included in the price bid for the item to which the work pertains.

B. Rock Excavation

1. Definition of Rock: Any material which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds (comparable to Caterpillar D 8K or comparable to Caterpillar 977 front-end loader and occupying an original volume of at least one cubic yard). The Engineer shall be the solely responsible for the determination as to the limits to which the material is classified as rock.

2. Excavation: Where rock is encountered within excavation for structures, it shall be excavated to the lines and grades indicated on the Drawings or as

otherwise directed by the Engineer. The Contractor shall be responsible for obtaining any blasting permits required.

3. Blasting: Blasting operations shall be conducted in accordance with all existing ordinances and regulations. All structures shall be protected from the effects of the blast. The blasting shall be done by licensed experienced workers. Dispose of excavated rock in accordance with applicable federal, state, county and local regulations.

   a. If, in the sole opinion of the Engineer, the Contractor persistently uses excessive blasting charges or blasts in an unsafe or improper manner, the Engineer will direct the Contractor to employ an independent, qualified blasting consultant, approved by the Engineer, to supervise the preparation for each blast and approve the quantity of each charge. The cost of the blasting consultant will be paid for by the Contractor and the Contractor shall not be reimbursed through the Contract allowance. The qualified blasting consultant when required to perform drilling and blasting will be paid for by the Contractor.

   b. The Contractor will notify the Engineer before any charge is set and prior to blasting. Following review by the Engineer regarding the proximity (normally within 300 linear feet) of permanent structures to the blasting site, the Engineer may direct the Contractor to employ an independent qualified specialty subcontractor, approved by the Engineer, to monitor the blasting by use of seismograph, identify areas where light charges must be used, conduct pre-event and post-event inspections of all structures, including photographs or videos, and maintain a detailed written log. The cost of this independent qualified specialty subcontractor will be paid for through the Contract allowance. The specialty subcontractor allowance will be used only to pay for a specialty subcontractor when directed by the Engineer to monitor blast, conduct pre-event and/or post-event inspections and maintain a log of these activities.

   c. Any damage done shall be promptly repaired by the Contractor at the Contractor's own expense.

4. No allowance shall be made for overcutting or for excavation below the required elevations. The Engineer must be given reasonable notice to measure all rock.

5. If excess excavation is made or the material becomes disturbed to require removal below final subgrade elevations or beyond the prescribed limits, the resulting space shall be refilled with TDOT Type III Concrete in accordance

with TDOT Specifications, Section 604.

C. Excavation for Foundations: Footings and slabs on grades shall rest on undisturbed earth, rock, or compacted materials to insure proper bearing.

1. Unsuitable Foundation Material

a. Any material in the opinion of the Engineer which is unsuitable for foundation shall be removed and replaced with compacted crushed stone, or with compacted fill material as directed by the Engineer. Crushed stone shall meet the requirements of the Tennessee Department of Transportation Specification 903. Stone size shall be No. 1, inclusive, as determined by the Tennessee Department of Transportation Specification 903.22.

b. No determination of unsuitability will be made until all requirements for dewatering are satisfactorily met.

c. Where shown on the Drawings, removal and replacement of unsuitable material shall be included in the unit price item as applicable. Payment for removal and replacement of unsuitable material not shown on the Drawings shall be incidental to earthwork activities with no additional payment being made.

2. Foundation in Rock

a. Foundations for a structure shall be on similar materials. Should excavation for a foundation be partially in rock, the Contractor shall undercut that portion of the rock 12-inches and bring the excavation to grade with compacted crushed stone.

b. Where ordered by the Engineer, undercutting of rock and replacement with crushed stone will be paid for at the unit price bid for rock excavation. The quantity shall equal one foot of depth over the horizontal dimensions authorized by the Engineer.

3. Unauthorized Excavation

a. Care shall be taken that excavation does not extend below bottom levels of footings or slabs on earth or rock. Should the excavation, through carelessness or neglect, be carried below such levels, the Contractor shall fill in the resulting excess excavation with concrete under footings and compacted crushed stone or other approved material under slabs. Crushed stone or gravel shall meet the Tennessee Department of Transportation

Specification 903. Stone size shall be No. 1, inclusive, as determined by the Tennessee Department of Transportation Specification 903.22. Should excavation be carried beyond outside lines of footings such excess excavation shall be filled with concrete, or formwork shall be provided, as directed by the Engineer.

b. Additional costs of corrective work, made necessary by unauthorized excavation of earth or rock, shall be borne by the Contractor.

D. Unsuitable Bearing

a. If suitable bearings for foundations are not encountered at the elevations indicated on the Drawings, immediately notify the Engineer.

b. Do not proceed further until instructions are received, and necessary measurements made for purposes of establishing additional volume of excavation.

3.04 Fill

A. Controlled Fill

1. The fill for establishing finished grade shall be controlled fill.

2. After the existing ground or excavated area has been proof rolled and examined by the Engineer, all holes and other irregularities shall be filled and compacted before the main fill is placed.

3. The fill shall be placed in even layers not exceeding 10-inches in depth and shall be thoroughly compacted as herein specified.

4. If an analysis of the soil being placed shows a marked difference from one location to another, the fill being placed shall not be made up of a mixture of these materials.

5. Each different type of material shall be handled continuously so that field control of moisture and density may be based upon a known type of material.

6. No fill shall be placed following a heavy rain without first making certain on isolated test areas that compaction can be obtained without damage to the already compacted fill.

B. Proof rolling

1. All areas where roadways, parking areas, sidewalks, structures, and buildings are to be constructed on cut areas, compacted fill, and other areas were

indicated on the Drawings, shall be proof rolled to detect soft spots prior to the placement of fill material and after placement of fill, which shall be construction of foundations.

2. Proof rolling shall consist of moving a 20-30 ton loaded dump truck or another pneumatic tire roller over the subgrade before the subgrade is shaped. The Engineer shall witness proof rolling.

3. Pneumatic-tired rollers shall have not fewer than four pneumatic tired wheels which shall be of such size and ply that tire pressures can be maintained between 80 and 100 pounds per square inch for 25,000-pound wheel load during rolling operations. Unless otherwise required, rolling shall be done with tires inflated to 90 psi. The roller wheels shall be located abreast in a rigid steel frame.

4. Each wheel shall be loaded with an individual weight box so that each wheel will bear an equal load when traversing uneven ground. The weight boxes shall be suitable for ballast loading such that the load per wheel shall be 25,000 pounds. The spacing of the wheels shall insure that the distance between the nearest edges of adjacent tires shall be not greater than one-half of the tire width of a single tire at the operating pressure for a 25,000-pound wheel load. The roller shall be operated no faster than 10 miles per hour.

5. Subgrade shall be proof rolled with six passes of the truck or roller. Depressions that develop during the proof rolling operation shall be filled with suitable material and those filled areas shall be proof rolled with six passes of the roller. If, after having been filled and proof rolled, the subgrade still contains depressions, the area shall be undercut to the full depth of the soft material or five feet whichever is less, backfilled, recompacted, and rolled to achieve a subgrade acceptable to the Engineer.

6. After the proof rolled subgrade has been accepted by the Engineer, the surface of the subgrade shall be finish rolled with a smooth steel wheel roller weighing not less than 10 tons. Finished surface of the subgrade shall be within a tolerance of 1/4-inch at every point.

7. Conduits, pipes, culverts and underdrains shall be neither disturbed nor damaged by proof rolling operations. Rollers shall neither pass over, nor approach closer than five feet to, conduits, pipes, culverts and underdrains unless the tops of those products are deeper than three feet.

C. Placement

1. Prior to placement of any material in embankments, the area within

embankment limits shall be stripped of topsoil and all unsuitable materials removed as described under Article 3.02. The area shall then be scarified to a depth of at least e-inches.

2. Fill materials shall be placed in continuous horizontal layers extending the full width of the embankment cross-section and the full dimension of the excavation where practical and having a net compacted thickness of not over 6-inches.

3. Fill materials shall be placed at optimum moisture content within practicable limits (not less than one percent below optimum). Optimum moisture shall be maintained by sprinkling the layers as placed or by allowing materials to dry before placement.

D. Compaction

1. Fill materials shall be compacted to dry densities as determined by the Standard Proctor Compaction Test performed in accordance with ASTM D 698.

2. Fill materials shall be compacted to 95 percent of the maximum dry density. The top 12-inches of fill material shall be compacted to 98 percent of the maximum dry density.

3. Compaction of embankments shall be by sheepsfoot rollers with staggered, uniformly spaced knobs and suitable cleaning devices. The projected area of each knob and the number and spacing of the knobs shall be such that the total weight of the roller and ballast when distributed over the area of one row of knobs shall be 250 psi. Placement and compaction of materials shall extend beyond the final contours sufficiently to insure compaction of the material at the resulting final surface. Final contours shall then be achieved by a tracked bulldozer shaping the face of the embankment.

4. Compaction of backfill around structures shall be accomplished by heavy power tamping equipment.

5. If tests indicate that density of fill is less than that specified, the area shall be either recompacted or undercut, filled, and compacted until specified density is achieved.

E. Final Grading: Upon completion of construction operations, the area shall be graded to finish contour elevations and grades shown on the Drawings. Graded areas shall be made to blend into conformation with remaining ground surfaces. All surfaces shall be left smooth and free to drain.

F. Excess Material

1. Any excess earth excavation and unsuitable materials shall be placed on the site as directed by the Engineer. Surfaces and slopes of waste fills shall be left smooth and free to drain.

2. No separate payment will be made for backfilling. The cost of all such work and all costs be incidental thereto shall be included in the price bid for the item to which the work pertains.

G. Moisture

1. All fill shall be compacted with the moisture content as established by the 98 percent intercept on the moisture density curves or the moisture content at the shrinkage limit, whichever is less.

2. If fill material is too wet, provide and operate approved means to assist the drying of the fill until suitable for compaction.

3. If fill material is too dry, provide and operate approved means to add moisture to the fill layers.

3.05 Backfilling

A. Backfill carefully to restore the ground surface to its original condition. Dispose of surplus material.

B. Compact backfill to 95 percent of the maximum dry density.

C. Backfill for Pipe – See Section 312000, Excavation and Filling (Trenching)

D. Backfilling Around Structures

1. General
   a. Remove debris from excavations before backfilling.

   b. Do not backfill against foundation walls until so directed by the Engineer nor until all indicated perimeter insulation and/or waterproofing is in place.

   c. Protect such insulation and/or waterproofing during filling operations.

   d. Wherever possible, backfilling shall be simultaneous on both sides of walls to equalize lateral pressures.

e. Do not backfill against walls until all permanent construction is in place to furnish lateral support on both top and bottom of wall.

f. Backfilling against walls is to take place after all the concrete in the affected members has attained the specified strengths.

2. Materials: Backfill material placed against structures built or encountered during the work of this Section shall be suitable fill material. No broken concrete, bricks or similar materials will be permitted as backfill.

3.06 Grading

A. General: Perform all rough and finish grading required to attain the elevations indicated on the Drawings. Perform finish grading to an accuracy of +/- 0.10 foot.

B. Compact backfill to 95 percent of the maximum dry density. The top 12-inches of backfill shall be compacted to 98 percent of the maximum dry density.

C. Backfilling Around Structures
   1. General
      a. Remove debris from excavations before backfilling.

      b. Do not backfill against foundation walls until so directed by the Engineer nor until all indicated perimeter insulation and/or waterproofing is in place.

      c. Protect such insulation and/or waterproofing during filling operations.
      d. Wherever possible, backfilling shall be simultaneous on both sides of walls to equalize lateral pressures.

      e. Do not backfill against walls until all permanent construction is in place to furnish lateral support on both top and bottom of wall.

      f. Backfilling against walls shall take place after all the concrete in the affected members has attained the specified strengths.

   2. Materials: Backfill material placed against structures built or encountered during the work of this Section shall be suitable fill material. No broken concrete, bricks or similar materials will be permitted as backfill.

D. Treatment After Completion of Grading

   1. After grading is completed, permit no further excavation, filling, or grading,

except with the approval of the Engineer.

2. Use all means necessary to prevent the erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.07 Surface Water Control

A. Regulations and Permits: Obtain all necessary soil erosion control permits in accordance with the Section 015713 of these specifications and all pertinent rules, laws, and regulations of all applicable federal, state, county and municipal regulatory agencies having jurisdiction.

B. Unfavorable Weather
   1. Do not place, spread, or roll any fill material during unfavorable weather conditions.

   2. Do not resume operations until moisture content and fill density are satisfactory to the Engineer.

   3. Contractor will be responsible for tracking unfavorable weather conditions as construction progresses and provided to Engineer if additional workdays are requested to complete work.

C. Provide berms or channels to prevent flooding of subgrade. Promptly remove all water collected in depressions.

D. Pumping and Drainage

   1. Provide, maintain, and always use during construction adequate means and devices to promptly remove and dispose of all water from every source entering the excavations or other parts of the work.

   2. Dewater by means which will ensure dry excavations, preserve final lines and grades, do not disturb, or displace adjacent soil.

   3. All pumping and drainage shall be done with no damage to property or structures and without interference with the rights of the public, owners of private property, pedestrians, vehicular traffic, or the work of other contractors, and in accordance with all pertinent laws, ordinances, and regulations.

   4. Do not overload or obstruct existing drainage facilities.

3.08 Settlement

A. The Contractor shall be responsible for all settlement of backfill, fills and embankments which may occur within one year after final acceptance of the Work by the Owner.

B. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from the Engineer or Owner.

3.09 Cleaning

Upon completion of the work of this Section, remove all rubbish, trash and debris resulting from construction operations. Remove surplus equipment and tools. Leave the site in a neat and orderly condition acceptable to the Engineer, and in conformance with Section 017400, Cleaning and Waste Management of these Specifications.

END OF SECTION

Part 1 General

1.01 Scope

A. This Section shall apply to all excavation, except trench excavation.

B. Construct all permanent work in areas free from water. Design, construct, and maintain all wells, pumps, vacuum systems, sumps, dikes, levees, cofferdams, and diversion and drainage channels as necessary to maintain the areas free from water and to protect the areas to be occupied by permanent work from water damage. Remove temporary works after they have served their purpose.

C. The CONTRACTOR shall be responsible for the stability of all temporary and permanent slopes, grades, foundations, materials, and structures during the course of the Contract. Repair and replace all slopes, grades, foundations, materials, and structures damaged by water, both surface and subsurface, to the lines, grades, and conditions existing prior to the damage, at no additional cost to the OWNER.

Part 2 Products (Not Used)

Part 3 Execution

3.01 Care of Water

A. Except where the excavated materials are designated as materials for permanent work, material from required excavation may be used for dikes, levees, cofferdams, and other temporary backfill.

B. Furnish, install, maintain and operate necessary pumping and other equipment for dewatering the various parts of the work, and for maintaining the foundation and other parts free from water, as required for constructing each part of the work.

C. Install all drainage ditches, sumps, and pumps to control excessive seepage on excavated slopes, to drain isolated zones with perched water tables, and to drain impervious surfaces at final excavation elevation.

D. Dewater by means which will insure dry excavations, preserve final lines, and

grades. Do not disturb or displace adjacent soil.

E. All pumping and drainage shall be done with no damage to property or structures, and without interference with the rights of the public, OWNERs of private property, pedestrians, vehicular traffic, or the work of other CONTRACTORs, and in accordance with all pertinent laws, ordinances and regulations.

F. Do not overload or obstruct existing drainage facilities.

G. After they have served their purpose, remove all temporary protective work at a satisfactory time and in a satisfactory manner. All diversion channels and other temporary excavations in areas where the compacted fill or other structures will be constructed shall be cleaned out, backfilled, and processed under the same Specifications as those governing the compacted fill. Fill or grout all temporary dewatering wells unless otherwise directed by the ENGINEER.

H. When the temporary works will not adversely affect any item of permanent work or the planned usage of the Project, the CONTRACTOR may be permitted to leave such temporary works in place. In such instances, breeching of dikes, levees, and cofferdams may be required.

3.02 Dewatering

A. By the use of well points, pumps, tile drains, or other approved methods, the CONTRACTOR shall prevent the accumulation of water in excavated areas. Should water accumulate, it shall be promptly removed.

B. Excavations shall be continuously dewatered to maintain a ground water level no higher than three feet (3') to four feet (4') below the lowest point in the excavation. Dewatering systems shall be designed to allow for localized variations in the depth of excavations required to reach a suitable foundation. Dewatering shall be accomplished well enough in advance of excavation to ensure that groundwater is already lowered prior to completing the final excavation to finish subgrade.

C. All destabilized subgrade conditions caused by inadequate or untimely dewatering operations shall be undercut and backfilled with suitable backfill material at no additional cost to the OWNER.

D. Piezometric observation wells are required to monitor the ground water level to insure proper dewatering prior to excavation below the static water table. The

number of wells required will vary depending on the size and depth of structures.

END OF SECTION

Part 1 General

1.01 Scope

The work covered by this section includes furnishing all labor, equipment, and materials to pump Controlled Low Strength Material (CLSM), Flowable Fill into abandoned underground pipes or to be used as trench backfill material, as noted on the Drawings or as directed by the ENGINEER.

Part 2 Products

2.01 Materials for CLSM

General Flowable Fill:

A. All flowable fill materials shall be considered general flowable fill unless otherwise depicted in the drawings or specified in other sections of the Contracted Documents.

B. Materials used in this construction shall meet the following requirements:

Material	Specification
Portland Cement Type 1	TDOT 901.01
Fine Aggregate	TDOT 903.01
Potable Water	TDOT 921.01
Chemical Admixtures and Additives	TDOT 921.06
Air Entraining Admixtures and Additives	TDOT 921.06
Fly Ash, Class C or Class F	TDOT 921.15
Ground granulated blast furnace slag	TDOT 921.16

C. General Flowable for final backfill shall have a compressive strength exceeding two-hundred-fifty pounds-per-square-inch (250 psi) as depicted in the Drawings.

D. Fine aggregate shall be well graduated from coarse to fine and when tested by means of laboratory sieves, for the CLSM strength as depicted in the Drawings.

E. Submittal of proposed mix design along with water requirements for CLSM shall be

provided for approval by Engineer prior to its use.

F. Flowable Fill shall be mixed and transported in accordance with ASTM C 94.

Excavatable Flowable Fill:

A. Materials used for excavatable flowable as indicated in the Drawings shall meet the following requirements:

Material	Specification
Portland Cement Type 1	TDOT 901.01
Fine Aggregate	TDOT 903.01
Potable Water	TDOT 921.01
Chemical Admixtures and Additives	TDOT 921.06
Air Entraining Admixtures and Additives	TDOT 921.06
Fly Ash, Class C or Class F	TDOT 921.15
Ground granulated blast furnace slag	TDOT 921.16

B. Flowable for excavatable backfill shall have a compressive strength as depicted in the Drawings or specified in other Sections but in no cases have a compressive strength exceeding one-hundred-fifty pounds-per-square-inch (150 psi).

C. Fine aggregate shall be well graded from coarse to fine and when tested by means of laboratory sieves, shall conform to the following requirements:

Sieve Size	**Total Percent Passing By Weight**
¾-inch	100
No. 4	95 to 100
No. 16	50 to 90
No. 50	10 to 30
No. 200	0 to 10

D. Submittal of proposed mix design along with water requirements for the excavatable CLSM shall be provided for approval by Engineer prior to its use.

E. Flowable Fill shall be mixed and transported in accordance with ASTM C 94.

2.02 Proportioning for CLSM

A. CLSM mix shall be proportioned to meet the compressive strength as depicted in the drawings.

B. The above proportions may be adjusted by the ENGINEER to obtain the consistency required for satisfactory pumping flow. Consistency shall be determined as follows:

1. Slump before adding foaming agent shall be 1.5-inches +/-.

2. Slump after adding foaming agent and mixing for at least five (5) minutes and no more than ten (10) minutes shall be seven inches (7”) to nine inches (9”).

Part 3 Execution

3.01 General

A. Foaming Agent

1. Before adding foaming agent, check initial slump. If slump meets this specification, reverse the drum and slowly move the mix to the discharge end of the drum.

2. Pour the foaming agent directly into the mix. Run the drum forward to blend the product into the mix.

3. DO NOT SPRAY THE FINS. If the foaming agent remains on the fins, bring mix to discharge end of drum several times to clean the foaming agent off.

4. Mix at full mixing speed for five (5) minutes minimum. The mix should be very fluid after mixing.

5. Only add water AFTER the foaming agent has mixed for a minimum of five (5) minutes. Unnecessary water is detrimental to the performance of the mix.

6. Minimum batch for foaming agent is three cubic yards (3 CY).

7. Pump pipes to capacity.

END OF SECTION

Part 1 General

1.01 Scope

A. The work to be performed under this section shall include replacing existing sidewalks and pavement in paved streets, driveways, and parking areas where such sidewalks and pavement have been removed for constructing water pipelines, fire hydrants, sewers, manholes, and all other water and sewer appurtenances and structures. It shall also include temporary and new sidewalks and pavements where applicable. Shoulders, roads, streets, drives, curbs, and walks impacted by construction are to be restored to their original condition and are to be paid for by the Unit Price line items as contracted or considered an incidental part of other items as indicated in the Measurement and Payment Section.

B. These specifications and the drawings make reference to the current edition of the standard specifications of the Tennessee Department of Transportation (TDOT). Even though the weather limitations, constructions methods, and materials requirements contained in the TDOT specifications may not be explicitly repeated in these specifications, they shall, wherever applicable to the work called for by this section, be considered as implied and therefore adhered to. However, the various subsections "Basis for Payment" contained in the TDOT specifications shall not be considered applicable.

C. Related Work:

1. Section 312300 – Excavation and Fill
2. Section 033000 – Cast-In-Place Concrete
3. Section 032000 – Concrete Reinforcement

Part 2 Products

2.01 Types of Pavement

A. All references to the Tennessee Department of Transportation (TDOT) specifications shall refer to "Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction", 2021 or latest edition.

1. Mineral Aggregate Base: Class A, Grading D crush stone (TDOT specs, Section 303)

2. Prime Coats: Emulsified asphalt, Grade AE-P (TDOT specs, Section 402)

3. Coarse Aggregate: Size 6 or Size 7 (TDOT specs, Subsection 903.22)

4. Double Bituminous Seal Coat: for both courses, emulsified asphalt, Grade CRS-2p (TDOT Specs, Subsections 405)

5. Bituminous Plant Mix Base (Hot Mix): Grading B or C, as directed by the ENGINEER (TDOT specs, Section 307)

6. Tack Coat: SS-1, SS-1h, CSS-1, TST-1P, CQS-1h, CQS-1hp, CSS-1h (TDOT Specs, Section 403)

7. Asphaltic Concrete Surface (Hot Mix): Grading E (TDOT specs, Section 411)

8. Pavement Markings: (TDOT Specifications, Section 716)

9. Thermoplastic Pavement Markings: Stop Bars, Crosswalks, legends, or Directional Arrows (TDOT Specifications, Section 716.03 & 919.01)

10. Spray Thermoplastic Pavement Markings: Lane, Edge, and Centerlines (TDOT Specifications, Section 716.03 & 919.02)

11. Preformed Plastic Pavement Marking: Stop Bars, Crosswalks, legends, or Directional Arrows (TDOT Specifications, Section 716.03 & 919.03)

12. Quick Dry Traffic Marking Paint (White and Yellow): (TDOT specs, Subsection 910.02)

13. Concrete: Class A (TDOT Specifications, Sections 604 and 703)

14. Cold Planing of Bituminous Pavements: Full Pavement Width Restoration (TDOT Specifications, Section 415)

B. All existing pavement in streets, driveways, or parking areas which is removed,

destroyed, or damaged by construction of sewage or water works shall be replaced per local requirements or as specified below, and as shown on the Drawings. If a conflict is discovered, local ordinances and specifications will govern. Unless otherwise shown or specified, all paved surfaces shall be replaced using the applicable pavement replacement Type 1 through 5 as shown on the Drawings. Pavement shown or specified to be replaced for the full width of the street shall be Types 6, 7, or 8 as applicable and as shown on the Drawings. Materials, equipment, and construction methods used for paving work shall conform to the Specifications applicable to the particular type required for replacement, repair, or new pavements.

1. Type 1 – Portland Cement concrete pavement shall be Class "A" concrete conforming to the Section 033000 - Cast-in-Place Concrete of these Specifications, having minimum compressive strength of three-thousand-five-hundred pounds-per-square-inch (3,500 psi). The surface shall conform to the grade and elevation of the surrounding pavement. The slab shall be of a depth of eight (8) inches as shown on the drawings.

2. Type 2 – Not used.

3. Type 3 – Asphaltic concrete pavement for heavy-duty use shall have a maximum thickness of six inches (6") placed in two (2) equal layers. Type 3 pavement shall be composed of four inches (4”) of plant mix binder and a two inch (2”) topping of asphaltic concrete surface (hot mix). The pavement mixture shall not be spread until the designated surface has been previously cleaned and prepared, is intact, firm, properly cured, dry, and the tack coat has been applied.

4. Type 4 – Asphaltic concrete pavement for commercial drives shall have a maximum thickness of four inches (4") placed in two (2) layers. Type 3 pavement shall be composed of two and a halve inches (2.5”) of plant mix binder and one and a half inch (1.5”) topping of asphaltic concrete surface (hot mix). The pavement mixture shall not be spread until the designated surface has been previously cleaned and prepared, is intact, firm, properly cured, dry, and the tack coat or prime coat has been applied.

5. Type 5 – Bituminous penetration pavement shall conform to Section 404, "Double Bituminous Surface Treatment," TDOT, *Standard Specification for Road and Bridge Construction*, latest edition.

6. Replacement of full pavement width bituminous asphalt pavement shall conform to TDOT Specifications, Section 415 for the Cold Planing Bituminous

Plant Mix Pavements in areas as required or as depicted in the Drawings. The existing asphalt shall be milled to the limits as indicated in the Construction Drawings to the thickness shown. The milling operations should occur after underground utility has been installed and trenching, mineral aggregate base, and asphaltic binder has been placed. The asphaltic concrete surface shall be placed once the milled surface has been cleaned and the tack coat has been placed.

7. Replacement of Portland Cement concrete driveways shall be Class "A" concrete conforming to Section 033000 - Cast-in-Place Concrete of these Specifications. The surface finish of the concrete pavement shall conform to that of the existing pavement. The slab shall be of depth equivalent to the existing concrete pavement, but in no case less than six inches (8”) thick. Expansion joints removed shall be replaced.

8. Replacement of Portland Cement concrete sidewalks shall be Class "A" concrete conforming to Section 033000 - Cast-in-Place Concrete of these Specifications. The surface finish of the concrete sidewalk shall conform to that of the existing sidewalk. The slab shall be of depth equivalent to the existing concrete sidewalk but in no case less than four inches (4”) thick. Expansion joints removed shall be replaced.

9. Where sewerage or water lines and appurtenances are constructed in or across unpaved, chert, or crushed stone surfaced streets, roadways, driveways, or parking areas, the surface removed or damaged shall be repaired or replaced with a minimum of six inches (6”) of crushed stone in accordance with Section 401, "Mineral Aggregate Surface," of the TDOT, *Standard Specifications for Road and Bridge Construction*, latest edition.

10. Unless permanent replacement can be made on the same day as the removal of the surface, and traffic is to be reinstated, holes shall be plated, or temporary pavement repairs shall consist of a single application of bituminous surface treatment, and be made with two inches (2”) of cold mix or hot bituminous seal coat, as directed by OWNER or ENGINEER. The bituminous surface treatment shall conform to TDOT specifications except the second application of bituminous material and mineral aggregate shall be eliminated. Permanent repair MUST be made within ten (10) working days from date of pavement cut.

C. With the prior approval of the ENGINEER, pavement restoration may be performed utilizing an infrared pavement restoration method. This method shall consist of the following:

1. Materials – A one-component emulsified maltenes recycling agent (rejuvenator) is to be applied to the restored area in a ratio of one-to-one (1:1) with water.

   a. This solution shall be well dispersed with a commercial grade sprayer at a rate of eight ounces per square yard (8 oz/yd^2) of heated area. This application area shall include both the area under repair as well as the area heated, but left undisturbed around the perimeter of the repair.

   b. The application shall take place after the area has been scarified and just prior to the addition of new asphalt. The Infrared repair CONTRACTOR shall provide TDOT 411E or D mix at plant mix temperature of two-hundred-seventy-five degrees Fahrenheit (275° F) to three-hundred-twenty-five degrees Fahrenheit (325° F) to be added to the repair to bring the area up to grade with the existing road.

2. Equipment – The infrared restoration equipment shall consist of a truck-mounted self- contained asphalt restoration system.

   a. The CONTRACTOR shall have a minimum of two (2) years' experience with this equipment. The infrared heating unit shall have a heating chamber consisting of fourteen (14) seventy-five-thousand British Thermal Units (75,000 BTU's) high Intensity infrared heaters with Venturi type gas mixing.

   b. The heat area shall be a minimum of six foot by twelve foot (6' x 12') to provide a minimum twelve foot (12') lane width repair area per heat. The chamber shall consume no more than fifteen-thousand British Thermal Units per square foot (15,000 BTU/ ft^2) of heated area. This rate of consumption shall translate into the ability of the heater to soften asphalt to a depth of 1.5-inches to 2.5- inches in a timeframe of eight (8) to ten (10) minutes without burning the surface.

   c. The infrared heat chamber shall be fueled by liquid propane using a high capacity Compressed Gas Association (CGA) approved vaporizer at forty United States Gallons at minus-forty degrees Fahrenheit (40 USG @ - 40° F) to convert the liquid propane to vapor

and provide full pressure to the heaters until the propane cylinders are empty. The truck unit shall contain at least four (4) cylinders of propane to provide enough fuel to operate heater chamber and re-claimer for two (2) days.

d. The heat system shall utilize an Intelligent Control Station with human-machine interface (HMI) and programmable logic controller (PLC) functions to monitor heat timing for quality control of infrared system. The asphalt storage unit shall consist of a thermostatically controlled storage unit that will be utilized to ensure that sufficient hot virgin asphalt is on hand. The re-claimer/storage unit shall contain two (2) thirty-seven-thousand British Thermal Units (37,000 BTU) atmospheric infrared heaters. The thermostats shall work in conjunction with timers to insure proper temperature is maintained without harming the asphalt.

e. An electronic ignition shall be standard on this unit. An automatic switchover regulator shall be used to reduce the tank pressure to an eleven inch (11") water column. Compaction equipment consisting of a compactor/roller unit shall be used and should be capable of generating at least two-thousand pounds (2,000 lbs) of applied force per square inch (in^2) through a vibratory unit. A steel rake shall be used to delineate the repair area along the marked chalk line and to scarify the heated area of the patch inside the chalk line to a depth of at least two inches (2”). A thirty-six inch (36”) wide asphalt lute shall be used to distribute the added asphalt and to establish the proper grade.

3. The CONTRACTOR performing this work shall possess a State of Tennessee CONTRACTOR’S license with a Highway, Railroad, and Airport (HRA) classification for roadway work.

D. In no case shall paving repair be commenced without prior approval of the ENGINEER of the type pavement, the equipment to be used, and the method or procedure to be used.

Part 3 Execution

3.01 Replacing Pavement

A. Pavements removed or damaged shall be replaced in accordance with the following procedures:

1. The existing street pavement or surface shall be removed along the line of the work for the allowable width specified for the trench or structure. All edges of the existing pavement shall be cut to a straight, vertical edge, and care shall be used to get a smooth joint between the old and new pavement and to produce an even surface on the completed street. Cement concrete slabs, cement concrete base slabs, and crushed stone bases, if required, shall be placed and the concrete allowed to cure for three (3) days before asphaltic concrete surface courses are applied. Expansion joints where applicable shall be replaced in a manner equal to the original joint.

2. After the installation of the sewer or water lines, the trench shall be backfilled with thoroughly compacted crushed stone from the top of bedding to finished grade unless otherwise specified on the Drawings or by local specifications. Backfill shall be placed as specified in Section 312300 – Excavation and Fill of these Specifications.

3. Trench backfill along streets shall be covered with permanent paving or with a temporary paving as specified above. The temporary paving shall be applied level with the existing paved surface at a time directed by the ENGINEER. Prior to the application of the temporary paving the crushed stone backfill shall be maintained carefully at grade and dust free. Additionally, immediately prior to application of permanent paving by CONTRACTOR or acceptance by the ENGINEER, CONTRACTOR shall again compact the top of all trench backfill in the streets with a hydrotamper and add sufficient crushed stone to bring surface back to bottom of permanent paving as shown on Drawings.

4. Unless otherwise shown or specified, all paved surfaces shall be replaced with pavement of like kind as specified in Paragraph 2.01. The pavement shall be either specified trench width or the full width of the street as shown in the Bid Schedule to included cold planing (milling) of the asphaltic pavement as required to achieve final pavement grades.

5. Where pavement is specified for trench width only, the temporary surface or sub-base for permanent paving shall be compacted and finished to the base grade compatible with the type of pavement to be applied before pavement is placed. Additional width of pavement to be removed, if any, as shown on the drawings shall be done immediately prior to replacing the pavement. Any additional pavement or street surface removed or damaged

beyond the limits shown on the Drawings shall be replaced or repaired by the CONTRACTOR at the CONTRACTOR'S expense.

6. Where the pavement is for the complete width of the street, the following procedures shall be used;

   a. After the crushed stone backfill and temporary surface have settled thoroughly, the entire width of the street to be paved shall be cleaned of loose materials as specified in Section 407, "Bituminous Plant Mix Pavements," Tennessee Department of Transportation (TDOT), *Standard Specifications for Road and Bridge Construction*, latest edition.

   b. All asphalt areas which will receive a top asphaltic surface shall be cold planed as necessary as specified in TDOT Specifications, Section 415 to match existing roadway grades prior to final surface paving. Prior to paving, a tack coat shall be applied to the full width of the street, as specified in TDOT Specifications, Section 403.

   c. All areas which have settled shall be filled and leveled as described above in Paragraph 3. Manholes shall be raised to match finished grade using precast concrete rings. Before paving a tack coat shall be applied to the full width of the street, as specified in TDOT Specifications, Section 403.

   c. During the time that the full width of the street is being paved, the CONTRACTOR shall extend the paving from the street into existing paved driveways in order to provide a smooth transition from the street to the existing driveway grade. This work shall be completed to the satisfaction of the ENGINEER with no separate payment being allowed.

7. Wherever sewer or water lines are constructed across state highways, the CONTRACTOR shall comply with all requirements and provisions of the Standard Method of the TDOT for opening trenches through highways and replacing pavements as shown on the Drawings and specified herein. All such work shall be subject to inspection and approval by the TDOT.

8. Whenever sewer or water lines are constructed across streets, roads, or highways that are not under the jurisdiction of the TDOT, the CONTRACTOR shall comply with all requirements set forth by the

governing body for opening trenches through highways and replacing pavements as specified herein. All such work shall be subject to inspection and approval by the governing body that has jurisdiction over the highway.

9. CONTRACTOR shall remove all surplus excavation materials and debris from the street surfaces and rights-of-way and shall restore street, roadway, or sidewalk surfacing to its original condition. This work shall be considered as cleanup and no separate payment will be made for this item.

3.02 New Pavements

A. Access roads, parking areas, and other roadways shall be surfaced as shown on the Contract Drawings. The material shall be placed sufficiently thick to produce, after compaction, a uniform surface with a minimum thickness as shown on the drawings and shall be shaped to the required line and grade. Materials, equipment, and construction methods used for paving work shall conform to the Specifications for the particular surface required.

B. Bituminous penetration pavement, Portland Cement Concrete base course or pavement, and bituminous concrete pavement shall include a base course constructed in accordance with the requirements of Section 303, "Mineral Aggregate Base," Tennessee Department of Transportation (TDOT), *Standard Specifications for Road and Bridge Construction*, latest edition. The completed crushed stone road base shall be maintained by the CONTRACTOR in a smooth, first-class condition to required line, grade, and cross section until the entire surface area has become stabilized and compacted. Roadway materials shall not be placed on soft, wet, or frozen sub-grade.

C. After the base has become stabilized, the entire surface shall be covered with the surface course called for on the Drawings. The surface course shall not be placed until all other items of work are completed.

D. Portland Cement Concrete base course or pavement shall be placed as herein specified in this Section. Asphaltic concrete pavement shall be placed as herein specified in Paragraph 2.01. Bituminous penetration surface shall be constructed in accordance with Section 404, "Double Bituminous Surface Treatment," TDOT, *Standard Specifications for Road and Bridge Construction*, latest edition.

E. Crushed stone surface shall be placed as herein specified in this section, Paragraph 2.01.

3.03. Subgrade

A. Before any base material is installed, compact the subgrade of the area to be paved to ninety-five percent (95%) of optimum density as determined by ASTM D698 (Standard Proctor).

B. The backfill material shall be thoroughly compacted crushed stone from the top of bedding to finished grade unless otherwise specified on the Drawings. For all areas where subgrade has been prepared, test for uniformity of support by driving a loaded dump truck at a speed of two to three miles-per-hour (2 to 3 mph) over the entire surface. Make further improvements on all areas that show a deflection of one inch (1") or more. When completed, the finished subgrade shall be hard, smooth, stable, and constructed in reasonably close conformance with the lines and grades that existed prior to beginning construction.

C. For tennis courts, the finished surface of the leveling course shall not vary from the specified grade more than one-fourth inch (1/4″) in ten feet (10′) when measured in any direction. The finished surface of the surface course shall not vary from the specified grade more than one-eighth inch (1/8″) in ten feet (10′) when measured in any direction.

3.04 Base

A. Install a mineral aggregate base of the type specified above in accordance with the requirements of Section 303, “Mineral Aggregate Base," Tennessee Department of Transportation (TDOT), *Standard Specifications for Road and Bridge Construction*, latest edition. The mineral aggregate layer shall be six inches (6”), and the total thickness of the base shall be that indicated by the standard drawings or as shown on the plans.

B. When a base course is compacted, cut back the surface course of the existing pavement a minimum of twelve inches (12”) beyond the limit of the joint between the old and new base course or as shown on the standard drawings. Take special care to ensure good compaction of the new base course at the joint. Apply and compact the surface to conform to the existing pavement so that it will have no surface irregularity.

3.05 Pavement (Above Base)

Apply pavement components as shown in the Drawings in manner and at rates specified in TDOT specifications for each component as referenced in Section 2.

3.06 Smoothness

The finished surfaces shall conform to the lines and grades that existed prior to construction. No deviations, variations, or irregularities exceeding one-fourth inch (1/4″) in any direction when tested with a twelve foot (12′) straightedge will be permitted in the finished work, nor will any depressions that will not drain. Correct all such defects.

3.07 Sampling and Testing

A. Submit to the ENGINEER test reports made by an independent testing laboratory on the crushed stone aggregate, bituminous materials, and asphaltic concrete design mixes, and obtain his/her approval of these reports before starting paving operations.

B. Tests shall be made by OWNER on the completed elements of the pavement to ascertain the compacted thickness of the base and surface courses. If sections with deficient thicknesses are found, the full section for a reasonable distance on each side of the deficiency shall be refused. All such sections shall be removed and reinstalled at the CONTRACTOR'S expense. Patch all test holes in connection with thickness tests.

3.08 Maintenance

The CONTRACTOR shall maintain the surfaces of roadways built and pavements replaced until the acceptance of the project. Maintenance shall include such dragging, reshaping, refilling, wetting, rerolling, and reapplication of the temporary paving surface as are necessary to prevent raveling of the road material, the preservation of reasonably smooth surface and repair of damaged or unsatisfactory surfaces to the satisfaction of the ENGINEER. Maintenance shall also include sprinkling as may be necessary to abate dust.

3.09 Sidewalk Replacement

A. Materials

1. All concrete sidewalks shall be built and/or replaced with Class "A" concrete

which shall conform to *Section 033000– Cast-In-Place Concrete* of these Specifications.

2. Preformed joints shall be 1/2-inch thick conforming to the latest edition of AASHTO Standard Specifications, M59, for preformed bituminous fiber joints.

3. Concrete forms shall be of wood or metal, shall be straight and free from warp, and shall be of sufficient strength when in place to hold the concrete true to line and grade without springing or distortion.

B. When a section of sidewalk is removed, the existing sidewalk shall be cut to a neat line perpendicular to both the centerline and the surface of the concrete slab. Existing concrete shall be cut along the nearest existing contraction joints unless such joints do not exist in which case the cut shall be made at minimum distances shown on the Drawings.

C. Existing concrete sidewalks that have been cut and removed for construction purposes shall be replaced with sidewalks of the same width and surface as the portion removed and shall have a minimum uniform thickness of four inches (4"). The new work shall be neatly joined to the old concrete so that the surface of the new work shall form an even unbroken plane with the old sidewalk.

D. The subgrade for concrete sidewalks shall be formed by excavating to a depth equal to the thickness of the concrete plus two inches (2”). Subgrade shall be of such width as to permit the proper installation and bracing of the forms. Subgrade shall be compacted by hand tamping or rolling. Soft, yielding, or unstable material shall be removed and backfilled with satisfactory material. Two inches (2") of porous compacted crushed stone shall be placed and shall be compacted thoroughly and finished to a smooth, unyielding surface at proper line, grade, and cross section.

E. Expansion joints shall be required to replace any existing expansion joints that are removed with the sidewalk or in new construction wherever shown on the Drawings. Expansion joints shall be true and even, shall present a satisfactory appearance, and shall extend to within one-half inch (1/2”) of the top of finished concrete surface.

F. Concrete shall be suitably protected from freezing and excessive heat. It shall be kept covered with burlap or other suitable material and kept wet until cured.

3.10 Replacing Curbs

A. All existing curbs which are removed, damaged, or destroyed during construction of sewerage or water works shall be replaced in accordance with the following:

1. Asphaltic concrete curbs shall be constructed with the same dimensions as the existing curb using asphaltic concrete pavement Grading E, conforming to the section entitled "Asphalt Paving." Prior to constructing curbs on pavement, the pavement shall be dry and cleaned of loose material and a tack coat of RS-2 asphalt shall be applied to the curb area of the pavement at the rate of 0.08 to 0.20 gallons per fifteen linear feet (15 LF) of curb area.

2. Portland Cement Concrete curbs shall be constructed with the same dimensions as the existing curb using Class A concrete in accordance with Section 033000 - Cast-in-Place Concrete and with Section 702, "Cement Concrete Curb," Tennessee Department of Transportation (TDOT), *Standard Specifications for Road and Bridge Construction*, latest edition.

3.11 Infrared Pavement Restoration

A. All Proper safety precautions shall be taken including traffic cones, signage, and flagmen to insure a safe workplace for workers, pedestrians and automobile traffic. All Traffic Control shall be in accordance with current Manual on Uniform Traffic Control Devices (MUTCD) standards.

B. Defining and Preparing the Work Area:

1. The area shall be swept clean of dirt, loose aggregate or standing water.

2. A chalk line shall be drawn six to twelve inches (6” to 12”) back from the damage.

C. Heating the Repair Area:

1. The infrared chamber shall be lowered over the repair being sure to allow at least twelve to eighteen inches (12” to 18”) of heated area beyond the perimeter of the original opening.

2. To insure the proper heating time, the CONTRACTOR shall check the surface temperature of the asphalt at seven minutes and every minute thereafter using an infrared thermometer so as not to allow the surface

temperature to exceed three-hundred-fifty degrees Fahrenheit (350° F).

3. After the appropriate heating time, typically eight (8) to ten (10) minutes, the asphalt surface will be softened to a depth of two inches (2”) to 2.5-inches.

D. Raking Heated Area:

1. Once the asphalt surface is softened, the infrared chamber will be removed from the heated area.

2. The backside of the steel rake will then be used to neatly square off the repair, cutting six inches (6”) to twelve inches (12”) back from the damaged area along the chalk line.

3. The area inside the repair will then be deeply scarified, taking special care to eliminate the original seam between the repair and the road surface.

4. The maltenes rejuvenator shall be applied to the repair and the surrounding heated asphalt surface.

E. Adding Plant Mix Asphalt:

TDOT 411E or D mix, one-fourth inch (1/4”) to one-half inch (½”) aggregate will then be added to the area to bring it up to the proper grade. The repair will then be luted smooth.

F. Compaction:

1. The area shall be properly compacted while ensuring that the edges are rolled first to fuse the hot repair to the heated but untouched surrounding pavement.

2. A light coating of stone dust will then be spread over the repair area to remove the tackiness.

3. The total time for a single heat restoration shall not exceed more than thirty (30) minutes to ensure that both the heated pavement and the added asphalt have not been allowed to cool.

END OF SECTION

Part 1 General

1.01 Scope

A. The CONTRACTOR shall furnish all labor, materials, equipment, and miscellaneous items as necessary for the installation of a complete chain link fence system. Fencing shall be installed in the location as shown on the Drawings in complete conformity with the manufacturer's written recommendations and as specified herein.

B. Related Work:

1. Section 013300 – Administrative Requirements

2. Section 016600 – Product Storage and Handling Requirements

3. Section 017400 – Cleaning and Waste Management

4. Section 033000 – Cast-in-Place Concrete

C. Security fencing for the CONTRACTOR is at CONTRACTOR'S option and is not included as part of the work specified.

1.02 Submittals

Product data shall be submitted in complete conformance with the requirements of Section 013000 – Administrative Requirements of these Specifications.

1.03 Transportation and Handling

A. Deliver materials with the manufacturer's tags and labels intact.

B. Handle and store materials in such a manner that will avoid damage.

1.04 Storage and Protection

Provide storage and protection in accordance with the requirements of *Section 016600 – Product Storage and Handling Requirements* of these Specifications.

1.05 Quality Assurance

A. Standards of manufacturer shall comply with the standards of the Chain Link Manufacturers Institute and these Specifications.

B. Provide fencing as a complete unit produced by a single manufacturer including the required erection accessories, fittings and fasteners.

Part 2 Products

2.01 General

A. Overall height for new fencing shall be eight feet (8'), including three (3) strands of barbed wire on malleable iron post tops. Posts shall be set at no more than eight foot (8') centers, a full three feet (3') deep in concrete footing, poured the full size of the holes as excavated. Corner posts shall have the necessary strut and tie bracing. Gates shall be provided of the size and at the locations indicated on the Drawings.

B. Where fencing crosses ditches, steep grades, and other unusual conditions, make special provisions to insure that the security, appearance, maintainability, and permanence of the standard fencing are equaled or exceeded.

2.02 Materials and Construction

A. Fence Mesh: Nine (9) gauge wire, woven to two inch (2") squares, galvanized after weaving, eight foot (8') wide roll. Continuous tension wire shall be provided at the lower edge of the mesh:

B. Line Post: Two-and-one-half inch (2 ½") Outside Diameter (O.D.) Galvanized Pipe (3.65 #/ft.)

C. Corner Post: Three inch (3") O.D. Galvanized Pipe (5.79 #/ft.)

D. Gate Post: Four inch (4") O.D. Galvanized Pipe (9.11 #/ft.)

E. Top Rail: One-and-five-eighth inch (1-5/8") O.D. Galvanized Pipe (2.27 #/ft.) with extra-long pressed steel sleeves.

F. Gates shall be supplied with heavy-duty latches, keepers, and heavy duty hardened bronze padlocks with duplicate keys.

G. Gate Frames: Two inch (2") O.D. Galvanized Pipe Frame (2.72 #/ft.)

H. Barbed wire shall consist of three strands of twelve (12) gauge wire, with four (4) point pattern barbs, galvanized after weaving.

I. Concrete shall be furnished in accordance with the requirements of *Section 033000 – Cast-in-Place Concrete* of these Specifications.

Part 3 Execution

3.01 Installation

A. Fence installation shall not be started before the final grading is completed, with finish grade elevations established, unless otherwise permitted.

B. Excavation: Drill holes of diameters and spacing shown, for post footings in firm, undisturbed, or compacted soil.

1. If not shown on the Drawings, excavate holes to the minimum diameters as recommended by fence manufacturer.

2. Unless otherwise indicated, excavate hole depths approximately three inches (3") lower than the post bottom, with bottom of posts set not less than thirty-six inches (36") below the surface when in firm, undisturbed soil.

3. If solid rock is encountered near the surface, drill into rock at least twelve inches (12") for line posts and at least eighteen inches (18") for end, pull corner, and gate posts. Drill hole at least one inch (1") greater diameter than the largest dimension for the post to be placed. If solid rock is below soil overburden, drill to full depth required. Penetration into rock need not exceed the minimum depths specified above.

C. Setting Posts: Remove loose and foreign materials from sides and bottoms of holes and moisten soil prior to placing concrete.

1. Center and align posts in holes three inches (3") above bottom of excavation.

2. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in

position during placement and finishing operations.

3. Trowel finish tops of footings and slope of dome to direct water away from posts. Extend footings for gate posts to the underside of bottom hinge. Set keeps, stops, sleeves and other accessories into concrete as required.

4. Keep exposed concrete surfaces moist for at least seven (7) days after placement or cure with membrane curing materials or other acceptable curing methods.

5. Grout-in posts set into sleeved holes, concrete constructions, or rock excavations with non-shrink Portland cement grout or other acceptable grouting material.

D. Concrete Strength: Allow concrete to attain at least seventy-five percent (75%) of its minimum twenty-eight (28) day compressive strength, but in no case sooner than seven (7) days after placement, before rails, tension wires, barbed wire, or fabric is installed. Do not stretch and tension fabric and wires and do not hang gates until the concrete has attained its full design strength.

E. Top Rails: Run rail continuously through post caps or extension arms, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer.

F. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

G. Tension Wire: Install tension wires by weaving through the fabric and tying to each post with not less than 6-gauge galvanized wire or by securing the wire to the fabric.

H. Fabric: Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence and anchor to framework so that fabric remains in tension after pulling force is released.

I. Repair damaged coatings in the shop or during field erection by recoating with manufacturers recommended repair compound, applied per manufacturer's directions.

J. Stretcher Bars: Thread through or clamp to fabric four inches (4”) on center and secure to posts with metal bands spaced fifteen inches (15”) on center.

K. Barbed Wire: Install three (3) parallel wires on each extension arm; on security side of fence, unless otherwise indicated. Pull wire taut and fasten securely to each extension arm.

L. Tie Wires: Use U-shaped wire appropriate for the diameter of pipe. Attach pipe and fabric firmly with tie wire ends twisted at least two (2) full turns. Bend ends of wire to minimize hazard to persons or clothing.

M. Fasteners: Install nuts for tension band and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.02 Cleaning

Perform cleaning during installation of the work and upon completion of the work. Remove from site all debris and equipment. Repair all damage resulting from chain link fence system installation. Cleaning shall be in accordance with the requirements of *Section 017400 – Cleaning and Waste Management* of these Specifications.

END OF SECTION

Part 1 General

1.01 Scope

A. The work covered by this Section consists of furnishing all labor, equipment, and material required to place topsoil, seed, commercial fertilizer, agricultural limestone, and mulch material, including seedbed preparation, harrowing, compacting, and other placement operations on graded earthen areas as described herein and/or shown on the Drawings.

B. In general, seeding operations shall be conducted on all newly graded earthen areas not covered by structures, pavement, or sidewalks; all cleared or grubbed areas which are to remain as finish grade surfaces; and on all existing turf areas which are disturbed by construction operations and which are to remain as finish grade surfaces. Areas disturbed by borrow activities shall also be seeded according to these Specifications.

C. The work shall include temporary seeding operations to stabilize earthen surfaces during construction or inclement weather and to minimize stream siltation and erosion. Temporary seeding shall be performed at the times and locations as directed by the ENGINEER.

D. Perform Work under favorable weather and soil moisture conditions as determined by accepted local practice.

Part 2 Products

2.01 Acceptable Manufacturers

A. All materials shall conform to the requirements and standards of this Section.

B. Wood-cellulose fiber mulch shall be manufactured by Weyerhauser Company or Conway Corporation.

2.02 Topsoil

A. Utilizing designated stockpiles or borrow areas on site, the CONTRACTOR shall place a minimum of four inches (4”) of topsoil over all graded earthen areas and over any other areas to be seeded. Sources of topsoil shall be approved by the

ENGINEER prior to disturbance. Importing topsoil from offsite sources shall be at the discretion of the ENGINEER and shall be justification for additional compensation to the CONTRACTOR. A change order properly authorized by the OWNER shall be agreed upon prior to importing offsite topsoil. No additional compensation will be allowed for spreading of topsoil.

B. Topsoil shall be a friable loam containing a large amount of humus and shall be original surface soil of good, rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than one-half inch (1/2") in diameter, lime, cement, bricks, ashes, cinders, slag, concrete, bitumen, or its residue, boards, sticks, chips, or other undesirable material harmful or unnecessary to plant growth. Topsoil shall be reasonably free from perennial weeds and shall not contain objectionable plant material, toxic amounts of either acid or alkaline elements, or vegetable debris undesirable or harmful to plant life.

C. Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classifiable as loam, silt loam, clay loam, sandy loam, or a combination thereof. The pH shall range from 5.5 to 7.0. Topsoil shall contain not less than five percent (5%) nor more than twenty percent (20%), by weight, of organic matter as determined by loss on ignition of oven-dried samples to sixty-five degrees Celsius (65° C).

2.03 Seed

A. Seed shall be delivered in new bags or bags that are sound and labeled in accordance with the United States Department of Agriculture (USDA) Federal Seed Act.

B. All seed shall be from the last crop available at time of purchase and shall not be moldy, wet, or otherwise damaged in transit or storage.

C. Seed shall bear the growers analysis testing to ninety-eight percent (98%) for purity and ninety percent (90%) for germination. At the discretion of the ENGINEER, samples of seed may be taken for verification against the grower's analysis.

D. Species, rate of seeding, fertilization, and other requirements as described herein and/or shown on the Drawings.

E. Furnish in standard containers with seed name, lot number, net weight, percentages of purity, germination, and hard seed and maximum weed seed content, clearly marked for each container of seed.

F. Keep dry during storage.

2.04 Fertilizer and Liming Materials

A. Fertilizer and liming materials shall comply with applicable state, local, and federal laws concerned with their production and use.

B. Commercial fertilizer shall be uniform in composition, free-flowing, and suitable for application with equipment designed for that purpose. It shall contain a minimum percentage of plant food by weight, with a ready mixed material equivalent to the grade or grades specified in the Seeding Schedule as described herein and/or shown on the Drawings. Container bags shall have the name and address of the manufacturer, the brand name, net weight, and chemical composition. Top Dress Type shall be as recommended by local soil service and standard practice.

C. Agricultural limestone shall be a pulverized dolamitic limestone having a calcium carbonate content of not less than eighty-five percent (85%) by weight. Agricultural limestone shall be crushed so that at least eighty-five percent (85%) of the material will pass a No. 10 mesh screen and fifty percent (50%) will pass a No. 40 mesh screen.

2.05 Sod

Sod shall consist of strongly rooted pads, capable of supporting its own weight and retaining size and shape when suspended vertically from a firm grasp on upper ten percent (10%) of the pad.

A. Grass Height: Normal.

B. Strip Size: Supplier’s standard.

C. Soil Thickness: Uniform; One inch plus (+1”) or minus one-fourth inch (1/4”) at time of cutting.

D. Age: Not less than ten (10) months or more than thirty (30) months.

E. Condition: Healthy, green, moist; free of diseases, nematodes and insects, and of undesirable grassy and broadleaf weeds. Yellow sod, or broken pads, or torn or uneven ends will not be accepted.

2.06 Mulch Material

A. All mulch materials shall be air dried and reasonably free of noxious weeds and weed seeds or other materials detrimental to plant growth.

B. Mulch shall be composed of wood cellulose fiber, straw or stalks, as specified herein. Mulch shall be suitable for spreading with standard mulch blowing equipment.

C. Straw mulch shall be partially decomposed stalks of wheat, rye, oats, or other approved grain crops. It shall be free from (i) seed of noxious weeds or (ii) clean salt hay.

D. Stalks shall be the partially decomposed, shredded residue of corn, cane, sorghum, or other approved standing field crops.

2.07 Mulch Binder

A. Mulch on slopes exceeding three-to-one (3:1) ratio shall be held in place by the use of an approved mulch binder. The mulch binder shall be non-toxic to plant life and shall be acceptable to the ENGINEER.

B. Emulsified asphalt binder shall be Grade SS-1, ASTM D 977. Cutback asphalt binder shall be Grade RC 70 or RC 250.

2.08 Hydroseeding Mulch

Wood Cellulose Fiber Mulch:

A. Specially processed wood fiber containing no growth or germination inhibiting factors.

B. Dyed a suitable color to facilitate inspection of material placement.

C. Manufactured such that after addition and agitation in slurry tanks with water, the material fibers will become uniformly suspended to form homogenous slurry.

D. When hydraulically sprayed on ground, material will allow absorption and percolation of moisture.

2.09 Netting

A. Jute: Heavy-duty, twisted, weighing one pound per square yard (1 lb/yd^2)

1. Openings Between Strands: Approximately one square inch (1 in^2).

B. Plastic:

1. Extruded Polypropylene: twenty (20) mils.

2. Opening Between Strands: One inch by two inches (1” x 2”).

C. Matting: Excelsior mat or straw blanket; staples as recommended by matting manufacturer

2.10 Tackifier

Derived from natural organic plant sources containing no growth or germination-inhibiting materials.

A. Capable of hydrating in water, and to readily blend with other slurry materials.

B. Wood Cellulose Fiber: Add as tracer, at rate of one-hundred pounds per acre (150 lbs/ac).

2.11 Inoculants for Legumes

All leguminous seed shall be inoculated prior to seeding with a standard culture of nitrogen-fixing bacteria that is adapted to the particular seed involved.

2.12 Water

Water shall be clean, clear water, free from any objectionable or harmful chemical qualities or organisms, and shall be furnished by the CONTRACTOR.

Part 3 Execution

3.01 Sodding

A. Do not plant dormant sod, or when ground is frozen.

B. Lay sod to form solid mass with tightly fitted joints, butt ends and sides. Do not overlap.

1. Stagger strips to offset joints in adjacent courses.

2. Work from boards to avoid damage to subgrade or sod.

3. Tamp or roll lightly to ensure contact with subgrade; work sifted soil into minor cracks between pieces of sod, remove excess to avoid smothering adjacent grass.

4. Complete sod surface true to finished grade, even, and firm.

C. Fasten sod on slopes to prevent slippage with wooden pins six inches (6”) long driven through sod into subgrade, until flush with top of sod. Install at sufficiently close intervals to securely hold sod.

D. Water sod with fine spray immediately after planting. During first week, water daily or more frequently to maintain moist soil to depth of four inches (4”).

3.02 Stripping Topsoil

A. Strip any available topsoil to its full depth at all areas to be regarded, resurfaced, or paved within contract limit work area.

B. Stockpile topsoil in a location acceptable to the OWNER, for use in finish grading.

1. Stockpiled topsoil shall be free from trash, brush, stones over three inches (3") diameter, and other extraneous matter.

2. Grade and slope stockpiles for proper drainage and to prevent erosion.

3. **No topsoil shall be removed from the site**. It is the property of the OWNER.

C. Protect all areas which are not to be resurfaced or regraded, and adjacent areas outside of the contract limits from damage due to site preparation.

D. Unless otherwise specified, topsoil, and other unsuitable materials at the site and at a minimum distance of five feet (5’) beyond the surfaced area, shall be removed in such a manner to minimize disturbance of the remaining subgrade soils, and to

facilitate placement of embankment materials and/or base course materials.

3.03 Securing and Placing Topsoil

A. Topsoil shall be secured from areas from which topsoil has not been previously removed, either by erosion or mechanical methods. Topsoil shall not be removed to a depth in excess of the depth approved by the ENGINEER.

B. The area or areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage and other characteristics as to offer assurance that, when removed the product will be homogeneous in nature and will conform to the requirements of these Specifications. On-site sources of topsoil shall be approved by the ENGINEER prior to disturbance. In securing topsoil from a designated pit, or elsewhere, should strata or seams of material occur which do not come under the requirements for topsoil, such material shall be removed from the topsoil or if required by the ENGINEER, the pit shall be abandoned.

C. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of subgrades.

D. Remove stones, roots, weeds, and debris while spreading topsoil materials. Rake surface clean of stones one inch (1”) or larger in any dimension and all debris.

E. All areas from which topsoil is to be secured, shall be cleaned of all sticks, boards, stones, cement, ashes, cinders, slag, concrete, bitumen or its residue, and any other refuse which will hinder or prevent growth.

F. In securing topsoil from a designated pit, or elsewhere, should strata or seams of material occur which do not come under the requirements for topsoil, such material shall be removed from the topsoil or if required by the ENGINEER, the pit shall be abandoned.

G. Before placing or depositing topsoil upon any areas, all improvement within the area shall be completed, unless otherwise approved by the ENGINEER.

H. The areas in which topsoil is to be placed or incorporated shall be prepared before securing topsoil for use.

3.04 Seedbed Preparation

A. Before fertilizing and seeding, the topsoil surfaces shall be trimmed and worked to true line from unsightly variation, bumps, ridges and depressions and all detrimental material, roots and stones larger than three inches (3”) in any dimension shall be removed from the soil.

B. Not earlier than twenty-four (24) hours before the seed is to be sown, the soil surface to be seeded shall be thoroughly cultivated to a depth of not less than four inches (4”) with a weighted disc, tiller, pulvimixer, or other equipment, until the surface is smooth and in a condition acceptable to the ENGINEER.

C. If the prepared surface becomes eroded as a result of rain or for any other reason, or becomes crusted before the seed is sown, the surface shall again be placed in a condition suitable for seeding.

D. Ground preparation operations shall be performed only when the ground is in a tillable and workable condition, as determined by the ENGINEER.

3.05 Fertilization and Liming

A. Following seedbed preparation, fertilizer shall be applied to all areas to be seeded so as to achieve the application rates as described herein and/or shown on the Drawings.

B. Fertilizer shall be spread evenly over the seedbed and shall be lightly harrowed, raked, or otherwise incorporated into the soil for a depth of one inch (1”).

C. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment. The seed shall not remain in water containing fertilizer for more than thirty (30) minutes when a hydraulic seeder is used.

D. Agricultural limestone shall be thoroughly mixed into the soil according to the rates shown in the Seeding Schedule as described herein and/or shown on the Drawings. The specified rate of application of limestone may be reduced by the ENGINEER if pH tests indicate this to be desirable. It is the responsibility of the CONTRACTOR to obtain such tests and submit the results to the ENGINEER for adjustment in rates.

E. It is the responsibility of the CONTRACTOR to make one application of a maintenance fertilizer according to the recommendations listed in the Seeding Schedule shown in these Specifications.

3.06 Seeding

A. Seed of the specified group shall be sown as soon as preparation of the seedbed has been completed. No seed shall be sown during high winds, nor until the surface is suitable for working and is in a proper condition. Seeding shall be performed during the dates as described herein and/or shown on the Drawings unless otherwise approved by the ENGINEER. Seed mixtures may be sown together, provided they are kept in a thoroughly mixed condition during the seeding operation.

B. Seed shall be uniformly sown by any approved mechanical method suitable for the slope and size of the areas to be seeded, preferably with a broadcast type seeder, windmill hand seeder, or approved mechanical power drawn seed drills. Hydro-seeding and hydro-mulching may be used on steep embankments, provided full coverage is obtained.

C. Care shall be taken to adjust the seeder for seedings at the proper rate before seeding operations are started and to maintain their adjustment during seeding. Seed in hoppers shall be agitated to prevent segregation of the various seeds in a seeding mixture.

D. Immediately after sowing, the seeds shall be covered and compacted to a depth of one-eighth inch (1/8”) to three-eighth inch (3/8”) by a cultipacker or suitable roller.

E. Leguminous seeds shall be inoculated prior to seeding with an approved and compatible nitrogen-fixing inoculant in accordance with the manufacturer's mixing instructions.

F. Schedule: (See end of Section)

3.07 Mulching

A. All seeded areas shall be uniformly mulched in a continuous blanket immediately after seeding. The mulch shall be applied evenly so as to permit sunlight to penetrate and the air to circulate and at the same time shade the ground, reduce erosion and conserve soil moisture. Approximately forty-five percent (45%) of the ground shall be visible through the mulch blanket.

B. One of the following mulches shall be spread evenly over the seeded areas at the following application rates:

1. Wood Cellulose Fiber: One-thousand pounds/acre (1,000 lbs/ac)

2. Straw: Four-thousand pounds/acre (4,000 lbs/ac)

3. Stalks: Four-thousand pounds/acre (4,000 lbs/ac)

4. These rates may be adjusted at the discretion of the ENGINEER at no additional cost to the OWNER, depending on the texture and condition of the mulch material and the characteristics of the seeded area.

C. Mulch on slopes greater than three-to-one (3:1) ratio shall be held in place by the use of an approved mulch binder. Binder shall be thoroughly mixed and applied with the mulch. Emulsified asphalt or cutback asphalt shall be applied at the approximate rate of five gallons per one-thousand square feet (5 gal/1,000 ft^2) as required to hold the mulch in place.

D. The CONTRACTOR shall cover structures, poles, fences, and appurtenances if the mulch binder is applied in such a way that it would come in contact with or discolor the structures.

E. Mulch and binder shall be applied by suitable blowing equipment at closely controlled application rates in a manner acceptable to the ENGINEER.

3.08 Watering

A. The CONTRACTOR shall be responsible for maintaining the proper moisture content of the soil to insure adequate plant growth until a satisfactory stand is obtained. If necessary, watering shall be performed to maintain adequate water content in the soil.

B. Watering shall be accomplished by hoses, tank truck, or sprinklers in such a way to prevent erosion, excessive runoff, and over-watered spots.

3.09 Maintenance

A. Upon completion of seeding operations, the CONTRACTOR shall clear the area of all equipment, debris, and excess material and the premises shall be left in a neat and orderly condition.

B. The CONTRACTOR shall maintain all seeded areas without additional payment until

final acceptance of the work by the OWNER, and any regrading, refertilizing, reliming, reseeding, or remulching shall be done at CONTRACTOR's own expense. Seeding work shall be repeated on defective areas until a satisfactory uniform stand is accomplished. Damage resulting from erosion, gulleys, washouts, or other causes shall be repaired by filling with topsoil, compacting and repeating the seeding work at CONTRACTOR's expense.

END OF SECTION

Part 1 General

1.01 Scope

A. The work covered by this Section includes furnishing all labor, materials, and equipment required to bore and jack casings and to properly complete pipeline construction as described herein and/or shown on the Drawings.

B. Related Work:

1. Section 013000 – Administrative Requirements

2. Section 015713 – Temporary Erosion and Sediment Control

3. Section 312300 – Excavation and Fill

C. Supply all materials and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable. If requested by the ENGINEER, submit evidence that manufacturer has consistently produced products of satisfactory quality and performance over a period of at least two (2) years.

1.02 Submittals

A. Submit product data and experience in accordance with the requirements of Section 013000 – Administrative Requirements of these Specifications.

B. Material Submittals: The CONTRACTOR shall provide shop drawings and other pertinent specifications and product data as follows:

1. Shop drawings for casing pipe showing sizes and connection details.

2. Design mixes for concrete and grout.

3. Casing Spacers.

C. Experience Submittals

1. Boring and jacking casings is deemed to be specialty CONTRACTOR work. If the CONTRACTOR elects to perform the work, the CONTRACTOR shall provide evidence as required by the General Conditions. A minimum of five (5) continuous years of experience in steel casing construction is required of the casing installer. Evidence of this experience must be provided with the shop drawings for review by the ENGINEER.

1.03 Storage and Protection

All materials shall be stored and protected in accordance with the manufacturer's recommendations and as approved by the ENGINEER.

Part 2 Products

2.01 Materials and Construction

A. Casing

1. The casing shall be new and unused pipe. The casing shall be made from steel plate having a minimum yield strength of thirty-five-thousand pounds-per-square-inch (35,000 psi). All casing pipe used must meet the approval of the permitting authority. The steel plate shall also meet the chemical requirements of one (1) of the following: ASTM A36; ASTM A139, Grade B, C, D or E; ASTM A53, Type S or Type E, Grade A or B.

2. The minimum material requirements for casing pipe used in highway and railroad crossings shall be steel conforming to ASTM A139, Grade B.

3. The thicknesses of casing shown in paragraph B. below are minimum thicknesses for Cooper E72 railroad loadings. Actual thicknesses shall be determined by the casing installer, based on an evaluation of the required forces to be exerted on the casing when jacking and on requirements of the authority having jurisdiction. Any buckling of the casing due to jacking forces shall be repaired at no additional cost to the OWNER.

4. The diameters of casing shown in paragraph B. below and shown on the Drawings are minimum. Larger casings, with the ENGINEER's approval, may be provided by CONTRACTOR at no additional cost to the OWNER, based on casing size availability, line and grade tolerances, soil conditions, etc. as determined by the CONTRACTOR.

B. Casing Sizes

UNDER HIGHWAYS & RAILROADS		
Carrier Pipe Diameter *(in)*	Casing Diameter *(in)*	Wall Thickness *(in)*
2	4	0.188
4	8	0.188
6	12	0.250
8	16	0.281
10	20	0.344
12	24	0.375
18	30	0.469
24	36	0.688
30	60	0.844
36	72	1.000

Wall thickness to be used at all roadway and railroad crossing by jack and bore methods are based on uncoated and non-catholically protected nominal steel pipe with wall thicknesses as established by CSX and Norfolk Southern Corporation for railroad installations having a minimum of 5.5 feet of pipe cover for the steel casing. Design calculations shall be provided to Engineer for any installations of less than 5.5 feet which meet H-20 live loads for roadways and Cooper E-80 for railways.

C. Casing Spacers: Casing spacers shall meet one of the following requirements:

1. Casing spacers shall be flanged, bolt-on style with a two (2) section stainless steel shell lined with a polyvinyl chloride (PVC) liner, minimum 0.09-inch thick, and also having a hardness of 85-90 durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float within the casing.

2. Casing spacers shall be a two (2) section, flanged, bolt on style constructed of heat fused PVC coated steel, minimum 14 gauge band and 10 gauge risers, with two inch (2”) wide glass reinforced polyester insulating skids,

heavy duty PVC inner liner, minimum 0.09-inch thick having a hardness of 85-90 durometer, and all stainless steel or cadmium plated hardware.

3. Casing spacers shall be equal to Cascade Waterworks Manufacturing Company, Pipeline Seal and Insulator, Inc., or Advance Products and Systems, Inc. No substitutions will be allowed without written approval by the Engineer.

D. Carrier pipes for sanitary sewers shall meet requirements as specified in Section 333000 – Sanitary Sewerage of these Specifications. If the sewer main must bore underneath a roadway, stream, railroad, etc., the nominal casing diameter shall be 2.5 times larger than the diameter of carrier pipe minimum. Otherwise, if the sewer main is installed in an open-cut situation, it is approved for the casing to be 2.0 times larger than the diameter of the carrier pipe minimum. Joints shall be continuously welded. Casing pipe and joints shall be lea-proof and capable of withstanding Cooper E-80 loading. Casing pipe shall be coated as specified herein.

E. Where specified, coating for steel casing pipe shall be a two component, self-priming, and chemically cured coal tar epoxy-polyamide protective coating. Minimum dry film thickness of completed coating shall be sixteen (16) mils. Material shall be Kopcoat 300 M, Tnemec 46H-413 Hi Build Tneme – Tar or equal. Preparation shall be SP6 commercial blast.

F. End seals will be used to seal the carrier and casing pipe ends. Seal material shall be 1/8–inch thick synthetic rubber secured with T-304 stainless steel banding straps. Seals shall be by Advance Products & Systems, Inc., Model AC.

G. Surface Settlement Markers: Surface settlement markers within pavement areas shall be P.K. nails. Surface settlement markers within non-paved areas shall be wooden hubs.

2.02 Equipment

A. A cutting head shall be attached to a continuous auger mounted inside the casing pipe.

Part 3 Execution

3.01 General

A. Interpretation of soil investigation reports and data, investigating the site, and determination of the site soil conditions prior to bidding is the sole responsibility of the CONTRACTOR. Any subsurface investigation by the Bidder or CONTRACTOR must be approved by the appropriate authority having jurisdiction over the site. Rock and/or water, if encountered, shall not entitle the CONTRACTOR to additional compensation.

B. Casing construction shall be performed so as not to interfere with, interrupt, or endanger roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the casing. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The CONTRACTOR shall be responsible for all settlement resulting from casing operations and shall repair and restore damaged property to its original or better condition at no cost to the OWNER.

C. Face Protection: The face of the excavation shall be protected from the collapse of the soil into the casing.

D. Casing Design: Design of the bore pit and required bearing to resist jacking forces are the responsibility of the CONTRACTOR. The excavation method selected shall be compatible with expected ground conditions. The lengths of the casing shown on the Drawings are the minimum lengths required. The length of the casing may be extended for the convenience of the CONTRACTOR, at no additional cost to the OWNER. Due to restrictive right-of-way and construction easements, boring and jacking casing lengths less than the nominal twenty foot (20') length may be necessary.

E. Highway and Road Crossings

1. The CONTRACTOR shall be held responsible and accountable for the coordinating and scheduling of all construction work within highway or road right-of-way with the authority having jurisdiction.

2. Work along or across the highway department rights-of-way shall be subject to inspection by such highway department.

3. All installations shall be performed to leave free flows in drainage ditches, pipes, culverts, or other surface drainage facilities of the highway, street, or its connections.

4. No excavated material or equipment shall be placed on the pavement or shoulders of the roadway without the express approval of the highway or road department.

5. In no instance will the CONTRACTOR be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed, which are placed on the right-of-way in advance of construction, shall be placed in such a manner as not to interfere with the safe operation of the roadway.

3.02 Groundwater Control

A. The CONTRACTOR shall control the groundwater throughout the construction of the casing.

B. Methods of dewatering shall be at the option and responsibility of the CONTRACTOR. Maintain close observation to detect settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, notify the ENGINEER immediately and take such action as necessary to maintain safe conditions and prevent damage.

C. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a twenty-four (24) hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum. Dewater into a sediment trap and comply with requirements specified in Section 015713 – Temporary Erosion and Sediment Control of these Specifications.

3.03 Safety

A. Provide all necessary bracing, bulkheads, and shields to ensure complete safety to all traffic, persons, and property at all times during the work. Perform the work in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it.

B. Observe all applicable requirements of the regulations of the authorities having jurisdiction over this site. Conduct the operations in such a manner that all work will be performed below the level of the roadbed.

C. Perform all activities in accordance with the Occupational Safety and Health Act (OSHA) of 1970 (PL-596), as amended, applicable regulations of the Federal Government, OSHA 29CFR 1926 and applicable criteria of ANSI A10.16-81, “Safety Requirements for Construction of Tunnel Shafts and Caissons”.

3.04 Surface Settlement Monitoring

A. Provide surface settlement markers, placed as specified and as directed by the ENGINEER. The CONTRACTOR shall place settlement markers outside of pavement area, along the centerline of the casing at twenty foot (20’) intervals and offset ten feet (10’) each way from the centerline of the tunnel. Markers shall also be placed at each shoulder of the roadway, at each edge of pavement, at the centerline of the pavement, and at ten feet (10’) and twenty-five feet (25’) in each direction from the centerline of the casing. Tie settlement markers to bench marks and indices sufficiently removed as not to be affected by the casing operations.

B. Make observations of surface settlement markers, placed as required herein, at regular time intervals acceptable to the ENGINEER. In the event settlement or heave on any marker exceeds one inch (1”), the CONTRACTOR shall immediately cease work and using a method approved by the ENGINEER and the authority having jurisdiction over the project site, take immediate action to restore surface elevations to that existing prior to start of casing operations.

C. Take readings and permanently record surface elevations prior to start of dewatering operations and/or shaft excavation. The following schedule shall be used for obtaining and recording elevation readings: all settlement markers, one (1) time per week. All settlement markers within fifty feet (50’) of the casing heading, at the beginning of each day, or more frequently at the ENGINEER's direction if settlement is identified. Make all elevation measurements to the nearest 0.01 foot.

D. The CONTRACTOR shall cooperate fully with jurisdictional personnel. Any settlement shall be corrected by, and at the expense of, the CONTRACTOR.

E. Promptly report any settlement and horizontal movement immediately to the ENGINEER and take immediate remedial action.

3.05 Boring and Jacking

A. Shaft

1. Conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.

2. The shaft shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever nature due to site and soil conditions. Keep preparations dry during all operations. Perform pumping operations as necessary.

3. The bottom of the shaft shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base if directed by the ENGINEER due to soil conditions.

B. Jacking Rails and Frame

1. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.

2. Place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads.

3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

C. Boring and jacking of casing pipes shall be accomplished by the dry auger boring method without jetting, sluicing, or wet boring.

D. Auger the hole and jack the casing through the soil simultaneously.

E. Bored installations shall have a bored-hole diameter essentially the same as the

outside diameter of the casing pipe to be installed.

F. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such as to require the use of a shield.

G. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation.

H. Any casing pipe damaged in jacking operations shall be repaired, if approved by the ENGINEER, or removed and replaced at CONTRACTOR's own expense.

I. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire joint circumference, in accordance with AWS recommended procedures. Prior to welding the joints, the CONTRACTOR shall ensure that both ends of the casing sections being welded are square.

J. The CONTRACTOR shall prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.

K. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the CONTRACTOR.

L. Care shall be taken to ensure that casing pipe installed by boring and jacking method will be at the proper alignment and grade.

M. The CONTRACTOR shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.

N. Adequate sheeting, shoring and bracing for embankments, operating pits, and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring, and bracing shall be left in place, cut off, or removed, as designated by the ENGINEER.

O. Trench excavation, all classes and type of excavation, the removal of rock, muck, debris, the excavation of all working pits and backfill requirements of Section 312300 – Excavation and Fill are included under this Section.

P. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.

Q. Grout backfill shall be used for unused holes or abandoned pipes.

3.06 Installation of Casing by Open Cut

A. After construction of the casing is complete, and has been accepted by the Engineer, install the pipeline in accordance with the Drawings and Specifications. Trench shall be excavated in accordance with Section 312300 – Excavation and Fill of these Specifications.

B. Check the alignment and grade of the casing and prepare a plan to set the pipe at proper alignment, grade and elevation, without any sags or high spots. Backfill shall not occur until proper alignment is obtained. Leveling of the casing pipe shall be accomplished by using bedding and haunching materials as outlined in Section 312300 – Excavation and Fill of these Specifications.

C. The pipe shall be supported within the casing by use of casing spacers sized to limit radial movement to a maximum of one inch (1”). Provide a minimum of two (2) casing spacers per nominal length of pipe. Casing spacers shall be attached to the pipe at maximum nine to ten foot (9’ to 10’) intervals.

3.07 Ventilation and Air Quality

Provide, operate, and maintain for the duration of casing project a ventilation system to meet safety and Occupational Safety and Health Administration (OSHA) requirements.

3.08 Rock Excavation

A. In the event that rock is encountered during the installation of the casing pipe which, in the opinion of the ENGINEER, cannot be removed through the casing, the ENGINEER may authorize the CONTRACTOR to complete the crossing by a method established in a change order given that the approved method meets requirements of the authority having jurisdiction.

B. At the CONTRACTOR's option, the CONTRACTOR may continue to install the casing and remove the rock through the casing at no additional cost to the OWNER.

3.09 Installation of Pipe

A. After construction of the casing is complete, and has been accepted by the ENGINEER, install the pipeline in accordance with the Drawings and Specifications.

B. Check the alignment and grade of the casing and prepare a plan to set the pipe at proper alignment, grade and elevation, without any sags or high spots.

C. The carrier pipe shall be held in and supported within the casing pipe by use of casing spacers sized to limit radial movement to a maximum of one inch (1”). Provide a minimum of one (1) casing spacer per nominal length of pipe. Casing spacers shall be attached to the pipe at maximum nine to ten foot (9’ to 10’) intervals.

D. Close the ends of the casing with end seals.

3.10 Sheeting Removal

Remove sheeting used for shoring from the shaft and off the job site. The removal of sheeting, shoring, and bracing shall be done in such a manner as not to endanger or damage either new or existing structures, or private or public properties, and also to avoid cave-ins or sliding in the banks.

END OF SECTION

Part 1 General

1.01 Scope

A. This Section describes products to be incorporated for installation of a precast reinforced concrete manhole, vault, or chambers to be installed for sanitary sewers or stormwater sewers as applicable to the project.

1. The work covered by this section includes furnishing all labor, equipment, and materials required to furnish, install, and test a precast reinforced concrete manhole, vaults, and chambers and appurtenances, as specified herein and/or shown on the Drawings, and to furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.

B. Related Work:

1. Section 013000 – Administrative Requirements
2. Section 017836 – Warranties
3. Section 033000 – Cast-In-Place Concrete
4. Section 036000 – Grouting
5. Section 312300 – Excavation and Fill

C. General: Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable.

1.02 Qualifications

If requested by the ENGINEER, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two (2) years.

1.03 Submittals

A. Complete shop drawings, product data, and engineering data shall be submitted to the ENGINEER in accordance with the requirements of *Section 013000 – Administrative Requirements* of these Specifications.

B. Shop drawings shall indicate piping layout in plan and elevations as may be required and shall be completely dimensioned for each manhole to be installed. The Drawings shall include a complete schedule of all pipe, fittings, specials, hangers, and supports. Special castings shall be clearly detailed showing all pertinent dimensions.

C. The CONTRACTOR shall furnish the ENGINEER with lists, in duplicate, of all pieces of pipe and fittings in each shipment received. These lists shall give the serial or mark number, weight, class, size, and description of each item received.

1.04 Transportation and Handling

A. Unloading: Furnish equipment and facilities for unloading, handling, distributing, and storing precast manhole structures, fittings, valves, and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification.

1. Handling: Handle all manhole structures and appurtenances carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front loader. Do not use material damaged in handling.

1.05 Storage and Protection

A. Store all pipe which cannot be distributed along the route.

1. Plan for the use of suitable storage areas. The CONTRACTOR shall be responsible for maintenance and protection of all equipment, materials, and products placed in storage and shall bear all costs of storage, preparation for transportation, rehandling, and preparation for installation.

2. The CONTRACTOR shall be responsible for providing satisfactory storage facilities which are acceptable to the ENGINEER. In the event that satisfactory facilities cannot be provided on site, a satisfactory warehouse, acceptable to the ENGINEER, will be provided by the CONTRACTOR for such time until the equipment, materials, and products can be

accommodated at the site.

B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times.

C. Store joint gaskets in a cool location, out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first in, first out basis.

1.06 Quality Assurance

A. Prior to delivery all basic materials specified herein shall be tested and inspected by an approved independent commercial testing laboratory or, if approved by the ENGINEER, certified copies of test reports prepared by the manufacturer's testing laboratory will be acceptable. All materials which fail to conform to these specifications shall be rejected.

B. Product manufacturers shall provide the ENGINEER with written certification that all products furnished comply with all applicable provisions of these Specifications. All materials which fail to conform to these Specifications shall be rejected. Certified copies of independent laboratory test results or mill test results from the pipe supplier may be considered evidence of compliance provided such tests are performed in accordance with the appropriate ASTM or AWWA testing standards by experienced, competent personnel. In case of doubt as to the accuracy or adequacy of mill tests, the ENGINEER may require that the CONTRACTOR furnish test reports from an independent testing laboratory on samples of pipe materials.

C. If ordered by the ENGINEER, each pipe manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe. This service will be furnished for a minimum of five (5) days during initial pipe installation.

D. After delivery to the site, any materials which have been damaged in transit or are unsuitable for use on the work shall be rejected and removed from site.

E. The supplier must provide and deliver pipe manufactured by one (1) company per project/job only. Mixing of different pipe manufacturers is not acceptable.

1.07 Guarantee

Provide a guarantee against defective materials and workmanship in accordance with the requirements of Section 017836 – Warranties of these Specifications.

Part 2 Products

2.01 Precast Concrete Manholes, Wet Wells, and Valve Vaults

A. Precast concrete manholes, wet wells, and valve vaults shall consist of precast reinforced concrete sections, a conical or flat slab top section, and a base section conforming with the typical manhole details as shown on the Drawings.

B. Precast manhole, wet well, and valve vault sections shall be manufactured, tested, and marked in accordance with the latest provision of ASTM C 478.

C. The cement shall meet requirements of ASTM C150 with minimum 7-day compressive strength of the concrete for all sections shall be four-thousand pounds-per-square-inch (4,000 psi).

D. The circumferential reinforcement for the manhole sections shall consist of welded wire fabric per ASTM C478.

E. The maximum allowable absorption of the concrete shall not exceed eight percent (8%) of the dry weight.

F. Transition slabs which convert bases larger than four feet (4’) in diameter to four foot (4’) diameter risers shall be designed by the manhole manufacturer to carry the live and dead loads exerted on the slab.

G. Joints of the manhole sections shall be tongue-and-groove. Sections shall be joined using Butyl Rubber Sealant. The sealant shall be applied in accordance with the manufacturer’s requirements and meet performance requirements as set forth in ASTM C-990.

H. All Joints shall also receive a Polyolefin Backed Exterior Joint Wrap prior to backfill installed in accordance with manufacturer’s requirements.

I. The ends of each reinforced concrete manhole or wet well riser section, and the bottom end of the manhole top section, shall be so formed that when the manhole risers and the top are assembled, they will make a continuous and uniform

manhole wet well.

J. Joints of the manhole, wet well, and valve vault sections shall be tongue-and-groove. Sections shall be joined using either an O-ring gasket or a mastic sealant consisting of bitumen and inert mineral fibers. The sealant shall be applied in accordance with the manhole manufacturer's requirements. A sufficient amount of sealant should be used to fill the annular joint space with some squeeze out.

K. Gaskets will be used between concrete grade ring and casting.

1. Pre-formed plastic gasket shall meet or exceed all requirements of Federal Specification SS-S-00210, *"Sealing Compound, Preformed Plastic for Pipe Joints"*, Type I, Rope Form. The sealing compound shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes, or obnoxious odors.

2. The compound shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength. It shall be supplied in extruded rope form of suitable cross section and in such sizes as to seal the joint space between sections. The sealing compound shall be protected by a suitable removable 2 piece wrapper, which shall be designed so that half may be removed longitudinally without disturbing the other half in order to facilitate application of the sealing compound. It shall have a minimum width or diameter of 2 inches. The flexible plastic gasket shall also meet the requirements of the following tables:

Composition	**Test Method**	**Minimum**	**Maximum**
Bitumen (Petroleum Plastic Content)	ASTM D4	50	70
Ash Inert Mineral Matter	AASHO T111	30	50
Volatile Matter	ASTM D6	–	2.0

Property	**Test Method**	**Minimum**	**Maximum**
Specific Gravity at 77° F	ASTM D71	1.2	1.3
Ductility at 77° F (cm)	ASTM D113	5	–
Softening Point	ASTM D36	320° F	–
Penetration 77° F (150gms) 5 sec.	ASTM D217	50	120

L. Each section of the precast shall have not more than two (2) holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with

rubber stoppers, non-shrinkable grout, or mortar after installation.

2.02 Manhole Frames, Covers, and Steps

A. Cast iron manhole steps, toe pockets, frames, and covers shall be cast iron conforming to the minimum requirements of Federal Specifications W-1-652 or to ASTM A 48. “Gray Iron Castings,” for Class 35B. All castings shall be made accurately to the required dimensions, fully interchangeable, sound, smooth, clean, and free from blisters and/or other defects.

B. All manhole frames and covers shall be the OWNER's Standard as manufactured by Vulcan Mfg. Co., Inc.; JWB Mfg., LLC.; or East Jordan Group, Inc. or an owner approved equal. Defective castings which have been plugged or otherwise treated shall not be used. All castings shall be thoroughly cleaned and painted or coated with a bituminous paint.

C. All manhole covers shall be marked as “Sewer”, “Storm”, or “Water” for the intended use of the manhole. “Sewer” shall indicate a sanitary sewer manhole.

D. All manhole frames and covers shall be of the size and weight shown on the Drawings. All regular manhole frames and covers shall be the OWNER's Standard as shown on the drawings.

E. The contact surfaces of all manhole covers and the corresponding supporting rings in the frames shall be machined to provide full perimeter contact.

F. An adjusting ring equal to R1979 as manufactured by Neenah Foundry Company of Neenah, Wisconsin, shall be provided for each manhole in a street. Adjusting rings shall provide a minimum inside clear opening of twenty-four inches (24”) and shall be made to be capable of being bolted to the manhole frame.

G. If used, reinforced plastic manhole steps shall conform to the minimum requirements of ASTM 2146-68 under Type II, Grade 16906 and ASTM C-478, Paragraph 11. The reinforcing bar shall be a Grade 60, deformed one-half inch (1/2”) reinforcing bar conforming to all the requirements of ASTM A-615.

2.03 Pipe Connections at Manholes

New pipes of all diameters shall be connected to manholes in a precast hole of the proper diameter using an integrally cast A-lok® flexible pipe to manhole connector, or Approved Equal meeting ASTM C-923, ASTM C-1478, ASTM C-1644 and ASTM F-2510 and shall

be factory installed.

Existing pipes of all diameters encountered in the field during construction to be connected to new precast manhole Kor-N-Seal® rubber boot, or Approved Equal flexible connector meeting ASTM C923, and shall be installed as recommended by the manufacturer. Connections using mortar or other rigid materials will not be acceptable. Connections to manholes shall be cored. The outer diameter of the core shall not encroach within 8 inches of a manhole joint, unless specifically approved by the Engineer. "Hammer taps" will not be acceptable. Corrugated Pipe connector by same manufacturer will be required when connecting corrugated pipe to manhole for storm water applications.

Part 3 Execution

3.01 Existing Utilities and Obstructions

A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the OWNER. This information is not to be relied upon as being exact or complete. The CONTRACTOR shall call the Tennessee One Call System, Inc. (1-800-351-1111) or “811” as required by the Tennessee Law "Underground Utility Damage Prevention Act" (Code Section 65 31 106). Additionally, the CONTRACTOR shall call the utility companies to request a field location of their utilities.

B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.

1. Provide the required notice to the utility OWNERS and allow them to locate their facilities according to Tennessee law. Field utility locations are valid for only ten (10) days after original notice. The CONTRACTOR shall ensure, at the time of any excavation, that a valid utility location exists at the point of excavation.

2. Expose the facility to verify its true location and grade for at specific locations that are a distance of at least two-hundred feet (200’) in advance of the current pipeline construction to verify its true location and grade. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.

3. Avoid utility damage and interruption by protecting it with means or methods recommended by the utility OWNER.

C. Conflict with Existing Utilities

1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed sewer does not permit safe installation of the sewer by the use of sheeting, shoring, tying back, supporting, or temporarily suspending service of the parallel or crossing facility. The CONTRACTOR may change the proposed alignment of the sewer to avoid horizontal conflicts if the new alignment remains within the available right of way or easement and complies with regulatory agency requirements after a written request to and subsequent approval by the ENGINEER.

2. If, in the opinion of the ENGINEER, the sewer's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the OWNER will direct the CONTRACTOR to relocate the utility as part of this Contract, with the costs of such relocation being paid for as part of a change order.

3. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed sewer does not permit the crossing without immediate or potential future damage to the utility, main, service, or the sewer. The CONTRACTOR may change the proposed grade of the sewer to avoid vertical conflicts if the changed grade provides minimum required capacity, maintains adequate cover, and complies with regulatory agencies requirements, after written request to and subsequent approval by the ENGINEER.

4. If, in the opinion of the ENGINEER, the sewer's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, the OWNER will direct the CONTRACTOR to relocate the utility as part of this Contract, with the costs of such relocation being paid for as part of a change order.

D. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.

E. Water and Sanitary Sewer Separation

1. Contributing sanitary sewer mains should maintain a minimum ten-foot (10’) edge to edge separation from water mains. Where the sanitary sewer crosses a water main, an eighteen inch (18”) vertical separation shall be

maintained where possible, where the elevation of the top (crown) of the sanitary sewer is at least eighteen inches (18”) below the bottom (invert) of the water main. Where possible, a full joint (length) of sanitary sewer pipe shall be centered under the water main so that both joints will be as far from the water main as possible.

2. When the elevation of the sanitary sewer main cannot be varied to meet the above requirement, the water main shall be relocated to provide this separation or reconstructed with mechanical-joint pipe with joint restraint glands for a distance of ten feet (10’) on each side of the sanitary sewer.

3. When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the sanitary sewer shall be designed and constructed equal to the water main pipe and shall be pressure-tested to assure water-tightness. Where the sanitary sewer crosses over a water main, the water main shall be encased in concrete to the first joint in each direction.

4. Any deviation shall be requested in writing to the ENGINEER.

5. No water main shall be permitted to pass through or come in contact with any part of a manhole.

3.02 Construction Along Highways, Streets, and Roadways

A. Install manholes and appurtenances along highways, streets, and roadways in accordance with the applicable regulations of, and permits issued by, the state Department of Transportation (DOT), the county, and the city with reference to construction operations, safety, traffic control, road maintenance, and repair.

B. Traffic Control

1. The CONTRACTOR shall provide, erect, and maintain all necessary barricades; suitable and sufficient lights, and other traffic control devices; provide qualified flagmen where necessary to direct traffic; take all necessary precautions for the protection of the work and the safety of the public.

2. Construction traffic control devices and their installation shall be in accordance with the current *Manual on Uniform Traffic Control Devices* (MUTCD) for streets and highways.

3. Placement and removal of construction traffic control devices shall be coordinated with the state Department of Transportation (DOT), the county, and the city a minimum of forty-eight (48) hours in advance of the activity.

4. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right of way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used intermittently, such as "Flagmen Ahead", shall be removed and replaced when needed.

5. Existing traffic control devices within the construction work zone shall be protected from damage. Traffic control devices requiring temporary relocation shall be located as near as possible to their original vertical and horizontal locations. Original locations shall be measured from reference points and recorded in a log prior to relocation. Temporary locations shall provide the same visibility to affected traffic as the original location. Relocated traffic control devices shall be reinstalled in their original locations as soon as practical following construction.

6. Construction traffic control devices shall be maintained in good repair, and shall be clean and visible to affected traffic for daytime and nighttime operation. Traffic control devices affected by the construction work zone shall be inspected daily.

7. Construction warning signs shall be black legend on an orange background. Regulatory signs shall be black legend on a white background. Construction sign panels shall meet the minimum reflective requirements of the state Department of Transportation, the county, and the city. Sign panels shall be of durable materials capable of maintaining their color, reflective character, and legibility during the period of construction.

8. Channelization devices shall be positioned preceding an obstruction at a taper length as required by the current *Manual on Uniform Traffic Control Devices* (MUTCD) for streets and highways, as appropriate for the speed limit at that location. Channelization devices shall be patrolled to insure that they are maintained in the proper position throughout their period of use.

C. Construction Operations

1. Perform all work along highways, streets, and roadways to minimize interference with traffic.

2. Stripping: Where the pipe line is laid along road right of way, strip and stockpile all sod, topsoil, and other material suitable for right of way restoration.

3. Pavement Cuts, Trenching, Laying, and Backfilling: Do not open the trench any further than is necessary. Backfill and remove excess material immediately after installation of the structure. Complete excavation and backfill for any portion of the trench in the same day.

4. Shaping: Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. Replace topsoil, sod, and any other materials removed from shoulders.

D. Excavated Materials: Do not place excavated material along highways, streets, and roadways in a manner which obstructs traffic. Sweep all scattered excavated material off the pavement in a timely manner.

E. Drainage Structures: Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

F. Landscaping Features: Landscaping features shall include, but are not necessarily limited to: fences, property corners, cultivated trees and shrubbery, manmade improvements, subdivision and other signs within the right of way and easement. The CONTRACTOR shall take extreme care in moving landscape features and promptly reestablishing these features.

G. Maintaining Highways, Streets, Roadways, and Driveways

1. Maintain streets, highways, roadways, and driveways in suitable condition for movement of traffic until completion and final acceptance of the work.

2. During the time period between pavement removal and completing permanent pavement replacement, maintain highways, streets, and roadways by the use of steel running plates. The edges of running plates shall have asphalt placed around their periphery to minimize vehicular impact. The backfill above the pipe shall be compacted, as specified

elsewhere up to the existing pavement surface to provide support for the steel running plates.

3. Furnish a road grader or front end loader for maintaining highways, streets, and roadways. Make the grader or front end loader available at all times.

4. Immediately repair all driveways that are cut or damaged. Maintain them in a suitable condition for use until completion and final acceptance of the work.

3.03 Location and Grade

A. The Drawings show the alignment and grade of the sewer and the position of manholes and other appurtenances. The slope shown on the profile and/or called for in the Specifications is the slope of the invert of the pipe.

B. From the information on the Drawings and the survey points found on the Project site, the CONTRACTOR shall perform all surveys necessary for the establishment of the horizontal and vertical alignment of the manhole.

C. Reference Points

1. The CONTRACTOR shall take all precautions necessary, which includes, but is not necessarily limited to, installing reference points, in order to protect and preserve the centerline or baseline established by the ENGINEER.

2. Reference points shall be placed at or no more than three feet (3’) from the outside of the construction easement or right-of-way. The location of the reference points shall be recorded in a log with a copy provided to the ENGINEER for use prior to his verifying reference point locations. Distances between reference points and the manhole centerlines shall be accurately measured to the nearest 0.01 foot.

3. The CONTRACTOR shall give the ENGINEER reasonable notice that reference points are set. The reference point locations must be verified by the ENGINEER prior to commencing clearing and grubbing operations.

D. After the ENGINEER locates and marks the manhole centerlines or baselines of the sewer, the CONTRACTOR shall perform clearing and grubbing.

E. Cut Sheets

1. Cut sheets shall be utilized for basis of payment and confirming that the profile is as shown on the Drawings.

2. Prior to beginning installation of any section of the gravity sanitary or stormwater sewer, prepare cut sheets from field run ground elevations and submit them to the ENGINEER for approval.

3. The survey from which cut sheets are prepared may be performed prior to or after clearing and grubbing operations. The surveyor shall obtain an elevation on each bench mark shown on the Drawings and provide this information to the ENGINEER.

4. No installation of the sewer shall commence prior to approval of the cut sheets.

5. Submittal of cut sheets shall be in accordance with *Section 013300 – Administrative Requirements* of these Specifications.

6. Cut sheets shall provide the station (to the nearest one foot [1']) and the elevation (to the nearest 0.1 foot) at maximum one-hundred foot (100') intervals, plus at each change in slope of the ground and at each manhole centerline. The cut sheet shall also show the invert elevation of the sewer at the corresponding sewer station. From a straight line interpolation of the data, the CONTRACTOR shall calculate and record the station of each point where there is a change in the cut brackets indicated on the Bid Form. The CONTRACTOR shall calculate and record the length of the sewer between each change in cut bracket. The CONTRACTOR shall also indicate the pipe material and class as well as the type of bedding. The slope of the sewer shall also be indicated between manholes. At least one offset hub or temporary benchmark shall be provided at each manhole. Its elevation and the resulting cut from the hub to the manhole invert shall also be shown on the cut sheets.

F Construction shall begin at the low end of the sewer and proceed upstream without interruption. Multiple construction sites shall not be permitted without written authorization from the ENGINEER for each site. As a minimum, cut sheets between construction sites shall be submitted and approved before multiple construction sites will be permitted.

G. The CONTRACTOR shall be responsible for any damage done to reference points,

base lines, center lines and temporary bench marks, and shall be responsible for the cost of reestablishment of reference points, base lines, center lines, and temporary bench marks as a result of the operations.

H. Construction Verification Survey allowance: The Construction Verification Survey cash allowance is solely for the use of the Engineer for verification of the Contractor's reference points, centerlines and work performed and is not to be used by the Contractor to provide cut sheets. The presence of this cash allowance in no way relieves the Contractor of the responsibility of installing reference points, centerlines, temporary bench marks, providing as-built drawings, or verifying that the work has been performed accurately.

3.04 Sanitary Sewer Bypass Pumping

A. The CONTRACTOR shall provide for continuous transmission of all flows in the sanitary sewer system by performing temporary bypass pumping.

B. The CONTRACTOR shall provide a Bypass Pumping Plan.

C. All flow shall be pumped around segments during the construction and testing of the new sanitary sewer, rehabilitated sewer sections, sewer connections/ reconnections, and rehabilitation of manholes.

D. The bypassed sewage flow shall be discharged into a manhole on the downstream side of the construction area, thus bypassing the sewer segment(s) under construction.

E. The CONTRACTOR’s requirements for providing temporary bypass pumping shall include, as a minimum:

1. Notification to homeowners via door hangers of service outage twenty-four (24) hours prior to beginning work. A sample of the proposed door hanger shall be submitted to the ENGINEER and OWNER for review and approval. After completion of the work, the CONTRACTOR shall notify customers that service has been restored.

2. Sizing and installing the piping, pumps, valves, and control system.

3. Providing and installing temporary suction and discharge piping and fittings.

4. Temporary pump systems shall be capable of conveying the flows within the pipeline plus additional peak flows that may occur. The CONTRACTOR shall ensure that an adequately sized back-up bypass pump be available in the case of lead pump failure.

5. Providing power and/or fuel required to operate the system, including facilities to prevent spills. No power will be available from the OWNER.

6. Personnel or automatic controls to adjust the flow rate of the pumping system to match the influent flows.

7. Removing all temporary pumping facilities when the work is completed.

F. The release of raw wastewater onto the ground or into a receiving stream is prohibited. The CONTRACTOR is responsible for paying all fines imposed for overflows or spills during construction. Should a condition arise that the CONTRACTOR cannot restore service within twelve (12) hours of service interruption, the CONTRACTOR shall make provisions for pumping all flows at no cost to the OWNER.

G. The CONTRACTOR will be responsible for acquiring any necessary environmental, Federal, State, Local, Department of Transportation (TDOT), and any other permits necessary for bypass pumping. The CONTRACTOR shall provide the local traffic engineering department a detailed schedule and plan regarding any temporary street and/or road closures a minimum of thirty (30) days prior to any construction activities.

H. Bypass pumps shall be located in areas that do not disturb nearby homeowners or businesses. The CONTRACTOR is responsible for coordinating with the OWNER and the nearby customers the bypass pump location and operating hours.

I. Bypass pumps shall be sound attenuated with a maximum noise level of seventy-two decibels (72 dBA) at nine meters. Bypass pumps shall be located a minimum of fifty feet (50’) from any residential structure.

J. Open channels or trenches shall not be used to convey flow.

3.05 Manhole and Precast Concrete Product Construction

A. Construct manholes as shown on the Drawings.

B. All manhole bases, including curved manhole bases and inverts, shall be constructed of Class A concrete in accordance with details on the Drawings, and inverts shall be smooth and accurately shaped and have the same cross section as the invert of the sewers which they connect.

1. The manhole base, channels, and benches shall be carefully formed to the required size and grade by gradual and even changes in sections, care being exercised to form the incoming and outgoing sewer pipes into the wall of the manhole at the required elevations. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit.

2. Manhole channel depths and benches shall be formed at a minimum depth of the soffits of the incoming and outgoing pipes to ensure manhole channel can adequately handle sewer pipe at full capacity without over toping the manhole bench. The bench shall grade to drain to channels without ponding on the bench.

3. Handle pre-cast concrete sections carefully to prevent cracking or chipping. Provide uniform bedding of the bottom section to prevent uneven loading. Install gaskets and joint sealants in accordance with manufacturer's recommendations to produce a watertight structure.

4. After the base section has been allowed to set for a period of not less than twenty-four (24) hours, the precast manhole sections shall be placed thereon, care being exercised to form the incoming and outgoing sewer pipes into the wall of the manhole at the required elevations.

5. Manhole sections shall be set so that the manhole steps (if installed) align vertically.

6. Fill all joints, lifting holes, and other imperfections inside and outside with non-shrink mortar, overlapping the seam two inches (2”) on both sides, to form a neat, smooth finish. Manholes shall be completely waterproof

C. Top Elevations: Build manholes outside of paved areas to eighteen inches (18”) above finished grade unless otherwise shown on the Drawings or directed by the ENGINEER. Build manholes in paved areas to existing grades.

D. Manholes shall be constructed such that their walls are plumb.

E. Invert Elevations: The invert elevations shown on the Drawings shall be for the invert at the centerline of the precast concrete manhole. Prior to setting the laser or other vertical alignment control system for the sewer upstream of the manhole, the CONTRACTOR shall verify the elevation of the sewer installed at the manhole. Should the elevation differ from that shown on the Drawings, the CONTRACTOR shall take the following corrective action:

1. If the sewer is laid at negative grade, the CONTRACTOR shall remove and reinstall the sewer at the correct grade at no additional cost to the OWNER.

2. If the sewer is laid at a grade less than that shown on the Drawings, thus reducing the sewer's capacity, the OWNER may require the sewer to be removed and re-laid at the correct grade at no additional cost to the OWNER. As a minimum, the grade to the next upstream manhole shall be adjusted such that the next upstream manhole shall be set at the correct elevation.

3. If the sewer is laid at a grade greater than that shown on the Drawings, and if the CONTRACTOR can show that there are no conflicts with upstream existing utilities or obstructions, the CONTRACTOR shall adjust the grade of the next upstream manhole such that the next upstream manhole shall be set at the correct elevation.

   If such an adjustment, in the ENGINEER's opinion, is substantial, the grade adjustment shall be spread over multiple sections of the sewer. If such an adjustment, in the OWNER's opinion, significantly reduces the sewer's capacity, the OWNER may require the CONTRACTOR to remove and relay that portion of the sewer laid at the improper grade.

F. Drop Connections: An interior or exterior drop manhole shall be required when sanitary sewer lines enter a manhole more than twenty-four inches (24”) above the manhole invert, as shown on the Drawings. Construct drop connections of the same materials as the upstream sanitary sewer and in accordance with the details shown on the Drawings.

G. Manholes Steps, if used, shall be inserted into the wall of the manhole at the proper locations and elevations and shall be securely embedded in the wall.

H. Any adjustment necessary for manhole frame elevation shall be made with precast

concrete grade rings. A maximum of two (2) rings shall be permitted.

I. The cast iron frame for the manhole cover shall be set at the required elevation and properly anchored to the masonry. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted to conform to the exact slope, crown, and grade of the existing adjacent pavement.

J. Seal all manhole lift holes, both inside and out, with a non-shrinkable grout. Between precast sections, this is in addition to joint sealant and primer and mastic wraps utilized on the outside of the manholes.

K. Masonry work shall be allowed to set for a period of not less than twenty-four (24) hours. Outside forms, if any, shall then be removed and the manhole backfilled and compacted in the manner provided in *Section 312300 – Excavation and Fill* of these Specifications. All loose or waste material shall be removed from the interior of the manhole. The manhole cover then shall be placed and the surface in the vicinity of the work cleaned off and left in a neat and orderly condition.

L. After backfilling has been completed, the excavated area, if located in a street, alley, or sidewalk, shall be provided with a temporary surface, as directed by the ENGINEER.

M. The sanitary sewer shall be vented through the use of designated manholes with vent pipe structures located approximately every one-thousand feet (1,000') along the sewer line. Vent stacks must be "factory" fabricated and "hot dipped" galvanized, and NOT field fabricated and galvanized. Vented manholes that are part of proposed sewers paralleling a creek shall be protected against 100-year flood conditions, with levels as identified by the Federal Emergency Management Agency (FEMA), by raising the opening elevation of the vent pipe three feet (3') above the 100-year flood elevation. The opening to the vent pipe structure shall be protected by a screen to prevent wildlife intrusion.

3.06 Sanitary Sewer Manhole Testing

A. Manholes: Prior to testing manholes for watertightness, all lift holes shall be plugged with a non-shrink grout, all joints between precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced. Each manhole shall pass one (1) of the following tests:

1. Exfiltration Tests: The manhole, after proper preparation as noted above,

shall be filled with water. The maximum allowable leakage shall be eight gallons per foot (8 gal/ft) of depth per twenty-four (24) hours for forty-eight inch (48”) diameter manholes. Tests shall last a minimum of eight (8) hours. The manholes may be backfilled prior to testing.

2. Vacuum Tests: The manhole, after proper preparation as noted above, shall be vacuum tested prior to backfilling. The test head shall be placed at the inside of the top of the cone section and the compression head inflated to forty pounds-per-square-inch (40 psi) to effect a seal between the vacuum base and the manhole structure.

B. Connect the vacuum pump to the outlet port with the valve open. A vacuum of ten inches (10”) of Mercury (Hg) shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to nine inches (9”). The manhole shall pass if the time is greater than sixty (60) seconds for forty-eight inch (48”) diameter manholes. If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

C. Existing manholes shall be vacuum tested prior to making any connection, and again upon completion of connection to assess any damage due to construction.

D. The cost and expense of all testing for watertightness and of providing a watertight structure shall be borne by the CONTRACTOR.

3.07 Protection and Restoration of Work Area

A. General: Return all items and all areas disturbed, directly or indirectly, by work under these Specifications, to their original condition or better, as quickly as possible after work is started.

1. The CONTRACTOR shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.

2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard

or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.

4. For projects affecting State or City's right-of-way, The Department of Transportation's (DOT's) ENGINEER shall be authorized to stop all work by the CONTRACTOR when restoration and cleanup are unsatisfactory and to require appropriate remedial measures at no cost to the Owner.

B. Man Made Improvements: Protect, or remove and replace with the ENGINEER's approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins, and other improvements that may be encountered in the work.

C. Cultivated Growth: Do not disturb cultivated trees or shrubbery unless approved by the ENGINEER. Any such trees or shrubbery which must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.

D. Cutting of Trees: Do not cut trees for the performance of the work except as absolutely necessary. Protect trees that remain in the vicinity of the work from damage from equipment. Do not store spoil from excavation against the trunks. Remove excavated material stored over the root system of trees within thirty (30) days to allow proper natural watering of the root system.

Repair any damaged tree over three inches (3") in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the CONTRACTOR. No stumps, wood piles, or trash piles will be permitted on the work site.

E. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate county, state, and federal regulatory agencies.

F. Cleanup and restoration of each yard shall be completed no later than seven (7) calendar days after each section of sewer line is installed.

G. Upon final inspection, if any foreign matter is present in the system, flush and clean

the sections of line as required.

3.08 Final Acceptance (Not Used)

END OF SECTION

Part 1 General

1.01 Scope

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified and required to furnish and install a stormwater culvert at locations depicted in the drawings.

B. Standard Details:

1. Concrete Headwall - Refer to TDOT Standard Roadway Drawing D-PEW-1 and D-PEW-2 for Protected Endwall for Round Pipes.

C. Related Sections:
1. Section 015713 – Erosion and Sediment Control
2. Section 031110 – Concrete Forming and Accessories
3. Section 032000 – Concrete Reinforcement
4. Section 033000 – Cast-In-Place Concrete
5. Section 312000 – Excavation and Fill (Trenching)
6. Section 334223 – Headwalls and Endwalls for Stormwater Piping

1.02 References

A. American Association of State Highway and Transportation Officials:
1. AASHTO M36 – Corrugated Steel Pipe, Metallic Coated, for Sewers and Drains.
2. AASHTO M190 – Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches.
3. AASHTO M196 – Corrugated Aluminum Pipe for Sewers and Drains.
4. AASHTO M294 - Specification for Corrugated Polyethylene Pipe, 305- to 915mm (12- to 36-In.) Diameter.
5. AASHTO M294 - Corrugated Polyethylene Pipe

B. ASTM International:
1. ASTM A929 - Standard Specification for Steel Sheet, Metallic-Coated by the Hot Dip Process for Corrugated Steel Pipe.
2. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
3. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
4. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

5. ASTM C506 - Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe.
6. ASTM C507 - Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe.
7. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
8. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
9. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

C. Tennessee Department of Transportation (TDOT), Standard Specifications for Road and Bridge Construction, January 1,2021

D. Tennessee Department of Transportation Standard Roadway Drawings D-PB-1, Standard Details for Concrete Pipe Installation and D-PB-2, Standard Detail for Flexible Pipe Installation.

1.03 Quality Assurance

A. Delivery and Acceptance Requirements (Precast Option)

1. Marking:

a. Before shipment from the casting or fabrication yard, clearly mark the following on each precast unit:
   1) Date of manufacture
   2) Name or trademark of the manufacturer
   3) Type and size designation

2. Causes for Rejection:

a. Precast units may be rejected for not meeting any one of the Specification requirements.

b. Individual units may also be rejected for fractures or cracks passing through the wall or surface defects indicating honeycombed or open texture surfaces.

c. Remove rejected units from the project and replace them with acceptable units meeting the requirements of this Section.

3. Storage and Handling Requirements

a. Secure and maintain a location to store the material in accordance with Section 016600, Product Storage and Handling Requirements.

b. Store precast units on a level surface.

c. Do not place any loads on precast concrete units until design strength is reached.

d. Do not ship units until design strength requirements have been met.

B. Delivery and Acceptance Requirements (Cast-in-Place)

1. Quality Control:

During Constructions shall be in conformance with but not limited to the Related Sections and the TDOT Standard Drawings as listed in other sections herein.

2. Causes for Rejection:

a. The cast-in-place structures may be rejected for not meeting any one of the Specification requirements.

b. Individual structures may also be rejected for fractures or cracks passing through the wall or surface defects indicating honeycombed or open texture surfaces.

c. Remove rejected units from the project and replace them with acceptable units meeting the requirements of this Section.

1.04 Submittals

A. Complete ENGINEERING and product data shall be submitted to the ENGINEER on all pipe, fittings, and accessories in accordance with the requirements of Section 013000 – Administrative Requirements of these Specifications.

B. Manufacturer's Installation Instructions: Submit special procedures required to install pipe, fittings, and accessories specified.

Part 2 Product

2.01 General

A. Reinforced Concrete Pipe (RCP): ASTM C76, bell and spigot or tongue and groove ends.

1. Pipe Class: Class III with Wall Type B, unless otherwise shown on Drawings.

2. Fittings: Reinforced concrete.

3. Joints: ASTM C443, rubber compression gasket.

B. Reinforced Non-Circular Concrete Pipe:

1. Reinforced Concrete Arch Pipe: ASTM C506, Class A-III.

2. Reinforced Horizontal Elliptical Concrete Pipe: ASTM C507, Class HE-II.

3. Reinforced Vertical Elliptical Pipe: ASTM C507, Class VE-III.

C. HDPE Corrugated Polyethylene Pipe: AASHTO M294, Type S or Type D.

1. Fittings: PVC conforming to pipe specifications.

2. Joints: ASTM F477, elastomeric gaskets.

D. Corrugated Metal Pipe (CMP):

1. Steel Pipe: ASSHTO M36, Gage 16 for 6” through 48”, Gage 14 for 54”, Gage 12 for 60”.

2. Fittings: Corrugated Steel or Aluminum to match pipe.

3. Joints: Corrugated coupling bands, galvanized steel or aluminum to match pipe, minimum 10 inches wide; connected with two neoprene "O" ring gaskets per and two galvanized steel bolts.

E. Bituminous Coated CMP: AASHTO M 190, Coated inside and out with 0.050-inch-thick bituminous coating.

2.02 Bedding and Cover Materials

A. General: Conform to Section 312000, Excavation and Fill (Trenching), for bedding and backfill around and on top of pipe.

B. Bedding for Flexible Pipe (HDPE and CMP): Clean coarse aggregate Gradation No. 57 conforming to Division 900 of the TDOT Standard Specifications, Section 903, current edition.

C. Cover and Fill: Conform to Section 312000, Excavation and Fill (Trenching).

2.03 Accessories

A. Geotextile Fabric: Non-woven, non-biodegradable conforming to Division 921 of the TDOT Standard Specifications for Type 1 Engineering Fabric.

B. Concrete: Class A Concrete conforming to Division 604 of the TDOT Standard Specifications.

1. Compressive strength of 3,000 psi at 28 days.

2. Maximum Water/Cement Ratio (pound/pound) shall not exceed 0.45.

3. Maximum slump of 3 inches for vibrated concrete and 4 inches for non-vibrated concrete.

4. Minimum cement content of 564 pounds per cubic yard.

Part 3 Execution

3.01 Preparation

A. Install Erosion Prevention and Sediment Control Measures

1. Provide temporary erosion prevention and sediment control devices as depicted in the Drawings and in conformance all applicable stormwater permits needed for construction.

B. Clearing and Grubbing

1. Implement clearing and grubbing for the area needed for installation of the storm culvert per Section 311100, Clearing and Grubbing.

C. Excavate area needed for the installation of the storm culvert in accordance with Section 312000, Excavation and Fill (Trenching).

3.02 Installation

A. Interface with Other Work

1. Make connections to new or existing structures in accordance with the details shown on the Drawings.

2. Furnish jointing material in accordance as detailed on the Drawings.

B. Excavation, Shaping, Bedding and Backfill

1. Excavate, shape, bed and backfill in accordance with Section 312000, Excavation and Fill (Trenching).

2. Take special precautions in placing and compacting the backfill to avoid any movement or damage to the units.

3. Bed precast units on foundations of firm and stable material accurately shaped to conform to the bases of the units.

C. Dewater excavations as required to maintain dry conditions and preserve final grades at bottom of excavation.

D. Protect pipe and bedding from damage or displacement until backfilling operation it in progress

E. Install in accordance with manufactures instructions and as indicated on Drawings.

F. Install plastic pipe, fittings, and accessories in accordance with ASTM D2321

G. Seal joints watertight.

H. Begin at the downstream end and progress upstream.

I. Keep pipe and fittings clean until work is completed and accepted by Engineer.

J. Lay bell and spigot pipe with bells upstream.

K. Repair surface damage to pipe with protective coating with two coats of compatible bituminous paint coating.

L. Install cover at sides and over top of pipe.

END OF SECTION

Part 1 General

1.01 Scope:

A. Scope:
   1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified and required to furnish and install a storm drain headwall or endwalls at locations depicted in the drawings.

   2. Headwalls can be cast-in-place or Precast at the discretion of the Contractor.

B. Standard Details:
   1. Concrete Headwall - Refer to TDOT Standard Roadway Drawing D-PEW-1 and D-PEW-2 for Protected Endwall for Round Pipes.

C. Related Sections:
   1. Section 031100 – Concrete Forming
   2. Section 032000 – Concrete Reinforcement
   3. Section 033000 – Cast-In-Place Concrete
   4. Section 312000 – Excavation and Fill (Trenching)
   5. Section 334213 – Stormwater Culverts

1.02 References

A. Tennessee Department of Transportation (TDOT), Standard Specifications for Road and Bridge Construction, January 1,2021

B. Tennessee Department of Transportation Standard Roadway Drawings, Current Edition.

1.03 Quality Assurance

A. Delivery and Acceptance Requirements (Precast Option)
   1. Marking:
      a. Before shipment from the casting or fabrication yard, clearly mark the following on each precast unit:
         1) Date of manufacture
         2) Name or trademark of the manufacturer
         3) Type and size designation

   2. Causes for Rejection:
      a. Precast units may be rejected for not meeting any one of the Specification requirements.
      b. Individual units may also be rejected for fractures or cracks passing

through the wall or surface defects indicating honeycombed or open texture surfaces.

c. Remove rejected units from the project and replace them with acceptable units meeting the requirements of this Section.

3. Storage and Handling Requirements

a. Secure and maintain a location to store the material in accordance with Section 016600, Product Storage and Handling Requirements.
b. Store precast units on a level surface.
c. Do not place any loads on precast concrete units until design strength is reached.
d. Do not ship units until design strength requirements have been met.

B. Delivery and Acceptance Requirements (Cast-in-Place)

1. Quality Control:

During Constructions shall be in conformance with but not limited to the Related Sections and the TDOT Standard Drawings as listed in other sections herein.

2. Causes for Rejection:

a. The cast-in-place structures may be rejected for not meeting any one of the Specification requirements.
b. Individual structures may also be rejected for fractures or cracks passing through the wall or surface defects indicating honeycombed or open texture surfaces.
c. Remove rejected units from the project and replace them with acceptable units meeting the requirements of this Section.

1.04 Submittals

Complete ENGINEERING and product data shall be submitted to the ENGINEER on all admixtures, curing compounds, hardeners, sealers, and waterstops in accordance with the requirements of Section 013000 – Administrative Requirements of these Specifications.

Part 2 Product

2.01 General

A. Materials

1. Concrete
   a. Furnish concrete that conforms to the provisions of Section 033000, Cast-in-Place Concrete.

2. Reinforcing Steel
   a. Furnish reinforcing steel that conforms to the requirements of Section 032000 Concrete Reinforcement.

3. Concrete Forming and Accessories
   a. Furnish concrete forming and accessories that conforms to the requirements of Section 031110, Concrete Forming and Accessories.

4. Grouting
   Furnish grouting that conforms to the requirements of Section 036000, Grouting.

B. Fabrication

1. Fabricate cast-in-place concrete units and precast units in accordance with Section 033000, Cast-In-Place Concrete.

   a. Safety End Treatment will be precast for 30-inch and smaller diameters and cast in place for greater than 30-inch diameters.

2. Fabrication Tolerances
   a. Lifting Holes
      1) For precast units, provide no more than 4 lifting holes in each section.

      2) Lifting holes may be cast or cored into concrete after form removal.

      3) Provide lifting holes large enough for adequate lifting devices based on the size and weight of the section.

         a. The maximum hole diameter is 3 inches at the inside surface of the wall and 4 inches at the outside surface.
         b. Do not cut more than 1 longitudinal wire or 2 circumferential wires per layer of reinforcing steel when locating lift holes.

Part 3 Execution

3.01 Preparation

A. Install Erosion Prevention and Sediment Control Measures

1. Provide temporary erosion prevention and sediment control devices as depicted in the Drawings and in conformance all applicable stormwater permits needed for construction.

B. Clearing and Grubbing

1. Implement clearing and grubbing for the area needed for installation of the storm headwall per Section 311100, Clearing and Grubbing.

2. Excavate area needed for the installation of the storm headwall or endwall in accordance with Section 311100, Clearing and Grubbing, and 312000, Excavation and Fill

3.02 Installation

A. Interface with Other Work

1. Make connections to new or existing structures in accordance with the details shown on the Drawings.

2. Furnish jointing material in accordance as detailed on the Drawings.

B. Excavation, Shaping, Bedding and Backfill

1. Excavate, shape, bed and backfill in accordance with Section 31 20 00, Excavation and Fill (Trenching).

2. Take special precautions in placing and compacting the backfill to avoid any movement or damage to the units.

3. Bed precast units on foundations of firm and stable material accurately shaped to conform to the bases of the units.

C. Placement of Precast Units- Provide adequate means to lift and place the precast units.

1. Utilize sufficient number of lifting holes to ensure that the units are not damaged during lifting.

2. Fill lifting holes with mortar or concrete and cure.

3. Precast concrete or mortar plugs may be used in lieu of mortar.

3.03 Repair

A. Occasional imperfections in manufacture or accidental damage sustained during handling may be repaired.

1. The repaired units will be acceptable if they conform to the requirements of this Section and the repairs are sound, properly finished and cured in conformance with pertinent Specifications.

B. Repair spalled areas around lifting holes.

END OF SECTION

APPENDIX

APPENDIX A

SIGNAL MOUNTAIN WASTE WATER TREATMENT PLANT ACCESS ROAD PRESENCE/ABSENCE MIST NETTING SURVEY REPORT FOR THE INDIANA BAT (*Myotis sodalis*) AND NORTHERN LONG-EARED BAT (*Myotis septentrionalis*) HAMILTON COUNTY, TN

May 31, 2023

Northern long-eared bat (*Myotis septentrionalis*)

Prepared for:
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Prepared by:
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Executive Summary

LJA Engineering, Inc. (LJA) has proposed the construction of the Signal Mountain Waste Water Treatment Plant Access Road (WWTP AR) in Hamilton County, Tennessee (TN).

AllStar Ecology LLC (ASE) was contracted on February 14, 2023, by LJA to conduct a site evaluation mist netting survey with regard to Indiana (*Myotis sodalis*) and northern long-eared (*Myotis septentrionalis*) bats at the proposed Signal Mountain WWTP AR. The survey was conducted along existing corridors within and adjacent to the 0.91 acre Limit of Disturbance (LOD) (0.45 kilometers) on the nights of May 15th to May 17th, 2023. Forests onsite were primarily comprised of a mid-successional, mesic mixed forest, containing numerous species such as oak (*Quercus* spp.), tulip poplar (*Liriodendron tulipifera*), hickory (*Carya* spp.), pine (*Pinus* spp.), maple (*Acer* spp.), and sweetgum (*Liquidambar styraciflua*). The LOD also contained small herbaceous openings and skid trails.

Summer roosting habitat located within the proposed LOD was suitable for both bat species. Trees displaying cavities and shagbark hickories (*Carya ovata*) were observed onsite. Feeding areas (e.g., herbaceous fields, forested streams, vernal pool) occurred within and near the 0.91 acre LOD. The LOD lies approximately 120 feet from the area's primary drainage, the Tennessee River. Main corridors consisted of skid roads/trails with openings and edges created by leaseholder and landowner development.

Five net sets on May 15th-17th, 2023 were established along primary corridors on previously established trails in an attempt to capture Indiana and northern long-eared bats. The survey locations were chosen based upon existing corridors located within or in close proximity to the LOD. A total of 12 individual bats consisting of six species were captured onsite. No Indiana bats were documented, but one (8.3%) northern long-eared bat was captured. The northern long-eared bat was a pregnant female. The bat was affixed with a radio transmitter but was unable to be located over three days of extensive searches (May 16-18) and it was assumed the transmitter failed. Due to the bat not being able to be found due to transmitter failure, potential roosting habitat could be contained within the project area. It appears that Indiana bats are not utilizing the project area. A total of one eastern small-footed bat (*Myotis leibii*; 8%), three gray bats (*Myotis grisescens*; 25%), one eastern red bat (*Lasiurus borealis*; 8%), one tricolored bat (*Perimyotis subflavus*; 8%), and five big brown bats (*Eptesicus fuscus*; 42%) were also captured.

The proposed removal of potential habitat during winter months (October 1 to March 31) would have limited impact on northern long-eared bat habitat due to the apparent suitability of bat habitat in the surrounding area. Energy expenditures by bats to relocate to suitable summer habitat should be minimal. Furthermore, a probable absence determination was made with regard to Indiana bats at the proposed access road during this survey. These results suggest that project development will not cause indirect adverse effects to the species. The site contained no apparent rock outcroppings, caves, or mine portals. ASE recommends coordination with the US Fish and Wildlife Service for concurrence with the findings of this survey.

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Introduction

The Signal Mountain WWTP AR is a proposed access road in the vicinity of the Tennessee River, approximately 0.9 miles southwest of Signal Mountain, Tennessee (Appendix A). Proposed activities include the construction of an access road off of Suck Creek Road. The proposed project area is located on a hillside and ridgetop, including southwest facing slopes. Elevations ranged from 689–825 feet with cover types that consisted of mixed forest. Forested trails and grassland areas were located within and adjacent to the LOD. The site was in close proximity to aquatic resources including the Tennessee River, which was approximately 120 feet from the project area. The site contained no apparent rock outcroppings, caves, or mine portals. The LOD contained suitable bat habitat including potential roost trees (PRTs), aquatic resources, flight corridors, and feeding areas.

The conservation of summer maternity roosts and winter hibernacula is the basis of Myotine bat management in North America (Jung *et al.* 1999, Menzel *et al.* 2002, Brooks and Ford 2005, Loeb and O'Keefe 2006). Summer maternity roosts are assumed to be critical, limiting resources for bats in both forested and formerly forested environments (Fenton 1997, Kunz and Fenton 2003). The current consensus is that management efforts should ensure that suitable roosts, particularly maternity roosts, are maintained on the landscape in the long term (Lacki and Schwierjohann 2001, Owens *et al.* 2004, Perry and Thill 2007). A variety of tree species have been noted as roost sites for Indiana bats including *Ulmus* spp., *Pinus* spp., *Quercus* spp., *Carya* spp., and *Populus* spp. (Whitaker and Brack 2002). The presence of exfoliating bark is important along with a roost site receiving solar radiation for warmth (Whitaker and Brack 2002). Snags with exfoliating bark are the most common roost tree, while shagbark hickory (*Carya ovata*) is the most commonly used live tree (Gumbert *et al*. 2002, Kurta *et al.* 2002). Northern long-eared bats, in contrast, select for smaller trees (≥3 inch dbh) and prefer their roosts to be located in closed canopy (Silvis *et al.* 2012, Owen *et al*. 2001, USFWS 2015). Selected roost of the northern long-ear bat are typically over-topped (i.e., live trees and/or snags), early successional tree species such as black locust (*Robinia psuedoacacia*) and sassafras (*Sassafras albidum*). In order to locate any potential day or maternal colony roosts in the area, a mist net survey to capture Indiana and northern long-eared bats was conducted. Mist netting is a common method to capture bats (Kunz and Kurta 1988, Gardner *et al.* 1989, Kunz *et al.* 1996, Lang *et al.* 2004).

The project location is within the Indiana and northern long-eared bat ranges and the project requests no tree clearing limitations. Due to these factors, LJA requested a summer mist net survey to determine presence/absence of Indiana and northern long-eared bats, species listed as federally endangered, and to evaluate the site for use by these species. In an attempt to capture Indiana and northern long-eared bats, ASE performed a mist net evaluation survey at the proposed access road.

Methods

Habitat Assessment

The habitat assessment entailed the remote sensing and onsite qualification of suitable Indiana bat and northern long-eared bat habitat. Remote sensing required the determination of forest/non-forest, forest fragmentation within a 2 mile (3.2 km) buffer and cover types within the LOD of the proposed Signal Mountain WWTP AR. The raster dataset National Land Cover Database 2019 (NLCD 2019) was used to characterize the landscape. The onsite habitat assessment involved the characterization of forest cover types onsite, including overall composition (i.e., species, successional stage, etc.) and qualitative assessment of habitat suitability (i.e., PRTs, riparian/upland corridors).

Mist Netting to Capture Indiana and Northern Long-Eared Bats

ASE followed the 2023 Range-Wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines provided by the USFWS for the capture of Indiana and northern long-eared bats. Because no previous surveys had established the presence of either bat species, sampling efforts at the proposed Signal Mountain WWTP AR were meant to determine presence/absence and to gauge the usage of the site by rare, threatened, and/or endangered bat species. Five net sets were established along the proposed project area and sampled for two nights (10 net nights).

Permits

The survey was conducted by Eric Schroder (USFWS Permit #: ES85228B; TWRA Scientific Collecting Permit #: 5845) and Brittney Watson (Appendices G and H).

Net Placement

Nets were placed perpendicularly across corridors and in proximity to small ephemeral aquatic resources (vernal pool). Nets filled corridors from side to side, extending beyond the corridor boundaries when possible, and from water (or ground) level up to the overhanging canopy where possible. Nets of varying widths and heights were used as the situation dictated. Net sets were 2.6 m to 7.8 m high consisting of one or more nets stacked on top one another and were 4 to 9 m wide. When netting over water, there was enough space between the net and the water so that captured bats did not get wet. Photos were taken to document placement (Appendix D) and biologists completed a “Mist Net Capture Sheet” (Appendix F). Net sets were placed > 100 feet apart.

Survey Period

The survey period began at sunset and continued for at least 5 hours. Each net set was checked approximately every 10–15 minutes (Gannon *et al.* 2007). Care was taken to minimize noise, lights, and movement near the nets. Biologists were prepared to cut the net if a bat was severely entangled and could not be safely extracted within 3 or 4 minutes (CCAC 2003; Kunz *et al.* 2009).

Morphological Data

Documentation of capture site, date of capture, time of capture, sex, reproductive condition, age, weight, right forearm measurement, band number and type (if applicable), and Reichard’s wing damage index score (Reichard and Kunz 2009) was conducted for each bat captured.

To minimize potential for disease transmission, any equipment that came into contact with bats was cleaned, following approved protocols. Any federal or state specific COVID-19 protocols were followed.

Weather Requirements

Specific weather conditions were avoided to conduct the most efficient mist netting possible. These included: (a) temperatures below 50°F (10°C) during the survey period; (b) precipitation that exceeded 30 minutes or continued intermittently during the survey, and (c) sustained wind speeds greater than 9 miles/hour during the survey period. Nightly weather conditions for survey sites were checked using the nearest private weather station in Chattanooga, TN (KCHA), accessed using MesoWest.

Radio Telemetry and Emergence Surveys

Radio-Tracking

The radio transmitter, adhesive, and any other markings (e.g., wing bands) complied with USFWS and state permits and weighed less than 5% of pre-attachment body weight (American Society of Mammalogists 1998).

Biologists tracked all radio-tagged bats captured to diurnal roosts using TRX-1000WR tracking receivers. Tracking was conducted for at least seven days or until transmitters fell off or failed.

Daily radio telemetry searches for roosts were conducted during daylight hours and were conducted until the bat(s) were located or for a minimum of 4 hours of ground effort for each tagged bat; bats were tracked simultaneously. Once a signal was detected, tracking continued until the roost was located. Biologists documented all ground searching efforts during radio-tracking for submittal with the survey report (Appendix E).

Results

Habitat Assessment

Forests onsite were primarily comprised of a mid-successional, mesic mixed forest type, with numerous tree species including tulip poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), pines (*Pinus* spp.), oaks (*Quercus* spp.) and ashes (*Fraxinius* spp.). A moderate understory, consisting of suppressed black locust (*Robinia pseudoacacia*) and shrubs such as multiflora rose (*Rosa multiflora*), was present. Trees suitable for use as diurnal roosts were observed, including red maple with sloughing bark and black locust with visible cavities. The LOD also contained herbaceous openings, and was in close proximity to the Tennessee River.

Habitat within two miles of the proposed project is described as primarily forest (5,105 acres; 63.5%; Appendix B). Approximately 4,922.0 acres of deciduous forest (61.2%) is located within two miles of the proposed project, with the remaining 91.4 acres of forest being evergreen and mixed (deciduous and coniferous). The remaining cover types within two miles of the site are primarily comprised of developed land (1964.0 acres) and open water (505.3 acres).

Based on our observations, habitat onsite and within two miles is likely suitable for use by forest obligate bats such as Indiana and northern long-eared bats.

Captured Bats

A total of 12 individual bats, consisting of six species, were captured at five net sets over two nights of sampling (10 net nights). No Indiana bats were documented, but one (8%) northern long-eared bat was captured. The one northern long-eared bat captured was a pregnant female. A total of 3 gray bats (*Myotis grisescens*; 25%), 5 big brown bats (*Eptesicus fuscus*; 42%), one eastern small-footed bat (*Myotis leibii;* 8.3%), one eastern red bat (*Lasiurus borealis*; 8.2%), and one tri-colored bat (*Perimyotis subflavus;* 8.2%) were also captured. Mist Net Set D accounted for 42% (5), Mist Net Set C accounted for 33% (4), Mist Net Set E accounted for 17% (2), and Mist Net Set A accounted for 8% (1) of the total bats captured.

Mist Net Set A (35.103879, -85.357702)

Mist Net Set A was situated across a flight corridor that ran along a forested hillside, an area suitable for travel (Appendix C). One bat was captured in the single high net over two nights (2 net nights). The individual captured was a gray bat (8.3%; Table 1). No Indiana or northern long-eared bats were captured.

Mist Net Set B (35.104314, -85.358119)

Mist Net Set B was situated across a flight corridor that ran along a forested hillside, an area suitable for travel (Appendix C). No bats were captured in the double high net over two nights (2 net nights).

Mist Net Set C (35.104920, -85.357204)

Mist Net Set C was situated across a flight corridor that ran along a forested ridgetop and in proximity to a herbaceous opening associated, an area suitable for foraging and travel (Appendix C). A total of 4 bats were captured in the double high net over two nights (2 net nights). Captured bats were identified to four species, a single northern long-eared (8.3%), a big brown

bat (8.3%), a tri-colored bat (8.3%), and a red bat (8.3%; Table 1). No Indiana bats were captured.

Mist Net Set D (35.105420, -85.357553)

Mist Net Set D was situated across a flight corridor that ran along a forested ridge line, near an abandoned brick shack, an area suitable for travel (Appendix C). A total of five bats were captured in the triple high net over two nights (2 net nights). Captured bats were identified to three species, three big browns (25%), one eastern small-footed bat (8.3%), and one gray bat (8.3%; Table 1). No Indiana bats or northern long-eared bats were captured.

Mist Net Set E (35.105048, -85.357747)

Mist Net Set E was situated across a flight corridor that ran along a forested ridge line and a small vernal pool, an area suitable for foraging and travel (Appendix C). A total of two bats were captured in the double high net over two nights (2 net nights). Captured bats were identified to two species, a big brown (8.3%) and a gray bat (8.3%; Table 1). No Indiana bats or northern long-eared bats were captured.

Weather Conditions

Weather conditions were recorded at station KCHA. During survey fieldwork, Chattanooga, TN experienced approximately 1.13 inches of precipitation. From May 15th to 17th, a low temperature of 60.8^{o}F and average wind speeds of 1 to 3 mph were recorded. All survey effort was conducted under suitable sampling conditions.

Telemetry

On May 15th, 2023, one reproductive, female northern long-eared bat was fitted with a radio transmitter to locate roosts within the immediate vicinity of the project area. Bat number TWRA11301 was fitted with a Holohil BD-2X transmitter using skin bonding latex adhesive. The radio frequency was 172.571. TWRA11301 able to fly away easily and was observed via telemetry to be feeding near the site after release.

Table 1. Mist Netting Bat Captures at the Proposed Signal Mountain WWTP AR May 15th-17th, 2023.

#	DATE	TIME	NET	SPECIES	AGE	SEX	REPRO	RFA (mm)	MASS (g)	HT. in NET (m)	WING SCORE	BAND (TWRA)	NOTES
1	5/15/2023	21:13:00	D	EPFU	A	M	NR	44	15.0	7.0	0	-	*Pin hole in wing*
2	5/15/2023	21:47:00	D	EPFU	A	F	L	46	21.5	5.2	0	-	-
3	5/15/2023	21:47:00	D	EPFU	A	M	TD	46	17.5	5.2	0	-	-
4	5/15/2023	21:57:00	C	EPFU	A	F	L	46	21.5	5.2	0	-	*Recapture*
5	5/15/2023	01:12:00	C	MYSE	A	F	P	38	9.0	1.0	0	11301	TRANSMITTER (172.571)
6	5/15/2023	01:12:00	C	PESU	A	M	NR	32	6.0	1.5	0	A05200	-
7	5/17/2023	21:26:00	E	EPFU	A	M	TD	45	16.5	2.5	0	-	-
8	5/17/2023	22:11:00	E	MYGR	A	M	TD	45	10.5	2.5	0	11299	-
9	5/17/2023	22:11:00	D	MYLE	A	M	NR	43	4.25	2.0	0	A05199	-
10	5/17/2023	22:40:00	C	LABO	A	F	P	42	16.75	1.0	0	-	-
11	5/17/2023	00:53:00	D	MYGR	A	F	NR	43	10.75	1.0	0	11298	-
12	5/17/2023	00:53:00	A	MYGR	A	F	P	44	14.5	2.0	0	11281	-

Conclusion

Mist net surveys were conducted at the proposed project site on May 15th to 17th (May 16th –rain out) and tracking was conducted on May 16th to 18th, 2023. Surveys were conducted at the request of LJA due to the proposed 0.9 acres of forest removal, as drawn from ESRI aerial imagery. Mist netting was conducted in an attempt to determine presence/absence of both Indiana and northern long-eared bats and to capture bats for the purpose of tracking and identification of roost tree(s).

A total of 12 individual bats consisting of six species were captured onsite. No Indiana bats were documented, but one (8.3%) northern long-eared bat was captured. The northern long-eared bat captured was a pregnant female. The northern long-eared bat was transmitted but no roost trees were able to be found. These results suggest that forests within the proposed Signal Mountain WWTP AR are habitat for the northern long-eared bat. It appears that Indiana bats are not utilizing the area. An examination of land cover from the NLCD 2011 raster dataset showed that disturbances to forest within the LOD will constitute less than 0.02% of its total value within two miles of the proposed WWTP AR, and forest habitat will remain nearby post construction of the site.

Mist netting surveys at the Signal Mountain WWTP AR resulted in a probable absence determination with regard to Indiana bats. This suggests project development will not result in indirect adverse effects to the species. Energy expenditures by bats to relocate to suitable summer habitat should be minimal. The site contained no apparent rock outcroppings, caves, or mine portals. ASE recommends coordination with the US Fish and Wildlife Service for concurrence with the findings of this survey.

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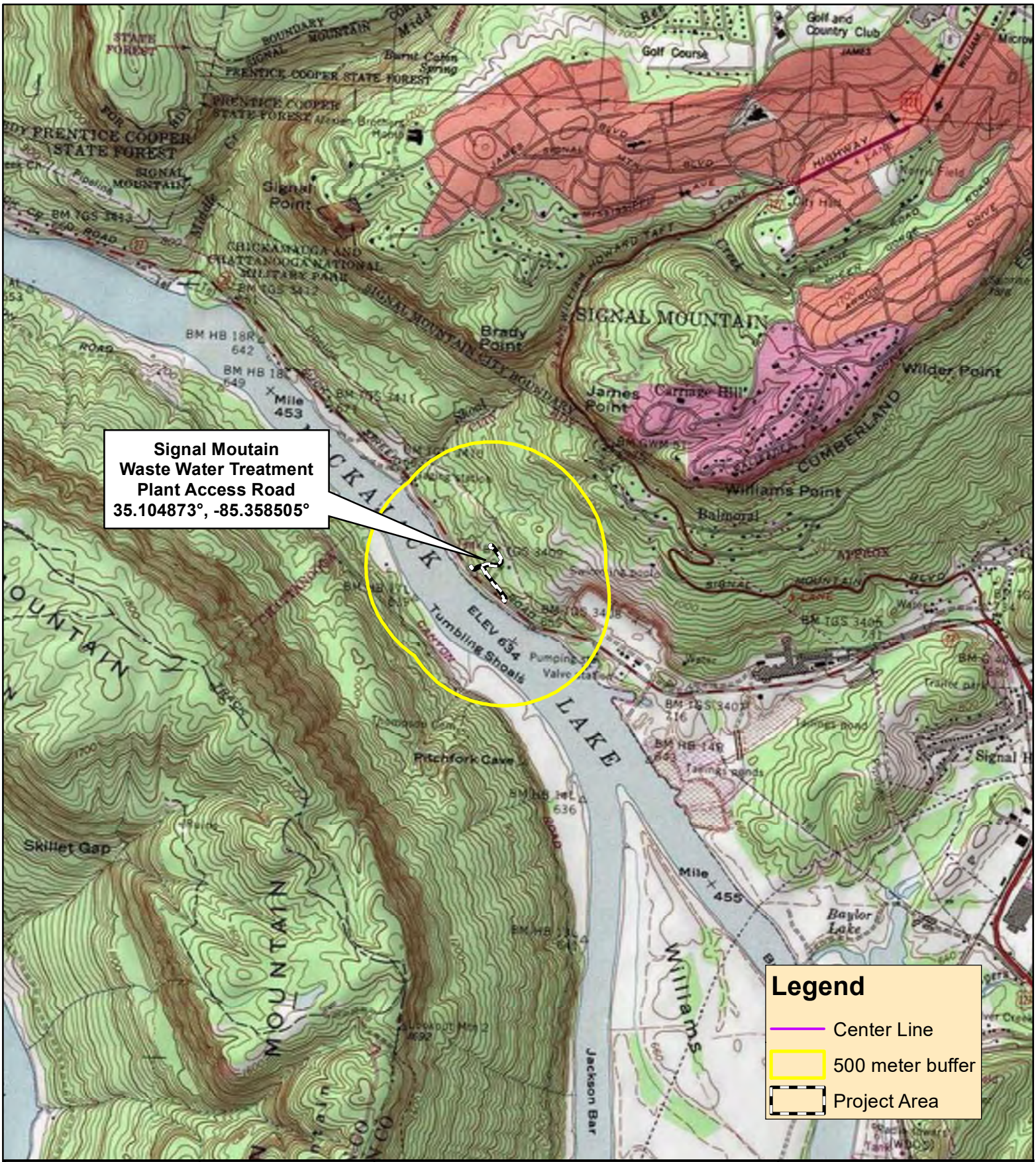
Appendix A: Vicinity Map (Chattanooga 7 ½’ USGS)



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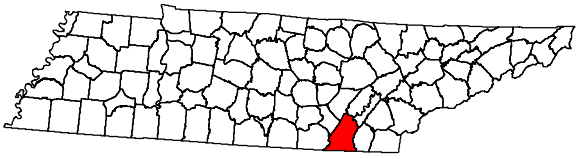

Hamilton County, Tennessee

USGS 7.5' Quad: Chattanooga

USFWS

Vicinity Map
Signal Moutain Waste Water Treatment Plant Access Road Project

Date: 03/16/2023

Version: #1

Appendix B: Map of Land Cover within a Two Mile Study Area

Notes:
1. Background is ESRI aerial imagery.
2. Map shows 2 mile buffer of the approximate center point of the LOD.
3. Land use land cover shapefile is from the National Land Cover Dataset, 2019.

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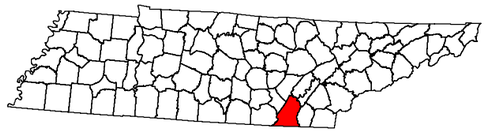

Hamilton County,
Tennessee

LOD
2 MILE BUFFER
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Hay/Pasture
Woody Wetlands
Emergenent Herbaceous Wetlands

USFWS

Appendix B
Landuse/Landcover Map
Signal Mountain WWTP AR

Date: 05/31/2023

Version #1

Appendix C: Map of Mist Netting Locations

Net D

Net C

Net E

Suck Creek Road

Net B

Tennessee River

Net A

Notes:
1. Background is an ESRI aerial image.
2. Netting occurred from May 15-17, 2023.

ALLSTAR ECOLOGY
Natural Resource Specialists

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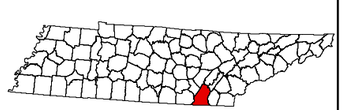
ft



Hamilton County,
Tenmnessee

Net Location

LOD

USFWS

Appendix C
Netting Locations
Signal Mountain WWTP AR

Date: 05/31/2023

Appendix D: Mist Netting Site Locations and Bat Photos

Signal Mountain WWTP AR
Mist Netting Photo Exhibit
May 15 & 17, 2023

Photo 1. A view of mist net set A.

Photo 2. A view of mist net set B.

Signal Mountain WWTP AR
Mist Netting Photo Exhibit
May 15 & 17, 2023

Photo 3. A view of mist net set C.

Photo 4. A view of mist net set D.

Signal Mountain WWTP AR
Mist Netting Photo Exhibit
May 15 & 17, 2023

Photo 5. A view of mist net set E.

Photo 6. A view of a captured big brown bat.

Signal Mountain WWTP AR
Mist Netting Photo Exhibit
May 15 & 17, 2023

Photo 7. A view of a captured northern long-eared bat (TWRA11301).

Photo 8. A view of a captured northern long-eared bat's foot (wing attaches at foot base) and not keeled calcar.

Signal Mountain WWTP AR
Mist Netting Photo Exhibit
May 15 & 17, 2023

Photo 9. A view of a captured northern long-eared bat's foot (wing attaches at foot base) and not keeled calcar.

Photo 10. A view of a captured gray bat (TWRA11299).

Signal Mountain WWTP AR
Mist Netting Photo Exhibit
May 15 & 17, 2023

Photo 11. A view of a captured gray bat's (TWRA11299) notched claw and free foot.

Photo 12. A view of a captured gray bat (TWRA11298).

Signal Mountain WWTP AR
Mist Netting Photo Exhibit
May 15 & 17, 2023

Photo 13. A view of a captured gray bat's (TWRA11298) notched claw and free foot.

Photo 14. A view of a captured gray bat (TWRA11281).

Signal Mountain WWTP AR
Mist Netting Photo Exhibit
May 15 & 17, 2023

Photo 15. A view of a captured gray bat's (TWRA11281) notched claw and free foot.

Photo 16. A view of a captured eastern small-footed bat (TWRAA05199).

Signal Mountain WWTP AR
Mist Netting Photo Exhibit
May 15 & 17, 2023

Photo 17. A view of a captured tri-colored bat (TWRAA05200).

Photo 18. A view of a captured tri-colored bat with wing extended (TWRAA05200).

Signal Mountain WWTP AR
Mist Netting Photo Exhibit
May 15 & 17, 2023

Photo 19. A view of a captured eastern red bat.

Appendix E: Radio Telemetry Tracking Effort Map

Notes:
1. Background is an ESRI aerial image.
2. Tracking occurred from May 16-18, 2023.

ALLSTAR ECOLOGY
Natural Resource Specialists

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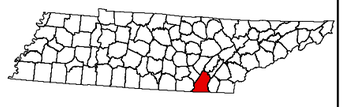
Miles



Hamilton County,
Tenmnessee

LOD

Tracking Effort

USFWS

Appendix E
Radio Telemetry Tracking
Effort Map
Signal Mountain WWTP AR

Date: 05/31/2023

Version: #1

Appendix F: Datasheets

Mist Net Capture Sheet

Site No.: 1 **Project:** Signal Mountain WWTP AR **Project #:** 2023-0058405 **Date:** 5/15/23

Location: Signal Mountain **State:** WV **County:** Hamilton **Quad:** Chattanooga

Latitude: 35.104873 **Longitude:** -85.358505 **Datum:** NAD83 **Units:** Decimal Degrees

Observers: Eric Schroder & Brittney Watson

#	Time	Net	Species	Age	Sex	Repro Cond.*	RFA (mm)	Mass (g)	Ht. in Net	Wing Score	Band # Type	Notes
1	21:13	D	Eptesicus fuscus	A	M	NR	44		7m	0		Pin hole in wing
2	21:47	D	Eptesicus fuscus	A	F	L	46	21.5	5.2m	0		
3	21:47	D	Eptesicus fuscus	A	M	TD	46	17.5	5.2m	0		
4	21:57	C	Eptesicus fuscus	A	F	L						Recapture
5	1:12	C	Myotis septentrionalis	A	Female	P	38	9	1m	0	TWRA11301	245785-172.571
6	1:12	C	Perimyotis subflavus	A	Female	NR	32	6	1.5m	0	TWRAA05200	
7												
8												
9												
10												
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25								16.5				
26												
27												
28												
29												
30												

Waning Crescent **Moon Phase:** % 18

	Rise	Set
Moon:	4:23	16:39
Sun:	6:37	20:38

Time	Temp	Sky	Wind	# Bats
20:38	71.1	3	0	4
22:17	69.4	3	0	0
23:17	68.5	3	0	0
00:17	68.5	2	1	2
Avg	69.38	2.75	0.25	1.5

Sky Code	
0	Clear
1	Few Clouds
2	Partly Cloudy
3	Cloudy or overcast
4	Smoke or fog
5	Drizzle or light rain
6	Thunderstorm

Beauford Wind Code	
0	Calm (0mph)
1	Light wind (1-3mph)
2	Light breeze (4-7 mph)
3	Gentle breeze (8-12 mph)
4	Moderate breeze (13-18 mph)

Repro. Cond: (P) pregnant; (L) lactatign; (PL) post-lactating; (NR) non-reproductive; (TD) testes descended

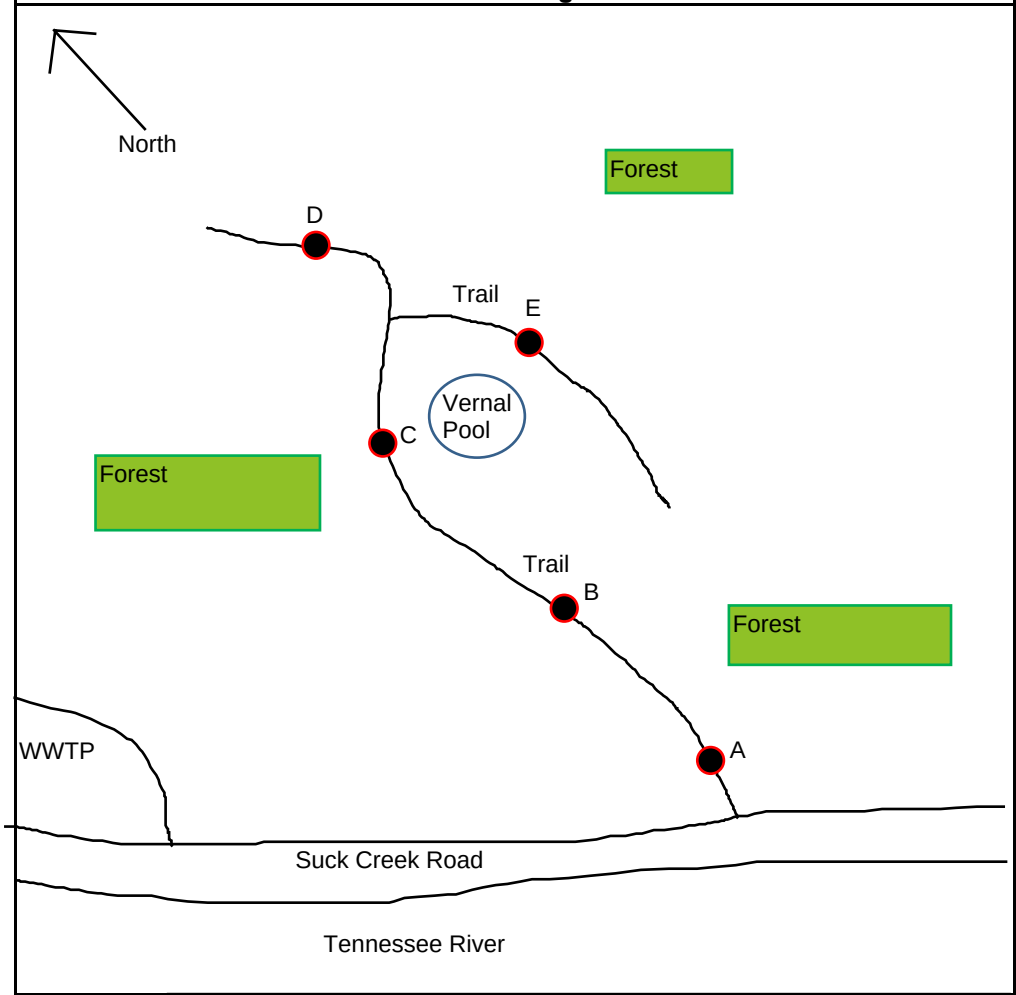
Mist Net Site Description

Site No. : 1 **Project:** Signal Mountain WWTP AR **Project No. :** 2023-0058405 **Date:** 5/15/23

Location: Signal Mountain **State:** TN **County:** Hamilton **Quad:** Chattanooga **Datum:** NAD83

Observers: Eric Schroder & Brittney Watson

Net Site Diagram



Dominant Vegetation

1 Acer rubrum
2 Liquidambar styraciflua
3 Pinus spp.
4 Liriodendron tulipifera
5 Fraxinus americana

Net(s) by Habitat

Habitat	A	B	C	D	E
River					
Stream					
Pond					
Road Rut					
Corridor	✘	✘	✘	✘	✘
Cave/Mine					
Other:					

Net	Net Size (wxh=m/sq)			Latitude	Longitude
A	4	2.6	10.4	35.103879	-85.357702
B	4	5.2	20.8	35.104314	-85.358119
C	6	5.2	31.2	35.104920	-85.357204
D	9	7.8	70.2	35.105420	-85.357553
E	6	5.2	31.2	35.105016	-85.357605

Comments: Nets set over forested trails.

Bats would be using this area to commute between roosting and foraging habitats.

Mist Net Capture Sheet

Site No.: 1 **Project:** Signal Mountain WWTP AR **Project #:** 2023-0058405 **Date:** 5/17/23

Location: Signal Mountain **State:** WV **County:** Hamilton **Quad:** Chattanooga

Latitude: 35.104873 **Longitude:** -85.358505 **Datum:** NAD83 **Units:** Decimal Degrees

Observers: Eric Schroder & Brittney Watson

#	Time	Net	Species	Age	Sex	Repro Cond.*	RFA (mm)	Mass (g)	Ht. in Net	Wing Score	Band # Type	Notes
1	21:26	E	Eptesicus fuscus	Adult	Male	TD	45	16.5	2.5m	0		
2	22:11	E	Myotis grisescens	Adult	Male	TD	45	10.5	2.6m	0	TWRA11299	
3	22:11	D	Myotis leibii	Adult	Male	NR	29	4.25	2.0m	0	TWRAA05199	
4	22:40	C	Lasiurus borealis	Adult	Female	P	42	16.75	1.0m	0		
5	00:53	D	Myotis grisescens	Adult	Female	NR	43	10.75	1.0m	0	TWRA11298	
6	00:53	A	Myotis grisescens	Adult	Female	P	44	14.5	2.0m	0	TWRA11281	
7												
8												
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30												

Moon Phase: Waning Crescent % 5

	Rise	Set
Moon:	5:19	18:52
Sun:	6:36	20:39

Time	Temp	Sky	Wind	# Bats
20:39	64.5	2	0	1
21:30	63.5	3	1	2
22:45	62.2	3	1	1
23:32	62.0	1	1	0
00:32	61.2	1	1	2
1:31	60.8	1	1	0
Avg	62.37	1.83	0.83	1

Sky Code	
0	Clear
1	Few Clouds
2	Partly Cloudy
3	Cloudy or overcast
4	Smoke or fog
5	Drizzle or light rain
6	Thunderstorm

Beauford Wind Code	
0	Calm (0mph)
1	Light wind (1-3mph)
2	Light breeze (4-7 mph)
3	Gentle breeze (8-12 mph)
4	Moderate breeze (13-18 mph)

Repro. Cond: (P) pregnant; (L) lactatign; (PL) post-lactating; (NR) non-reproductive; (TD) testes descended

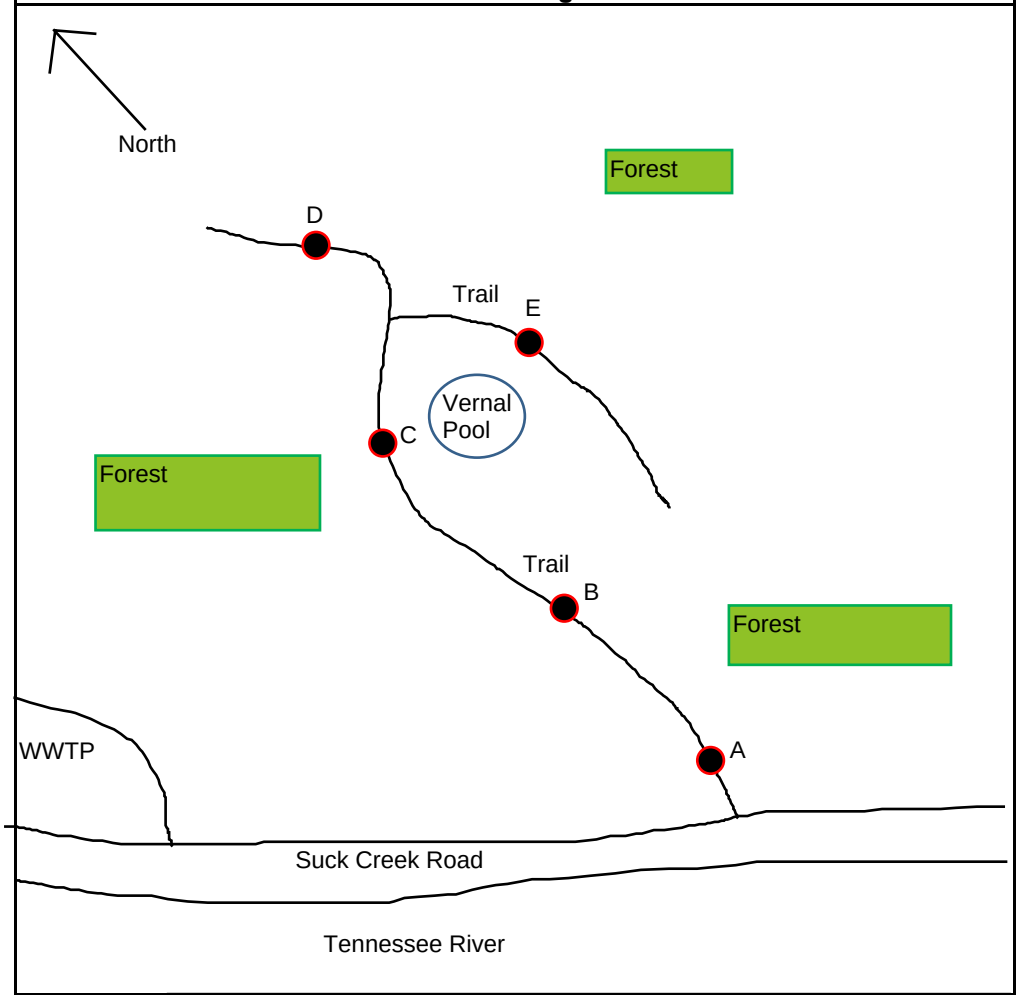
Mist Net Site Description

Site No. : 1 **Project:** Signal Mountain WWTP AR **Project No. :** 2023-0058405 **Date:** 5/17/23

Location: Signal Mountain **State:** TN **County:** Hamilton **Quad:** Chattanooga **Datum:** NAD83

Observers: Eric Schroder & Brittney Watson

Net Site Diagram



Dominant Vegetation

1 Acer rubrum
2 Liquidambar styraciflua
3 Pinus spp.
4 Liriodendron tulipifera
5 Fraxinus americana

Net(s) by Habitat

Habitat	A	B	C	D	E
River					
Stream					
Pond					
Road Rut					
Corridor	X	X	X	X	X
Cave/Mine					
Other:					

Net	Net Size (wxh=m/sq)			Latitude	Longitude
A	4	2.6	10.4	35.103879	-85.357702
B	4	5.2	20.8	35.104314	-85.358119
C	6	5.2	31.2	35.104920	-85.357204
D	9	7.8	70.2	35.105420	-85.357553
E	6	5.2	31.2	35.105016	-85.357605

Comments: Nets set over forested trails.

Bats would be using this area to commute between roosting and foraging habitats.

Appendix G. State Permit

TENNESSEE WILDLIFE RESOURCES AGENCY

ELLINGTON AGRICULTURAL CENTER
P. O. BOX 40747
NASHVILLE, TENNESSEE 37204

Scientific Collection Permit : 5845 **Issue date:** 3/31/2023 **Expiration date:** 3/31/2024

Pursuant to authority of T.C.A. 70-2-213: Eric Schroder

and the following additional permittees:
N/A

are granted permission to take the following species:

This study is not meant to "take" any bats as the study will be catch and release. However, these are species we may encounter: Gray Bat-1, Indiana bat-1, Northern long-eared bat-1, big brown bat-1, eastern red bat-1, tricolor bat-1, eastern small-footed bat-1, little brown bat-1, evening bat-1, hoary bat-1, silver-haired bat-1, Rafinesque's big-eared bat-1,seminole bat-1, southeastern bat-1, and Brazilian free-tailed bat-1.

TENNESSEE WILDLIFE RESOURCES AGENCY

ELLINGTON AGRICULTURAL CENTER
P. O. BOX 40747
NASHVILLE, TENNESSEE 37204

Scientific Collection Permit : 5845 **Issue date:** 3/31/2023 **Expiration date:** 3/31/2024

Pursuant to authority of T.C.A. 70-2-213: Eric Schroder

and the following additional permittees:
N/A

Restricted to the following locations:

The Signal Mountain Waste Water Treatment Plant Access Road Project (Center Point: 35.104873, -85.358505) is located in Hamilton County, Tennessee.

TENNESSEE WILDLIFE RESOURCES AGENCY

ELLINGTON AGRICULTURAL CENTER
P. O. BOX 40747
NASHVILLE, TENNESSEE 37204

Scientific Collection Permit: 5845 **Issue date:** 3/31/2023 **Expiration date:** 3/31/2024

Pursuant to authority of T.C.A. 70-2-213:
Eric Schroder

and the following additional permittees:
N/A

Restricted to the following collection methods:

We will capture bats via mist nets. After data collection we will release the individual(s) back into the capture area.

Subject to the following rules:

Wildlife may not be held longer than 24 hours without prior approval. All containers and equipment utilized in the collection of amphibians and reptiles shall be decontaminated and disinfected for ranavirus and other pathogens. This permit is invalid unless accompanied by all applicable federal permits.

No species listed by TWRA as endangered, threatened, in need of management, or of greatest conservation need may be taken without approval; release these species immediately. Report the occurance of endangered or threatened species to TWRA within five days.

Prior to collecting in the field, you are required to notify the TWRA Regional Dispatcher with the name(s) of person(s) doing the collecting, where, when and what species you will be collecting. Contact information is attached.

Executive Director, Tennessee Wildlife Resources Agency

3/31/2023
Date

The State of Tennessee

AN EQUAL OPPORTUNITY EMPLOYER

Appendix H. Federal Permit

NATIVE THREATENED SPECIES-RECOVERY

Permit Number: ES85228B

Version Number: 2

Effective: 2022-11-07 **Expires:** 2027-12-31

Issuing Office:

Department of the Interior

U.S. FISH AND WILDLIFE SERVICE

ES Bloomington Permit Office
5600 American Boulevard, West, Suite 990
Bloomington, Minnesota 55437-1458
permitsR3ES@fws.gov

Digitally signed by

"Acting for" FWS T&E Chief

Permittee:

ERIC SCHRODER
1847 MORGANTOWN AVENUE
FAIRMOUNT, WV 26554
US

Authority: Statutes and Regulations: 16 U.S.C. 1533 (d) 50 CFR 17.32, 50 CFR 13

Location where authorized activity may be conducted:

On Lands Specified Within the Attached Special Terms and Conditions

Reporting requirements:

See permit conditions for reporting requirements.
An annual report is due on 1/31 following each year that this permit is in effect.

Authorizations and Conditions:

A. General Conditions set out in Subpart B of 50 CFR 13, and specific Conditions contained in Federal regulations cited above, are hereby made a part of this permit. All activities authorized herein must be carried out in accord with and for the purposes described in the application submitted. Continued validity, or renewal of this permit is subject to complete and timely compliance with all applicable Conditions, including the filing of all required information and reports.

B. The validity of this permit is also conditioned upon strict observance of all applicable foreign, state, local, tribal, or other Federal law. Necessary state and/or local permits where applicable, must also be acquired and observed; this permit is invalid without such permits.

C. Valid for use by Eric Schroder.

C.1. Unnamed assistants may work on permitted activities only under the direct and on-site supervision of Eric Schroder. "On-site supervision" is defined as having the Permittee at a distance close enough to enable immediate assistance to a supervised individual, as needed, while the supervised individual conducts an authorized activity. **Permittee must remain present at each mist-net site while it is being operated.**

D. Acceptance of this permit serves as evidence that the Permittee understands and agrees to abide by the terms of this permit and all sections of Title 50 Code of Federal Regulations (CFR), Parts 13 and 17, pertinent to issued permits (https://www.ecfr.gov/current/title-50/chapter-I/subchapter-B/part-13 and https://www.ecfr.gov/current/title-50/part-17 (https://www.ecfr.gov/current/title-50/part-17)). Section 11 of the Endangered Species Act of 1973, as amended, provides for civil and criminal penalties for failure to comply with permit conditions.

A request for permit renewal and the $100 application processing fee must be received **at least 30 days prior to the expiration date** of this permit to continue conducting authorized activities under the expired permit while your application is being processed (subject to compliance with 50 CFR, Parts 13.21 and 13.22). Please use https://fwsepermits.servicenowservices.com/fws to obtain specific information regarding the new ePermitting process to apply for and submit your digital recovery permit application and application processing fee. When these requirements are not met, this permit becomes invalid on the expiration date. *Unless otherwise instructed within the Authorizations and Conditions*, **annual reports** are due by January 31 following each year your permit is in effect and shall be submitted to all offices identified in the permit Conditions.

E. Permittee is authorized to take (capture with mist nets, handle, identify, radio-tag, band, collect non-intrusive measurements, and release) Indiana bat (*Myotis sodalis*), gray bat (*Myotis grisescens*), northern long-eared bat (*Myotis septentrionalis*) and Virginia big-eared bat (*Corynorhinus townsendii virginianus*) for scientific research aimed at recovery of the species including presence/absence surveys, studies to document habitat use, population monitoring, and evaluation of potential impacts. This permit does **not** authorize the collection of voucher specimens.

F. Activities are authorized at the following locations:

F.1. Within the U.S. Fish and Wildlife Service (USFWS) Region 2: Oklahoma, upon receipt of written concurrence from the Field Supervisor, and upon coordination with Ozark Plateau National Wildlife Refuge prior to (1) surveys of caves known to be used by federally-listed bats, and (2) examinations of caves suspected of containing federally-listed bat species (some presence/absence surveys may require the presence of a U.S. Fish and Wildlife Service Biologist), and as outlined in Condition G.

F.2. Within the USFWS Region 3: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio and Wisconsin, upon receipt of written concurrence from the Field Supervisor, as outlined in Condition G.

F.3. Within the USFWS Region 4: Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina and Tennessee, upon receipt of written concurrence from the Field Supervisor, as outlined in Condition G.

F.4. Within the USFWS Region 5: Connecticut, Delaware, District of Columbia, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia and West Virginia, upon receipt of written concurrence from the Field Supervisor, as outlined in Condition G.

F.5. Within the USFWS Region 6: Kansas, Montana, Nebraska, North Dakota, South Dakota, and Wyoming, upon receipt of written concurrence from the Field Supervisor, as outlined in Condition G.

G. Permittee shall notify and request approval from the USFWS Field Supervisor for the state in which activities are proposed to occur at least 15 days prior to conducting any activities. Contact information is available at: https://www.fws.gov/media/region-3-recovery-permit-contact-information. Your request for this site-specific approval must be in writing and must indicate:

G.1. Species for which proposed activities are being conducted.

G.2. Location of proposed activities, including project site, county, and state.

G.3. A complete description of activities (i.e., proposed project plan, including purpose and need, surveys, methods, etc.).

G.4. Dates when the project is proposed to take place.

G.5. Evidence that Permittee has received any required contracts to complete the activities.

G.6. Whether all annual reporting requirements have been fulfilled.

You may proceed with only the activities described in your written concurrence letter, upon receipt from the applicable USFWS Field Supervisor. ***Your concurrence letter must be carried with this permit to authorize site-specific activities.***

H. Permittee shall adhere to the following conditions involving capture and handling of bats:

H.1. Bats may be captured with mist nets following the protocol included in the Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines. Guidelines are available at: https://fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines. Note: Permittee must use the most up-to-date version of the Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines, available on the USFWS website page, for your summer surveys. The monitoring interval for mist nets is +/- 10 minutes and may not exceed 15 minutes. Captured bats may be held for a maximum of 30 minutes, unless injured. In extenuating circumstances, bats shall be held for no longer than 45 minutes.

H.2. Permittee shall carry out non-intrusive measurements on all captured bats. Data shall be recorded for all bats captured and include, but not be limited to, the data requested in any automated or species-specific data sheet provided by the USFWS (e.g., Bat Reporting Spreadsheet). Handling should be limited to the maximum extent practicable and should cease immediately at signs of undue stress (e.g., bat becoming unresponsive, etc.). Bats that appear stressed from handling should be placed in a dark, quiet location away from activity where it can safely fly away after recovery, and should be checked to ensure successful recovery before leaving the study site. Photographs of the identifying characteristics for each individual federally-listed species captured are encouraged. The Permittee may be requested to provide individual photographs after submittal of annual reporting data.

H.4. Lipped metal bands having a unique identifier may be applied to the forearm of captured bats prior to release. No more than one band per bat may be used. Bands should be applied to the forearm of captured bats prior to release. Position the band on the wing so that when the bat is hanging upside down, the band numbers are right-side up. A single band should be placed on the right forearm of each male and the left forearm of each female bat.

H.5. Radio transmitters may be applied during spring, summer, and fall roosting and migration periods via nontoxic skin bond adhesive. The total weight of the transmitter may not exceed 5% of the bat's body weight and the total weight of the package (forearm band, transmitter and adhesive) may not exceed 6% of the bat's body weight. The lightest package (both transmitter and adhesive) capable of accomplishing the required task should be used, especially with pregnant females and newly volant juveniles. Bats carrying transmitters must be monitored daily for at least three days, or until the transmitter falls off, whichever occurs first.

H.6. No trapping activities shall occur within 20 meters of a known Indiana bat maternity roost site, either natural or artificial roosts, unless Permittee receives prior written approval from the USFWS Field Supervisor for the state in which the activities are proposed to occur.

H.7. Equipment used to capture and handle bats shall be cleaned and decontaminated, including personal gear such as boots and gloves, using products cited in decontamination guidelines and in compliance with label directions. The most recent decontamination guidance is found on the web at: https://www.whitenosesyndrome.org/topics/decontamination.

H.8. You shall immediately remove Virginia big-eared bats (VABB) from the net/trap after capture, then process and release each individual. When there are multiple bats in the net, VABB shall be removed first and processed as quickly as possible. If this is not possible, the species shall be placed into a **HOLDING CAGE** and held no longer than 10 minutes. Place the cage in a dark, quiet location, and process all as soon as possible. **Do not put these bat species in holding bags, nor in an individual holding bag or container** (VABB are highly social and being held individually in a bag increases stress and can lead to mortality). Holding cage options include small rubber/plastic/vinyl coated soft-sided (mesh) pet carriers or modified standard minnow traps with rubber coated mesh where the top of the trap is either a plastic bucket or flower pot with a hole in the center (contact the VABB Lead Recovery Biologist for further information on acceptable enclosures -- see Condition P for contact information). A holding cage shall contain only multiple VABBs. Do not place other species/subspecies in either cage(s). Holding cages shall be decontaminated using the most current White-nose Syndrome decontamination guidance after a night of use (https://www.whitenosesyndrome.org/topics/decontamination). Do not decontaminate holding cages within a single net night.

When an VABB appear to be going into shock (i.e., becomes limp and unresponsive), place the bat in a dark, quiet location either on a rock or other flat surface considered the safest option for the bat in that situation to recover (removed from capture activities and predators) and monitor it periodically. **Do not continue to handle the bat, nor place it in a holding cage or in a holding cage with other VABBs**. If the stressed bat recovers, release it immediately without an attempt to gather additional data, collect samples, apply a band or a transmitter, etc.

H.9. Permittee is not authorized to take Ozark big-eared bats (*Corynorhinus townsendii ingens*). The USFWS acknowledges that incidental (unintentional) capture of this co-occurring listed bat species may potentially occur while conducting lawful survey activities directed at authorized bat species. This permit does not authorize any activities for the specific purpose of capture of Ozark big-eared bat. Permittee shall be observant and cautious to eliminate or minimize “take” of co-occurring listed species to the maximum extent practicable. In the event of incidental (unintentional) capture of Ozark big-eared bat, Permittee shall immediately remove the bat(s) from the net/trap after

capture, document with a photograph and release at the capture site. Do not put these bat species in holding cages, bags, or containers. Within 48 hours, you must notify the USFWS in the state in which you are working of the incidental capture (see https://www.fws.gov/media/region-3-recovery-permit-contact-information).

H.10. When carrying out mist-netting and handling of bats under this permit, Permittee must use COVID-specific Personal Protective Equipment (PPE) in addition to the PPE already identified by the USFWS and states for mitigating the risk of spread of the fungus that causes white-nose syndrome, which includes the use of disposable gloves, disposable or site-dedicated clothing, and adherence to decontamination procedures. COVID-specific PPE is a non-vented N95 respirator (no exhalation valve) or any respirator or mask that provides a similar level of protection filtering exhaled air (https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/respsource1quest3.html#half).

I. Upon determination that endangered or threatened bats are present at previously undocumented sites, Permittee shall notify the following within 48 hours: the USFWS Regional Recovery Permit Coordinator, the Species Recovery Lead (See below), and the USFWS Field Office within the geographic location of study areas at https://www.fws.gov/media/region-3-recovery-permit-contact-information

J. Accidental injury or mortality may not exceed two (2) specimens. In the event that any accidental injury or mortality occurs, all activities must cease. The Permittee must report any bat mortality or serious injury within 24 hours to the applicable USFWS Field Office in the state in which the incident occurred (contact information provided at: https://www.fws.gov/media/region-3-recovery-permit-contact-information. Written notification must also be made within 48 hours to the Minnesota office Regional Recovery Permit Coordinator and the Species Recovery Lead (See below). The Permittee's statement must document the cause of the injury or mortality, and identify all remedial measures employed by the Permittee to eliminate future mortality or injury events. Based on consultation between the USFWS offices, decisions will be made regarding remedial measures that will be implemented and whether and/or when any of the authorized activities may continue. The Species Recovery Lead Office will provide a decision within five (5) business days concerning the disposition of any injured or dead specimen. Dead or moribund bats may be retained for further study only with the written permission of the USFWS. Any bats that are not authorized for retention are to be chilled and promptly transferred to the USFWS Species Recovery Lead for potential necropsy and/or contaminants analysis. Permitted activities may resume upon receipt of written approval from the Species Recovery Lead Office.

K. This permit is non-transferable.

L. Permittee must carry a copy of this permit at all times when conducting the authorized activities. Shipments of collected biological materials should also be accompanied by a copy of this permit. Note that this permit is limited to the above activities and identified species.

M. Issuance of this permit does not constitute permission to conduct these activities on National Wildlife Refuges or any other public or private lands; such permission must be obtained separately from the appropriate landowner or land manager before beginning these authorized activities. This permit, neither directly nor by implication, grants the right of trespass.

N. Upon locating a dead, injured, or sick federally listed species, under circumstances not addressed in this authorization, initial notification must be made immediately to the USFWS Field Office in the State in which the specimen is found at https://www.fws.gov/media/region-3-recovery-permit-contact-information (https://www.fws.gov/media/region-3-recovery-permit-contact-information). Notification should also be made by the next business day to the USFWS' Regional Minnesota Office Recovery Permit Coordinator identified below. Those offices will confer with the USFWS' Division of Law Enforcement as appropriate and determine next steps. Care should be taken in handling sick, injured, or dead specimens to ensure effective treatment or to preserve biological materials for later analysis. In conjunction with the care of sick or injured endangered or threatened species, and the preservation of biological materials from a dead individual, the finder should take responsible steps to ensure that the site is not unnecessarily disturbed.

O. An Annual Report of all activities conducted under the authority of this permit is due by January 31 following **each year** this permit is in effect. When assisting with netting, the permit number of the individual responsible for each capture should be recorded on the data collection form. Reports shall be sent electronically and your transmittal email must cite your Federal permit number, Permittee name, and the Annual Report year in the subject line (***Note: thumb drives/flash drives and links to documents cannot be accepted***). In addition, copies of all publications and reports resulting from work conducted under this permit must be submitted as they become available. Failure to furnish any reports required by this permit is cause for permit revocation and/or denial of future permit applications. At a minimum, your report shall include:

O.1. The "Bat Reporting Spreadsheet" is required for reporting data and can be found on the FWS website (https://fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines). Prior to reporting, check the permits website to ensure you are using the most up to date form. Using the reporting form will help standardize data collection and increase efficiency in reporting.

O.2. The date, time, geographic locations (including datum and projection information), species, age, sex, and weight of all bats encountered.

O.3. A description of locations surveyed where no bats were encountered.

O.4. Band numbers of all bats banded.

O.5. Information on any injuries and/or mortalities and disposition of specimens.

O.6. Location and characteristics of roost trees and bat colonies.

O.7. Copies of any separate reports and/or publications resulting from work conducted under the authority of this permit.

O.8. A completed data collection sheet as found in the Survey Guidelines, cited in Condition H.1.

O.9. Data shall be submitted for all bats captured and include, but not be limited to, the data requested in any automated or species-specific data sheet provided by the USFWS (e.g., the reporting spreadsheets found on the current Range-wide Indiana Bat Summer Survey Guidelines website cited in Condition H.1. or other species-specific data sheets). Photographs of the identifying characteristics for each individual federally listed species captured are encouraged. The Permittee may be requested to provide individual photographs after submittal of annual reporting data.

O.10. Copies of all site-specific authorization letters required under Condition G.

IF NO ACTIVITIES OCCURRED OVER THE COURSE OF THE YEAR, INDICATION OF SUCH SHALL BE SUBMITTED AS AN ANNUAL REPORT.

P. Copies of your reports shall be sent to **all offices** indicated below**.** Your transmittal letter (or email) must cite your Federal permit number, Permittee name, and the Annual Report year in the subject line. Electronic copies shall be submitted in MS Word, Portable Document Format, Rich Text Format, or other file format that is compatible with the receiving office (**thumb drives/flash drives and links to documents cannot be accepted**).

P.1. Regional Recovery Permits Coordinator
U.S. Fish and Wildlife Service – Midwest Region (Region 3)
Ecological Services – Endangered Species
5600 American Blvd. W., Suite 990
Bloomington, Minnesota 55437-1458
(612/713-5343; fax 612/713-5292)
permitsR3ES@fws.gov

P.2. Regional Recovery Permits Coordinator
U.S. Fish and Wildlife Service – Southwest Region (Region 2)
Endangered Species Permits Office
P.O. Box 1306
Albuquerque, New Mexico 87103-1306
(505/248-6420; fax 505/248-6788)

permitsR2ES@fws.gov

P.3. Regional Recovery Permits Coordinator
U.S. Fish and Wildlife Service – Southeast Region (Region 4)
Endangered Species Permits Office
1875 Century Blvd.
Atlanta, Georgia 30345-3301
(404/679-7097; fax 404/679-7081)
permitsR4ES@fws.gov

P.4. Regional Recovery Permits Coordinator
U.S. Fish and Wildlife Service – Northeast Region (Region 5)
Endangered Species Division
300 Westgate Center Drive
Hadley, Massachusetts 01035-9589
(413/253-8212; fax 413/253-8482)
permitsR5ES@fws.gov

P.5. ESA Assistant Recovery Coordinator & Permits Coordinator
U.S. Fish and Wildlife Service – Mountain-Prairie Region (Region 6)
Endangered Species Permits Office
Denver Federal Center, P.O. Box 25486
Denver, Colorado 80225-0489
(303/236-4224; fax 303/236-0027)
permitsR6ES@fws.gov

P.6. Keith Lott
U.S. Fish and Wildlife Service Ohio Field Office
4625 Morse Road, Suite 104 Columbus, Ohio 43230
(614/416-8993; fax 614/416-8994)
Keith_Lott@fws.gov

Additionally, based on species, reports and publications shall be submitted to the following:

P.7. ***For studies involving gray bat:***
Vona Kuczynska

U.S. Fish and Wildlife Service
Missouri Field Office
101 Park DeVille Drive, Suite A
Columbia, Missouri 65203-0007
(573/234-2132; fax 573/234-2181)

P.8. ***For studies involving Indiana bat:***

Lori Pruitt
U.S. Fish and Wildlife Service
Indiana Field Office
620 S. Walker Street
Bloomington, Indiana 47403-2121
(812/334-4261; fax 812/334-4273)

P.9. ***For studies involving northern long-eared bat:***

Jill Utrup
U.S. Fish and Wildlife Service
Minnesota-Wisconsin Field Office
4101 American Blvd. E.
Bloomington, Minnesota 55425-1665
(952/252-0092; fax 952/646-2873)

P.10. ***For studies involving Virginia big-eared bat:***

Liz Stout
U.S. Fish and Wildlife Service
West Virginia Field Office
6263 Appalachian Highway
Davis, West Virginia 26260
elizabeth_stout@fws.gov (mailto:elizabeth_stout@fws.gov)
FW5_WVFO@fws.gov (mailto:FW5_WVFO@fws.gov)

P.11. Additionally, based on geographic area, reports and publications shall be submitted to the applicable offices found at https://www.fws.gov/service/3-200-59-scientific-purposes-enhancement-propagation-or-survival-permits-recovery-permits.

cc: FWS/Regional Offices –Region 2, 3, 4, 5 and 6 (Attn: Regional Recovery Permit Coordinator)

FWS, TE Coordinator: Illinois-Iowa, Indiana, Michigan, Minnesota-Wisconsin, Missouri, Ohio

DNR/DOC, TE Coordinator: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin

END

APPENDIX B

LJA ENGINEERING
1110 Market Street, Suite 314, Chattanooga, Tennessee 37402
t 423.720.2743 LJA.com

June 29 2023
Tennessee Wildlife Resources Agency
Ellington Agricultural Center
P.O. BOX 40747
Nashville, Tennessee 37204

Signal Mountain Floral Survey

To whom it may concern,

This report provides the results of a pedestrian floral survey conducted by LJA Engineering, Inc. (LJA) within the proposed limits of disturbance at the Signal Mountain Wastewater Treatment Plant. The assessment process included a literature review of state and federal publications and databases. Pedestrian surveys were conducted on June 28, 2023 and spent a minimum of 4 person-hours in the field evaluating the limits of disturbance.

1.0 GENERAL SITE DESCRIPTION

The subject site is located off Suck Creek Rd, Chattanooga, Tennessee adjacent to the existing Signal Mountain Wastewater Treatment Plant, located in the Appalachian Plateau physiographic province. The subject site consists of approximately 16 acres which includes a mixture of woodland habitat and preexisting development. The proposed area of disturbance at the site covers a total of approximately 4.4 acres (Appendix A). The habitat of the site consists of a mature canopy layer with moderately dense shrub and herbaceous layers over a rocky terrain. The limited area of disturbance, in accordance with the USDA Custom Soil Resource Report for Hamilton County, states that the soil in the area of interest consists of Bouldin-Gilpin complex at 20-60% slopes facing Southwest. Topographically, the site is sloping with natural and artificial elevations ranging from 720 to 815 feet above mean sea level (AMSL). Site photographs are provided in Appendix B.

2.0 THREATENED OR ENDANGERED SPECIES

State and federal agency literature reviews were conducted to identify the potential occurrence of the Large-flowered Skullcap (*Scutellaria montana*), Morefield's Leather Flower (*Clematis morefieldii*), and Small Whorled Pogonia (*Isotria medeoloides*) in the vicinity of the subject site. These reviews included information from the United States Fish & Wildlife Service Information Planning and Consultation (IPaC), Environmental Conservation Online System (ECOS), the Federal Register documents, and species recovery plans. Although Virginia Spiraea (*Spiraea virginiana*) appeared on the site-specific IPaC Resource List generated 12/20/2022 (Appendix C), no preferred habitat for the species (along rivers and streams) was observed within the project area and the species was thus removed from further evaluation.

<u>Large-flowered Skullcap (LFS)</u>

According to the USFWS 1996 recovery plan, LFS is expected to be found in northwestern Georgia and southeastern Tennessee. Typical habitat includes sloped, rocky woodlands which encompass some natural pine, a canopy typically dominated by oaks and hickories, a mostly deciduous shrub layer, moderately dense herbaceous layer (~20-50%) with mesic and xeric species such as *Hexastylis spp*. LFS is not known to compete well with other herbaceous species and is not usually found in thick herbaceous cover.

Morefield's Leather Flower (MFS)

MFS is expected to be found in Alabama, Georgia, and Tennessee. Typical habitat includes rocky limestone forests near seeps or springs. It has been noted that this species does not require a specific habitat, but it is typically found on south and southwest facing mountain slopes at 800 to 1100 ft elevations (USFWS 1994). MFS is found to establish roots in basic clay-loam soils. Often, MFS is found sprawling over boulders and shrubs. Additionally, MFS can be found climbing shrubs or trees in the understory.

Small Whorled Pogonia (SWP)

SWP is a widely distributed species with limited occurrences extending from Georgia up to Maine. SWP typically grows in a variety of upland, mid-successional woodland habitats, usually older hardwood and mixed wood stands of beech, birch, maple, oak, and white pine. This orchid is almost always found in proximity to features that create long-persisting breaks in the forest canopy (streams, logging roads, etc); the tree canopy is relatively open (USFWS 1992). SWP is found to establish in acidic soils with a thick layer of dead leaves and sparse to moderate ground cover. It often occurs on slopes near small streams.

3.0 FIELD RECONNAISSANCE

Qualified natural resource specialists with LJA conducted a field reconnaissance on June 28, 2023, to survey the site to determine the presence of any individuals of the three aforementioned species of interest. The limit of disturbance was divided into subsections based on observed suitable habitat features and the surveyors slowly walked each subsection. Observations of vegetation, both target and associate species, within assigned area were recorded using Esri Field Maps. Survey protocols for the Small Whorled Pogonia from USFWS 2016 were used with a heavy focus on areas not previously cleared or disturbed. After completing the pedestrian survey, it was determined that no species of interest were present; however, associate species Wild Yam (*Dioscorea quaternata*) and Little Brown Jugs (*Hexastylis arifolia*) were present. Other representative herb stratum plants include Heart-leafed skullcap (*Scutellaria ovata*), American Lopseed (*Phyrma leptostachya*), Naked-flowered tick-trefoil (*Hylodesmum nudiflorum*), Trillium (*Trillium spp.*), and Carolina Ruellia (*Ruellia caroliniensis*). Representative tree stratum included Hickory *(Carya spp*), Maple (*Acer spp.*) and Oak (*Quercus spp.*) species.

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t 423.720.2743 LJA.com

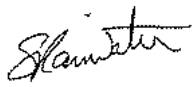
4.0 SIGNATURE OF ENVIRONMENTAL PROFESSIONAL

LJA has performed a site-specific rare plant survey on the subject site and found no evidence of occurrence of the Large-flowered skullcap, Morefield's leather flower or the small whorled pogonia. LJA evaluated the subject site to the extent that was reasonably possible within the scope of work.

If you have any questions, please feel free to contact us.

Sincerely,

For LJA Engineering



Stephanie Rainwater

Project Manager/USFWS Permitted Biologist (TE-00284A)

918-219-9951

srainwater@lja.com

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APPENDIX A: AREA MAP

Figure 1: Map of the area of interest

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APPENDIX B: SITE AND OBSERVATION PHOTOS

Figure 2: Area Photo - facing Southwest

Figure 3: Area Photo - facing Southwest

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Figure 4: Area Photo - facing Southwest

Figure 6: Diascorea villosa (Wild Yam)

Figure 5: Hexastylis arifolia (Little Brown Jugs)

Figure 7: Scutellaria ovata (Heart-leafed Skullcap)

Figure 8: Hylodesmum nudiflorum (Naked-flowered tick-trefoil)

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APPENDIX C: IPaC RESOURCE LIST

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

Hamilton County, Tennessee

Local office

Tennessee Ecological Services Field Office

(931) 528-6481
(931) 528-7075

446 Neal Street

Cookeville, TN 38501-4027

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

NOT FOR CONSULTATION

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Gray Bat *Myotis grisescens* Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat *Myotis sodalis* Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat *Myotis septentrionalis* Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Clams

NAME	STATUS
Cumberland Monkeyface (pearlymussel) *Theliderma intermedia* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6999	EXPN
Dromedary Pearlymussel *Dromus dromas* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6377	Endangered

NOT FOR CONSULTATION

Orangefoot Pimpleback (pearlymussel) Plethobasus cooperianus — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/1132

Pink Mucket (pearlymussel) Lampsilis abrupta — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/7829

Rough Pigtoe Pleurobema plenum — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/6894

Tubercled Blossom (pearlymussel) Epioblasma torulosa torulosa — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4126

Insects

NAME	STATUS

Monarch Butterfly Danaus plexippus — Candidate
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/9743

Flowering Plants

NAME	STATUS

Large-flowered Skullcap Scutellaria montana — Threatened
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4721

Morefield''s Leather Flower Clematis morefieldii — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/133

NOT FOR CONSULTATION

Small Whorled Pogonia Isotria medeoloides — Threatened

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/1890

Virginia Spiraea Spiraea virginiana — Threatened

Wherever found

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/1728

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

NOT FOR CONSULTATION

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how

this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NOT FOR CONSULTATION

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Sep 1 to Aug 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Cerulean Warbler *Dendroica cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 27 to Jul 20
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20

Golden-winged Warbler Vermivora chrysoptera — Breeds May 1 to Jul 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8745

Kentucky Warbler Oporornis formosus — Breeds Apr 20 to Aug 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Prairie Warbler Dendroica discolor — Breeds May 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Prothonotary Warbler Protonotaria citrea — Breeds Apr 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Red-headed Woodpecker Melanerpes erythrocephalus — Breeds May 10 to Sep 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Wood Thrush Hylocichla mustelina — Breeds May 10 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

NOT FOR CONSULTATION

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

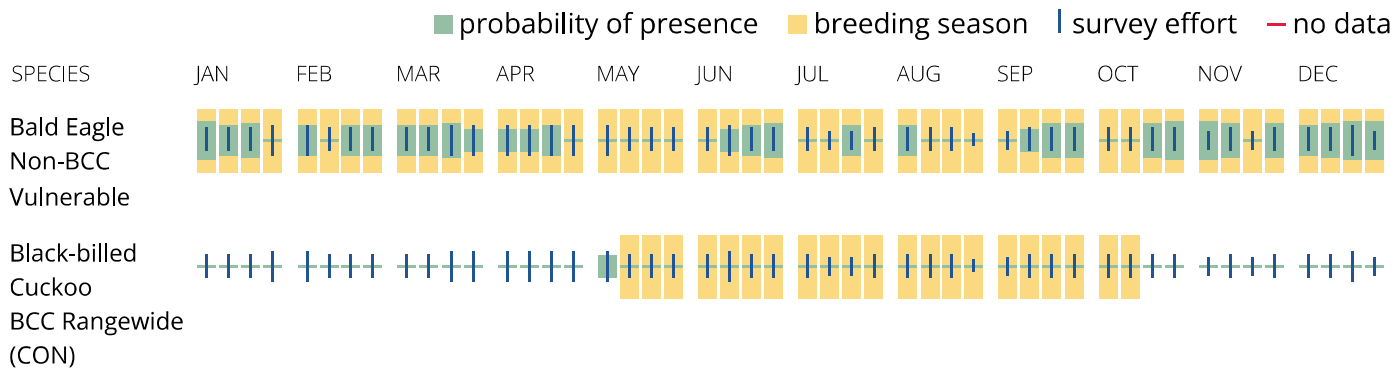
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

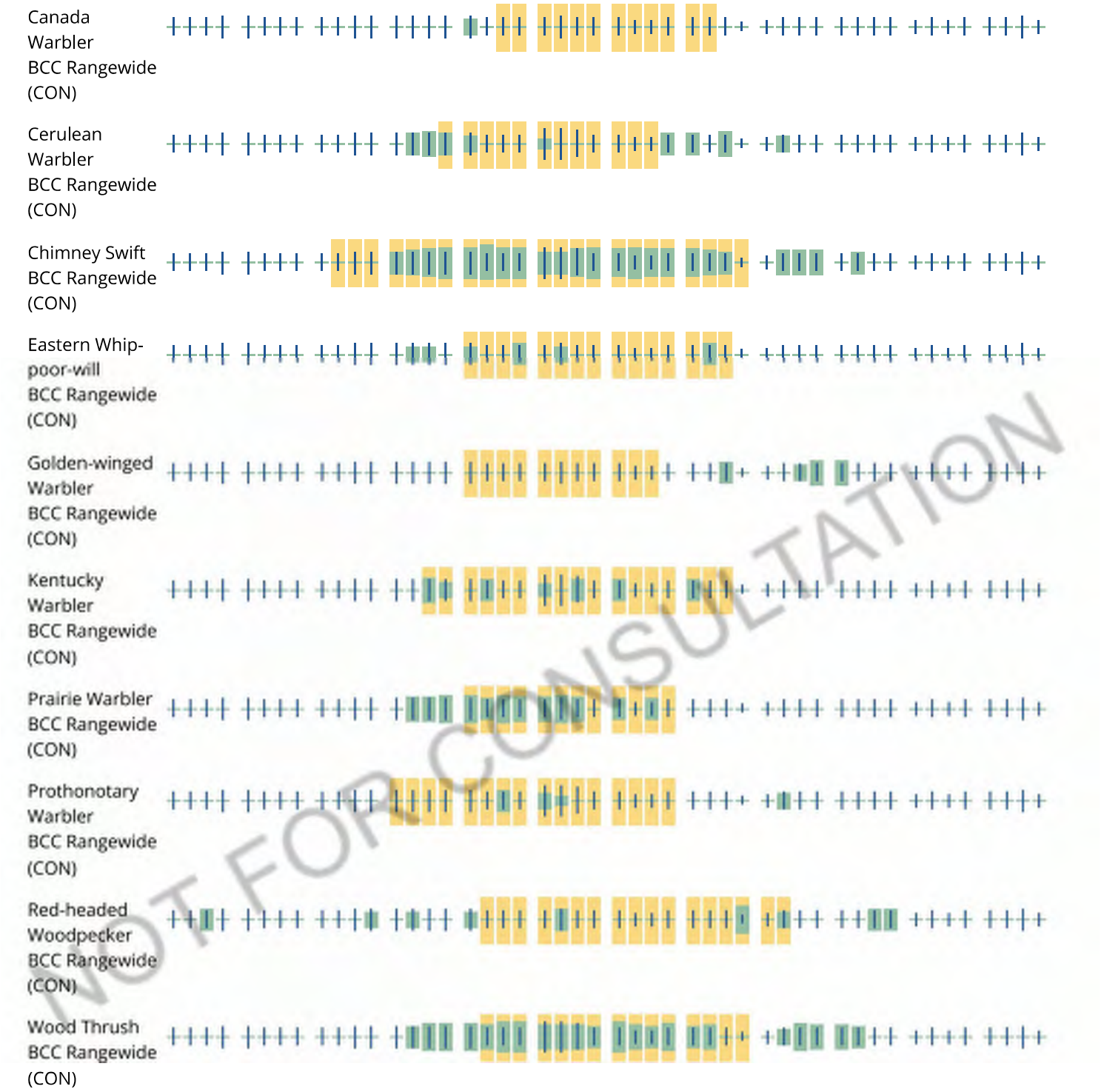
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

NOT FOR CONSULTATION





NOT FOR CONSULTATION

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

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Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

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Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

This location did not intersect any wetlands mapped by NWI.

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NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

References

NatureServe. 2023. *Isotria meleoides* comprehensive report. NatureServe Explorer. Arlington, Virginia.

USDA Custom Soil Resource Report for Hamilton County, Tennessee. <https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>. Accessed June 28, 2023

US Fish and Wildlife Service (USFWS). 1992. Small Whorled Pogonia (*Isotria medeloides*) Recovery Plan, First Revision. Newton Corner, Massachusetts.

US Fish and Wildlife Service (USFWS). 1994. Recovery Plan for Morefield's leather flower (*Clematis morefieldii*). Atlanta, Georgia. 7pp.

US Fish and Wildlife Service (USFWS). 1996. Large-flowered Skullcap (*Scutellaria montana*) Recovery Plan. Asheville, North Carolina. 9pp

US Fish and Wildlife Service (USFWS). 2016. Small Whorled Pogonia Survey Protocol for Maine. East Orland, Maine. < https://www.fws.gov/media/small-whorled-pogonia-survey-protocol-maine>. Accessed June 27, 2023

APPENDIX C

July 27, 2022

LJA Engineering Inc.
1110 Market Street, Suite 300
Chattanooga, Tennessee 37402

Attn: Mr. Scott McDonald
P: 423-779-7439
E: smcdonald@lja.com

Re: Supplemental Exploration and Shear Strength Testing
Suck Creek WWTP Expansion
1701 Suck Creek Road
Chattanooga, Hamilton County, Tennessee
Terracon Project No. E2215040

Dear Mr. McDonald:

Terracon has performed supplemental site exploration and related laboratory soil testing for the above referenced project. This report is to be used in conjunction with Terracon's Geotechnical Engineering Report dated September 3, 2021 and was performed in general accordance with our Master Services Agreement dated March 5, 2018 and Task Order dated May 11, 2022.

1.0 PROJECT INFORMATION

Expansion of the Suck Creek WWTP has resulted in acquisition of additional property south and east of the existing facility. A two-lane road will be constructed to provide access to the southern end of the existing WWTP. LJA requested that Terracon explore the proposed roadway alignment with 6 borings, which have been designated B-101 through B-106.

As marked in the field, the borings were spaced approximately 90 feet to 160 feet apart along the existing trail that approximates the proposed roadway alignment. The relative position of soil borings is provided on the Exploration Plan.

In addition to Standard Penetration Test (SPT) sampling, thin-wall tube sampling was attempted, but the colluvial soil included rock fragments that impeded the sampling process, and only one usable sample was obtained, from B-102 between 6 and 8 feet below ground level. Laboratory testing was performed on this sample to provide shear strength parameters to be used in design of the retaining walls which are anticipated to be necessary at the southern end of the proposed roadway.

A summary of drilled depth follows:

Boring Location	Surface Elevation (ft)[1]	Completion Depth (ft)	Comments
B-101	670	12	Auger refusal
B-102	589	18.5	Auger refusal
B-103	707	20	Boring terminated, no auger refusal
B-104	713	21	Auger refusal
B-105	715	31	Auger refusal
B-106	708	12	Auger refusal

1. Elevations based on LJA Sheet Number ALT-C "Preliminary Layout, Alternative C – Two-Way Road with Retaining Wall" dated 05/09/2022.

During drilling and after completion of borings, boreholes were observed for groundwater, with no water observed during or after drilling and sampling. Long-term observation of boreholes for water levels was not performed. For safety reasons, boreholes were backfilled with drill cuttings. Based on previous exploration results, groundwater was not expected.

2.0 LABORATORY TESTING

Laboratory testing of soil recovered during SPT sampling included water content on all samples and Atterberg limits (plasticity) and grain-size distribution testing of selected samples.

Results are included on the boring logs, and detailed results of grain size analysis are included as an attachment. These results indicate the soils are lean and fat clays with variable gravel and sand content.

Thin-wall tube samples were utilized to perform a consolidated undrained (CU) triaxial shear test and a series of direct shear tests. Summarized results follow:

	Total Unit Weight (pcf)	Total Stress (Drained) Shear Strength Parameters	
		c, psf[2]	ϕ, degrees
Direct Shear	130	573	26.3

	Total Unit Weight (pcf)	Shear Strength Parameters	
		psf[2]	degrees
CU Triaxial (total stress)	132	c = 491	ϕ = 15.6
CU Triaxial (effective stress)	132	c' = 222	ϕ' = 31.2

Complete results of these laboratory tests are attached.

3.0 GEOTECHNICAL DESIGN PARAMETERS

Based on available laboratory test data performed for this project, our experience with similar soils, and drained shear strength correlations in the published literature[1,2], we developed the following geotechnical design parameters for use in the analysis.

Material Type	Total Unit Weight (pcf)	Effective Stress (Drained) Shear Strength Parameters	
		c′, psf[2]	ϕ′, degrees
Reinforced Zone[1]	125	0	34
Retained Zone	132	0	30
Foundation Zone	132	0	30

These parameters are based on the assumption that the reinforced zone will consist of free-draining crushed stone. Soils in the retained zone and foundation zone may be modeled with the parameters tabulated above, which are based on shear strength test results, and have been adjusted to provide conservative parameters for wall design and slope stability analysis.

4.0 MSE WALL CONSTRUCTION CONSIDERATIONS

Subgrade soils exposed following excavation to design wall elevation should be proofrolled in accordance with Tennessee Department of Transportation (TDOT) specifications. Loose or soft

[1] Kulhawy, F. H., & Mayne, P. W. (1990). *Manual on Estimating Soil Properties for Foundation Design, Final Report EL-6800.* Cornell University, Ithaca, New York. Palo Alto, CA: EPRI.
[2] Stark, T.D., Choi, H., & McCone, S. (2005). Drained Shear Strength Parameters for Analysis of Landslides. J. Geotech. Geoenviron. Eng., 131 (5), 575-588.

soils encountered during proofrolling should be removed, moisture conditioned, and compacted, or replaced with suitable embankment fill or granular material prior to constructing the retaining wall's reinforced zone.

Reinforcing for the MSE wall should have a minimum length to wall height (Lr : Hd) ratio of 70%, or 8 feet, whichever is longer. Backslope drainage, in the form of either manufactured drain panels or a clean, drainable crushed stone chimney should be installed between the excavated face of the retained zone and the reinforced zone. Backslope drainage should be collected at the base of the drain and discharged beyond the limits of the wall footprint.

Terracon should be retained to review the MSE wall designer's shop drawings, plans and calculations for conformance with the recommendations presented in this letter.

5.0 LIMITATIONS

This design memorandum has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. If the scope, location, or geometry of the proposed retaining walls change from that described in this memorandum, we should be consulted to review and update our recommendations

Findings, conclusions, and recommendations resulting from these services are based upon information derived from the on-site activities and other services performed under this scope of work. Subsurface conditions may vary from those encountered at specific locations or during other surveys, tests, assessments investigations or exploratory services; the data, interpretations, findings, and our recommendations are based solely upon data obtained at the time and within the scope of these services.

We appreciate this opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service to you, please contact us.

Sincerely,
Terracon Consultants, Inc.

John Cannon, P.E.
Senior Engineer

Frank Whitman, P.E.
Senior Engineer

Attachments:
Site Location
Exploration Plan

GoeModel
Boring Logs B-101 through B-106
Laboratory Results

ATTACHMENTS

SITE LOCATION

Suck Creek WWTP Expansion ■ Chattanooga, TN
July 27, 2022 ■ Terracon Project No. E2215040

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: .

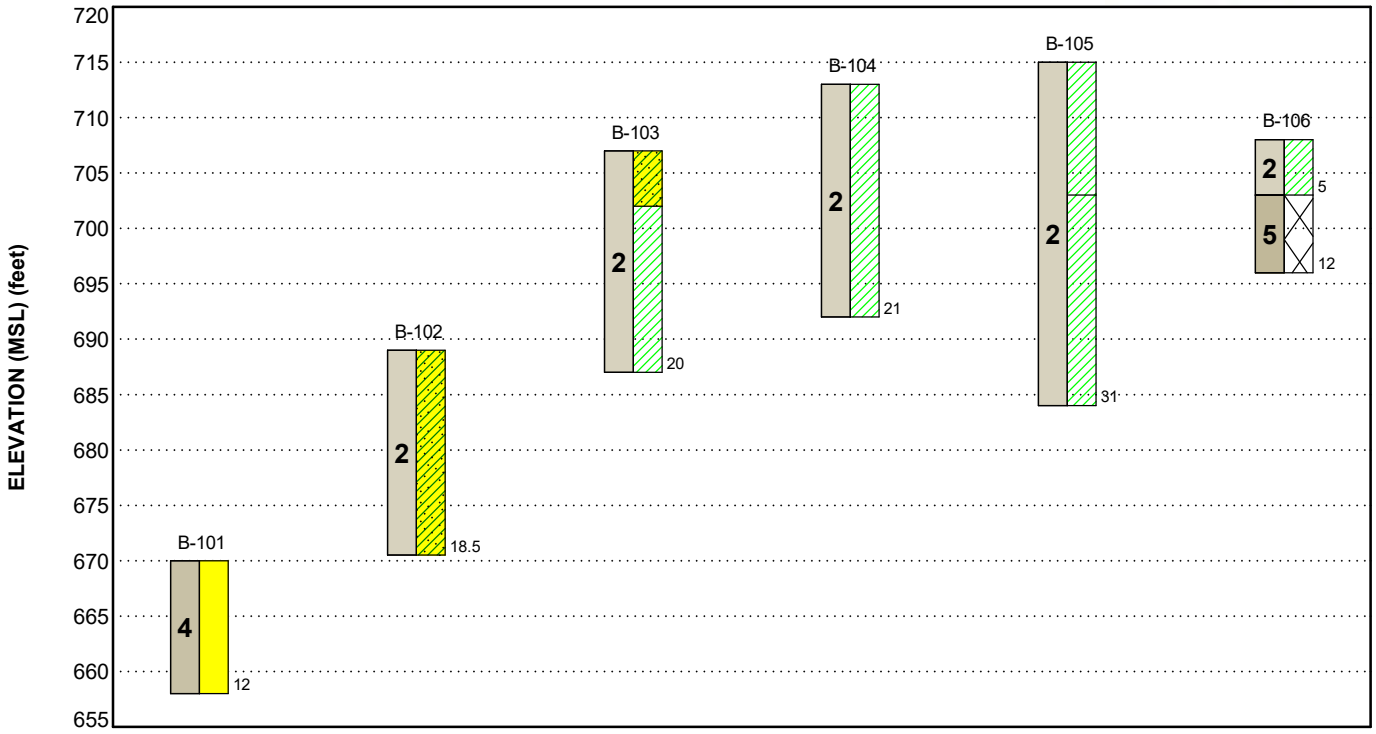
DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

GEOMODEL

Suck Creek WWTP Expansion ■ Chattanooga, TN
Terracon Project No. E2215040

Terracon GeoReport



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	COLLUVIUM	Sandy clay matrix containing sandstone boulders and cobbles
2	Clay	Sandy clay or clay with sand (CL)
3	Silt	Sandy silt (ML)
4	Sand	Silty sand or highly wetared sandstone
5	Sandstone	Sandstone bedrock

LEGEND

- Sand
- Sandy Lean Clay
- Lean Clay
- Weathered Rock

▽ First Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

BORING LOG NO. B-101

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1038° Longitude: -85.3578°

Approximate Surface Elev.: 670 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4			**SAND**, silty, with weathered sandstone fragments, light brown, loose to dense							
						X	2-4-50/3"			
				5		X	5-7-10 N=17	9.6	NP	32
						X	11-14-22 N=36	8.6		
				10		X	9-15-13 N=28	11.1		
		12.0	658+/-							
			Auger Refusal at 12 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-12' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 06-21-2022 | Boring Completed: 06-21-2022

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 7/27/22

BORING LOG NO. B-102

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1041° Longitude: -85.3578°

Approximate Surface Elev.: 689 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2			**SANDY LEAN CLAY (CL)**, red brown, medium stiff							
							1-2-4 N=6	17.7		
							2-2-3 N=5	15.3	30-16-14	63
				5						
							5-3-3 N=6	12.1		
				10						
							4-3-5 N=8	14.5		
				15						
		18.5	670.5+/-							
			Auger Refusal at 18.5 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-18.5' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 06-21-2022 | Boring Completed: 06-21-2022

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 7/27/22

BORING LOG NO. B-103

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1043° Longitude: -85.3581°

Approximate Surface Elev.: 707 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			SANDY LEAN CLAY (CL), red brown, stiff							
						X	3-5-6 N=11	11.9		
						X	3-5-4 N=9	17.0		
		5.0	702+/-	5						
			LEAN CLAY (CL), trace sand, red and yellow, very stiff			X	5-10-10 N=20	19.7	56-26-30	99
						X	5-11-11 N=22	20.3		
2				10						
			blocky, relict structure, stiff			X	3-5-6 N=11	17.3		
				15						
						X	5-7-9 N=16	20.2		
		20.0	687+/-	20						
			Boring Terminated at 20 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-20' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 06-21-2022 | Boring Completed: 06-21-2022

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 7/27/22

BORING LOG NO. B-104

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1047° Longitude: -85.3584°

Approximate Surface Elev.: 713 (Ft.) +/-

DEPTH ELEVATION (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2		0		X	2-4-6 N=10	11.9		
		5		X	7-10-10 N=20	16.4		
				X	5-7-9 N=16	19.9		
		10		X	6-7-10 N=17	15.5		
		15		X	6-9-12 N=21	15.6		
		20		X	2-6-14 N=20	15.2		

LEAN CLAY (CL), sandy, with mineral staining, red brown, stiff to very stiff

with relict structure, yellow brown and gray

21.0 692+/-

Auger Refusal at 21 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-21' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 06-21-2022 Boring Completed: 06-21-2022

Drill Rig: DR009 Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 7/27/22

BORING LOG NO. B-105

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1050° Longitude: -85.3587°

Approximate Surface Elev.: 715 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			LEAN CLAY (CL), sandy, with relict structure, yellow brown, very stiff			X	10-15-9 N=24	7.9		
						X	2-7-10 N=17	18.0		
				5		X	5-7-12 N=19	18.4		
						X	5-7-9 N=16	23.2		
				10						
		12.0	703+/-							
2			**LEAN CLAY (CL)**, (highly weathered shale), dark brown and gray, stiff			X	5-8-8 N=16	20.3		
				15						
						X	5-7-7 N=14	14.0		
				20						
						X	4-8-12 N=20	14.4		
				25						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-31' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 06-21-2022 | Boring Completed: 06-21-2022

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 7/27/22

BORING LOG NO. B-105

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 35.1050° Longitude: -85.3587° Approximate Surface Elev.: 715 (Ft.) +/- DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2		**LEAN CLAY (CL)**, (highly weathered shale), dark brown and gray, stiff *(continued)*							
			30			4-7-15 N=22	15.7		
		31.0 684+/-							
		Auger Refusal at 31 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-31' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 06-21-2022 | Boring Completed: 06-21-2022

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 7/27/22

BORING LOG NO. B-106

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1052° Longitude: -85.3589°

Approximate Surface Elev.: 708 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2			**LEAN CLAY (CL)**, with relict structure, yellow brown and light gray				3-5-7 N=12			
							4-8-11 N=19	16.4		
5		5.0	703+/-	5						
			WEATHERED SANDSTONE, yellow brown, dense				8-31-21 N=52	12.5		
							21-18-16 N=34			
		12.0	696+/-	10						
			Auger Refusal at 12 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-12' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 06-21-2022 | Boring Completed: 06-21-2022

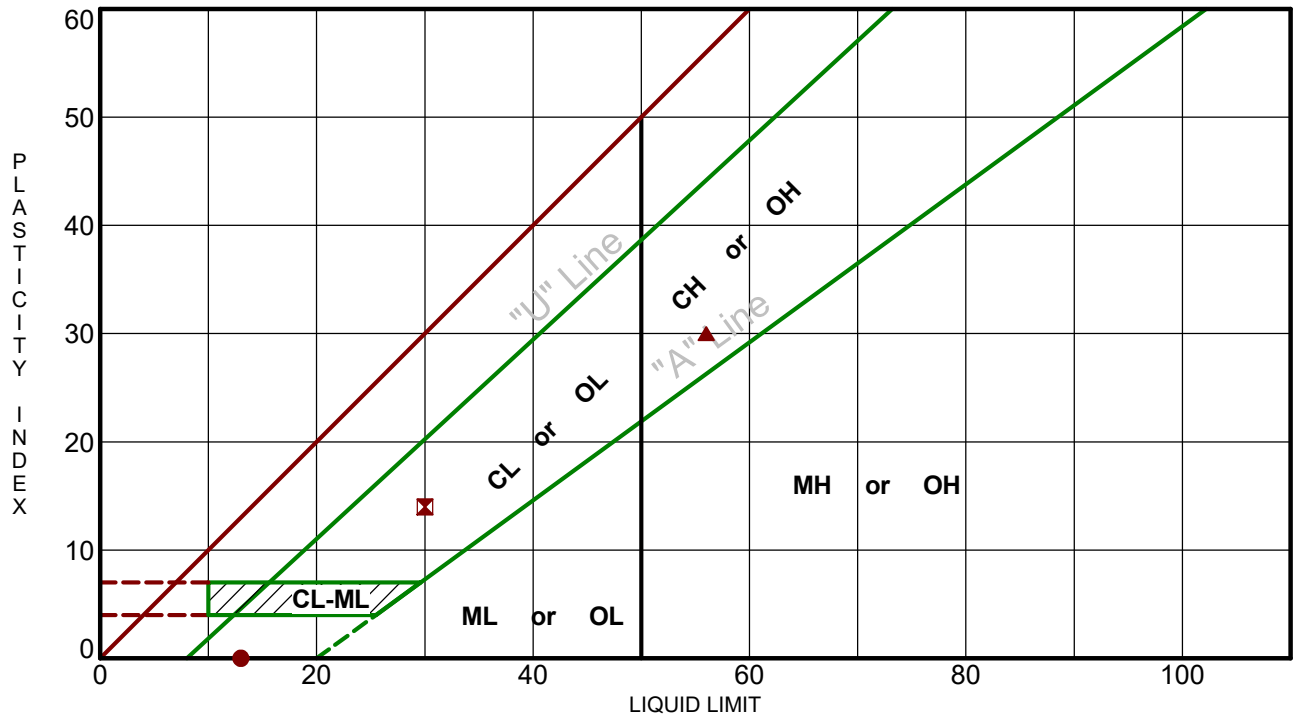
Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 7/27/22

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	B-101	3.5 - 5	13	13	NP	31.9	SM	SILTY SAND with GRAVEL
⊠	B-102	3.5 - 5	30	16	14	62.8	CL	SANDY LEAN CLAY
▲	B-103	6 - 7.5	56	26	30	98.9	CH	FAT CLAY

PROJECT: Suck Creek WWTP Expansion

PROJECT NUMBER: E2215040

SITE: 1701 Suck Creek Road
Chattanooga, TN

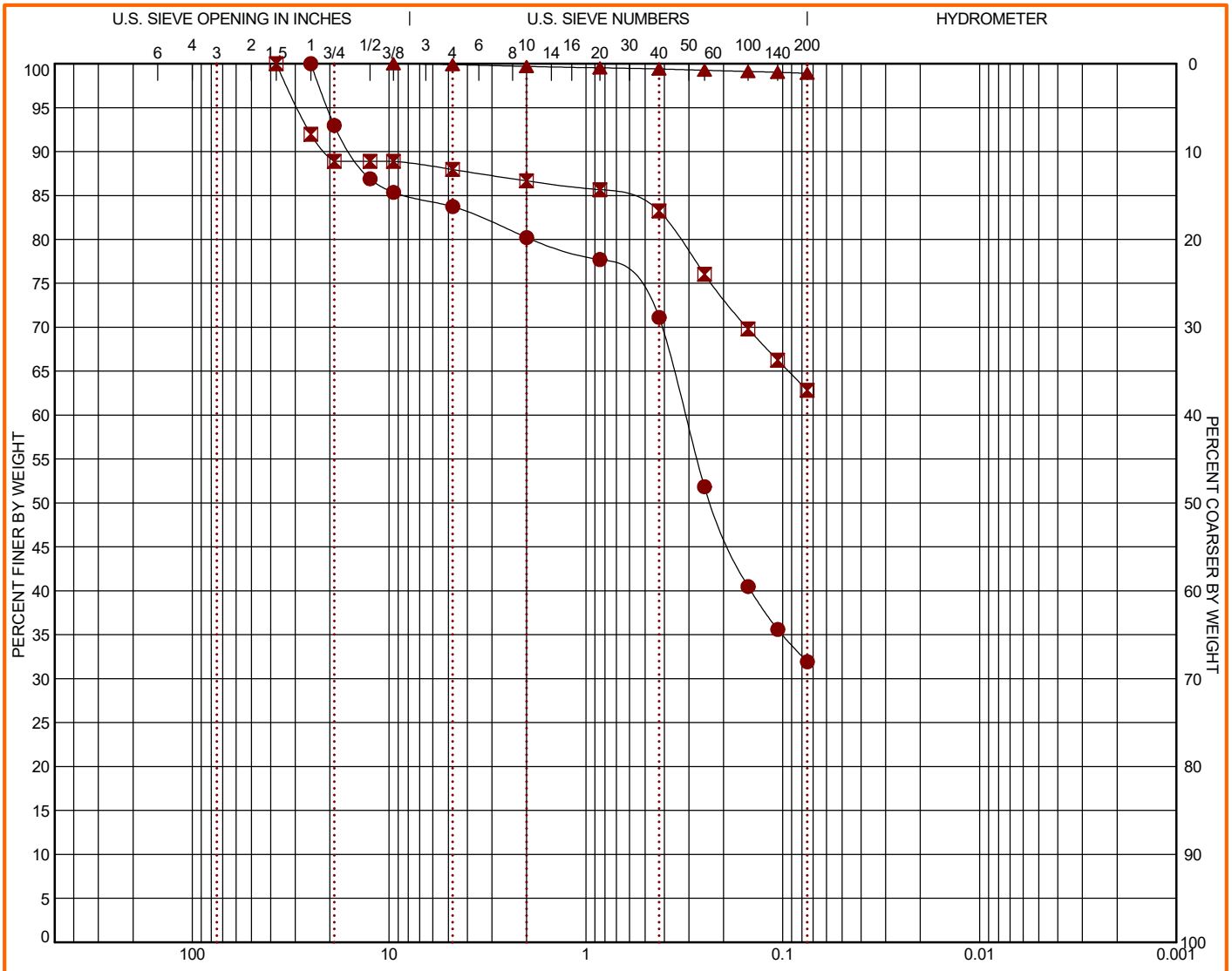
Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

CLIENT: LJA Engineering Inc
Chattanooga, TN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 7/13/22

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-101	3.5 - 5	0.0	16.3	51.8		31.9		SM
⊠	B-102	3.5 - 5	0.0	12.0	25.1		62.8		CL
▲	B-103	6 - 7.5	0.0	0.1	1.0		98.9		CH

GRAIN SIZE	●	⊠	▲
D_{60}	0.313		
D_{30}			
D_{10}			

COEFFICIENTS	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
1"	100.0	1 1/2"	100.0	3/8"	100.0
3/4"	92.97	1"	91.96	#4	99.9
1/2"	86.89	3/4"	88.9	#10	99.69
3/8"	85.35	1/2"	88.9	#20	99.53
#4	83.73	3/8"	88.9	#40	99.4
#10	80.2	#4	87.96	#60	99.25
#20	77.71	#10	86.66	#100	99.11
#40	71.12	#20	85.66	#140	99.02
#60	51.85	#40	83.24	#200	98.9
#100	40.49	#60	76.05		
#140	35.6	#100	69.82		
#200	31.93	#140	66.25		
		#200	62.83		

SOIL DESCRIPTION	
●	SILTY SAND with GRAVEL (SM)
⊠	SANDY LEAN CLAY (CL)
▲	FAT CLAY (CH)

REMARKS	
●	
⊠	
▲	

PROJECT: Suck Creek WWTP Expansion

PROJECT NUMBER: E2215040

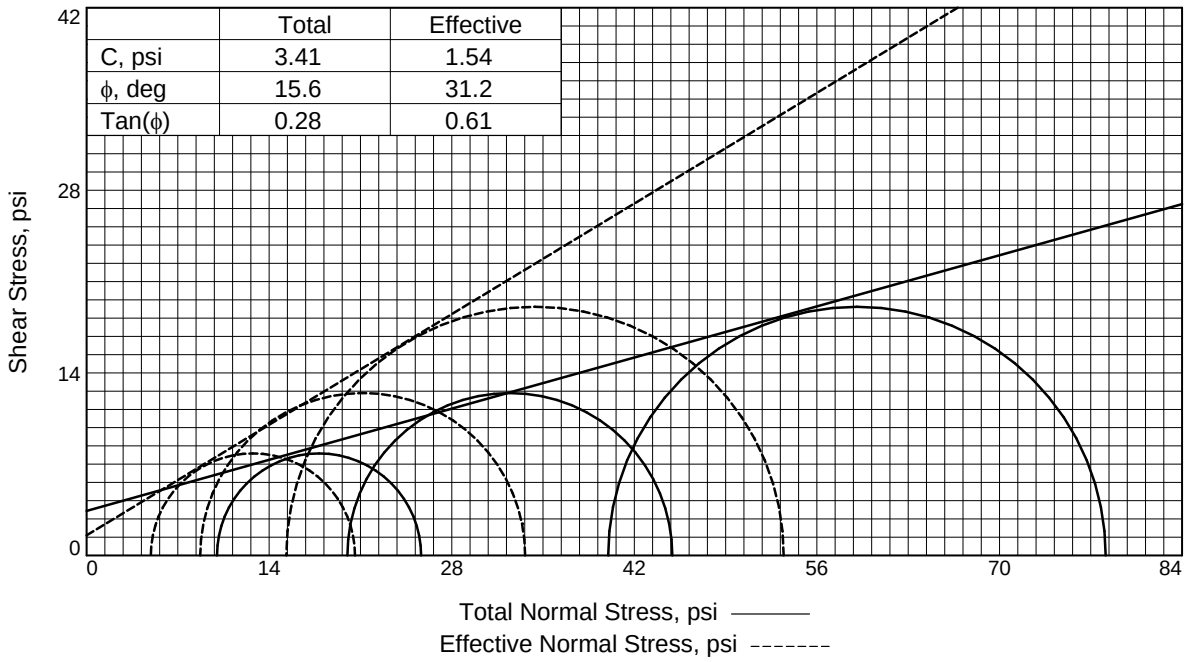
SITE: 1701 Suck Creek Road
Chattanooga, TN

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

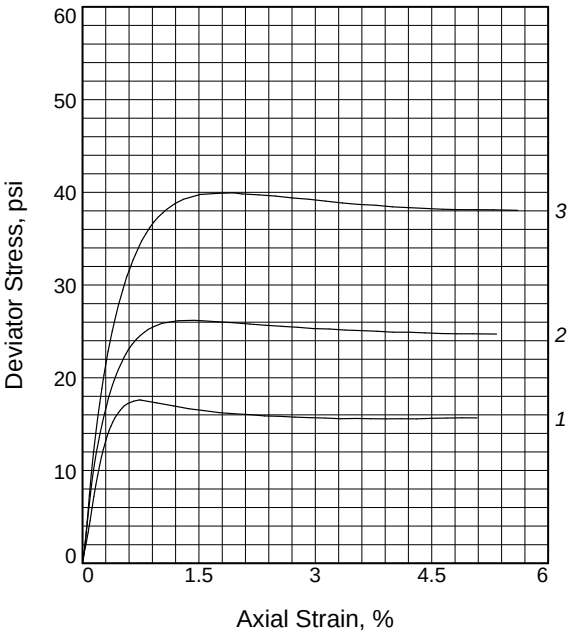
CLIENT: LJA Engineering Inc
Chattanooga, TN

GRAIN SIZE: USCS 1 E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 7/13/22

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT.



	Total	Effective
C, psi	3.41	1.54
ϕ, deg	15.6	31.2
Tan(ϕ)	0.28	0.61



Sample No.		1	2	3
Initial	Water Content, %	17.2	17.2	17.2
	Dry Density, pcf	102.2	102.2	102.2
	Saturation, %	71.3	71.3	71.3
	Void Ratio	0.6491	0.6491	0.6491
	Diameter, in.	2.817	2.817	2.817
	Height, in.	5.773	5.773	5.773
At Test	Water Content, %	22.7	23.4	24.4
	Dry Density, pcf	104.4	103.3	101.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6142	0.6320	0.6576
	Diameter, in.	2.797	2.881	2.977
	Height, in.	5.732	5.461	5.196
Strain rate, in./min.		0.005	0.005	0.005
Back Pressure, psi		50.0	50.0	50.0
Cell Pressure, psi		60.0	70.0	90.0
Fail. Stress, psi		15.7	24.9	38.1
Excess Pore Pr., psi		5.1	11.3	24.7
Ult. Stress, psi		15.7	24.7	38.1
Excess Pore Pr., psi		5.1	11.3	24.7
$\bar{\sigma}_1$ Failure, psi		20.6	33.6	53.5
$\bar{\sigma}_3$ Failure, psi		4.9	8.7	15.3

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description:

Specific Gravity= 2.7

Remarks:

Figure _____

Client: LJA Engineering, Inc.

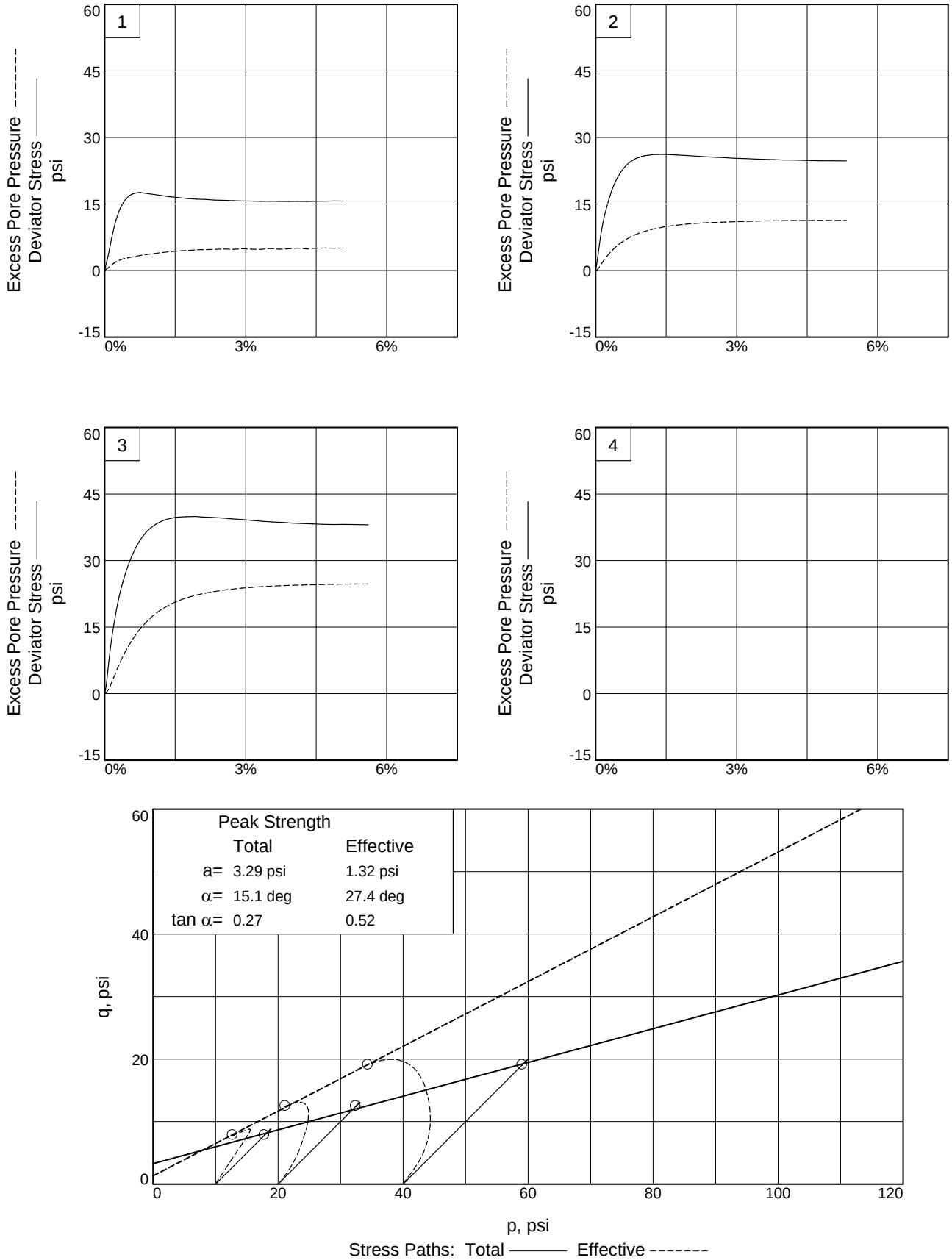
Project: Suck Creek WWTP Expansion

Source of Sample: B-102 **Depth:** 6-8'

Proj. No.: E2215040 **Date Sampled:** 6/21/2022

TRIAXIAL SHEAR TEST REPORT

Terracon Consultants, Inc.
Chattanooga, TN



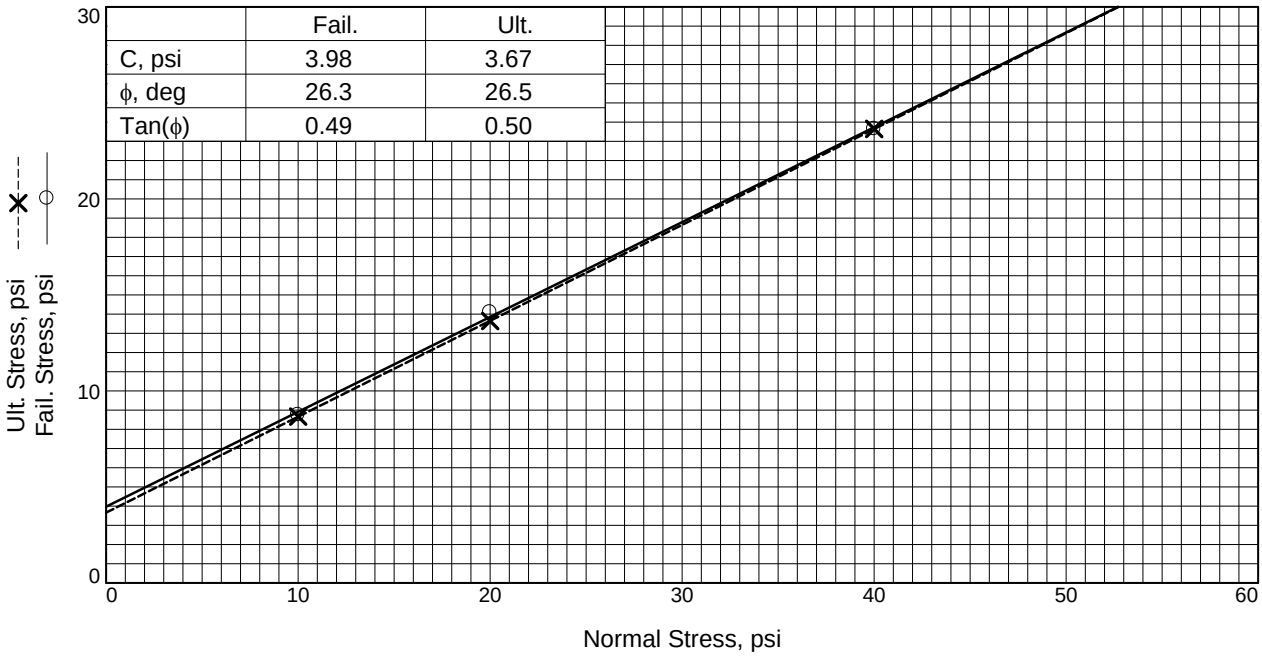
Client: LJA Engineering, Inc.

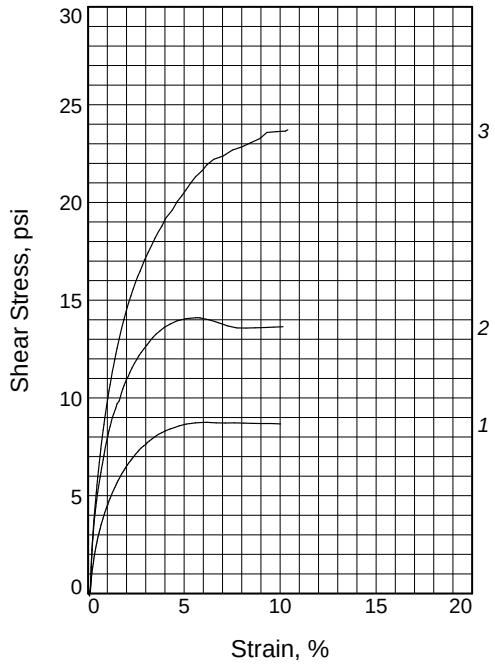
Project: Suck Creek WWTP Expansion

Source of Sample: B-102 **Depth:** 6-8'

Project No.: E2215040 **Figure** _____

Terracon Consultants, Inc.





Sample No.		1	2	3
Initial	Water Content, %	16.5	15.4	16.9
	Dry Density, pcf	106.8	110.3	103.7
	Saturation, %	76.9	79.0	73.1
	Void Ratio	0.5785	0.5276	0.6256
	Diameter, in.	2.500	2.500	2.500
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	19.0	16.8	20.0
	Dry Density, pcf	109.4	115.8	111.3
	Saturation, %	95.0	99.7	104.8
	Void Ratio	0.5414	0.4555	0.5143
	Diameter, in.	2.500	2.500	2.500
	Height, in.	0.977	0.953	0.931
Normal Stress, psi		10.00	20.00	40.00
Fail. Stress, psi		8.75	14.11	23.65
Strain, %		5.9	5.7	10.3
Ult. Stress, psi		8.67	13.65	23.65
Strain, %		10.0	10.2	10.3
Strain rate, in./min.		0.002	0.002	0.002

Sample Type: Shelby Tube
Description:

Specific Gravity= 2.7
Remarks:

Figure _____

Client: LJA Engineering, Inc.

Project: Suck Creek WWTP Expansion

Source of Sample: B-102 **Depth:** 6-8'

Proj. No.: E2215040 **Date Sampled:** 6/21/2022

DIRECT SHEAR TEST REPORT
Terracon Consultants, Inc.
Chattanooga, TN

Geotechnical Engineering Report

Suck Creek WWTP Expansion
Chattanooga, Hamilton County, Tennessee
September 3, 2021
Terracon Project No. E2215040

Prepared for:
LJA Engineering
Chattanooga, TN

Prepared by:
Terracon Consultants, Inc.
Chattanooga, Tennessee

September 3, 2021

LJA Engineering
200 West MLK Blvd. Suite 1049
Chattanooga, TN 37402

Attn: Mr. Scott McDonald
P: 423.720.2745
E: smcdonald@lja.com

Re: Geotechnical Engineering Report
Suck Creek WWTP Expansion
1701 Suck Creek Road
Chattanooga, Hamilton County, Tennessee
Terracon Project No. E2215040

Dear Mr. McDonald:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PE2215040 dated April 19, 2021. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

John D. Cannon, P. E.
Senior Engineer

David A. Been, P.E.
Senior Engineering Consultant

REPORT TOPICS

INTRODUCTION 1
SITE CONDITIONS 1
PROJECT DESCRIPTION 2
GEOTECHNICAL CHARACTERIZATION 3
GEOTECHNICAL OVERVIEW 5
EARTHWORK 7
SHALLOW FOUNDATIONS 12
SPECIALTY FOUNDATIONS 15
SEISMIC CONSIDERATIONS 15
TANK SLABS 16
LATERAL EARTH PRESSURES 17
GENERAL COMMENTS 19
FIGURES 21
ATTACHMENTS 22

Note: This report was originally delivered in a web-based format. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS
SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.

Geotechnical Engineering Report

Suck Creek WWTP Expansion

1701 Suck Creek Road

Chattanooga, Hamilton County, Tennessee

Terracon Project No. E2215040

September 3, 2021

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed expansion of the existing waste water treatment plant located at 1701 Suck Creek Road in Chattanooga, Hamilton County, Tennessee. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil (and rock) conditions
- Groundwater conditions
- Site preparation and earthwork
- Demolition considerations
- Excavation considerations
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per IBC
- Lateral earth pressures

The geotechnical engineering Scope of Services for this project included the advancement of 10 test borings to depths ranging from approximately 11 to 54 feet below existing site grades.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and/or the individual laboratory reporting sheets in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at 1701 Suck Creek Road in Chattanooga, Hamilton County, Tennessee. Based on the provided topographic map, the size of the property in the area of interest is approximately 2 acres. Approximate Latitude/Longitude: 35.1056° N, 85.3597° W (See **Site Location**)

Item	Description
Existing Improvements	The site is currently occupied by an operating waste water treatment plant (WWTP) on the north side of the road consisting of a stabilization tank about 60 feet in diameter, a clarifier approximately 40 feet in diameter, headworks, an operations building and other small ancillary structures, plus on the south side of the road existing sludge drying beds that are currently out of use.
Current Ground Cover	Based on site reconnaissance, the current ground cover outside the perimeter of structures is either grass, asphalt paving, or crushed stone.
Existing Topography	Based on the provided topographic map, the majority of the site slopes steeply downward to the west and southwest, toward the Tennessee River. Ground surface elevations vary from about 710 feet north of the WWTP to around 680 feet around the existing operational structures, and then to 654 feet at the fence line below the drying beds.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	Project information was provided by Mr. Scott McDonald of LJA Engineering via email and follow-up telephone conversations between April 4 and 14, 2021. Supplementary site plans were provided by Mr. Ross Baker on August 13, 2021.
Project Description	The site is being explored for the suitability and feasibility of constructing new tanks, drying beds or other improvements to the existing WWTP.
Proposed Structures	At present two concepts are being explored: 1. Upgrading the existing plant by Adding a 20 ft diameter waste activated sludge (WAS) tank (new loading 2,500 psf) Adding a new 45 ft by 36 ft disk filter pad (new loading 1,060 psf) Constructing new headworks 40 ft by 8 ft (new loading 940 psf) 2. Diverting flow to the Chattanooga system Adding 3M gallon 90 ft diameter equalization tank (new loading 4,100 psf – includes est. weight of structure) Adding a new 27 ft by 8 ft pump station (new loading approximately 200 psf)
Construction Type	Reinforced cast-in-place concrete tanks
Bearing Elevation	To be determined
Loading	See **Proposed Structures**

Item	Description
Grading/Slopes	If upgrading of the existing plant takes place, changes in grade of less than 2 feet are anticipated for the Disk Filter Pad. The WAS tank is shown on a slope with changes in grade of about 16 feet across its 20-ft diameter, indicating a probable need for re-grading and possible construction of retaining walls. If diverting flow to the Chattanooga system is chosen, substantial re-grading will be needed for construction of the new 3M gallon equalization tank. The topographic map indicates ground elevations beneath the tank footprint vary between approximately 663 ft and 705 ft, MSL. A balanced cut and fill could be used to reduce the need for extreme cutting or filling, but the steepness of existing 2H:1V (Horizontal:Vertical) ground surface will require creating a grading plan to deal with the existing terrain.
Pavements	None anticipated
Estimated Start of Construction	Late 2022

GEOTECHNICAL CHARACTERIZATION

Regional Bedrock Geology

Formation	Description
Pennington Formation / Newman Limestone [1, 2] **(overlain with Colluvium)**	The project site is underlain by bedrock in sedimentary sequences that were deposited during the Mississippian geologic age. Based on the available geologic information, the site is in the vicinity of the contact between the Pennington Formation, primarily a shale, and the Newman Limestone. USGS descriptions indicate both units include tertiary sandstone, the primary bedrock observed during this exploration. Identification of bedrock on the project site is obscured by a surface blanket of colluvium of variable thickness. Colluvium is “a general term applied to loose and incoherent deposits, usually at the foot of a slope . . . and brought there chiefly by gravity.” [3] The site location at the foot of Signal Mountain makes it a strong candidate for deposition of colluvium, which in this locale consists of sandstone fragments of a wide size range in a matrix of clay, silt and sand soils.

References:

1 Greene, D.C., and Wolfe, W.J., 2000, Superfund GIS - 1:250,000 Geology of Tennessee, USGS.
2 Hardeman, W.D., Miller, R.A., and Swingle, G.D., 1966, Geologic Map of Tennessee: Division of Geology, Tennessee Department of Environment and Conservation
3 *Dictionary of Geological Terms*, 1962, Dolphin Reference Book, prepared under direction of American Geological Institute.

Subsurface Profile

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting, and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation, foundations and floor slabs,. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section and the GeoModel can be found in the **Figures** section of this report.

Model Layer[1]	Layer Name	General Description
1	COLLUVIUM[2]	Sandy clay matrix containing sandstone boulders and cobbles
2	Clay	Sandy clay or clay with sand (CL)
3	Silt	Sandy silt (ML)
4	Sand	Silty sand or highly weathered sandstone and/or sandstone boulders
5	Sandstone	Sandstone bedrock

1. A topsoil veneer of 1 inch or less was encountered at most boring locations but was not included in the GeoModel to reduce clutter. See boring logs for details.
2. Colluvium is described in detail in **Regional Bedrock Geology** on the preceding page.

Groundwater conditions

Groundwater was observed in boring B-7 at a depth 23.5 feet while drilling. Groundwater was not observed in any of the other borings while augering or for the short duration that the borings were allowed to remain open. However, this does not necessarily mean these borings terminated above groundwater, or that the water levels summarized above are stable groundwater levels. Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for the groundwater level to develop and stabilize in a borehole in these materials. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define the field or in-situ groundwater level in materials of this type.

From experience, perched/trapped water may be present within the existing colluvium. Seepage is commonly encountered along the interface of materials with very different permeabilities (i.e., soil/bedrock interface).

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than

the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

Field exploration was performed in 10 locations on the site: B-1 through B-7 in the vicinity of the existing WWTP north of Suck Creek Road, and B-8 through B-10 on the south side of the road adjacent to the existing unused drying beds.

As noted in our **Exploration Results** and **GeoModel**, the borings encountered loose/soft colluvium underlain by typically stiff lean sandy clay with some zones of sandy silt soils, and low plasticity cohesive soils with varying rock content. Based on the findings of the borings, laboratory testing, and engineering analyses, the proposed structure can be supported by spread footings that bear below the colluvium directly on at least stiff cohesive soils, at least medium dense natural cohesionless soils, or exposed bedrock.

The on-site soils appear suitable to be re-used as fill in other areas of the site, subject to moisture conditioning. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section.

Bearing on rock and soil (differential settlement):

Considering it is anticipated that a portion of each structure will be supported by foundations bearing in soil fill consisting of low plasticity soil containing weathered sandstone and other rock fragments of varied size and weathering. When incorporated in fill subjected to vibratory compaction we anticipate rock fragments will break down to achieve a relatively uniform bearing that is expected to result in relatively uniform settlement. However, to reduce the potential for excessive differential settlement, we recommend undercutting tank pads no less than 5 feet below the proposed bearing elevation and backfilling with granular engineered fill placed and compacted in uniform lifts as described in the **Earthwork** section, and possibly reinforced with a geogrid.

Preliminary settlement estimates for the 90-foot diameter equalization tank, which will have estimated uniform loading of 4,100 psf range from 3 to 6 inches where the soil at foundation bearing level has been pre-loaded by existing soil, with more settlement where little pre-loading has occurred. This magnitude of settlement is usually considered unacceptable. Though the magnitude of loading is 2,500 psf for the WAS tank and the diameter is 20 feet, estimated settlement was of similar magnitude. However, because of the smaller footprint, deeper undercutting would be more practical. Settlement should be re-evaluated when a preliminary grading plan has been developed. As indicated above, undercutting of the tank pad could be preliminary to placement of a geo-grid reinforced crushed stone pad on the order of 5 feet thick. Additional foundation recommendations are included in the **Shallow Foundations** section.

Difficult Excavation:

The proposed foundation bearing elevation for the various structures has yet to be determined. Auger refusal is an indication of rock which is either too hard or too large – or a combination of the two – to be readily penetrated with machine-driven augers. To observe the degree of difficulty to be expected during construction, we recommend excavating test pits with equipment of the appropriate size and power, with test pits located where typical and deep excavations are anticipated. Where hard rock removal techniques are required, use of hydraulic splitters or other heavy-duty equipment should be budgeted. About half the borings in the vicinity of the existing WWTP encountered auger refusal between 10 and 15 feet below ground level, with the remaining locations refusing at depths between 25 and 47 feet below ground level. Such variability would present a significant challenge to a conventional earthwork grading operation.

Based on the results of the geotechnical investigation, the following geotechnical hazards were identified and will require mitigation for this project:

- A mixture of soil and rock, some natural and some graded
- Elevated potential for excessive total and differential settlement
- Slope stability issues
  - Soil/rock mixture: The existing WWTP is located on a bench apparently excavated into the existing slopes which descend from Signal Mountain to the Tennessee River. The soil is predominantly sandy clay which contains rock fragments consisting mostly of sandstone in varying states of weathering. Some of this material is clearly colluvium, which for the most part is gravity deposited. The sandstone fragments which spalled from the top of Signal Mountain are similar to the sandstone associated with the contact between the Pennington Formation and the Newman Limestone. Where slightly weathered, the bedrock provides good core recovery and a high RQD (rock quality designation). Where heavily weathered, the sandstone provides poor recovery and RQD values associated with poor quality rock.

    Support of foundations, tank slabs, and other structures on or above colluvium requires treatment similar to the requirements for undocumented fill. Though deposited by natural processes, colluvium has similar variability and unknown characteristics when compared to engineered fill. Therefore, one approach to construction would be undercutting the area of the proposed structure until stiff residual materials are encountered and then backfilling, utilizing the undercut materials to the greatest extent possible. Ground improvement techniques commonly used in the Chattanooga area may be of limited use on this site because of the colluvium. For example, compacted aggregate piers may not be economical or practical if rock inclusions prevent drilling to terminate on a stratum suitable for support of loads.

  - Elevated potential for excessive total and differential settlement.

Settlement calculations were performed using results of consolidation tests performed on relatively undisturbed thin-wall tube samples obtained in borings B-7 and B-8. Despite the apparent difference in settings – B-7 at the base of the slope just north of the existing clarifier and B-8 adjacent to the drying beds south of Suck Creek Road – consolidation results were similar. Overburden pressures of 1,200 to 1,500 psf and preconsolidation pressures of about 5,000 psf suggest these soils have been subjected to multiple wet-dry cycles that make them slightly overconsolidated, but still susceptible to significant settlement under moderate loading.

- Slope stability issues

Slope stability is of concern because the native slopes are relatively steep and are composed of colluvium. Slopes of similar geometry are found north of the Buzzi Unicem cement plant, about ¾ mile southeast of the WWTP site. During development of the cement plant site, slope toes were excavated to provide additional room for buildings and structures. Removal of material at the toe of the slope in combination with surface and subsurface drainage issues resulting in massive slope failures. Because slope failures were largely a result of creep movement, several attempts were made to stabilize the toe using rock buttresses and surface and subsurface drainage elements. Detailed slope analysis was used to develop a large scale stabilization project involving tie backs and cast-in-place anchor blocks, supplemented with subsurface drains.

Terracon advises against excavations which remove significant materials at the slope toes. Though construction of the existing WWTP appears to have involved benching into the toe of existing colluvial soils, further excavation could destabilize slopes to the north of the site. Any preliminary plan that includes slope excavation should be submitted to Terracon for slope stability analysis. Additional exploration and laboratory testing could be warranted.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Earthwork is anticipated to include clearing and grubbing, excavations, and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations and tank/floor slabs.

Colluvium

As noted in **Geotechnical Characterization**, borings B-2, B-4, B-5 and B-7 encountered colluvium extending to depths ranging from about 6 to 21 feet. The colluvium appears to be missing for borings B-1, B-3 and B-6 as a result of grading activities associated with construction of the bench on which the current WWTP was constructed. Because the colluvium was deposited

primarily by gravity, voids between boulder-sized rock fragments gradually filled with soil and/or smaller rock fragments, resulting in a non-homogeneous material. The materials themselves are suitable for use as fill but need to be overexcavated to underlying stiff residual material. The bottom of the excavation should then be proofrolled, repaired if necessary and moisture conditioned prior to compaction. Undercutting should extend at least 5 feet below the proposed bearing surface of the given structure. And should extend at least 10 feet beyond the perimeter of the structure.

Compressible Soils

As noted in **Geotechnical Characterization**, the site is underlain by slightly over-consolidated soils extending to variable depths below existing ground level, but in the area of the upgrade structures, to a depth of about 15 feet. Proposed grades are not known at this time. However, if the WAS Tank is constructed near existing grade at boring B-7, we preliminarily estimate that post construction settlement resulting from the proposed loads could be in excess of 6 inches. However, colluvium beneath the structure should be excavated to stiff material with measures taken to avoid destabilization of slopes north of the structure. Excavations should then be backfilled with suitable structural fill, settlement could be controlled. Loading on the subgrade could be further reduced by constructing a pad of structural fill at least 5 feet thick by placing fill in controlled lifts and compacting to the standards described in **Earthwork Construction**. The time for two-thirds of this settlement to occur could exceed 6 months. To expedite the settlement process and limit the post construction settlements to specified tolerances, it will be necessary to place three (3) feet of temporary surcharge fill and delay the tank construction until at least 80 percent of the settlement has occurred. Settlement monitoring plates should be installed to monitor and evaluate consolidation settlement prior to tank construction.

Site Preparation

Prior to placing fill, existing vegetation and root mat should be removed. Complete stripping of the topsoil should be performed in the proposed tank and pad areas.

The subgrade should be proofrolled with an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck. The proofrolling should be performed under the direction of the Geotechnical Engineer. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Mitigation might include processing to remove excess moisture, overexcavation and backfilling, chemical stabilization, or modification with geotextile reinforcement. Should mitigation of wet and pumping soils be required, our office should be notified so that appropriate mitigation can be prescribed by the project geotechnical engineer.

Fill Material Types

Fill required to achieve design grade should be classified as engineered fill. Earthen materials used for engineered fill should meet the following material property requirements:

Soil Type [1]	USCS Classification	Acceptable Parameters (for Engineered Fill)
Low Plasticity Cohesive	CL, CL-ML ML, SM, SC	Liquid Limit less than 49 Plasticity index less than 30 Greater than 10% passing on No. 200 sieve
Granular	GW, GP, GM, GC, SW, SP, SM, SC	Complying with applicable ASTM standards
On-Site Soils [2]	CL	Liquid Limit less than 49 Plasticity index less than 30 Greater than 10% passing on No. 200 sieve

1. Engineered fill should consist of approved materials free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site.
2. High silt content soils are extremely sensitive to variations in moisture content and can lose strength rapidly with increases in moisture. It should be noted that the moisture content of the silt must be closely controlled in order to achieve the desired degree of compaction. Drying of soils excavated from deeper cut areas of the site should be anticipated prior to use as engineered fill.

Fill Compaction Requirements

Engineered fill should meet the following compaction requirements.

Item	Engineered Fill
Maximum Lift Thickness	9 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used
Minimum Compaction Requirements [1, 2]	98% of the material's standard Proctor maximum dry density (ASTM D 698), with stability present
Moisture Content Range [1]	***Cohesive***: Within -1% to +2% percent of optimum moisture content as determined by the standard Proctor test at the time of placement and compaction. ***Granular:*** -3% to +3% of optimum

1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698).
2. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D 4253 and D 4254).

Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. If utility trenches are backfilled with relatively clean

granular material, they should be capped with at least 18 inches of cohesive fill in non-pavement areas to reduce the infiltration and conveyance of surface water through the trench backfill.

For low permeability subgrades, utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath structures should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the structure. The trench should provide an effective trench plug that extends at least 5 feet from the face of the exterior of the structure. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for engineered fill stated previously in this report.

Grading and Drainage

All grades must provide effective drainage away from the structures during and after construction and should be maintained throughout the life of the structure. Water retained next to the structure can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the structure.

Exposed ground should be sloped and maintained at a minimum 5% away from structures for at least 10 feet beyond the perimeter. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

The near-surface soils are sensitive to increases in moisture content and have a tendency to lose strength and stability as the moisture content increases or as a result of construction traffic. We suggest earthwork construction take place during generally drier months of the year. Wet season earthwork has an increased risk that may require additional mitigation measures beyond that which would be expected during the drier summer and fall months.

As previously mentioned, colluvium is gravity deposited and consists of a wide range of particle sizes from soil fines to large boulders. When deposited in a dense and well-drained configuration, colluvium can achieve accidental stability due to the absence of large voids, a fortunate combination of grain sizes, and limited effects of surface and subsurface water. However, this apparent stability can change rapidly if the soil and rock configuration and flow paths for surface

and subsurface water are altered. In general, placement of additional fill, which would act as a buttress, in areas where colluvium has been previously utilized to create a building pad, probably has a low potential for destabilizing the subgrade. However, changes that involve excavating into slopes, particularly at or near the toe, are in danger of destabilizing the upslope colluvium, initially in the immediate vicinity of the excavation, and later as changes in slope geometry alter the stability of the slope as a whole.

Shallow excavations for the proposed structures are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of foundations, floor slabs, and pavements. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction

Temporary high groundwater tables could affect overexcavation efforts, especially for over-excavation and replacement of lower strength soils. A temporary dewatering system consisting of sumps with pumps could be necessary to achieve the recommended depth of over-excavation.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, “Excavations” and its appendices, and in accordance with any applicable local, and/or state regulations.

Any excavations adjacent to existing foundations should extend vertically to the bottom of the existing grade beam/footing. Below that depth, the excavation should be sloped no steeper than two vertical to one horizontal (2V:1H). Excavation and backfill along existing foundations should be performed in sections that allow for excavation and backfill full depth of the section to the bottom of the adjacent foundation within a working day. We recommend excavation sections adjacent to existing foundations not extend greater than 50 linear feet along the existing structure. Excavations adjacent to existing foundations should not be allowed to remain open overnight.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Trees or other vegetation whose root systems can remove excessive moisture from the subgrade and foundation soils should not be planted next to critical structures. Trees and shrubbery should be kept away from the exterior edges of the foundation element a distance at least equal to 1.5 times their expected mature height.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and topsoil, proofrolling, and mitigation of areas delineated by the proofroll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least 3 tests per lift. One density and water content test should be performed for every 50 linear feet of compacted utility trench backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. If unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Design Parameters – Compressive Loads

Item	Description
Maximum Net Allowable Bearing pressure [1, 2]	2,500 psf (on existing residual soils or engineered fill)
Required Bearing Stratum [3]	Stiff or better residual clay or sandy clay Bearing stratum should be verified by Terracon.
Minimum Foundation Dimensions	Columns: 24 inches Continuous: 18 inches
Ultimate Passive Resistance [4] **(equivalent fluid pressures)**	325 pcf
Ultimate Coefficient of Sliding Friction [5]	0.3
Minimum Embedment below Finished Grade [6]	18 inches
Estimated Total Settlement from Structural Loads [2]	To be determined

Item	Description
Estimated Differential Settlement [2, 7]	About ½ of total settlement

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.
2. Values provided are for maximum loads noted in **Project Description**.
3. Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in the **Earthwork**.
4. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted engineered fill be placed against the vertical footing face.
5. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions.
6. Embedment necessary to minimize the effects of frost and/or seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
7. Differential settlements are as measured over a span of 50 feet.

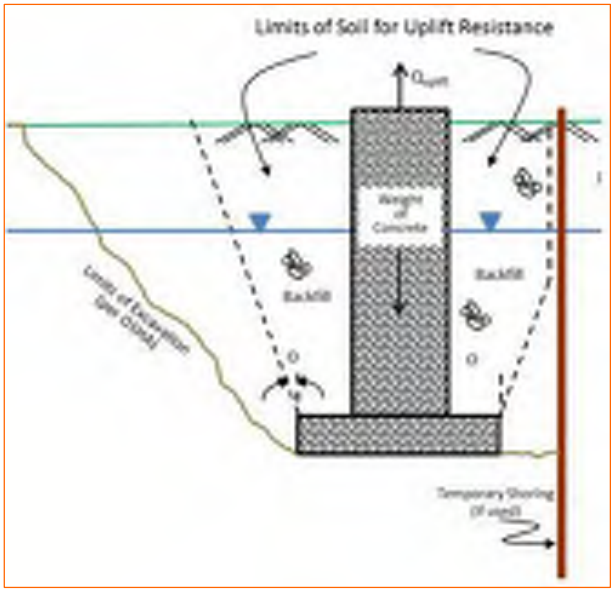
Construction Adjacent to Existing Structures

Differential settlement between the additions and the existing building is expected to approach the magnitude of the total settlement of the addition. Expansion joints should be provided between the existing building and the proposed addition to accommodate differential movements between the two structures. Underground piping between the two structures should be designed with flexible couplings and utility knockouts in foundation walls should be oversized, so minor deflections in alignment do not result in breakage or distress. Care should be taken during excavation adjacent to existing foundations, to avoid disturbing existing foundation bearing soils.

New footings should bear at or near the bearing elevation of immediately adjacent existing foundations. Depending upon their locations and current loads on the existing footings, footings for the new addition could cause settlement of adjacent walls. To reduce this concern and risk, clear distances at least equal to the new footing widths should be maintained between the addition's footings and footings supporting the existing building.

Design Parameters - Uplift Loads

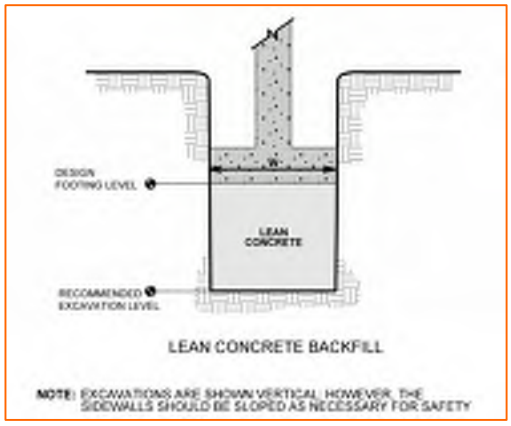
Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated on the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle, θ, of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 100 pcf should be used for the backfill. This unit weight should be reduced to 40 pcf for portions of the backfill or natural soils below the groundwater elevation.



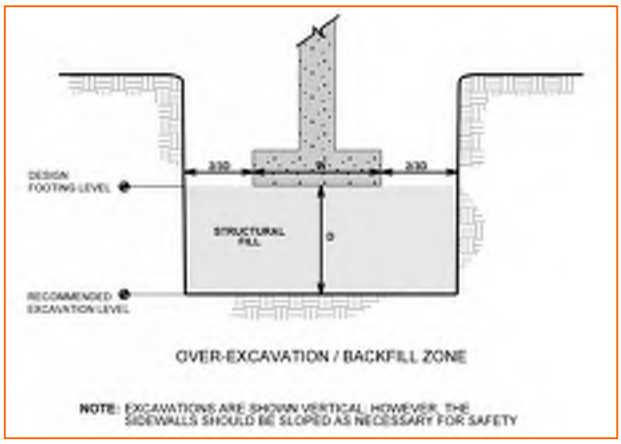
Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



Over-excavation for engineered fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation, with engineered fill placed, as recommended in the **Earthwork** section.



SPECIALTY FOUNDATIONS

Micropiles may be considered to support tank foundations. However, the absence of sound rock in most of our deep borings and termination around a depth 56 feet in sand suggests that rock bearing micropiles in excess of 75 feet in depth is not an unreasonable estimate.

Compacted aggregate piers are considered an unlikely approach because of the numerous rock obstructions, some of which appear large, encountered during exploration.

SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil and bedrock properties encountered at the site and as described on the exploration logs and results, it is our professional opinion that the **Seismic Site Classification is D**. Subsurface explorations at this site were extended to a maximum depth of 56 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

TANK SLABS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the tank slab.

Tank Slab Design Parameters

Item	Description
Floor Slab Support	Minimum 6 inches of free-draining (less than 5% passing the U.S. No. 200 sieve) crushed aggregate compacted to at least 98% of ASTM D 698 [1, 2] At least 2 feet of low plasticity cohesive soils with at least 70% passing the U.S. No. 200 sieve material should be present below floor slabs where fat clay soils are present
Estimated Modulus of Subgrade Reaction [1]	100 pounds per square inch per inch (psi/in) for point loads

1. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.
2. Free-draining granular material should have less than 5% fines (material passing the No. 200 sieve). Other design considerations such as cold temperatures and condensation development could warrant more extensive design provisions.

Where slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Settlement of slabs supported on existing fill materials cannot be accurately predicted, but could be larger than normal and result in some cracking. Mitigation measures, as noted in **Earthwork**, are critical to the performance of floor slabs. In addition to the mitigation measures, the floor slab can be stiffened by adding steel reinforcement, grade beams and/or post-tensioned elements.

Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed and engineered fill should be added to replace the

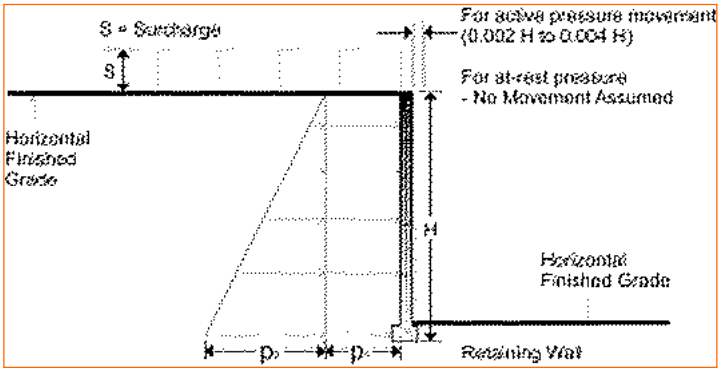
resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

LATERAL EARTH PRESSURES

Design Parameters

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



Lateral Earth Pressure Design Parameters				
Earth Pressure Condition [1]	**Coefficient for Backfill Type** [2]	**Surcharge Pressure p_1 (psf)** [3, 4, 5]	**Effective Fluid Pressures (psf)** [2, 4, 5]	
			Unsaturated [6]	**Submerged** [6]
Active (Ka)	Granular - 0.31 Fine Grained - 0.41	(0.31)S (0.41)S	(40)H (50)H	(80)H (85)H
At-Rest (Ko)	Granular - 0.47	0.47)S	(55)H	(90)H

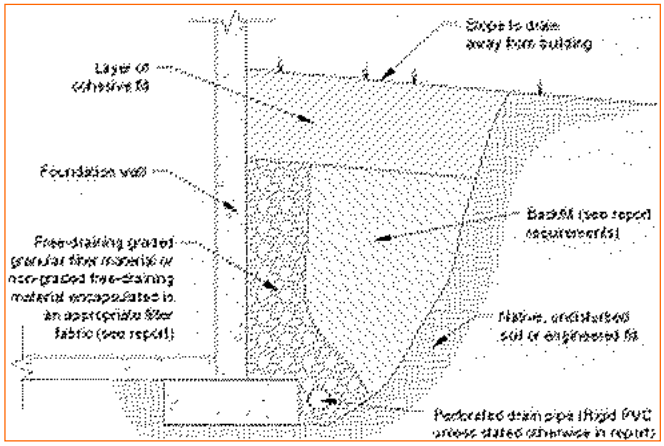
Lateral Earth Pressure Design Parameters				
Earth Pressure Condition [1]	**Coefficient for Backfill Type** [2]	**Surcharge Pressure** [3, 4, 5] **p_1 (psf)**	**Effective Fluid Pressures (psf)** [2, 4, 5]	
			Unsaturated [6]	**Submerged** [6]
	Fine Grained - 0.58	(0.58)S	(70)H	(95)H
Passive (Kp)	Granular - 3.25	---	(390)H	(250)H
	Fine Grained - 2.46	---	(295)H	(205)H

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.
2. Uniform, horizontal backfill, compacted to at least 95% of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. No safety factor is included in these values.
6. To achieve "Unsaturated" conditions, follow guidelines in **Subsurface Drainage for Below-Grade Walls** below. "Submerged" conditions are recommended when drainage behind walls is not incorporated into the design.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively.

Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5% passing the No. 200 sieve, such as No. 57 aggregate. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.



As an alternative to free-draining granular fill, a pre-fabricated drainage structure may be used. A pre-fabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion, and is fastened to the wall prior to placing backfill.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

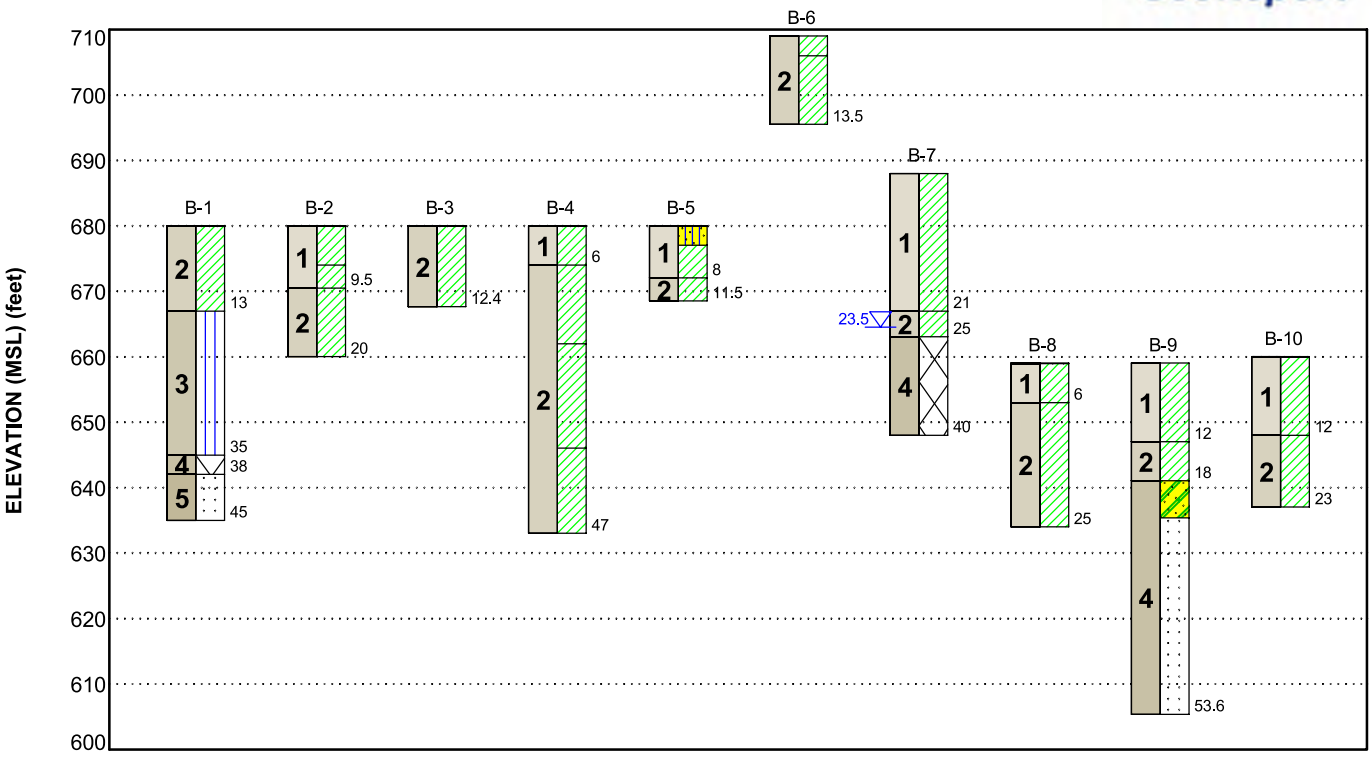
FIGURES

Contents:

GeoModel

GEOMODEL

Suck Creek WWTP Expansion ■ Chattanooga, TN
Terracon Project No. E2215040



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	COLLUVIUM	Sandy clay matrix conatining sandstone boulders and cobbles
2	Clay	Sandy clay or clay with sand (CL)
3	Silt	Sandy silt (ML)
4	Sand	Silty sand or highly wetared sandstone
5	Sandstone	Sandstone bedrock

LEGEND

- Topsoil
- Lean Clay
- Silt
- Weathered Rock
- Sandstone
- Silty Sand
- Clayey Sand
- SCDOT-SANDSTONE

▽ First Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)	Planned Location
7	11.5 to 47 (auger refusal)	Existing WWTP improvement areas
3	23 to 54 (auger refusal)	Unused drying beds

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and approximate elevations were obtained by interpolation from a topographic map provided by LJA. If more precise boring layout and elevations are desired, we recommend borings be surveyed

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted rotary drill rig using continuous flight augers (solid stem or rotary wash methods, as necessary, depending on soil conditions). Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We observed and recorded groundwater levels during drilling and sampling. For safety purposes and in accordance with Tennessee State Regulations, all borings were backfilled with auger cuttings or bentonite grout after their completion. Pavements were patched with cold-mix asphalt and/or pre-mixed concrete, as appropriate.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. We performed the following tests on the obtained samples,

- Water content testing
- Atterberg limits testing
- Grain size analysis

The laboratory testing program often included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Rock classification was conducted using locally accepted practices for engineering purposes; petrographic analysis may reveal other rock types. Rock core samples typically provide an improved specimen for this classification. Boring log rock classification was determined using the Description of Rock Properties.

Contents:

Site Location Plan
Exploration Plan

Note: All attachments are one page unless noted above.

SITE LOCATION

Suck Creek WWTP Expansion ■ Chattanooga, Hamilton County, Tennessee
September 3, 2021 ■ Terracon Project No. E2215040

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Contents:

Boring Logs (B-1 through B-10)
Atterberg Limits
Grain Size Distribution
Consolidation

Note: All attachments are one page unless noted above.

BORING LOG NO. B-1

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1057° Longitude: -85.3597°

Approximate Surface Elev.: 680 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		0.1	680+/-									
			TOPSOIL, approximately 1 inch									
			LEAN CLAY (CL), sandy, yellow-red and gray, stiff				0	6-6-7 N=13				
							56	4-7-9 N=16	4.5 (HP)	15.4		
2			with sandstone fragments, black mineralization	5			50	5-6-7 N=13	4.25 (HP)	19.0		
							44	4-5-9 N=14	3.5 (HP)	17.3		
			yellow brown	10								
		13.0	667+/-									
			SILT (ML), sandy, yellow brown, stiff				88			21.8	41-30-11	57
				15								
3			sandy with weathered shale fragments, stiff				61	4-5-8 N=13	4.25 (HP)	19.9		
				20								
							67	5-8-10 N=18	4.5 (HP)	19.2		
			very stiff	25								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-35' 3 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-27-2021 | Boring Completed: 07-27-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-1

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1057° Longitude: -85.3597°

Approximate Surface Elev.: 680 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
3			**SILT (ML)**, sandy, yellow brown, stiff *(continued)*	30			56	4-8-10 N=18	2.5 (HP)	21.6		
							100	5-10-50/4"	3.25 (HP)	20.1		
		35.0	with weathered siltstone 645+/-	35								
4			Auger Refusal at 35' **HIGHLY WEATHERED SANDSTONE**									
		38.0	642+/-									
5			**SANDSTONE**, light brown and light gray	40				Rec: 78% RQD: 66%				
		45.0	635+/-	45								
			Boring Terminated at 45 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-35' 3 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-27-2021 | Boring Completed: 07-27-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-2

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1057° Longitude: -85.3598°

Approximate Surface Elev.: 680 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		0.1	680+/-									
		TOPSOIL, approximately 1 inch										
1		**LEAN CLAY (CL)**, COLLUVIUM, with sandstone fragments, brown, medium stiff				X	39	3-2-1 N=3	2.75 (HP)	20.5		
						X	33	1-2-2 N=4	2.0 (HP)	15.5		
				5								
		6.0	674+/-									
		LEAN CLAY (CL), COLLUVIUM, sandy with gravel, gray, soft, colluvium				X	44	1-1-1 N=2		22.9	25-14-11	53
		9.5	670.5+/-			X	32	1-2-50/0"		9.5		
2		**LEAN CLAY (CL)**, sandy with rock fragments, red, brown and light gray, very stiff		10								
						X	44	8-44-16 N=60				
				15								
						X	72	6-10-14 N=24	3.75 (HP)	22.6		
		20.0	660+/-	20								
		Auger Refusal at 20 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-20' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-26-2021 | Boring Completed: 07-26-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-3

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1058° Longitude: -85.3596°

Approximate Surface Elev.: 680 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		0.1	680+/-									
		TOPSOIL, approximately 1 inch										
2		**LEAN CLAY (CL)**, sandy, red and brown, stiff to very stiff				X	100	6-6-7 N=13	4.0 (HP)	11.1		
				5		X	89	3-12-12 N=24	2.5 (HP)	10.6		
						X	92	4-6-50/1"	3.0 (HP)	19.1		
						X	94	4-7-7 N=14	4.25 (HP)	18.0		
				10								
		12.4	667.5+/-									
		Auger Refusal at 12.4 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-12.4' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-26-2021 | Boring Completed: 07-26-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-4

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1056° Longitude: -85.3597°

Approximate Surface Elev.: 680 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		0.1	680+/-									
		TOPSOIL, approximately 1 inch										
1		**LEAN CLAY (CL)**, COLLUVIUM, with rock fragments, dark brown, medium stiff to soft				X	11	2-4-1 N=5				
						X	6	0-1-1 N=2				
				5								
		6.0	674+/-									
2		**LEAN CLAY (CL)**, with sand, red, gray and yellow brown, stiff				X	78	4-5-5 N=10	2.5 (HP)	22.1		
						X	0	5-6-8 N=14				
				10								
		very stiff				X	0	8-10-12 N=22				
				15								
		18.0	662+/-									
		LEAN CLAY (CL), with sand, red, stiff				X	78	4-5-8 N=13	3.5 (HP)	23.4	42-25-17	74
				20								
						X	67	4-6-7 N=13	3.25 (HP)	20.1		
				25								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-47' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-26-2021 | Boring Completed: 07-26-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-4

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1056° Longitude: -85.3597°

Approximate Surface Elev.: 680 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2												
			LEAN CLAY (CL), with sand, red, stiff *(continued)*									
			with highly weathered shale fragments	30			78	3-6-9 N=15	2.75 (HP)	21.2		
		34.0	646+/-									
			LEAN CLAY (CL), sandy, red, stiff	35			67	6-6-9 N=15	3.25 (HP)	19.7		
			with sandstone fragments	40			78	6-7-7 N=14	2.75 (HP)	19.2		
			very stiff	45			72	6-9-31 N=40	3.25 (HP)	28.9		
		47.0	633+/-									
			Auger Refusal at 47 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-47' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-26-2021 | Boring Completed: 07-26-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-5

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1057° Longitude: -85.3595°

Approximate Surface Elev.: 680 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		0.1	680+/-									
		TOPSOIL, approximately 1 inch										
		SAND (SM), COLLUVIUM, silty with fine rock fragments, dense						50/5"		8.1		
		3.0	677+/-									
1		**LEAN CLAY (CL)**, COLLUVIUM, with sand and rock fragments, red, yellow to gray, stiff to hard		5			78	3-5-6 N=11	3.5 (HP)	27.3		
							39	3-30-27 N=57	3.5 (HP)	20.0		
		8.0	672+/-									
2		**LEAN CLAY (CL)**, sandy, with sandstone fragments, red, very stiff		10			33	11-12-7 N=19		16.8		
		11.5	668.5+/-									
		Auger Refusal at 11.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-11.5' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-27-2021 | Boring Completed: 07-27-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-6

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1057° Longitude: -85.3592°

Approximate Surface Elev.: 709 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
						X	72	6-12-18 N=30		17.4		
		3.0	706+/-									
2				5		X	61	6-11-13 N=24	3.25 (HP)	22.0		
						X	64	5-50/5"	4.0 (HP)	14.7		
				10		X	72	6-11-15 N=26	3.5 (HP)	14.4		
		13.5	695.5+/-									
		50/0"										

LEAN CLAY (CL), with sand, brown and gray, very stiff

LEAN CLAY (CL), sandy, red, brown and gray, very stiff

with sandstone fragments

Auger Refusal at 13.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-13.5' 2 1/4" Hollow Stem AUger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-29-2021 | Boring Completed: 07-29-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-7

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1054° Longitude: -85.3593°

Approximate Surface Elev.: 688 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1			**LEAN CLAY (CL)**, COLLUVIUM, with sand rock fragments, yellow brown and red, stiff									
							67	3-4-5 N=9		20.7	44-19-25	75
							78	2-2-4 N=6		23.5		
			medium stiff	5			56	10-6-6 N=12		19.0		
							67	2-3-4 N=7		18.5		
				10			50					
			red				56	4-2-4 N=6		17.8		
				15								
							67	1-12-8 N=20		18.2		
		21.0	667+/-	20								
2			**LEAN CLAY (CL)**, sandy with sandstone fragments, brown, stiff to medium stiff		▽							
							67	5-6-10 N=16		15.1		
		25.0	663+/-	25								
4			**WEATHERED SANDSTONE BOULDERS IN MATRIX OF SANDY CLAY**									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-25' 3 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Ground water was observed at 23.5' while drilling*

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-27-2021 | Boring Completed: 07-27-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-7

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1054° Longitude: -85.3593°

Approximate Surface Elev.: 688 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4			**WEATHERED SANDSTONE BOULDERS IN MATRIX OF SANDY CLAY** *(continued)*	30				Rec: 42% RQD: 10%				
				35								
		40.0	648+/-	40								
			Boring Terminated at 40 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-25' 3 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Ground water was observed at 23.5' while drilling*

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-27-2021 | Boring Completed: 07-27-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-8

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1053° Longitude: -85.3602°

Approximate Surface Elev.: 659 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		0.1	659+/-									
		TOPSOIL, approximately 1 inch										
1		**LEAN CLAY (CL)**, COLLUVIUM, with weathered rock fragments, brown and gray, stiff				X	44	2-3-4 N=7	4.5 (HP)	16.1		
						X	33	6-3-4 N=7	3.5 (HP)	17.9		
		6.0	653+/-	5								
		LEAN CLAY (CL), with weathered rock fragments, brown				X	56	2-3-5 N=8	3.0 (HP)	15.8		
						■	58					
				10								
						■	96			17.4		
2				15								
		includes highly weathered sandstone boulders				X	72	3-8-40 N=48	2.5 (HP)	15.3		
				20								
		brown, red and yellow				X	78	4-7-9 N=16	3.5 (HP)	16.1		
		25.0	634+/-	25								
		Boring Terminated at 25 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-25' 3 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-28-2021 | Boring Completed: 07-28-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-9

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1052° Longitude: -85.3601°

Approximate Surface Elev.: 659 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1												
			LEAN CLAY (CL), COLLUVIUM, sandy with sandstone fragments, brown and gray, medium stiff									
						X	22	4-3-2 N=5		13.2		
						X	17	1-6-2 N=8		17.8	33-18-15	63
				5								
						X	67	4-6-8 N=14	4.5 (HP)	16.9		
						X	44	2-4-4 N=8	2.5 (HP)	16.0		
		12.0	647+/-	10								
2			**LEAN CLAY (CL)**, sandy, brown and gray, stiff									
						X	67	3-5-5 N=10		15.3		
		18.0	641+/-	15								
4			**SAND (SC)**, clayey, brown, dense									
						X	61	9-14-15 N=29		10.6		31
		23.6	635.5+/-	20								
			HIGHLY WEATHERED SANDSTONE			X	72	50/5"		11.0		11
				25								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-23.6' 3 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-28-2021 | Boring Completed: 07-28-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-9

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1052° Longitude: -85.3601°

Approximate Surface Elev.: 659 (Ft.) +/-

DEPTH ELEVATION (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4		30				Rec: 24% RQD: 13%				
		35				Rec: 11% RQD: 0				
		40								
		45				Rec: 14% RQD: 6%				
		50								

HIGHLY WEATHERED SANDSTONE *(continued)*

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-23.6' 3 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-28-2021 Boring Completed: 07-28-2021

Drill Rig: DR009 Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

BORING LOG NO. B-9

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1052° Longitude: -85.3601°

Approximate Surface Elev.: 659 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4			**HIGHLY WEATHERED SANDSTONE** *(continued)*									
		53.6	605.5+/-									
			Boring Terminated at 53.6 Feet (sand washing into casing)									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-23.6' 3 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-28-2021 | Boring Completed: 07-28-2021

Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

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BORING LOG NO. B-10

PROJECT: Suck Creek WWTP Expansion

CLIENT: LJA Engineering Inc
Chattanooga, TN

SITE: 1701 Suck Creek Road
Chattanooga, TN

LOCATION See Exploration Plan

Latitude: 35.1050° Longitude: -85.3599°

Approximate Surface Elev.: 660 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		0.1	660+/-									
		TOPSOIL, approximately 1 inch										
1		**LEAN CLAY (CL)**, COLLUVIUM, sandy with sandstone fragments, brown, stiff				X	33	7-7-7 N=14	4.5 (HP)	13.3		
						X	56	2-4-6 N=10	4.5 (HP)	13.9		
				5		X	61	4-6-11 N=17	2.5 (HP)	14.3		
		soft to medium stiff				X	61	1-1-3 N=4	1.0 (HP)	17.4		
		12.0	648+/-	10								
2		**LEAN CLAY (CL)**, sandy with sandstone fragments										
		dark gray, stiff				X	67	4-5-8 N=13	3.5 (HP)	16.3		
				15								
		red, very stiff				X	56	11-24-10 N=34	3.25 (HP)	17.7		
		23.0	637+/-	20								
		Auger Refusal at 23 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-23' 2 1/4" Hollow Stem Auger

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-28-2021 | Boring Completed: 07-28-2021

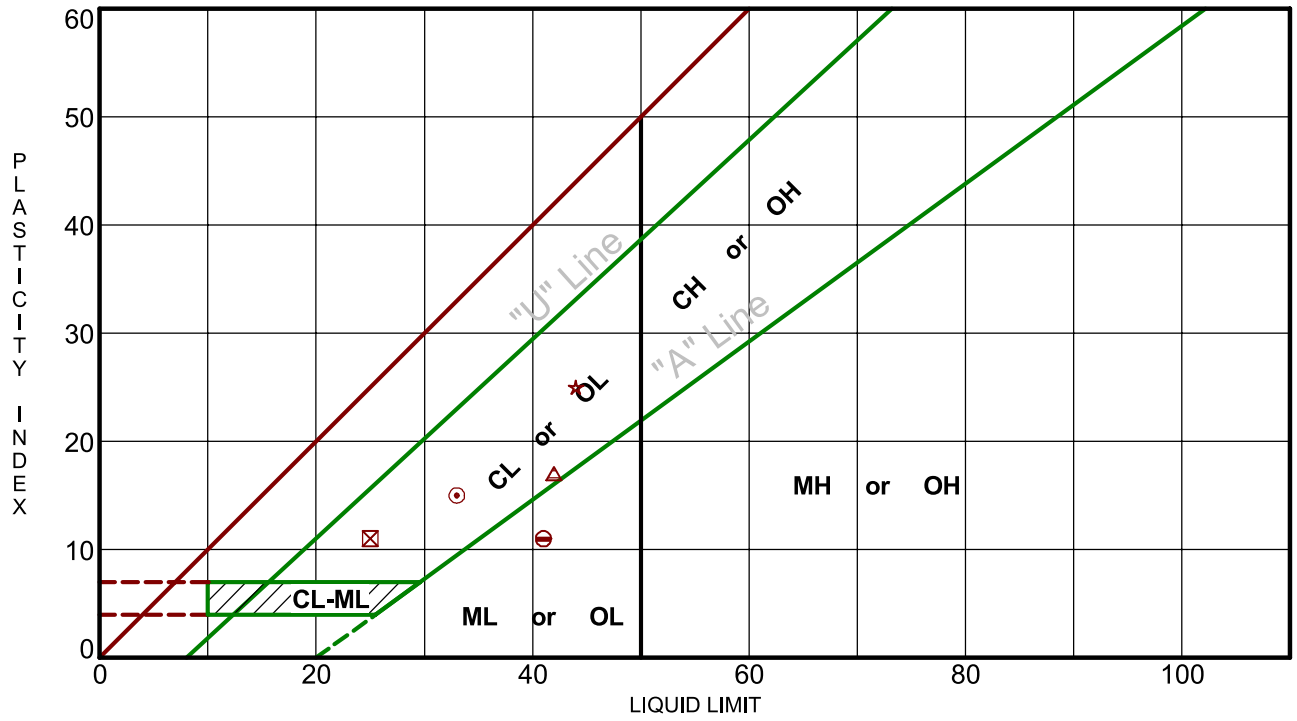
Drill Rig: DR009 | Driller: C. Penton

Project No.: E2215040

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 9/3/21

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth	LL	PL	PI	Fines	USCS	Description
⊖	B-1	13 - 15	41	30	11	57.4	ML	SANDY SILT
⊠	B-2	6 - 7.5	25	14	11	52.7	CL	SANDY LEAN CLAY with GRAVEL
△	B-4	18.5 - 20	42	25	17	73.7	CL	LEAN CLAY with SAND
☆	B-7	1 - 2.5	44	19	25	74.9	CL	LEAN CLAY with SAND
⊙	B-9	3.5 - 5	33	18	15	63.2	CL	SANDY LEAN CLAY

PROJECT: Suck Creek WWTP Expansion

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SITE: 1701 Suck Creek Road
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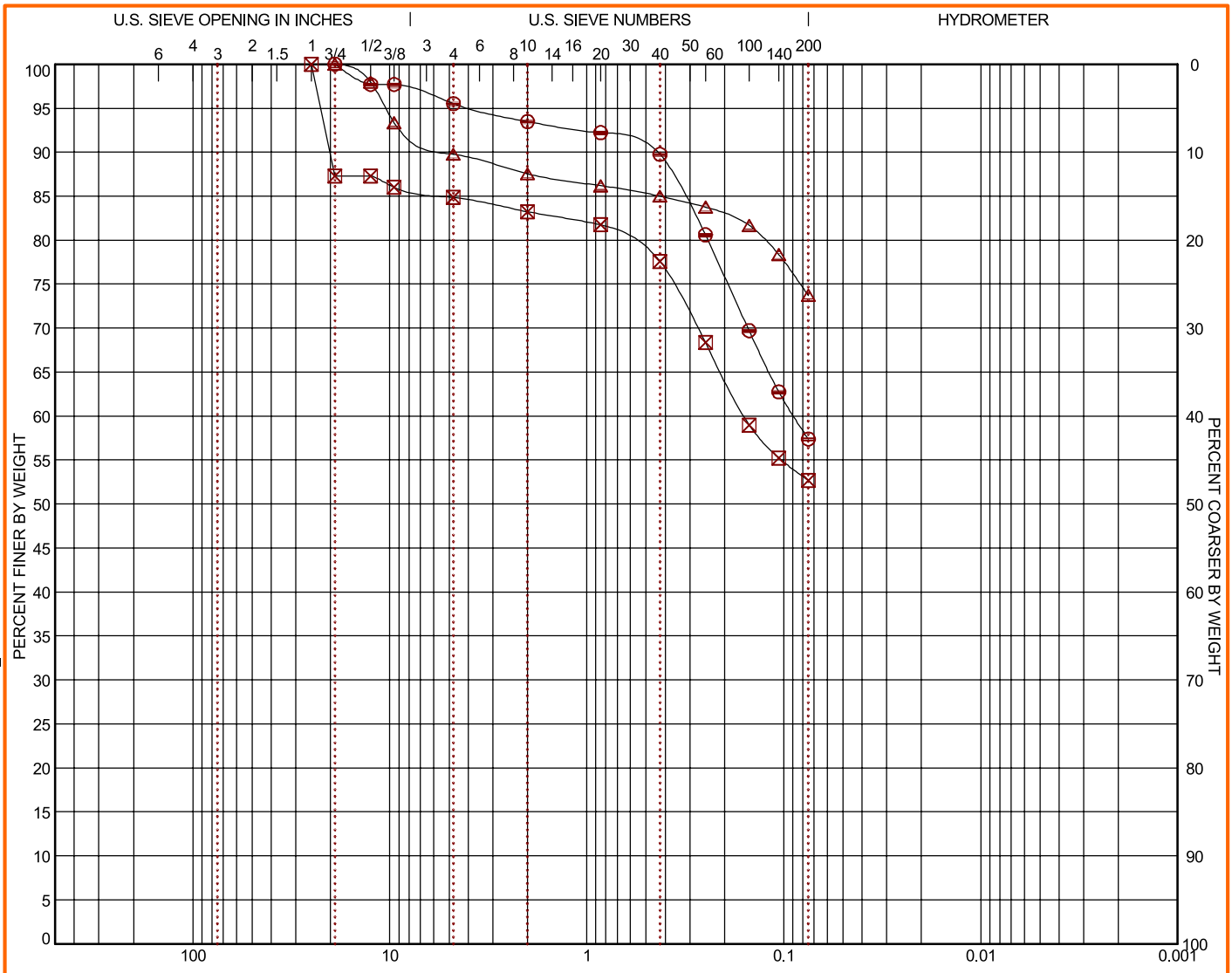
Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

CLIENT: LJA Engineering Inc
Chattanooga, TN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 8/6/21

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
⊖	B-1	13 - 15	0.0	4.5	38.1		57.4		ML
⊠	B-2	6 - 7.5	0.0	15.2	32.2		52.7		CL
△	B-4	18.5 - 20	0.0	10.2	16.0		73.7		CL

GRAIN SIZE	⊖	⊠	△
D_{60}	0.089	0.158	
D_{30}			
D_{10}			

COEFFICIENTS	⊖	⊠	△
C_C			
C_U			

⊖		⊠		△	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
3/4"	100.0	1"	100.0	3/4"	100.0
1/2"	97.69	3/4"	87.32	1/2"	97.95
3/8"	97.69	1/2"	87.32	3/8"	93.33
#4	95.52	3/8"	85.99	#4	89.76
#10	93.48	#4	84.85	#10	87.54
#20	92.22	#10	83.23	#20	86.19
#40	89.75	#20	81.74	#40	85.01
#60	80.6	#40	77.58	#60	83.76
#100	69.71	#60	68.37	#100	81.68
#140	62.75	#100	59.0	#140	78.36
#200	57.39	#140	55.24	#200	73.71
		#200	52.66		

SOIL DESCRIPTION	
⊖	SANDY SILT (ML)
⊠	SANDY LEAN CLAY with GRAVEL (CL)
△	LEAN CLAY with SAND (CL)

REMARKS	
⊖	
⊠	
△	

PROJECT: Suck Creek WWTP Expansion

PROJECT NUMBER: E2215040

SITE: 1701 Suck Creek Road
Chattanooga, TN

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

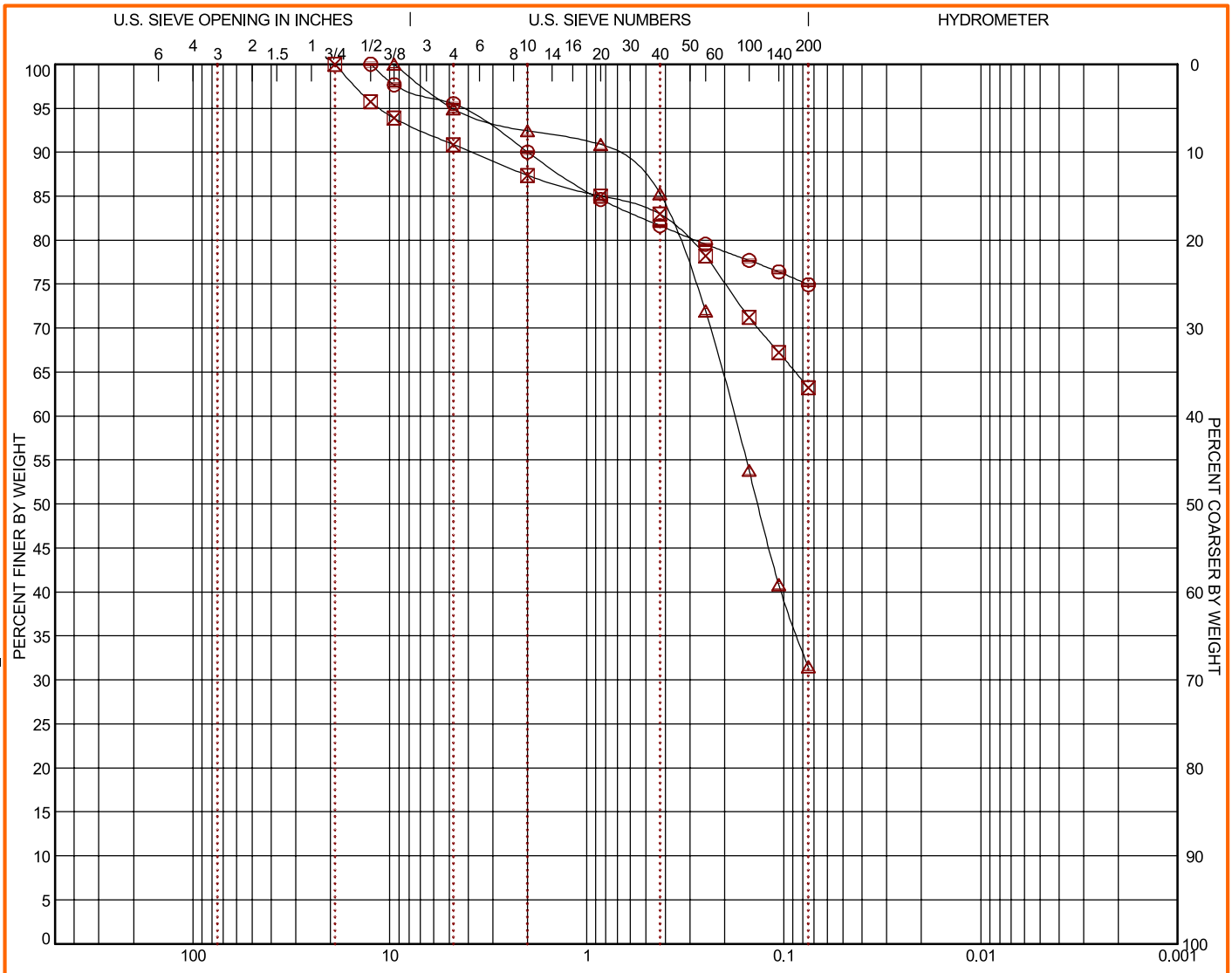
CLIENT: LJA Engineering Inc
Chattanooga, TN

GRAIN SIZE: USCS 1 E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 8/6/21

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
⊖	B-7	1 - 2.5	0.0	4.5	20.6		74.9		CL
☒	B-9	3.5 - 5	0.0	9.1	27.7		63.2		CL
△	B-9	18.5 - 20	0.0	5.1	63.4		31.5		

GRAIN SIZE	⊖	☒	△
D_{60}			0.178
D_{30}			
D_{10}			

COEFFICIENTS	⊖	☒	△
C_C			
C_U			

⊖		☒		△	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
1/2"	100.0	3/4"	100.0	3/8"	100.0
3/8"	97.65	1/2"	95.71	#4	94.92
#4	95.52	3/8"	93.86	#10	92.43
#10	90.02	#4	90.87	#20	90.88
#20	84.63	#10	87.36	#40	85.3
#40	81.65	#20	85.01	#60	71.97
#60	79.54	#40	82.96	#100	53.82
#100	77.69	#60	78.21	#140	40.83
#140	76.39	#100	71.22	#200	31.49
#200	74.93	#140	67.25		
		#200	63.2		

SOIL DESCRIPTION	
⊖	LEAN CLAY with SAND (CL)
☒	SANDY LEAN CLAY (CL)
△	

REMARKS	
⊖	
☒	
△	

PROJECT: Suck Creek WWTP Expansion

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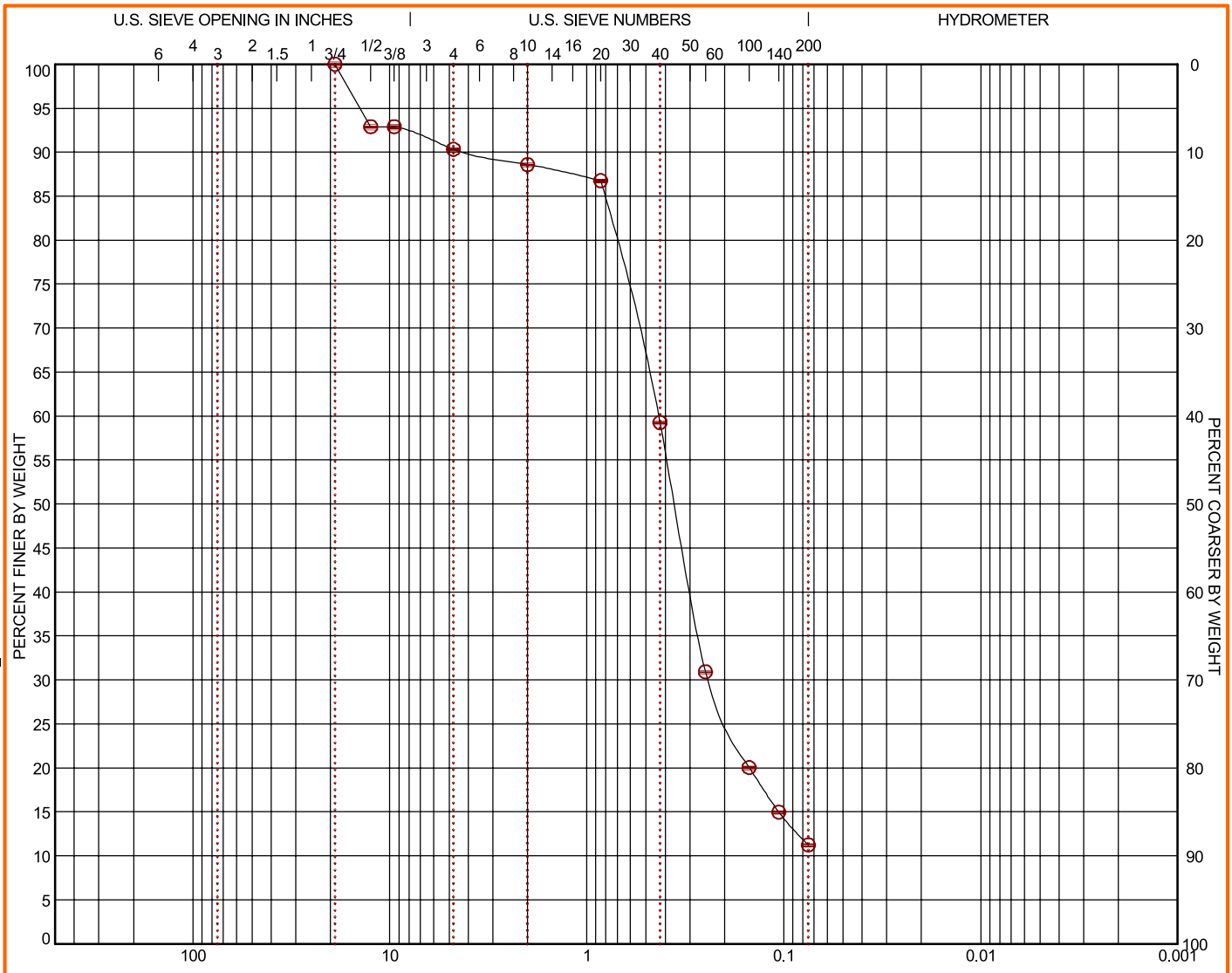
Chattanooga, TN

CLIENT: LJA Engineering Inc
Chattanooga, TN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 8/6/21

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
⊖	B-9	23.5 - 24	0.0	9.7	79.1		11.2		

GRAIN SIZE	⊖
D_{60}	0.433
D_{30}	0.239
D_{10}	

COEFFICIENTS	⊖
C_C	1.98
C_U	6.48

⊖ Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
3/4"	100.0				
1/2"	92.89				
3/8"	92.89				
#4	90.33				
#10	88.6				
#20	86.76				
#40	59.27				
#60	30.93				
#100	20.04				
#140	14.98				
#200	11.25				

SOIL DESCRIPTION
⊖

REMARKS
⊖

PROJECT: Suck Creek WWTP Expansion

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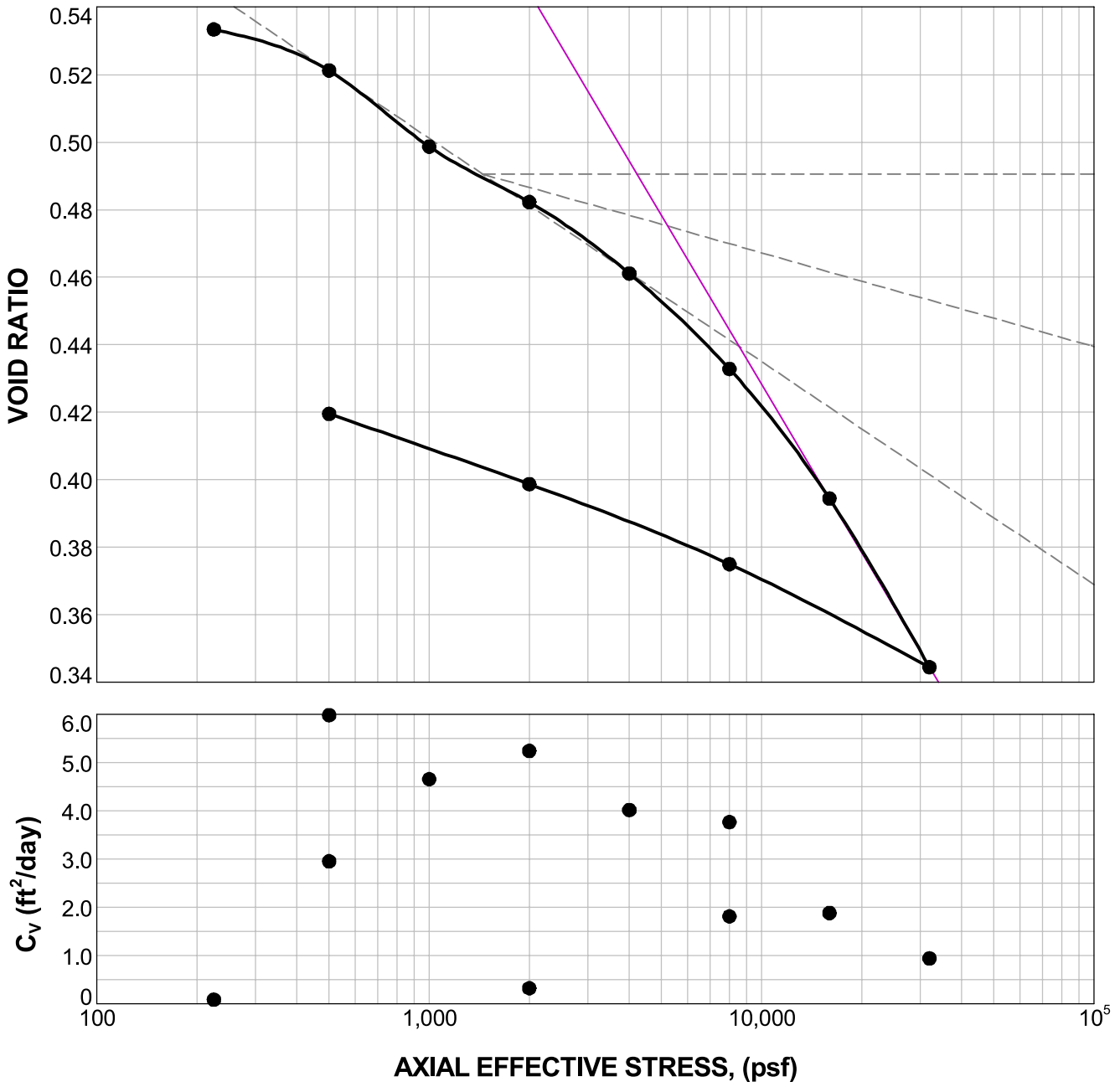
GRAIN SIZE: USCS 1 E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 8/6/21

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

CONSOLIDATION TEST (D2435)



Natural		Initial Dry Density (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c (vr / log stress)	C_r (vr / log stress)	Initial Void Ratio
Saturation	Moisture									
93.3 %	18.5 %	109.7			2.70	1560	5,233	0.166	0.041	0.536

MATERIAL DESCRIPTION	USCS	AASHTO

NOTES:

Borehole: B-7 Depth: 10 ft

PROJECT: Suck Creek WWTP Expansion

PROJECT NUMBER: E2215040

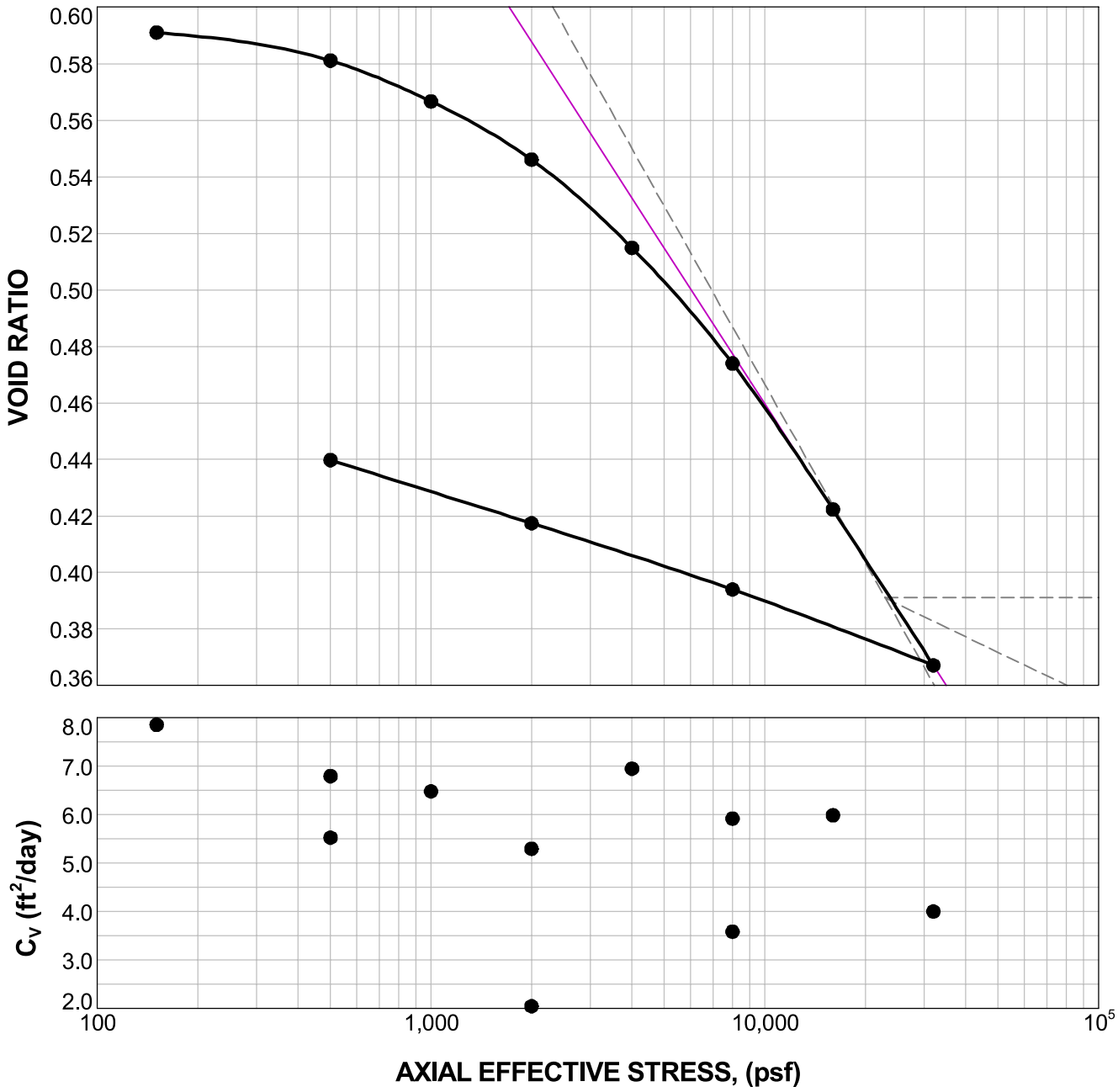
SITE: 1701 Suck Creek Road
Chattanooga, TN

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

CLIENT: LJA Engineering Inc
Chattanooga, TN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CONS_LOAD-DEF_PROP_STRESS-VOIDRATIO_CV E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 8/23/21

CONSOLIDATION TEST (D2435)



Natural		Initial Dry Density (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c (vr / log stress)	C_r (vr / log stress)	Initial Void Ratio
Saturation	Moisture									
92.2 %	20.2 %	105.9			2.70	1273	24,056	0.183	0.040	0.591

MATERIAL DESCRIPTION	USCS	AASHTO

NOTES:

Borehole: B-8 Depth: 8 ft

PROJECT: Suck Creek WWTP Expansion

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Chattanooga, TN

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

CLIENT: LJA Engineering Inc
Chattanooga, TN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CONS_LOAD-DEF_PROP_STRESS-VOIDRATIO_CV E2215040 SUCK CREEK WWTP E.GPJ TERRACON_DATATEMPLATE.GDT 8/23/21

Contents:

General Notes
Unified Soil Classification System
Description of Rock Properties

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS
Suck Creek WWTP Expansion ■ Chattanooga, TN
Terracon Project No. E2215040

SAMPLING	WATER LEVEL	FIELD TESTS
Rock Core Shelby Tube Standard Penetration Test	**Water Initially Encountered** **Water Level After a Specified Period of Time** **Water Level After a Specified Period of Time** **Cave In Encountered** Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	**N** Standard Penetration Test Resistance (Blows/Ft.) **(HP)** Hand Penetrometer **(T)** Torvane **(DCP)** Dynamic Cone Penetrometer **UC** Unconfined Compressive Strength **(PID)** Photo-Ionization Detector **(OVA)** Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or [Cc<1 or Cc>3.0] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or [Cc<1 or Cc>3.0] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K, L, M, N]
			Liquid limit - not dried			Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K, L, M, P]
			Liquid limit - not dried			Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

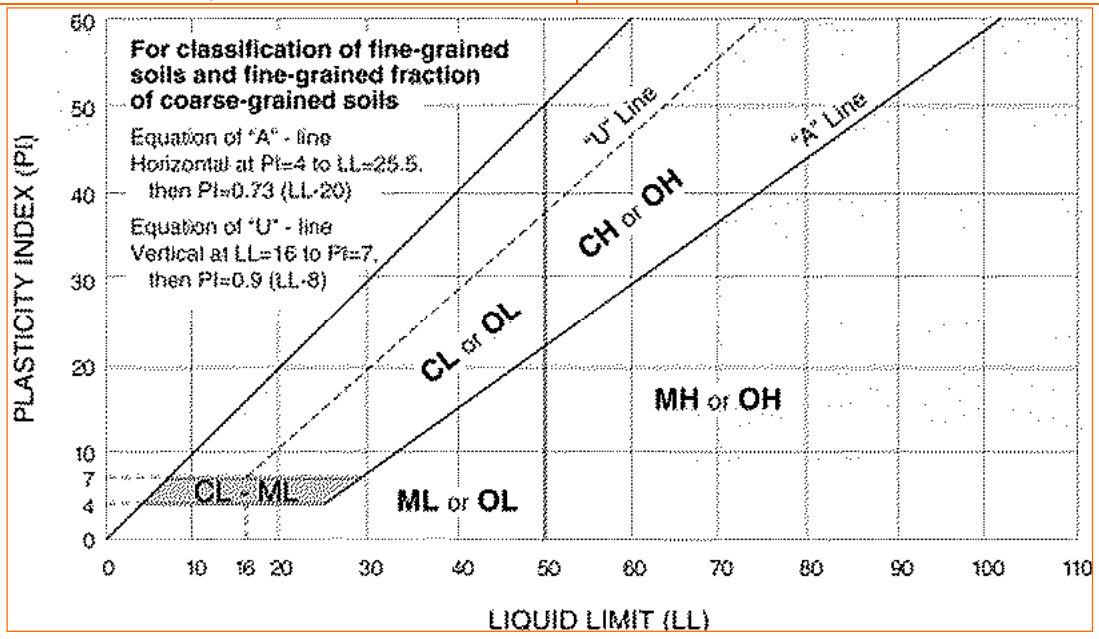
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



DESCRIPTION OF ROCK PROPERTIES

WEATHERING	
Term	**Description**
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	**Field Identification**	**Uniaxial Compressive Strength, psi (MPa)**
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		**Bedding Spacing (May Include Foliation or Banding)**	
Description	**Spacing**	**Description**	**Spacing**
Extremely close	< ¾ in (<19 mm)	**Laminated**	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	**Very thin**	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	**Thin**	2 in – 1 ft. (50 – 300 mm)
Moderate	8 in – 2 ft. (200 – 600 mm)	**Medium**	1 ft. – 3 ft. (300 – 900 mm)
Wide	2 ft. – 6 ft. (600 mm – 2.0 m)	**Thick**	3 ft. – 10 ft. (900 mm – 3 m)
Very Wide	6 ft. – 20 ft. (2.0 – 6 m)	**Massive**	> 10 ft. (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0-degree angle.

ROCK QUALITY DESIGNATION (RQD) [1]	
Description	**RQD Value (%)**
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009
Technical Manual for Design and Construction of Road Tunnels – Civil Elements

DESCRIPTION OF ROCK PROPERTIES

WEATHERING	
Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Very slight	Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	Rock generally fresh, joints stained, and discoloration extends into rock up to 1 in. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately severe	All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick.
Severe	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very severe	All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.
Complete	Rock reduced to "soil". Rock "fabric" no discernible or discernible only in small, scattered locations. Quartz may be present as dikes or stringers.

HARDNESS (for engineering description of rock – not to be confused with Moh's scale for minerals)	
Very hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately hard	Can be scratched with knife or pick. Gouges or grooves to ¼ in. deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 in. deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1-in. maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1-in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

Joint, Bedding, and Foliation Spacing in Rock [1]

Spacing	Joints	Bedding/Foliation
Less than 2 in.	Very close	Very thin
2 in. – 1 ft.	Close	Thin
1 ft. – 3 ft.	Moderately close	Medium
3 ft. – 10 ft.	Wide	Thick
More than 10 ft.	Very wide	Very thick

1. Spacing refers to the distance normal to the planes, of the described feature, which are parallel to each other or nearly so.

Rock Quality Designator (RQD) [1]

RQD, as a percentage	Diagnostic description
Exceeding 90	Excellent
90 – 75	Good
75 – 50	Fair
50 – 25	Poor
Less than 25	Very poor

1. RQD (given as a percentage) = length of core in pieces 4 inches and longer / length of run

Joint Openness Descriptors

Openness	Descriptor
No Visible Separation	Tight
Less than 1/32 in.	Slightly Open
1/32 to 1/8 in.	Moderately Open
1/8 to 3/8 in.	Open
3/8 in. to 0.1 ft.	Moderately Wide
Greater than 0.1 ft.	Wide

References: American Society of Civil Engineers. Manuals and Reports on Engineering Practice - No. 56. Subsurface Investigation for Design and Construction of Foundations of Buildings. New York: American Society of Civil Engineers, 1976. U.S. Department of the Interior, Bureau of Reclamation, Engineering Geology Field Manual.

APPENDIX D

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER RESOURCES
Chattanooga Environmental Field Office
1301 Riverfront Parkway, Suite 206
Chattanooga, TN 37402
Phone 423-634-5745 Statewide 1-888-891-8332 Fax 423-634-6389

April 3, 2023

Mr. Rodney Ashby
Wastewater Manager
HCWWTA
e-copy: rodneya@hamiltontn.gov
1250 Market Street, Suite 3050
Chattanooga, TN 37402

Subject: **NPDES Construction General Permit Tracking No. TNR113984**
Master Tracking Number: TNR113984
Access Road for Signal Mountain Sewage Treatment Plant
Hamilton County Water and Wastewater Treatment Authority
Chattanooga, Hamilton County, Tennessee

Dear Mr. Ashby:

You recently submitted a Notice of Intent (NOI) form as part of an application package to obtain coverage under a General NPDES Permit for Storm Water Discharges Associated with Construction Activity. The Division of Water Resources (the division) acknowledges receipt of the most recent version of the application for the above referenced project on March 28, 2023. After review, the application was deemed to be complete on March 31, 2023. Enclosed is the Notice of Coverage (NOC) form which shows the site name and location, receiving stream, effective date of coverage, etc.

Contractor Information

You have not identified a contractor on the NOI. You must identify a primary contractor, or contractor otherwise responsible for sediment and erosion controls on the construction site, if appropriate, and submit a revised NOI to this office prior to beginning earth clearing operations onsite. When submitting the NOI, please include the above referenced permit tracking number.

Storm Water Pollution Prevention Plan (SWPPP)

You have submitted a Storm Water Pollution Prevention Plan (SWPPP) as required by Section 1.4.2 of the CGP. Please note that the division has not performed an engineering review of the SWPPP and does not certify whether the SWPPP adequately provides for the pollution prevention requirements at the site as described in the general permit. The division acknowledges that you have submitted a SWPPP that appears to include the required components of a SWPPP. It is the responsibility of all site operators to design, implement, and maintain measures that are sufficient to prevent pollution at the referenced site, and to remain in compliance with the terms and conditions of the general permit.

Annual Maintenance Fee and Termination of Permit Coverage

Effective July 1, 2014, permit fees for the General Permit have been revised. In addition to new application fee amounts, annual maintenance fees are now required for projects that exceed one year of coverage. Permittees wishing to terminate coverage must submit a completed notice of termination (NOT) form, which is available on the division's construction stormwater webpage at https://www.tn.gov/content/tn/environment/permit-permits/water-permits1/npdes-permits1/npdes-stormwater-permitting-program/npdes-stormwater-construction-permit.html.

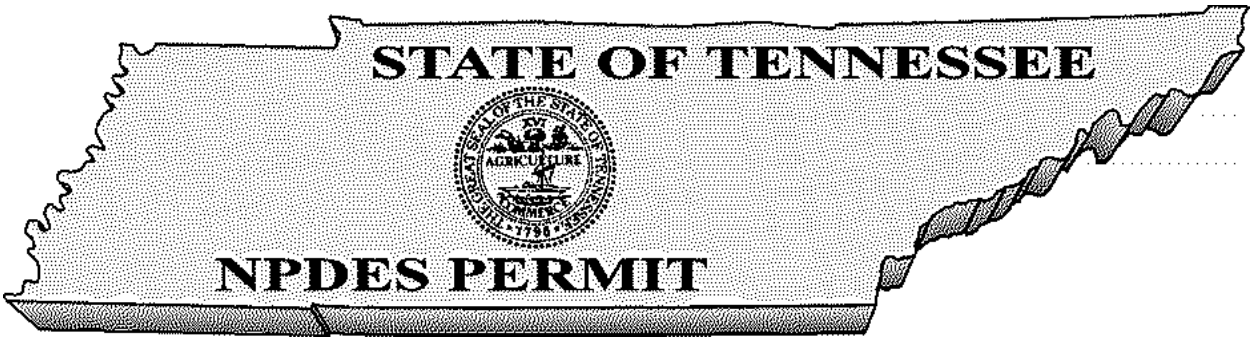
The division will review the NOT for completeness and accuracy and, when necessary, investigate the site for which the NOT was submitted. The division will notify the applicant that either the NOT form was received and accepted, or that the permit coverage is not eligible for termination and has not been terminated. If applicable, the notification will include a summary of existing deficiencies.

We appreciate your attention to the general construction storm water permit and its requirements. A copy of the CGP can be obtained from https://www.tn.gov/content/tn/environment/permit-permits/water-permits1/npdes-permits1/npdes-stormwater-permitting-program/npdes-stormwater-construction-permit.html. We believe this does make a difference to the quality of state waters. If you have any questions, please contact Ms. Nikki Carpenter at (423) 661-5267 or by e-mail at *Nikki.Carpenter@tn.gov*.

Sincerely,

Micah Gravitt
Environmental Program Coordinator

cc: DWR, Chattanooga EFO Permit File
Mr. Scott McDonald, Vice PresidentLJA Engineering, smcdonald@lja.com
Mr. James Heusser, Project ManagerLJA Engineering, gheusser@lja.com
Dr. Mounir Minkara, Water Quality ManagerCity of Chattanooga MS4 Program, mminkara@chattanooga.gov



Tracking Number TNR113984

NOTICE OF COVERAGE UNDER THE GENERAL NPDES PERMIT FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY (CGP)

Tennessee Department of Environment and Conservation
Division of Water Resources
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, TN 37243

Under authority of the Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101 et seq.) and the delegation of authority from the United States Environmental Protection Agency under the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C. 1251, et seq.):

Name of the Construction Project:	**Access Road for Signal Mountain Sewage Treatment Plant (4.7 acres)**
Master Tracking Number at the Site:	**TNR113984**
Permittee Name:	**Hamilton County Water and Wastewater Treatment Authority**
Project Name:	**Access Road for Signal Mountain Sewage Treatment Plant**
Contractor(s):	**no contractor**
is authorized to discharge:	storm water associated with construction activity
from site located at:	**1701 Suck Creek Road, Hamilton County**
to receiving waters named:	

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

Likely presence of threatened or endangered species in one mile radius: **NO**
Likely presence of threatened or endangered species downstream: **NO**

Additional pollution prevention requirements apply for discharges into waters which TDEC identifies as:

- **Exceptional Tennessee Waters: NO**

Your coverage under the CGP shall become effective on **April 3, 2023**, and shall be terminated upon receipt of Notice of Termination.

A copy of the CGP can be obtained from
https://www.tn.gov/content/tn/environment/permit-permits/water-permits1/npdes-permits1/npdes-stormwater-permitting-program/npdes-stormwater-construction-permit.html

LJA ENGINEERING