



# CONTRACT DOCUMENTS AND SPECIFICATIONS

FOR

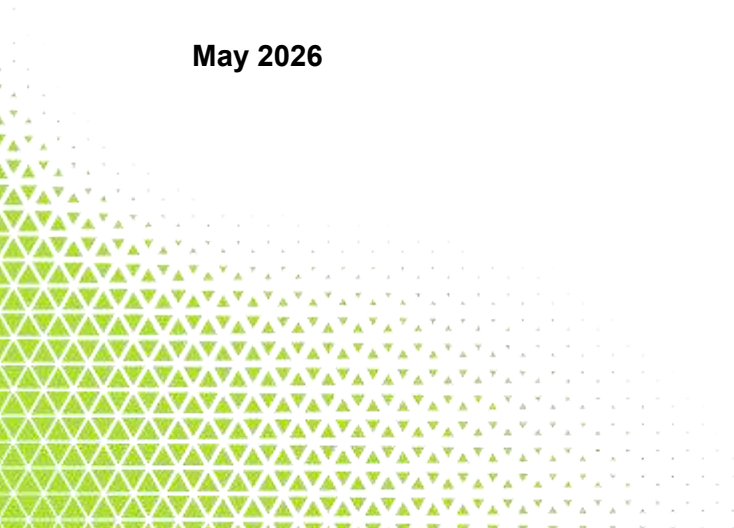
# VINCENT DRIVE DRAINAGE AND ROADWAY IMPROVEMENTS

**Prepared for:**  
CITY OF TAYLOR MILL  
5225 TAYLOR MILL ROAD  
TAYLOR MILL, KENTUCKY 41015

**Prepared by:**  
Verdantas LLC  
300 Buttermilk Pike, Suite 332  
Fort Mitchell, Kentucky 41017

**Verdantas Project No: 34158**

**May 2026**



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# 1. Project Information

**PROJECT:** VINCENT DRIVE DRAINAGE AND ROADWAY IMPROVEMENTS

**OWNER:** CITY OF TAYLOR MILL  
5225 TAYLOR MILL ROAD  
TAYLOR MILL, KENTUCKY 41015  
KENTON COUNTY, KENTUCKY

**ENGINEER:** VERDANTAS, LLC  
300 BUTTERMILK PIKE, SUITE 332  
FORT MITCHELL, KENTUCKY 41017

**CONTACT:** JIM SHUMATE  
**TELEPHONE:** (859) 534-9931  
**EMAIL:** JSHUMATE@VERDANTAS.COM  
**Web Site:** [www.verdantas.com](http://www.verdantas.com)

**PROJECT #:** 34158

**BID OPENING DATE:** THURSDAY, JUNE 4, 2026 @ 2:00 PM

**ADVERTISING DATE:** THURSDAY, MAY 14, 2026

**COMMENCEMENT DATE:** JULY 15, 2026 (Estimated)

**COMPLETION DATE:** SEPTEMBER 30, 2027



## 2. CITY OF TAYLOR MILL OFFICIALS

MAYOR

DANIEL BELL

CITY ADMINISTRATOR

BRIAN HANEY

CITY COUNCIL

CAROLINE BRADEN

MARK KREIMBORG

ROSE MERRITT

DANIEL MURRAY



### 3. Legal Notice – Invitation to Bid

## CITY OF TAYLOR MILL, KENTUCKY

### KENTON COUNTY

### LEGAL NOTICE

Sealed proposals will be received at the office of the City Clerk, Municipal Building, **CITY OF TAYLOR MILL, 5225 TAYLOR MILL ROAD, TAYLOR MILL, KENTON COUNTY, KENTUCKY, 41015** until **2:00 PM**. local time on **THURSDAY JUNE 4, 2026**, for furnishing all labor, materials, and equipment necessary to complete project known as **VINCENT DRIVE DRAINAGE AND ROADWAY IMPROVEMENTS** and, at said time and place, publicly opened and read aloud.

Bids must be in accordance with drawings and specifications and on forms available from Verdantas LLC at a non-refundable cost of One Hundred Dollars (\$100.00) for mailed hard copies and \$45.00 for electronic files. Documents may be ordered by registering and paying for the documents online at <https://bids.verdantas.com>. Please contact [planroom@verdantas.com](mailto:planroom@verdantas.com) or call 440-530-2351 if you encounter any problems registering or paying for the documents.

The bid specifications, drawings, plan holders list, addenda, and other bid information (**but not the bid forms**) may be viewed and/or downloaded for free via the internet at <https://bids.verdantas.com>. The bidder shall be responsible to check for Addenda and obtain same from the web site.

Proposals must contain the full name of the party or parties submitting the same and all persons interested therein. It is the intent and requirements of the owner that this project be completed no later than **SEPTEMBER 30, 2027**.

The City Council of the **CITY OF TAYLOR MILL**, reserve the right to waive irregularities and to reject any or all bids.

The City Council of the **CITY OF TAYLOR MILL** shall authorize acceptance of the bid made by the responsible bidder who, in Council's judgment, offers the best and most responsive proposal to the City, considering quality, service, performance record, and price; or Council may direct the rejection of all bids. The City may award based on "functional equivalence" concerning specified work or products.

By the order of the City Council of the **CITY OF TAYLOR MILL**.

Publishing Date: LINKNKY.com – **MAY 14, 2026**



## 4. Instructions to Bidders

### 4.1 General

Sealed bids will be received until **JUNE 4, 2026**, at **2:00 PM**, at the office of the City Clerk, Municipal Building, **CITY OF TAYLOR MILL, 5225 TAYLOR MILL ROAD, TAYLOR MILL, 41015** for the furnishing of labor and materials required for the **VINCENT DRIVE DRAINAGE AND ROADWAY IMPROVEMENTS**, all in accordance with these instructions, conditions, specifications, and on the enclosed forms. All shall be submitted in a sealed envelope addressed to the **CITY OF TAYLOR MILL** and shall be plainly marked on the outside of the envelope **VINCENT DRIVE DRAINAGE AND ROADWAY IMPROVEMENTS**. No bid may be withdrawn, once the bid has been deposited with the Owner, except in accordance with Kentucky Standard Specifications for Road and Bridge Construction, Section 102.11. Proposals received after the time for the opening of bids will be returned to the Bidder unopened. All bids shall remain valid for a period of sixty (60) days from the date of Bid Opening.

### 4.2 Definition of Terms

Whenever the term “Bidder” occurs, it shall mean any person, firm or corporation as a Prime Contractor who submits a proposal/bid for the Project, either acting directly or through a duly authorized representative.

Whenever the term “Bid Packet” occurs, it shall mean all the documents contained herein and any addenda thereto.

Whenever the term “City” or “Owner” occurs, it shall mean the **CITY OF TAYLOR MILL**. The Mayor, or their designee, shall be the representative for the Owner.

Whenever the term “Contract” occurs, it shall mean the written agreement between the Owner and the Contractor covering the performance of the Work on the Project and the furnishing of labor and/or materials in the construction of the Work on the Project, including the Contract Documents.

“Contract Documents” shall mean these Instructions to Bidders and General Conditions, the Specifications, any Drawings and/or Plans, the Contract Bond and all other forms or certificates required by these Instructions, all forms included with the Contractor’s Bid, all the material contained in this Bid Packet, any Change Orders, and all addenda to any of the aforementioned items. The Contract Documents shall be a part of the Contract as if fully rewritten therein.

Whenever the term “Contractor” occurs, it shall mean a person, firm or corporation contracting with the Owner as a Prime Contractor to supply labor, materials, or equipment or all for the Project.

Whenever the term “Construction Manager” or “Engineer” occurs, it shall mean Verdantas., or agent so designated by the Owner to act as the Owner’s agent.

Whenever the term “Director” occurs, it shall mean the Owner, or the Owner’s agent.

Whenever the term “Project” occurs, it shall mean the entire public improvement proposed by the Owner to be constructed in part or in whole pursuant to the Contract.

Whenever the term “Proposal or “Bid” occurs, it shall mean the offer of the Bidder to perform the Work on the Project, when said offer is made out and submitted on the prescribed forms, properly signed and guaranteed, and in the prescribed manner.



Whenever the term “Subcontractor” occurs, it shall mean a person, firm, or corporation other than the Prime Contractor supplying labor and materials for the Work to the Contractor and under the control of the Contractor.

Whenever the term “the Work” occurs, it shall mean the Work to be performed in constructing and completing the Project, including all labor, materials and equipment.

### **4.3 General Provisions**

The most current State of Kentucky, Transportation Cabinet, Department of Highways (KTC) Standard Specifications for Road and Bridge Construction, as specifically set forth herein, are adopted and made part of these Contract Documents, unless specifically excluded herein.

All references to the Director, the Director of Highways, the First Assistant Director, and Chief Engineer, the Deputy Director of Design and Construction, the Deputy Director of Operations, the Engineer of Construction, the Engineer of Maintenance, the Engineer of Bridges, the Engineer of Tests, shall be considered to read the Engineer.

All references to the State, the State of Kentucky, the Cabinet, or the Transportation Cabinet shall be considered to read the Owner.

### **4.4 Examination of Plans, Specifications, General Provisions and Site**

The Bidder is expected to examine carefully the site of the proposed Work, the proposal, plans, specifications, contract documents, general provisions, and addenda, before submitting a proposal. The submission of a bid shall be considered evidence that the Bidder has made such examination and is satisfied as to the conditions to be encountered in performing the Work and as to the requirements of the plans, specifications, general conditions, special provisions, addenda and Contract.

Subject to public safety and convenience, prospective Bidders will be permitted to explore the site of the Work by boring or test pits, permits for which will be issued by the Engineer.

Explorations shall be at the sole risk and expense to the Bidder and under conditions of safety, maintaining traffic, and restoring all areas disturbed by any and all explorations to conditions equal to, or better than, the condition prior to exploration.

The Owner does not make any representation of soil or foundation conditions or materials, nor does it represent that drawings may not be modified to meet changes in soil conditions encountered as the Work progresses. The Contractor must inspect the site of the proposed Work and must assume all risk as to the nature and behavior of the material which may be encountered in excavation, whether apparent on the surface or disclosed only in the course of the Work.

### **4.5 Interpretation of Quantities in Proposal**

The quantities appearing in the proposal are approximate only and are prepared for the comparison of the bids. Payment to the Contractor will be made only for the actual quantities of Work performed



and accepted or materials furnished and accepted in accordance with the Contract except for lump sum contracts and except for lump sum items in unit price contracts. The scheduled quantities of Work to be done and materials to be furnished may be increased, decreased, or omitted as hereinafter provided.

#### **4.6 "Or Approved Equal" Items**

In the preparation of these documents and plans, several proprietary products may have been specified. In all such cases, it is to be understood that the Contractor may offer a substitute for the specified product, as indicated by "Or Approved Equal". However, the Contractor must be aware that, before commencement of construction, he must provide information to the Engineer concerning the substituted product, and that the Engineer must approve in writing the offered product as being equal to the specified product before use or incorporation in the Work.

Unless otherwise modified by the Engineer, proprietary products are to be installed and/or constructed in strict compliance with the pertinent manufacturer's specifications.

#### **4.7 Addenda**

The Contractor shall notify the Engineer promptly of any discrepancies in, or omissions from the Contract Documents. The Engineer will issue a clarifying addendum to each person on record as having received a set of Contract Documents. The Owner will not be responsible for oral instruction or information. Questions received less than five (5) days prior to bid date cannot be answered. Any Addenda issued during the bidding period are to be included in the Proposal and shall become a part thereof.

#### **4.8 Alternate Bid**

It is the Owner's intent for the Contractor to bid on both the base and alternate bid items (if provided). Upon award of the Contract, the Owner will inform the Contractor, in writing, if the standard bid or alternate bid items will be included with the Project.

Award of the project will be based on the standard bid and/or alternate bid items ultimately selected by the Owner for inclusion in the project and award amount.

**The Owner reserves the right to award or delete any or all combinations.**

#### **4.9 General Conditions**

The successful Bidder/Contractor shall be responsible for all site operations related to the Work as shown and described in the Specifications, Plans and related General Provisions, and shall meet all requirements of these Instructions, General Provisions, and Specifications. All Work shall be completed in compliance with these Instructions, the General Provisions, Specifications, Plans and other Contract Documents.



#### **4.10 Bidder Qualifications**

The Owner requires that the Bidder furnish satisfactory evidence that he has the necessary resources to fulfill the conditions of the Contract and the Specifications. Each Bidder shall submit on the form included in the Bid Packet, a statement of the Bidder's qualifications. Each Bidder must furnish satisfactory evidence that it is operating a business of a type that can meet the Specifications for the Work and that it has operated such business for at least the last two (2) years. Only Bidders who have sufficient experience; ample equipment and personnel; adequate financial resources or the ability to obtain such resources as required during the performance of the Contract; who are able to comply with the required performance schedule for the Work; who have a satisfactory record of integrity; who have a satisfactory record of performance (Bidders who are delinquent in current contract performance, when the number and the extent of the delinquencies of each are considered, shall be presumed to be unable to fulfill this requirement, in the absence of evidence to the contrary or circumstances properly explained); and who are otherwise qualified and eligible to receive an award under applicable Kentucky laws and regulations, shall be considered.

The Owner shall have the right to take such steps as it deems necessary to determine the ability of the Bidder to perform his obligations under the Contract, and the Bidder shall furnish to the Owner all such information and data for this purpose as it may request. The right is reserved to reject any bid where an investigation of the available evidence or information does not satisfy the Owner that the Bidder is qualified to carry out properly the terms of the Contract.

The Owner requires that the Bidder furnish a list of references of **all** persons, corporations, political subdivisions or firms for whom the Bidder has done the type of Work required for this Project within the last two (2) years.

#### **4.11 Subcontracts**

The Bidder shall submit, with his bid, a complete list of the names and addresses of any subcontractors he contemplates for use on the Project. In addition, the Owner requires that the Bidder furnish a list of subcontractor references of **all** persons, corporations, political subdivisions or firms for whom the proposed subcontractor has done the type of Work proposed under contract between the Contractor and the subcontractor within the last two (2) years.

The subcontractor must be acceptable to the Owner and approved by the Owner, in writing, prior to the execution of the Contract. Although such approval shall not be arbitrarily withheld, subcontractors that have proven unsatisfactory in the past or do not have adequate manpower or resources to perform the Work will not be accepted. Only subcontractors who have sufficient experience; ample equipment and personnel; adequate financial resources or the ability to obtain such resources; who are able to comply with the required performance schedule for the Work; who have a satisfactory record of integrity; who have a satisfactory record or performance (Bidders who are delinquent in current contract performance, when the number and the extent of the delinquencies of each are considered, shall be presumed to be unable to fulfill this requirement, in the absence of evidence to the contrary or circumstances properly explained); and who are otherwise qualified and eligible to receive an award under applicable Kentucky laws and regulations, shall be considered.

The subcontractor must submit a non-collusion affidavit prior to the execution of the Contract.

Approval of the proposed subcontractor(s) will not be given by the Owner unless and until the above requirements are met. Although the Bidder is not required to submit the required Subcontractor forms, filled out by any proposed subcontractors, with its bid, the Bidder is hereby advised of these requirements



so that appropriate action can be taken to prevent subsequent delays in subcontract awards and/or the execution of the Contract.

After the Subcontractors have been approved and the Contract signed, no changes in the subcontractors shall be made without the prior written approval of the Owner.

#### **4.12 Bid Guaranty**

In accordance with Kentucky Transportation Cabinet Standard Specifications for Road and Bridge Construction Section 102.09, and in order to assure that if the Bidder's bid is accepted that it will enter into the Contract with the Owner, each bid must be accompanied by a Bid Guaranty in the form of either:

1. A Bond for 10% percent of the bid, in the form of a Bid Guaranty Bond, acknowledged by the Bidder, as principal, and by a surety company qualified to do business in the State of Kentucky, and satisfactory to the Owner as surety; or
2. A cashier's check or certified check issued by a responsible bank or trust company, and made payable to the order of the Owner, in the sum of at least ten percent (10%) of the Bid.

The Bid Guaranty shall be enclosed in the sealed envelope containing the Bid.

If the bidder chooses to submit a Bid Guaranty Bond, the bond shall be in form prescribed by KTC Standard Specifications for Road and Bridge Construction Section 103.05. The Bond must be signed by an authorized agent of an acceptable surety bonding company and by the Bidder. The bond must be countersigned by a resident agent of the bonding company and its corporate seals must be affixed to all copies. ***The name and address of both the surety and surety's agent must appear on the bond.*** Bid Guaranty must be supported by credentials showing the Power of Attorney of the surety's agent.

Bid guaranties (cashier's check or certified check) will be returned to unsuccessful Bidders within fifteen (15) days of the execution of the Contract with the successful Bidder.

Once the bid is awarded pursuant to the Notice of Award, the Contractor will be required to execute the Contract with the Owner within ten (10) days of its receipt of said Notice. Execution of the Contract shall require the submittal of a Performance Bond (unless the Bidder has already submitted a Bid Guaranty Bond), proof of insurance, and other documents, as outlined below. Executed copies of the bond and insurance certificates are required for each set of Contract Documents. If the Contractor fails to execute the Contract within the required time, the Contractor's Bid Guaranty may be forfeited to the Owner, not as a penalty, but as liquidated damages, in accordance with the terms of the Bid Guaranty. The Project may then be rebid or awarded to the next lowest and best bidder, as the Owner determines at its own discretion.

#### **4.13 Preparation of Proposal**

The Bidder shall submit their Proposal upon the forms furnished by the Owner. All blank spaces for bid prices must be filled in, in words or figures, and shall be written in ink or typewritten. The Bidder shall initialize any corrections or changes in the Proposal.

The Bidder's Proposal must be signed in ink by the individual, by one or more members of the partnership, or by one or more officers of a corporation, or by an agent of the Bidder legally qualified and acceptable to the Owner. If the Proposal is made by an individual, his name and business address must be shown; by a partnership, the name and business address of each partnership member must be shown; by a corporation, the name of the state under the laws of which the corporation is chartered and the name and



title of the officer or officers having authority under the bylaws to sign contracts, the name of the corporation and the business address of its corporate officials must be shown.

A foreign corporation submitting a Proposal must comply with the laws of doing business in the State of Kentucky, if its Proposal or any part thereof is accepted.

To be considered responsive, each bid shall consist of the following, fully executed:

1. Bidder Information Sheet
2. Bid Proposal
3. Bid Form
4. Bid Guaranty and Contract Bond
5. Certificate as to Interest
6. Subcontractors List
7. Certification As to Kentucky Resident Status OR Certification As to Non-Resident Status
8. Personal Property Tax Affidavit

The Bidder's attention is directed to all applicable Federal, State, and local laws, and the rules and regulations of all authorities and agencies having jurisdiction over the Work. All such laws, rules, and regulations shall apply to the Contract and every aspect of the Work and shall be deemed included as a part of the Contract as if the same were fully written therein.

The attention of Bidders is especially directed to the following:

1. Federal and Civil Rights Law regulating Equal Opportunity Employment
2. Bid Guaranty and Contract Bond requirements
3. Statutory requirements of the State of Kentucky relative to licensing of corporations organized under the laws of any other state
4. Federal or State of Kentucky Prevailing Wage Law

The price or prices shown on the proposal shall include all costs associated with the Work (including labor), shall be the actual price(s) to be paid by the Owner, and shall include all discounts, allowances, etc. Each Bidder shall bid on each item listed in the Proposal.

Where a discrepancy appears between the sum shown in the "Total" column and the correct product of the sums appearing in the "Estimated Quantity" and "Unit Price" columns, the correct product of the sums appearing in the "Estimated Quantity" and "Unit Price" columns shall control.

#### **4.14 Commencement And Completion Dates**

Contractor may not begin work prior to **JULY 15, 2026** (estimated) (unless previous approval is given by the Owner).

It is the intent and requirement of the Owner that the proposed work shall be installed and operational no later than the date stated in the contract contained within this document.

#### **4.15 Delivery of Proposals**

The total Contract Documents and Specifications book shall be placed, together the required completed forms, in a sealed envelope addressed to the Owner. Proposals will be received until the hour and date



set for the opening thereof and must be in the hands of the Owner's appointed representative by such time. Proposals received after the time indicated for the opening of bids will be returned to the Bidder unopened.

#### **4.16 Withdrawal or Modification of Proposals**

No bid may be withdrawn, once the bid has been deposited with the Owner, except in accordance with Kentucky Standard Specifications for Road and Bridge Construction, Section 102.11. Likewise, modifications to a bid, once submitted, shall not be accepted.

#### **4.17 Public Opening of Proposals**

Proposals will be opened and read aloud publicly at the time and place designated in the Legal Notice to Bidders. Bidders, their authorized agents, and other interested parties are invited to be present.

#### **4.18 Disqualification of Bids**

Any bid submitted unsealed or unsigned, or any bid deemed unresponsive will be disqualified and returned to the Bidder. Bids submitted without a Bid Guaranty or an invalid Guaranty will be disqualified and will be returned to the Bidder.

#### **4.19 Non-Responsive Proposals**

Proposals may be considered non-responsive and may be rejected for the following reasons:

1. If the Proposal is on a form other than that furnished by the Owner or if the form is altered or any part thereof is detached.
2. If there are unauthorized additions, conditional or alternate bids, conditions, or irregularities of any kind which may tend to make the Proposal incomplete, indefinite or ambiguous as to its meaning.
3. If the Bidder adds any provisions reserving the right to accept or reject the Award or to enter into the Contract pursuant to the Award. This does not exclude a bid limiting the maximum gross amount of awards acceptable to any one Bidder at any one bid letting, provided that any selection of awards will be made by the Owner.

#### **4.20 Rights Reserved By The Owner**

The Owner reserves the right to review and evaluate all bids for a period of sixty (60) days before final notice of award. The Owner may hold the Bid Proposal of the lowest bidder longer than 60 days if the bidder concurs. An notice of award will be sent to the mailing address or email address as listed in the Bid Proposal, which will serve as the official notice that the project has been awarded to the selected contractor.

The Owner reserves the right to reject any and all bids, to waive any discrepancies or irregularities in the bidding, and to determine, in its own discretion, which Proposal is the best bid. Lowest bid, while a major



consideration, will not exclusively govern the Bid Award. The Bid Award shall be made from all considerations, including costs and the responsibility of the Bidder.

The Owner reserves the right to reject the bid of any Bidder who has previously failed to perform properly or complete on time contracts of similar nature; who is not in a position to perform the Contract; or who has habitually, and without just cause, neglected the payment of bills or otherwise disregarded his obligations to subcontractors, materialmen or employees.

In addition to the above-mentioned items, the Owner will also consider the following in determining the best bid: that the Bidder maintains a permanent place of business; has adequate equipment to do the Work properly and expeditiously; has suitable financial status to meet the obligations incidental to the Work; and has the necessary experience.

The Owner reserves the right to award or delete any or all items or combination of items.

#### **4.21 Material Guaranty**

Before the Contract is awarded, the Bidder may be required to furnish a complete statement of the origin, composition and manufacturer of any or all materials to be used in the construction of the Work together with samples, of which said samples may be subjected to any tests the Owner, in its sole discretion, deems appropriate to determine their quality and fitness for the Work.

#### **4.22 Notice of Award**

The award of the Contract, if it be awarded, will be made to the best overall Bidder whose Proposal complies with all the requirements prescribed. In no case will an award be made until all necessary investigations are made as to the responsibility of the Bidder to whom it is proposed to award the Contract. The successful Bidder will be notified by letter, mailed or emailed to the address shown on his Proposal that his bid has been accepted and that he has been awarded the Contract.

#### **4.23 Documents Required Prior To Signing of Contract**

Immediately upon the award of the bid and prior to the signing of the Contract, the Contractor shall furnish to the Owner:

1. Kentucky Workers' Compensation Certificate.
2. Credentials showing the Power of Attorney of the Agent of the Surety
3. A Certificate of Compliance issued by the Division of Insurance showing the right of the bonding company to do business in the State of Kentucky.
4. A Certificate of Insurance with coverage as specified in these Instructions, covering the period of time the Work will be in progress.
5. Listing of selected subcontractor(s) for Owner approval, in accordance with the second paragraph under "Subcontracts" of these Instructions.



#### **4.24 Contract Guaranty**

The Contractor at the time the Contract is entered into, shall furnish a Performance Bond, in the form prescribed by KTC Standard Specifications for Road and Bridge Construction Section 102.09, payable to the Owner, for the total amount of the Contract. Said Bond shall be duly executed by the Contractor, as principal, and by a surety company qualified to do business under the laws of the State of Kentucky and satisfactory to the Owner, as surety, for the faithful performance of the Contract and payment for labor and materials. The Bond must be signed by an Authorized Agent of an acceptable surety bonding company and by the Contractor. The Performance Bond must be countersigned by a resident agent of the bonding company and its corporate seals must be affixed to all copies. The name and address of both the surety and surety's agent must appear on Bond, and it must be supported by credentials showing the Power of Attorney of the surety's agent.

The premiums of such Bonds shall be paid by the Contractor.

If the Contractor fails to perform under the Contract, the Performance Bond may be forfeited by the Contractor to the Owner, in accordance with the termination provisions contained herein.



## 5. General Provisions

### 5.1 Quantities

The Owner reserves the right to delete quantities of either labor or materials or both, from the Contract, as deemed necessary by the Owner, to meet any funding restrictions for the Work.

### 5.2 Subcontractors

The Contractor may utilize subcontractors, subject to the following:

1. The Contractor shall not assign, transfer, convey, sublet, or otherwise dispose of the Contract or his rights, title or interest in or to the same or any part thereof, without the written consent of the Owner. Such consent shall not release or relieve the Contractor or his Surety from any obligation or liability under the Contract. In no case will the Contractor be permitted to sublet more than fifty percent (50%) of the total Contract cost.
2. The Contractor shall not award subcontracts to any subcontractor without prior written approval of the Owner.
3. The Contractor shall be fully responsible for the acts or omissions of any of its subcontractors. Nothing contained in the Contract or the Contract Documents shall create any contractual relationship between the Owner and any subcontractors.
4. The Contractor shall cause appropriate provisions to be inserted in all subcontracts that bind the subcontractor to the Contractor under the same terms of any provisions of the Contract Documents that are applicable to the Work of the subcontractor, and that give the Contractor the right to terminate the subcontractor for any violation of those provisions by the subcontractor.

### 5.3 Insurance

The Contractor shall not commence Work under the Contract until it has obtained all insurance required under this paragraph. The policies shall also protect the Owner, its officers, agents, and employees as additional insured, and shall be in a form approved by the Owner. Certified copies of the insurance policies, fully executed by officers of the insurance company, shall be submitted with the executed Contract and must be submitted before the Notice to Proceed will be sent. Coverage will be provided through insurance companies licensed to do business in the State of Kentucky.

During the term of the Contract, the Contractor will agree to provide evidence of insurance in the amounts stated below. The Contractor may also be required to submit the original insurance policies for inspection and approval of the Owner before Work is commenced. Said policies shall provide that they cannot be cancelled, permitted to expire, or be changed without fifteen (15) days advanced written notice to the Owner. The Contractor shall provide all insurance required by this Contract.

Required Insurance: The Contractor shall take out, and maintain during the life of the Contract, Comprehensive General Liability Insurance, Automobile Liability Insurance and an Excess Liability



Umbrella Form. Such policies shall protect the Contractor and the Owner from any and all claims or damages for bodily injury, including accidental death, as well as any and all claims for property damage, during the performance of any and all Work under the Contract, whether such performance be by the Contractor, any subcontractor, or by anyone directly or indirectly employed by either of them or in any such manner as would impose liability on the Owner. The **minimum** required limits for each type of policy are as follows:

A. Comprehensive General Liability:

- |     |                              |   |
|-----|------------------------------|---|
| (1) | General Aggregate            | \$1,000,000   |
| (2) | Bodily Injury/Wrongful Death | \$1,000,000 per person<br>\$1,000,000 per occurrence<br>\$2,000,000 aggregate liability |
| (3) | Property Damage*             | \$1,000,000 per occurrence<br>\$2,000,000 aggregate liability                           |

B. Comprehensive Automobile Liability:

- |     |                              |   |
|-----|------------------------------|---|
| (1) | Bodily Injury/Wrongful Death | \$1,000,000 per occurrence<br>\$1,000,000 aggregate liability |
| (2) | Property Damage*             | \$1,000,000 per occurrence<br>\$1,000,000 aggregate liability |

\*Including any damage caused by blasting or underground excavation.

C. Excess Liability Umbrella Form:

- |     |                   |             |
|-----|-------------------|-------------|
| (1) | General Aggregate | \$3,000,000 |
| (2) | Each Occurrence   | \$1,000,000 |

Owner's Protective Liability Insurance: The Contractor shall take out, and maintain during the life of the Contract, an Owner's Protective Liability Insurance policy in the name of the Owner. The primary insurance policy shall not be less than a minimum combined single limit of \$1,000,000. In addition, a \$1,000,000 excess policy will be required. The policy shall protect the Owner from any claims or damages that may arise out of or result from the performance of any Work or from any operations, either directly or indirectly, by the Contractor or its subcontractors under the Contract.

Subcontractor's Insurance: The Contractor shall require subcontractors not protected under the Contractor's insurance policies to take out and maintain insurance of the same nature and kind and in the same amounts as required of the Contractor.

Workers' Compensation Insurance: Before any Work is commenced, the Contractor shall take out, and maintain during the life of the Contract, Workers' Compensation Insurance for all of its employees, in accordance with the laws of the State of Kentucky. In case any Work is subcontracted, the Contractor shall require the subcontractor similarly to provide Workers' Compensation Insurance for all of the latter's employees, unless such employees are covered by the protection afforded by the Contractor. In case any class of employees engaged in Work under this Contract is not protected under the Workers' Compensation statute, the Contractor shall provide Employee Liability Insurance for any such employees and shall provide or cause each subcontractor to provide the same.



#### **5.4 Antidiscrimination Clause**

The Contractor hereby agrees to the following:

1. That in the hiring of employees for the performance of the Work under this Contract or any subcontract, neither the Contractor nor any subcontractor, nor any persons acting on behalf of the same, will discriminate against any citizen in the employment of or laborers or workers who are qualified and available to perform the Work, for reasons of race, creed, color, national origin, religion, age, sex, handicap, or familial status; and
2. That neither the Contractor nor any subcontractors, nor any persons acting on behalf of the same, shall in any manner discriminate or intimidate any employee hired for the performance of the Work on account of race, creed, color, national origin, religion, age, sex, handicap, or familial status.

#### **5.5 Preconstruction Conference And Partnering**

A preconstruction conference with the Owner will be required of the successful Bidder/Contractor. Said conference will be held for the purpose of reviewing the Specifications, Plans, and execution of the Work. The Engineer will arrange the meeting between the Contractor, the Owner, and representatives of the utility companies, and all parties shall be notified of the time, date, and location of the conference by the Engineer. The Agenda for the conference shall include, as a minimum, the following items:

1. Status of Contract and Notice to Proceed
2. Utility company requirements, BUD notification
3. Designation of emergency 24-hour Contractor contacts
4. Discussion of critical items
5. Required permits.
6. Notice to property owners
7. Maintenance of Traffic
8. Review of testing requirements and inspection procedures
9. Operations schedule and completion date
10. Listing of haul roads
11. Confirmation of subcontractors and suppliers
12. Review of the Change Order process
13. Payment Request submittal procedures
14. Payroll submittal procedure

#### **5.6 Haul Roads**

The Contractor shall also provide at the preconstruction conference, a list of the local roads to be used for the purpose of hauling equipment and/or material to or from the Project site. Only the local roads in the vicinity of the Project have to be listed; state and/or Federal roads do not have to be included. Where necessary, the list shall include the extent of the roads to be affected and any special restrictions, such as height or weight restrictions, which may be applicable. Construction shall not commence until the Owner has reviewed the haul roads list and approved the same. The submission of the list and approval of the same do not relieve the Contractor the responsibility for conforming to and obeying all applicable height and weight restriction on the haul roads, nor from responsibility for any damages done to, on or along said haul roads. The Contractor is referred KTC Standards and Specifications for Road and Bridge Construction Section 105.10 concerning restrictions.



## **5.7 Permits**

The Contractor will be required to obtain all permits necessary in connection with the Work. All permits shall be subject to the inspection of the Owner.

Work on this project will be subject to the requirements of the encroachment permit obtained from the Kentucky Transportation Cabinet, including work hours and maintenance of traffic requirements.

## **5.8 Operations/Progress Schedule and Coordination**

At the preconstruction meeting, the Contractor shall submit to the Engineer a schedule showing the method and manner which the Contractor proposes to pursue so as to complete the proposed Work in such a manner that it will be ready for final acceptance within the time stated in the Proposal. Said schedule will show location, sequence, equipment, manpower, and estimated calendar days to complete each segment of Work required. Upon approval by the Engineer of the starting point of the various phases of the construction, the method and manner of performing the Work and the sequence of operations shall not be altered except with the approval of the Owner. Changes to said schedule are to be issued in writing and approved by the Engineer and Owner before operations are changed or rescheduled.

The Contractor shall use all practical means to make the progress of the Work conform to that shown on the progress schedule which is in effect. No payment will be made to the Contractor while he is delinquent in the submission of a progress schedule. Should the prosecution of the Work, for any reason, be discontinued, the Contractor shall notify the Owner at least twenty-four (24) hours in advance of resuming operations.

## **5.9 Coordination of Specifications, Plans and General Provisions**

The specifications, the supplemental specifications, the plans, general provisions, and all supplementary documents are essential parts of the Contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary to each other and to describe and provide for a complete project. In case of discrepancy, calculated dimensions will govern over scaled dimensions, plans will govern over specifications, proposals and special provisions will govern over both specifications and plans.

The Contractor shall take no advantage of any apparent error or omission in the plans or specifications. In the event the Contractor discovers such an error or omission, he shall immediately notify the Engineer. The Engineer will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the plans and specifications. See "Extra Work" and "Modification of Contract or Change Orders".

All items salvaged as part of this Contract shall be removed by the Contractor without damage as excavation and work progresses, and placed within the right-of-way where they may be conveniently picked up by the Owner's forces. Old materials not reserved by the Owner and not being used in the work will become property of and must be disposed of by the Contractor.



## **5.10 Plans**

If applicable, the plans illustrate the general character and scope of the Work covered by the Specifications and Contract Documents. Additional detailed drawings and other information deemed necessary by the Engineer will be furnished to the Contractor when and as required by the Work. Shop drawings, when approved by the Engineer, shall govern all details of the Work and shall take precedence over all other drawings. Figured dimensions on drawings shall take precedence over general drawings and shall be considered as explanatory and not as indicating extra work.

## **5.11 Notice To Proceed**

Once the Contract has been entered into and the preconstruction conference held, the Owner will provide the Contractor a Notice to Proceed. Said Notice shall state the beginning date the Contractor shall commence the Work and the date by which the Work is to be completed.

## **5.12 Safety Standard And Accident Prevention**

With respect to all Work performed under the Contract, the Contractor shall comply with all safety standard provisions of (1) all applicable building and construction codes; (2) the *Manual of Accident Prevention in Construction*, published by the Associated General Contractors of America; (3) the requirements of the Occupational Safety & Health Act, and the requirements of Title 29 of the Code of Federal Regulations, Chapter 15.

The Contractor shall maintain at the job site all medical items and equipment necessary for administering first aid to the injured, and shall make standing arrangements for the immediate removal to a hospital or doctor's care of all persons injured on the job site. In no case shall the Contractor permit any employee to work at the job site before it has made arrangements for the immediate removal of injured persons to a hospital or doctor's care.

The Contractor shall at all times exercise every precaution for the protection of persons, including its employees, and property, and shall guard against creating any unnecessarily hazardous conditions. This protection shall include, but is not limited to, sheeting and shoring, barricades, and warning lights as needed.

The Contractor shall be responsible for all accidents arising out of or connected with its performance under the Contract and Contract Documents, and shall indemnify and hold harmless the Owner and the Engineer from all liability, costs, suits, claims or actions brought against it for any injury or alleged injury to any person or property. All loss or damage to the Work arising from fire, floods, storms or other natural causes, or from any detention, obstruction or difficulties which may be encountered in the prosecution of the Work shall be borne by the Contractor.

No blasting of any kind will be permitted on this Project.

## **5.13 Cooperation By Contractor**

The Contractor will be supplied with three (3) copies of the specifications and three (3) sets of approved plans and contract assemblies including special provisions, one (1) set of which the Contractor shall keep available on the Work site at all times.



The Contractor shall give the Work the constant attention necessary to facilitate the progress thereof. He shall cooperate with the Engineer, his inspectors, and all other Contractors of any agency in every way possible.

#### **5.14 Cooperation Between Contractors**

The Contractor shall coordinate his work with other Contractors within or adjacent to the Project area. All completed Work shall meet the line and grade of other work in an acceptable manner.

#### **5.15 Warranty**

The Contractor warrants to the Owner that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations, to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

#### **5.16 Control Of Material**

The materials used on the Work shall meet all requirements of the Contract. In order to expedite the inspection and testing of materials, the Contractor shall notify the Engineer of his proposed sources prior to delivery. **All materials supplied shall meet KTC requirements or as otherwise specified in these Contract Documents.**

Unless otherwise specified, all materials shall be new, and both workmanship and material shall be of proper quality and sufficient for the purpose contemplated. The Contractor shall furnish, if requested by the Owner or Engineer, satisfactory evidence as to type and quality of materials and workmanship.

All items of equipment and/or material proposed by the Contractor for substitutions must be pre-approved by the Engineer, in writing, and shall be equal or superior to the items specified in the Contract Documents. If substitutions proposed by the Contractor for a specified item requires engineering revisions, the total expense of said revisions shall be paid by the Contractor.

Any items of labor or materials required, but not shown as a separate pay item in the Proposal, shall be furnished and installed as incidental to the Contract, except as noted in the plans and specifications.

#### **5.17 Storage Of Materials**

The Contractor shall obtain prior written approval from the Owner for any locations proposed for use for the temporary storage of construction materials, tools and/or equipment. All such materials shall be neatly and compactly maintained in a manner as to cause the least inconvenience to adjacent property owners and to traffic. Under no circumstances shall existing drainage courses be blocked or water hydrants,



valves, or meter pits covered in storing materials. All materials stored upon public thoroughfares must be provided with warning lights and reflective striping at nighttime and on weekends in a manner to alert traffic of such obstructions.

Private property shall not be used for storage purposed without written permission of the owner or lessee, and if requested by the Engineer, copies of such written permission shall be furnished him.

Any additional space required must be provided by the Contractor at their expense.

### **5.18 Sanitary Measures**

The Contractor shall construct and maintain sanitary conveniences for use by its employees at the site of the Work. Such conveniences shall be of sufficient number and shall be placed in locations approved by the Engineer. The Contractor shall require all employees and persons connected with the Work to use said conveniences, and any employee or person who violates this rule shall not again be employed at the site of the Work by the Contractor. Such conveniences shall be in compliance with all State and local health department regulations, and the Contractor shall promptly and fully comply with all health department orders and regulations regarding said conveniences.

### **5.19 Public Convenience And Safety**

The Contractor shall at all times so conduct his work as to assure the least possible obstruction to traffic. The safety and convenience of the general public and the residents along the highway and the protection of persons and property shall be provided for by the Contractor as specified under subsection Maintenance of Traffic.

The Contractor shall provide and maintain safeguards, safety devices and protective equipment and take any other needed actions as may be necessary to protect the public and property in connection with the work. The Contractor shall notify the Chiefs of the Police Department and Fire Department of the temporary blocking of any street.

The presence of barricades, lights or other traffic control devices provided and maintained by any party other than the Contractor, shall not relieve the Contractor of this responsibility.

### **5.20 Protection And Restoration Of Property**

The Contractor shall be responsible for the preservation of all public and private property. The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect or misconduct in his manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the project shall have been completed and accepted.

**Dust nuisance originating from any work shall be controlled by the Contractor at the sole expense of the Contractor.**

When and where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the nonexecution thereof by the Contractor, he shall restore, at his own expense, such property to a condition



equal or better to that existing before such damage or injury was done, by repairing, rebuilding or otherwise restoring as may be directed, or he shall make good such damage or injury in an acceptable manner.

When mailboxes, road or street name signs and supports interfere with construction, the Contractor shall remove and erect them in a temporary location during construction in a manner satisfactory to and as directed by the Engineer. After completion of the construction and before final acceptance of the project, the Contractor shall erect the mailboxes, road or street name signs and supports in a permanent location in accordance with the plans unless otherwise directed by the Engineer. This shall be considered a subsidiary obligation of the Contractor under the affected items. The Contractor shall cooperate with the Engineer in protecting and preserving cornerstones and monuments that are within the work area. Monuments, cornerstones and land markers unexpectedly encountered shall be protected, referenced and preserved in the same manner.

### **5.21 Clean Up During Construction**

The Contractor shall at all times maintain the job site and working areas in an orderly condition, reasonably clean and free of accumulations of dirt and debris. If the Contractor fails to maintain the job site and working area in a satisfactory condition, the Owner shall have the right to employ others to do so at the Contractor's expense, commencing 24 hours after the Contractor has been notified that the job site and/or working areas require clean-up.

### **5.22 Final Clean-Up**

As soon as portions of the work are ready for use, they shall be thoroughly cleaned by the Contractor of all dirt and rubbish, and cleared of all materials, forms, falsework, temporary structures and equipment.

The Contractor shall also clean out all sewer drains, inlets, manholes, and other underground lines and structures affected by his work and restore all disturbed areas to their original or better condition.

As soon as portions of the work are ready for use, they shall be thoroughly cleaned by the Contractor of all dirt and rubbish, and cleared of all materials, forms, falsework, temporary structures and equipment.

The Contractor shall also clean out all sewer drains, inlets, manholes, and other underground lines and structures affected by his work and restore all disturbed areas to their original or better condition.

### **5.23 Final Inspection**

When the work has been entirely completed and final cleanup has been performed, the Engineer will inspect the improvement. If items remain which must be completed or remedied by the Contractor, he shall perform the work immediately upon being notified by the Engineer. When such items have been corrected by the Contractor, final inspection will be made. The work must pass final inspection before it will be accepted by the Owner.

### **5.24 Utilities**

Any utility, such as telephone, electricity or water, required by the Contractor for the performance of the Work shall be the responsibility of the Contractor, who shall be responsible for the cost of the same.



### **5.25 Sewage, Surface, and Floor Flows**

The Contractor shall furnish all the necessary equipment, shall take all necessary precautions, and shall assume the entire cost of handling and properly disposing of any sewage, seepage, storm, surface, flood or underground flows which may be encountered at any time during the performance of the Work. The manner of providing for these flows shall meet with the approval of the Engineer, and the entire cost of same shall be included in the unit prices stipulated for the various items of the Work. As applicable, all work must comply with the municipality or County storm water regulations.

### **5.26 Use Of Existing Facilities**

The Owner, upon written notice to and with the approval of the Contractor, shall have the right to connect any sewers, conduit, or pipeline with any existing similar facilities or appurtenances, or to grant permits to make connections therewith at any time before the Work is completed. The Contractor shall not interfere with any such connections and no extra compensation shall be made to the Contractor on account thereof. The performance of the Work shall be planned in such a manner as to allow the use of all existing facilities during the construction period.

### **5.27 Underground Utility Facilities/Cooperation With Utilities**

The Owner will notify all utility companies, all pipeline owners, or other parties affected and endeavor to have all necessary adjustments of the public or private utility fixtures, pipelines, and other appurtenances within or adjacent to the limits of construction made as soon as practicable.

Within ten (10) days of the award of the Contract, the Owner shall notify the utility companies listed in the Utility Ownership section of these documents of the name, address, and phone number of the Contractor. The Contractor shall notify the Registered Underground Utility Protection Service and nonmember owners of the starting date at least two (2) working days prior to starting the Work. The utility shall mark, stake, or otherwise designate the location of the underground facilities within 48 hours of receiving the Contractor's notice of the starting date. The marking or locating shall be coordinated to stay approximately two (2) days ahead of the planned construction.

The Identification of underground facilities, any necessary relocation thereof, and the protection of the same shall be undertaken in conformance with KTC Standards and Specifications for Road and Bridge Construction Section 107.15. At least two (2) working days prior to commencing Work in an area that may involve underground utility facilities, as shown on the plans, the Contractor shall notify the Engineer, the registered utility protection service, and the owners of the underground utility facility who are not members of the registered utility service.

The existing underground utilities are shown as accurately as possible on the plans, based on the information available. The Owner and/or Engineer do not assume any liability for location of underground service lines. Any utility services damaged that were previously marked in the field shall be replaced at the Contractor's expense.

Where the plans provide for conduit to be connected to, or to cross either over or under, or close to an existing underground structure, it shall be the responsibility of the Contractor to locate the existing structure, both as to line and grade, before starting to lay the proposed conduit, in order to assure compatibility with line and grade of the conduit. Payment for all such operations shall be included in the unit price bid for the pertinent conduit item.



The Contractor shall make arrangements with the utility company if adjustments to proposed grade of existing facilities (e.g. manholes, catch basins, valves, boxes, etc.) are to be made prior to the commencement of any paving operations. This shall include utility facilities not shown on the plans but that are located within the pavement area. Work performed on utility facilities shall be in strict accordance with the specifications of the applicable utility company and shall be performed under the direction, supervision and inspection of said company.

At points where the Contractor's operations are adjacent to properties of telephone and power companies, or are adjacent to other property, damage to which might result in considerable expense, loss, or inconvenience, work shall not be commenced until all arrangements necessary for the protection thereof have been made.

The Contractor shall cooperate with the owner of any underground or overhead utility lines in their removal and rearrangement operations in order that these operations may progress in a reasonable manner, that duplication of rearrangement work may be reduced to a minimum, and that services rendered by those parties will not be unnecessarily interrupted.

In the event of interruption to underground or overhead utility services as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall immediately alert the occupants of nearby premises as to any emergency that the Contractor may create or discover at or near such premises. The Contractor shall then notify the Engineer and the owner or operator of the utility facility of the disruption and shall cooperate with said utility owner or operator in the restoration of service. If water service is interrupted, repair work shall be continuous until the service is restored. No work shall be undertaken around fire hydrants until the local fire authority has approved provisions for continued service.

### **5.28 Maintenance During Construction**

The Contractor shall maintain the work during construction and until the project is accepted. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces to the end that the roadway or structures are kept in satisfactory condition at all times.

In the case of a contract for the placing of a pavement course upon other pavement courses or a subgrade previously constructed, the Contractor shall maintain the previous pavement course or subgrade during all construction operations.

### **5.29 Failure To Maintain Roadway Or Structure**

If the Contractor, at any time, fails to comply with the provisions of the above-reference section, the Engineer will immediately notify the Contractor of such non-compliance. If the Contractor fails to remedy unsatisfactory maintenance within 24 hours after receipt of such notice, the Engineer may immediately proceed to maintain the Project and the entire cost of this maintenance will be deducted from monies due or to become due to the Contractor on his Contract.



### **5.30 Protection Of Existing Structure**

It shall be the responsibility of the Contractor to perform the Work in such a manner as not to damage or destroy any existing feature which is not marked for replacement or removal. The Contractor shall, at its own expense, protect and maintain any bridges, curbs, gutters, sidewalks, roadways, or any other private or public structures that may be endangered in the prosecution of the Work. The Contractor shall also exercise due care during the Work so as not to destroy any trees, plants, shrubs, or structures not specifically marked for removal or relocation within the area of the Project site. The Contractor hereby agrees to repair and make good any damages caused to any such property by reason of its prosecution of the Work.

In some instances, the Contractor will be required to excavate under and around existing utilities. The Contractor shall exercise extreme care so as not to damage the utility during the Work.

The Contractor shall schedule his operations so that the improved areas have had sufficient time to cure, set and/or harden before the area is opened to traffic or other use. The Contractor shall be responsible for the immediate repair of all improved areas if damage is done by traffic or other use. The Contractor shall also be responsible for the immediate rectification of problems created in areas outside of the improved areas, which are attributable to the failure of the improved area, such as, but not limited to, the tracking of materials into unimproved areas.

The Contractor shall be responsible for the protection of areas outside of the limits of the designated Project site, but which are adjacent to those limits. This will include those areas used by construction traffic for access to and from the Project site. Where the Engineer and/or the Owner determine that the Contractor's operations have been responsible for damage to areas outside of the Project site limits, the Contractor shall be responsible for the repair of the area, subject to the approval of the Engineer. No additional compensation will be due the Contractor for any such repairs.

### **5.31 Construction Videos And Photographs**

Contractor shall document existing site conditions, progress of the work and the completed project through the use of videos and photographs. Videos and photographs shall be taken along the length of the project area and all areas of egress to the site pre-construction, during construction and post-construction. Pictures shall be taken at all property affected by the Work and at least every 50 feet along the project area. All existing structures or facilities affected by the Work shall also have videos and photographs taken of their before and after conditions. The OWNER shall be present during the pre-construction and post construction videotaping and photograph work and shall determine the limits at each location. All photographs shall be in digital format with a time and date stamp. All videos shall be provided in digital format.

Before starting work, take a minimum of two photographs to show existing conditions at and adjacent to each driveway, landscaped area, fence and any other permanent structure that could potentially be affected by construction. Areas of particular concern or currently damaged areas adjacent to the work area shall be documented and reported to the OWNER.

CONTRACTOR shall audibly record a brief description of each video and the date and time of the recording.

Provide digital files of each photograph and video to the OWNER and ENGINEER as soon as they are available. Each digital file shall be labeled with the following information:



- i. Date photograph or video taken.
- ii. Title of Project.
- iii. Description of view shown in photograph or video.
- iv. Numbered identification of exposure.

All work for the above shall be incidental to the Contract.

### **5.32 Monuments And Landmarks**

The Contractor shall not remove, relocate or in any way damage any monuments, survey pins or landmarks without the approval of the Engineer. Any monument, survey pin or landmark so removed without approval of the Engineer may be replaced by the Owner and the expense of the survey and replacement charged to the Contractor.

### **5.33 Base Lines and Benchmarks**

The Contractor shall carefully preserve all base lines and benchmarks which have been set by the Owner or its agent. The Contractor shall be charged with the expense of resetting any base lines or benchmarks caused by the loss or disturbance of such by the Contractor.

### **5.34 Restoration Of Disturbed Areas**

In all cases where the Work requires the restoration of areas with topsoil, seeding and mulching, the Contractor shall not seed and mulch until directed to do so by the Engineer. The Engineer shall not so direct the Contractor until he has assured that the site is properly graded and topsoiled.

Upon completion of the seeding and mulching, the Contractor shall immediately notify the Engineer of the same. Upon receipt of notice from the Engineer that the restoration is complete, the Owner shall notify the property owners of their maintenance duties.

In cases where the Engineer determines the seeding and mulching should not be performed until after the designated completion date for the Work, the Engineer shall notify the Contractor of the same, in writing. Suspension of the seeding and mulching at the direction of the Engineer shall not count against the Contractor as a delay.

### **5.35 Supervision Of The Work**

The Engineer or upon the authorization of the Engineer, the Owner's Public Works Director, shall in all cases, determine the amount, quality acceptability and fitness of the kinds of labor and material, which are to be paid for under the Contract. The Owner or the Owner's agent shall determine all questions related to the Work and the performance thereof, and decide every question which may arise relative to the fulfillment of the Contract on the part of the Contractor.

The Engineer will evaluate the materials furnished and the labor to be performed under the Contract, and is authorized by the Owner to reject all labor or materials, or any part thereof, that does not comply in



kind, quality, quantity, time, place or manner with the Contract or Contract Documents. The approval or acceptance or any part of the Work, or any payment on account thereof, shall not prevent the rejection of said labor or materials at any time thereafter during the term of the Contract, if said labor or materials are found to not be in accordance with the requirements of the Contract or the Contract Documents.

### **5.36 Defective Or Unacceptable Work**

All materials and each part or detail of the Work shall be subject to evaluation by the Engineer. The Engineer shall be allowed access to all parts of the Work and shall be furnished with such information and assistance by the Contractor, as is required to make a complete and detailed review.

Any work done or materials used without direct observation by an authorized representative may be ordered removed and replaced at the Contractor's expense.

All work, which does not conform to the requirements of the Contract, will be considered unacceptable unless otherwise determined acceptable.

Should defective or unacceptable labor or materials be suspected, and the Engineer so require, the Contractor shall uncover, take down or make openings in the finished work for the purpose of examination at such points as the Engineer designates.

If the Work so exposed or examined is satisfactory, the cost of uncovering, taking down or making openings shall be paid by the Owner to the Contractor as a change in Work; however, should the Work thus exposed or examined be unsatisfactory, the cost of uncovering, taking down or making openings shall be borne by the Contractor.

If the exposed or examined labor or materials are found to be unacceptable or defective by the Engineer, he shall serve on the Contractor written notice of his rejection of the unsatisfactory labor or materials, his instructions for remedying the same, and a time within which the defective material or labor is to be remedied. If the Contractor neglects or refuses to remove and/or replace the defective labor or materials within the time limit given, the Owner may remedy the situation and charge the expense thereof to the Contractor. The expense so charges shall be deducted out of the monies due to the Contractor under the Contract. If the amounts still due the Contractor under the Contract are insufficient to meet the expense, the additional monies shall be paid by the Contractor, and if the Contractor refuses or neglects to pay, the monies shall be paid by his Surety or shall be deducted from its Performance/Contract Bond.

If, in the opinion of the Owner, an emergency arises that jeopardizes the continuity of water service and/or the public health, safety or welfare of the residents of the Owner, the Owner shall give notice of the emergency to the Contractor by telephone or in person. If the Contractor is unable to remedy the situation at the time it exists, the Owner reserves the right to immediately take steps to have the situation remedied. If, in the opinion of the Owner, the emergency was created through the carelessness or recklessness of the Contractor, then the Contractor and its Surety shall be liable to the Owner for all expenses incurred by the Owner in correcting the situation.

### **5.37 Intent of Contract**

The intent of the Contract is to provide for the construction and completion in every detail of the Work described. The Contractor shall perform all items of work covered and stipulated in the proposal and perform altered and extra work, furnish all labor, materials, equipment, tools, transportation and supplies required to complete the work in accordance with the plans, specifications and terms of the Contract. Should any misunderstanding arise as to the intent or meaning of the plans, specifications, special



provisions or proposal, or any discrepancy appear, the decision of the Engineer shall be final and conclusive.

### **5.38 Measurement Of Quantities**

For all contracts, except lump sum contracts, after an item of the Work is completed and before final payment is made, the Engineer will determine the quantities of various items of work performed, as the basis for final settlement. The Contractor, in case of unit price items, will be paid for the actual amount of work performed in accordance with these specifications as provided under the various items.

### **5.39 Plans And Estimated Quantities**

The Plans and Bid Proposal quantities prepared by the Owner are intended to outline the Work to be done by the Contractor. The estimated quantities shall be used in determining the total amount of the bid and for the purpose of determining the lowest and best bid. It is understood and agreed, however, that the Plan is subject to minor changes from time to time during the progress of the Work, that the estimated quantities listed in the Proposal are approximate only, that the Contractor has no claim for damage and is not entitled to extra pay above and beyond the agreed unit prices on account of increasing or decreasing the quantities, and that in measuring the work for payment to the Contractor, the Owner shall consider only the number, length, area and solid contents of the various items of Work incorporated in the improvement in accordance with the Plans or as ordered placed by the Owner.

### **5.40 Prices**

The Owner will pay to the Contractor the prices herein stipulated as full compensation for everything furnished and work completed by the Contractor under the Contract, including all incidental work required but not specifically mentioned, and for any work arising from any unforeseen obstruction or difficulty encountered in the prosecution of the work, and for all risks of every description connected with the work, and for all expenses incurred by or in consequence of the suspension or discontinuance of the work, as herein specified and for well and faithfully completing the work, together with remedying all defects developing during the guarantee period.

### **5.41 Alternation Of Plans Or Character Of Work**

The Owner reserves the right to make, at any time during the progress of the Work, such increases or decreases in quantities and such alterations in details of construction as may be found to be necessary or desirable. Increases in quantities may include work on facilities named in the contract and/or additional facilities not named in the contract as additional work at unit prices contained in the contract. Such increases or decreases and alterations shall not invalidate the Contract nor release the Surety, and the Contractor agrees to perform the Work as altered, as if it had been a part of the original Contract.

Unless such alterations and increases or decreases materially change the character of the work to be performed or the cost thereof, the altered work shall be paid for at the same unit prices as other parts of the Work. No claim shall be made by the Contractor for any loss of anticipated quantities and the quantities of work as done. Payments shall be in accordance with Section 109 of the KTC Standard and



Specifications for Road and Bridge Construction. If, however, the character of the Work of the unit costs thereof are materially changed, an allowance shall be made on such basis as may have been agreed to in advance of the performance of the Work, or in case no such basis has been previously agreed upon, then an allowance shall be made, either for or against the Contractor, in such amount as the Owner may determine to be fair and equitable.

Should the Contractor encounter or discover during the progress of Work, subsurface or latent physical conditions at the site differing materially from those indicated in this Contract, or unknown physical conditions at the site of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract, the Engineer shall be promptly notified in writing of such conditions before they are disturbed. The Engineer will thereupon promptly cause the investigation of said conditions, and if they are found to so materially differ and cause an increase or decrease in the cost of, or the time required for performance of the Contract, an equitable adjustment will be made.

Any adjustment in compensation because of a change or changes resulting from one or more of the conditions described in the previous paragraph will be made in accordance with the provisions of Extra Work. Any adjustments in Contract time because of changes will be made in accordance with the provisions in 108.07 of the Kentucky Standard Specification for Road and Bridge Construction.

#### **5.42 Additional Work of a Similar Nature**

The Owner reserves the right, at any time during the progress of the Work, to add construction work of a similar nature to that included in the original Contract. Such work may include extensions of the project limits, additional locations requiring the same work items, or separate facilities requiring substantially similar work methods, materials and performance expectations.

Added work of a similar nature shall be paid at the unit prices established in the Contractor's original Bid Proposal, provided the added work is similar in scope, type and complexity to the work described in the original contract; requires substantially the same materials, means and methods; and can be executed under the same regulatory, safety and traffic control requirements.

Added work shall only be performed after issuance of a written Change Order executed by both the Owner and Contractor. The Change Order shall identify a description of added work, applicable unit prices, required modifications to contract time and any associated conditions of performance.

Nothing in this section guarantees the addition of similar nature work. The Owner may, at its sole discretion, elect to procure additional work separately or not at all.

#### **5.43 Extra Work**

Items of work with unit prices included in the estimate of the original Contract, in an amount less than \$10,000 may be authorized as Extra Work by the Engineer.

#### **5.44 Modification Of Contractor Or Change Orders**

Items of Work not included in the estimate of the original Contract and additional units of items included in the estimate of the original Contract in an amount in excess of \$10,000, may be authorized as a



Modification of the Contract or Change Order. Payment shall be in accordance with Sections 109.04 of the Kentucky Standard Specification for Road and Bridge Construction. The Owner may, when necessary by ordinance, authorize alterations or modifications in the Specifications and Plans for the Work, or omit from the Work covered by this Contract any portion thereof. Before any such alteration or modification shall be effective, the price to be paid for the Work or the material, or both, under the altered or modified Contract, shall have been agreed upon in writing and signed by the Contractor and by the Contractual Agent or Agents of the Owner. It is expressly agreed that such changes shall not, in any way, violate or annul the Contract, and the Contractor hereby agrees not to claim or bring suit for any damages, whether for loss of profits or otherwise, on account of these changes. Whenever, during the progress of the Work, any change or modification of the Work is agreed upon, such change shall be considered and treated as though originally contracted for, and shall be subject to all provisions of the original Contract.

The Contractor's Sureties will not be notified of changes in the work or cost thereof, except when by reason of any Change Orders, the total Contract price increases by more than twenty (20%) percent of the original price.

#### **5.45 Disputes And Contractor Claims**

In cases where there arises a dispute (whether over payment, claims, or quality of Work) between the Contractor and the Owner, the Contractor shall not cease Work on the Project because of said dispute, unless told to cease work by the Owner. The Contractor shall continue Work on the Project and agrees that such a dispute shall not relieve him from the requirements under "Time of Completion and Damages for Delays".

In all cases, the Contractor shall submit to the Owner any claims for disputed amounts, in writing, within seven (7) calendar days of learning of said dispute. In submitting such claim, the Contractor shall include his actual original calculations and raw cost data, along with his job cost reports and field diaries.

If the Owner makes to the Contractor an offer on a claim which the Contractor refuses, and if the Contractor then gets an amount equal to or less than the Owner's last offer in court, the Contractor shall pay all legal costs, including attorney's fees and expert witness fees, that the Owner incurs from the date of the Owner's last offer until the day the Contractor is awarded judgment.

Any claims or disputes shall be limited by the requirements of "Modification of Contract or Change Order".

#### **5.46 Time Of Completion And Damages For Delays**

The Project construction time shall commence upon the date indicated in the Notice to Proceed, which shall be sent to the Contractor by the Owner. The Contractor shall agree to commence the Work on the date specified in the written Notice to Proceed, weather permitting, and to fully complete the Work by the date stated in the contract, unless such time for completion is extended, in writing, by the Owner. However, neither the Contractor nor any subcontractors shall commence any part of the work under the Contract until it has obtained all insurance required, as listed in the General Conditions, and such insurance has been approved by the Owner.

The Contractor agrees that time is of the essence, and therefore, if the Contractor neglects, fails, or refuses to complete the Work within the allotted time, or fails to secure an extension of time for delays, the Contractor does hereby agree to pay to the Owner, as liquidated damages and not as a penalty, the amount as stated in the Contract for each calendar day beyond the completion date stated in the Notice



to Proceed, unless the time for completion has been extended in writing by the Owner. Such damages shall be deducted from any monies due and owing to the Contractor under the Contract. If the amounts still due the Contractor under the Contract are insufficient to meet the expense, the additional monies shall be paid by the Contractor, and if the Contractor refuses or neglects to pay, the monies shall be paid by his Surety or shall be deducted from its Performance/Contract Bond.

If the Contract is revised in any material respect and it is determined that said revision will cause delay in the completion of the work, the Engineer will postpone the completion date by the number of calendar days he determines to be equitable.

If the Contractor finds it impossible for reasons beyond his control to complete the work by the date as specified or as extended in accordance with the provisions of this subsection, he may make a written request to the Engineer for an extension of time setting forth therein the reasons which he believes will justify the granting of his request. Requests for extensions of time shall be filed in writing by the Contractor to the Engineer not later than thirty (30) days following the termination of the delay. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Engineer finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, he may extend the time for completion in such amount as the conditions justify.

Delays caused by weather or seasonal conditions should be anticipated and will not be considered as the basis for an extension of time. The Engineer will not allow any extension of time for weather or resulting conditions, except for delays caused by earthquakes, tornadoes or other catastrophic forces per Section 108 of the Kentucky Standard Specification for Road and Bridge Construction.

The extended time for completion shall then be in full force and affect the same as though it were the original time for completion.

If the Owner should suspend the Work in whole or in part, the date for completion shall be extended by the number of days that the suspension directly or indirectly delays the completion of the Work.

If the Work is delayed for unforeseeable causes beyond the control and without the fault of negligence of the Contractor, such as severe or unusual climatic conditions, acts of God, acts of the Owner or interference by other contractors, extensions of time may be granted by the Owner, upon the Contractor's written request for an extension. The Contractor shall, within five (5) days from the beginning of such delay, notify the Owner in writing of the causes of the delay and request an extension. In no case shall such an extension of time exceed the time actually lost to the Contractor by reason of such delay or interference.

The Owner, reserves the right to suspend the whole or any part of the Work, when in the best interest of the Owner, in its sole discretion. Without any additional compensation to the Contractor for such suspension; however, the Contractor shall be granted an extension of time for completing the Work in the same amount of time that it was delayed by such suspension, unless said suspension was necessitated by the actions or inactions of the Contractor.

#### **5.47 Failure To Complete On Time**

If the Contractor fails to complete the Work within the time or times allowed by the Contract, the Owner, if satisfied that the Contractor is carrying the Work forward with reasonable progress and deems it to be in the best interest of the Public, may allow him to continue in control of the Work. It shall be necessary for the Contractor to make written application to the Owner in order to warrant such continuance. Payments to the Contractor for work performed and materials furnished will be made.



When the work is not completed within the time or times allowed by the Contract, and the Contractor is permitted to remain in control, the Work shall be prosecuted at as many different places, at such times, and with such forces as the Owner may request.

For each calendar day that any work shall remain uncompleted after the Contract completion date or dates, the sum specified in the Contract will be deducted from any money due the Contractor, not as a penalty but as liquidated damages provided, however, that due account shall be taken of any adjustment of the completion date or dates granted under the provision of "Time of Completion and Damages for Delays". In the event one or more interim completion dates are specified without specific separate liquidated damages, the amount set forth in the Schedule in Section 108 of the Kentucky Standard Specification for Road and Bridge Construction will separately apply to each interim date. In the event a period of liquidated damages for an interim completion date overlaps a subsequent completion date, the liquidated damages will be cumulative.

Permitting the Contractor to continue and finish the Work or any part of it after the date or dates fixed for its completion, or after the date or dates to which completion may have been extended, will in no way operate as a waiver on the part of the Owner of any of its right under the Contract.

The Owner may waive such portions of the liquidated damages as may accrue after the work is in condition for safe and convenient use by the public.

#### **5.48 Unsatisfactory Progress And Termination Of The Contract**

In case the Contractor or any Subcontractor fails to furnish materials or to execute the Work in accordance with the Plans and Specifications, or if the provisions of the Contract are otherwise violated, then in any such case, upon ten days written notice to the Contractor and his Surety, the Owner shall have the right to declare the Contractor in default on the Contract. Said notice shall contain the reason for the Owner's intention to declare the Contractor in default on the Contract and, unless within ten days after service of said notice the violation shall cease or satisfactory arrangements shall have been made for its correction, the Contractor, upon the expiration of said ten days, shall be in default on the Contract and his right to proceed under the Contract shall be terminated.

In the event the Contract is thus declared to be defaulted, the Owner will immediately notify the Contractor and his Surety of such action, and will at once cause the work already done to be measured and computed. The action of the Owner in the declaration of the default of the Contract shall be final and conclusive, and the Contractor shall not be entitled to claim or receive any damages for not being allowed to continue. After the default of the Contract, the Surety shall have the right to take over and complete the Work, provided, however, that the Surety shall notify the Owner in writing of its intent to do so within twenty (20) days after the notice of the default of the Contract. Such completion of the Work by the Surety shall be done in strict accordance with all the provisions of the original Contract. However, if the Surety does not take over the Contract as stated above, then the Owner shall cause the Work to be completed under a second contract. If the cost of the Work done under the second contract exceeds what it would have cost under the original Contract, the increased cost shall be paid from any money due the Contractor under the Contract, and if that is not sufficient, then the increased cost shall be paid by the Contractor and/or his Surety.

The Contractor and/or his Surety shall also pay all cost and expense of reletting the Work and all damages resulting from noncompletion of the Work within the Contract time. If, when the Work is completed, it is found that there is any money due the Contractor, it will be paid to him; but no money shall be paid to the Contractor under the Contract after it has been declared in default, until the Work has been completed and accepted and all claims and suits resulting therefrom shall have been settled.



## **5.49 Payments**

The Owner shall pay to the Contractor the price stipulated in the Contract, by making progress payments to the Contractor during the performance of the Work, on the basis of the value of work performed.

The Contractor shall submit an invoice to the Engineer of the quantity of work performed for approval. Requests for payment shall not be made more frequently than every thirty (30) days. The Engineer shall forward the invoice to the Owner for approval, and upon approval of the invoice by the Engineer and the Owner. The Owner shall pay the Contractor within thirty (30) days.

With each payment, the Contractor shall submit all material tickets for concrete and asphalt materials delivered to and used on the project. Each ticket shall be dated and indicated the amount of materials used. Requested quantities for that pay period shall match the amount of materials used. If these tickets are not submitted, the City will not make payment until these items are provided.

Partial payment may be reduced or withheld entirely if, in the opinion of the Owner, construction is not proceeding according to the Contract, or if for any other violation, or for failure of the Contractor to comply with the orders of the Owner, or pending settlement of claims of liens filed against the Contractor.

The Owner shall make partial payments to the Contractor for work performed and materials delivered to the site at 95% of the value of work.

The Contractor shall submit one (1) signed and notarized copy of each Application for Payment to the Engineer either electronically or hard copy. The request shall include waivers of lien and similar attachments if required.

## **5.50 Waiver Of Mechanic's Lien**

Prior to Final Application for Payment, the Contractor shall submit waivers of mechanic's liens from subcontractors, materialmen, and suppliers for all construction to date.

1. Owner reserves the right to designate which entities involved in the Work must submit waivers.
2. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
3. Waiver Forms: Submit waivers of lien on forms provided.

## **5.51 Acceptance Of Final Payment**

After the final inspection has been made and the Owner has accepted the Work, the final estimate and Final Statement of Cost will be prepared. If any items were erroneously overestimated in any partial estimate, such errors will be corrected in any subsequent partial estimate or in the final estimate, and the Contractor shall have no right to any such excess and shall not be entitled to any damage on account of such corrections in the final estimate.

The following paperwork is necessary from the Contractor to close-out the Project:

1. Final invoice for payment.
2. Final affidavit listing all subcontractors/suppliers used on the Project and indicating the amount paid in full



3. Final Release of Liens from all subcontractors indicating the amount paid in full.
4. Prevailing Wage Affidavit, if applicable.
5. Guarantee
6. Final Release of Lien.
7. Concrete Test Reports, if applicable.
8. Asphalt tickets stamped with the Inspector's seal, if applicable.
9. Any additional testing reports as required by the Contract.

After the final estimate and Final Statement of Cost have been prepared and after the Contractor has fulfilled all of his obligations under the Contract and all the above paperwork has been accepted, the Owner will pay the entire sum found to be due the Contractor after deducting all previous payments and any liquidated damages, if applicable.

After the final estimate and Final Statement of Cost have been prepared and after the Contractor has fulfilled all of his obligations under the Contract, the Owner will pay the entire sum found to be due the Contractor after deducting all previous payments and any liquidated damages, if applicable.

The date of acceptance of the Work by the Owner shall be the date of approval of the Final Statement of Cost.

If, after physical completion of the work and acceptance of the Owner's final measurements by the Contractor, the Owner finds that the Final Statement of Cost or final estimate or both may be unavoidably delayed, he may allow a payment on one-hundred percent (100%) of the final measurements, less such estimated amount of money as the Owner may deem necessary to withhold to take care of any contingencies which may arise.

Should the Contractor have any claim against the Owner because of a variance with the Owner's final measurement, the Owner may allow payment based on the Owner's measurement pending adjustments of the disputed item or items. Acceptance of payment on such basis shall not stop the Contractor's claim nor prevent its satisfactory adjustment.

Retainage shall be paid to the Contractor within thirty (30) days from the date of the Owner's final acceptance of the Work and the completion of the Contract. Upon the Contractor's acceptance of this final payment, the Owner and the Engineer shall be released from any and all claims and any liability to the Contractor for anything further under or relating to the Contract or the Contract Documents, including any act or omission by the Owner or any of its employees or agents, including the Engineer; however, no payments, final or otherwise, shall operate as a release on the Contractor or its Sureties from any obligations under the Contract or the Contract Documents.

### **5.52 Termination Of The Owner's Liability**

No person, partnership, firm, or company other than the Contractor shall have any interest in the Contract and no claims shall be made or held valid and neither the Owner nor its agents shall be held liable for, nor shall be held to pay any money except as herein provided. The acceptance by the Contractor of the final payment made as aforesaid shall operate as, and shall constitute, a release to the Owner and its agents from any claim or liability to the Contractor for anything done or furnished for, or relating to the Work or for any act or neglect of the Owner or any person related to or connected with the Work.



### **5.53 Termination For Cause**

- A. In the event that any of the provisions of the Contract are violated by the Contractor, or by any of its subcontractors, the Owner may serve written notice upon the Contractor and its surety of its intention to terminate the Contract. Such notice shall list the act or omission causing the breach, upon the service of such notice, the Contractor shall have ten (10) business days to correct the breach or to make arrangements for correction that is satisfactory to the Owner.
- B. If no such correction or arrangements are made within the allotted time, the Owner may, in its sole discretion, terminate the Contract on a date solely determined by the Owner. In the event of such termination, the Owner shall immediately serve notice thereof to the Contractor and its surety. The surety shall then have the right to take over and perform the Contract provided, however, if the surety does not elect to continue performance, the Performance Bond will be forfeited and the Owner shall cause the Contract to be completed.
- C. Upon termination for cause the payment to the Contractor of compensation earned for Work performed to the date of such termination shall be in full satisfaction of all claims against the owner under this Contract, however the Owner shall have the right to deduct from any amounts due and owing to the Contractor, including retainage, any costs, both direct and incidental, incurred by the Owner in completing the Project. The Contractor and/or surety shall be liable for any excess costs the Owner may so incur, and the Owner shall have the right to pursue any legal remedies necessary to affect the same.

### **5.54 Termination For Convenience**

- A. The Contractor hereby acknowledges that as the Owner is a public entity, due to unforeseen circumstances, funding restraints, or changes in the nature of the Work, it may become necessary for the Owner to terminate the Contract for convenience.
- B. In the event the owner finds it necessary to terminate the Contract for convenience, the Owner shall serve notice upon the Contractor and its surety of its intention to terminate the Contract ten (10) business days prior to the termination date.
- C. Upon termination for convenience, the Owner shall pay to the Contractor all compensation due for Work performed to the date of termination, including all costs for materials that were to be incorporated into the Project that cannot be returned; all restocking fees for materials that were to be incorporated into the Project that can be returned only upon the payment of a restocking fee. The Contractor shall submit to the Owner detailed invoices and proof of restocking fees, if any, within ten (10) business days of his receipt of notice of termination from the Owner. In addition, the Owner will negotiate compensation with the Contractor for actual costs incurred as a result of the termination.

### **5.55 Contractors Right To Terminate Contract**

The Contractor may terminate the Contract, upon ten (10) days written notice to the Owner if any public authority should stop the work for three (3) months, or if the Owner should fail to issue a Certificate of Payment, or if the Owner should fail to pay in accordance with this agreement.



### **5.56 Guarantee Of Work**

The Contractor hereby guarantees all work performed for a period of one (1) year from the date of completion, against all defects resulting from the use of inferior materials or equipment (unless said materials or equipment were provided by the Owner) or inferior workmanship. The Contractor hereby agrees that during the guarantee period, it shall make all repairs, corrections, replacements or changes that, in the opinion of the Engineer, are necessary due to the use of materials, equipment or workmanship which are inferior, defective or not in accordance with the Contract or Contract Documents. The Contractor shall, promptly upon receipt of written notice from the Owner, remove and replace all unsatisfactory work with suitable materials, equipment or workmanship, without additional expense to the Owner.

If the Contractor fails to proceed with these terms of the guarantee in a timely manner, the Owner shall have the right to have the defects corrected, and the Contractor and its sureties shall be liable to the Owner for all expenses incurred by the corrections.

Any or all special guarantees applicable to any definite parts of the Work, including the materials or equipment, shall also be subject to the terms of this section during the first year of the life of such special guarantees.

Customary manufacturer's guarantees in excess of one year shall be turned over to the Owner. If the terms and conditions as set forth are met to the satisfaction of the Owner and Contractor, the Owner may reduce the Performance Bond to ten percent (10%) of the total amount paid the Contractor in the performance of this Contract as a Guarantee bond.

### **5.57 Notice**

Any written notice required to be served under the Contract or the Contract Documents shall be served by certified mail, or by personal service at the parties' places of business.

### **5.58 No Estoppel**

At no time shall the Owner be precluded or estopped by any provisions of the Contract, from demanding and recovering from the Contractor any damages sustained because of the Contractor's failure to comply with the Contract or the Contract Documents. The final inspection of the Work shall not be binding or conclusive upon the owner if it subsequently appears that the Contractor willfully, fraudulently, or through collusion with an agent of the Owner, supplied inferior materials or workmanship, or departed from the terms of the Contract or Contract Documents, notwithstanding the acceptance of the Work and payment for the same by the Owner.

### **5.59 Assignment**

Neither the Contract or any part thereof, nor any funds to be received there under, by the Contractor shall be assigned, except upon the prior written permission of the Owner, upon any conditions that may be imposed by the Owner, and upon the prior written permission of any sureties who executed the Performance Contract Bond on behalf on the Contractor.



## **5.60 Independent Contractor Status**

At all times during the term of the Contract, the Contractor shall be and remain as an Independent Contractor with respect to all services performed under the Contract, The Contractor agrees that all income reporting requirements to the U.S. government, the State of Kentucky, and any local governments are its responsibility and not that of the Owner. The Contractor shall be responsible for the payment of all taxes including, but not limited to, Federal, state, and local taxes, Social Security taxes, unemployment insurance taxes, and other taxes or license fees required by law, for its officers, agents, and employees. The Contractor agrees that neither it, nor any of its officers, agents, nor employees is entitled to receive workers' compensation, unemployment compensation, vacation leave, sick leave, or any other fringe benefits provided to the employees of the Owner or any other Owner agency, under this Contract. Contractor acknowledges that under this Contract, the Owner is not required to contribute to the Kentucky Public Employees Retirement System on behalf of the Contractor, its officers, agents, or employees, nor is the Contractor eligible to contribute to or receive benefits from said system.

## **5.61 Other Contracts**

The Owner reserves the right to allow other work or to enter into other contracts for work or materials to be constructed or placed in or about the Work to be performed under this Contract, and to order the starting and progress of such other contracts at any time prior to the completion of this Contract. The Contractor hereby agrees to allow the construction or progress of other such work, under such arrangements for the joint occupation for the site of the Work as the Engineer may establish. The Contractor hereby waives any claim for damages or extra compensation by reason of any real or supposed interference with his performance of the Work; however, if in the judgment of the Engineer, the joint occupation of the site has unreasonably impeded the progress of the Contractor's work under the Contract, then the time for completion of the Work may be extended by the Owner.

## **5.62 Patents**

The Contractor shall indemnify and hold harmless the Owner, its officers, employees, and agents from all liabilities, judgments, costs, damages, or claims arising from the infringement of any patent, patent rights or royalty rights by reason of the use of any patented materials, machinery, devices, and equipment furnished or used in the performance of the Work, or by reason of the use of patented designs furnished and incorporated into the Work by the Contractor and accepted by the Owner, excepting any materials or equipment furnished by the Owner. In the event that any claim, suit, or action in law or equity of any kind whatsoever is made or brought against the Owner involving any such patents, then the Owner shall have the right to retain, from the money due and owing to the Contractor, an amount the Owner deems sufficient to protect the Owner against loss until such claim, suit, or action has been settled and evidence of such settlement has been satisfactorily presented to the Owner's Law Director.

## **5.63 Laws, Ordinances And Regulations**

The intent of the Contract and the Contract Documents is to include each and every provision and clause required by law to be inserted herein, and they shall be read and enforced as though there were included herein. The Contractor shall keep itself fully informed of, and shall strictly observe and comply with, all applicable Federal, State, County, and local laws, rules and regulations, and ordinances; building code



requirements; permit requirements; licensing requirements; inspection requirements; all laws, rules, and regulations regarding the employment of and payment of all laborers, the legal rights of all laborers employed under the Contract; all orders or decrees that exist or that may be enacted by anybody or tribunal having jurisdiction or authority over any aspect of the Work. The Contractor shall also insure that its subcontractors are also informed of and strictly comply with and observe all applicable laws, rules, regulations, and ordinances.

The Contract shall be required to give all notices and pay all fees for any required permits, licenses, or inspection, unless the Owner assumes the responsibility for giving such notices or paying such fees. The Engineer will discuss any special permits that may be required for the Project at the preconstruction conference.

The Contractor shall indemnify and hold harmless the Owner, the Owner's officers, employees and agents, including the Engineer, against any claim or liability arising from or based upon any violation of any such law, rule, regulations, ordinance, order, decree or requirement, whether by the Contractor itself, its employees or agents, or any of its subcontractors.

Should the Contractor at any time find that any requirement of the Contract of the Contract Documents is at variance with any applicable law, rule, regulation, requirement, order, or decree, it shall promptly notify the Engineer.

#### **5.64 Environmental Protection**

The Contractor shall observe and comply with all Federal, State, and local laws and regulations controlling pollution of the environment and shall comply with provisions of Section 107 of the Kentucky Standard Specification for Road and Bridge Construction.

#### **5.65 Taxes**

The Contractor will be required to pay, without additional expense to the Owner, all Federal, State, local and other taxes which may be applicable to the Work, excepting any taxes and assessments on the real property comprising the site of the Work.

The Contractor hereby agrees to withhold all City income taxes due or payable under the provisions of the Codified Ordinances of the City for wages, salaries, and commission paid to its employees who will work within the City limits for more than 12 workdays and further agrees that any of its subcontractors shall be required to withhold any such City income taxes due under said Code for services performed under this Contract. The Contractors are advised to get full information from the Tax Office prior to bidding.



## 6. Utility Ownership

|   |   |
|---|---|
| Gas (Duke Energy)                           | Scott Pfefferman<br>617 Todhunter Road<br>Monroe, Ohio 45050  |
| Electric (Duke Energy)                      | Matt Coleman<br>2010 Dana Ave-EF 324<br>Cincinnati, Ohio 45207  |
| Water (Northern Kentucky<br>Water District) | Kyle Ryan<br>P.O. Box 18640<br>Erlanger, Kentucky 41018   |
| Telephone (Cincinnati Bell/<br>Alta Fiber)  | Breck Cowan/Underground<br>Jodi Geiman/Overhead<br>Altafiber<br>221 E. Fourth St., M.L. 121-900<br>Cincinnati, Ohio 45201 |
| Cable TV (Spectrum)                         | Shane Gerdus, Anthony Miracle<br>10920 Kenwood Road<br>Cincinnati, Ohio 45252   |
| Sanitary and Storm Sewer (SD1)              | Zach Atkerson<br>1045 Eaton Drive<br>Fort Wright, Kentucky  |



## **7. Specifications For Construction**

In general, unless specifically set forth herein, the work, material, and methods of measurement and payment shall conform to the applicable divisions and paragraphs (as noted on the Bid Proposal or in the plans) of the most current edition of the:

Commonwealth of Kentucky  
Transportation Cabinet  
Department of Highways, Frankfort

Standard Specifications  
for  
Road and Bridge Construction

AND

Storm Sewer and Sanitary Sewer Construction Items Shall Conform to  
the Specifications and Details of Sanitation District No. 1



## 8. Special Provisions

### 8.1 Items 105.07 / 107.15 - Cooperation With Utilities

All portions of Item 105.07 and Item 107.15 of the Kentucky Department of Highways Standard Specifications for Road and Bridge Construction shall apply.

At least two (2) working days prior to commencing construction operations in an area which may involve underground utility facilities as shown on the plans, the Contractor shall notify the Engineer, the registered utility protection service, and the owners of each underground utility facility not members of the registered utility protection service.

The existing underground utilities are shown as accurately as possible on the plans, based on information available. The Owner and/or the Engineer do not assume any liability for location of these underground utility service lines. Any utility services damaged that were previously marked in the field shall be replaced at the Contractor's expense.

Where the plans provide for conduit to be connected to, or to cross either over or under, or close to an existing underground structure, it shall be the responsibility of the Contractor to locate the existing structure, both as to line and grade, before he starts to lay the proposed conduit, in order to assure compatibility with line and grade of the proposed conduit. Payment for all operations described above shall be included in the unit price bid for the pertinent conduit item.

The Contractor shall adjust or arrange with utility company to adjust to proposed grade all existing utility facilities, i.e., manholes, catch basins, valves, boxes, etc., prior to the commencement of paving operations. This shall include utility facilities not shown on the plans, which may be found to be located within the pavement area. Work performed on the utility facilities shall be in strict accordance with the specifications of the applicable utility company and shall be performed under the direction, supervision, and inspection of said company.

### 8.2 Coordination With Utilities

Coordination of work schedules with affected utilities will be required. Upon the contract award, the coordination of all necessary relocations or adjustment of all utility facilities becomes the responsibility of the Contractor.

### 8.3 Item 105.06 – Cooperation Between Contractors

The Contractor shall coordinate his work with other Contractors within or adjacent to the project limits. All improvements completed under this contract shall meet the line and grade of other work in an acceptable manner.

### 8.4 Item 106 – Control Of Material

Unless otherwise specified, all materials shall be new, and both workmanship and materials shall be of proper quality and sufficient for the purpose contemplated. The Contractor shall furnish, if so required, satisfactory evidence as to type and quality of materials and workmanship.



All items of equipment and/or material proposed by the Contractor for substitutions must be approved by the Engineer in writing and shall be equal or superior to the items specified in the contract documents. If said substitution proposed by the Contractor for a specified item requires engineering revisions, the total expense of said revisions shall be paid by the Contractor.

Any items of labor and materials required, but not shown as a separate pay item in the proposal, shall be furnished and installed as incidental to the contract, except as noted in the plans and specifications.

### **8.5 Item 106.08 - Storage Of Materials**

The Contractor shall obtain prior approval in writing from the Owner for the locations to be used for the temporary storage of construction materials, tools, and/or machinery. All such materials, tools, and machinery shall be neatly and compactly piled in such a manner as to cause the least inconvenience to the property owners and to traffic. Under no circumstances shall existing drainage courses be blocked or water hydrants, valves, or meter pits covered. All materials, tools, machinery, etc., stored upon public thoroughfares must be provided with warning lights and reflective sheeting at nighttime and weekends to alert traffic of such obstructions.

### **8.6 Item 108.02 - Preconstruction Conference**

Prior to the commencement of construction activities, the Engineer will arrange a meeting between the Contractor, the representatives of the Owner, and the representatives of each of the utility companies. The time, date, and location of said meeting will be determined after the awarding of the contract, and the parties will be notified by the Engineer.

The agenda for the preconstruction meeting shall include the following items:

1. Announcement of Award
2. Utility Company Requirements
3. Designation of Emergency 24-hour Contractor Contacts
4. Discussion of Critical Plan Items
5. Review of Testing and Inspection Procedures
6. Operations Schedule
7. Listing of Haul Roads
8. Identification of Subcontractors
9. Review of Change Order Process
- 10.. Payment Request Submittal Procedure

The Contractor shall coordinate all work with the Engineer. A detailed schedule of operations shall be furnished by the Contractor to the Engineer at the preconstruction meeting and shall list the order of operations and the time frame for the completion of each item of work. The schedule of operations shall be approved by the Engineer and the Owner in writing prior to the beginning of the work. Changes to said schedule are to be issued in writing and approved by the Engineer and the Owner before operations are



changed or rescheduled. No payment will be made to the Contractor while he is delinquent in the submission of a progress schedule.

The Contractor shall supply to the Engineer at the preconstruction meeting, a list of the local roads to be used for the purpose of hauling equipment and/or material to or from the job site. Only the local roads in the vicinity of the project have to be listed; state and/or federal roads do not have to be included. Where necessary, the list shall include the extent of the roads to be affected and any special restrictions, such as height or weight restrictions, which may be applicable along said roads. Construction shall not commence until the Engineer and/or Owner has reviewed the haul road list and approved the haul roads in writing.

The submission of the list to and the review and approval of the list by the Engineer do not relieve the Contractor of the responsibility for the conforming to and the obeying of all applicable height and weight restrictions on the haul roads and of the responsibility for any damage done to and/or along said haul roads. The Contractor is referred to Item 105.10 concerning load restrictions.

### **8.7 Item 107.04 - Permits, Licenses And Taxes**

The Contractor shall insure that all required notices are given and all permits acquired before the commencement of work. The Engineer will discuss any special permits required for this project at the preconstruction meeting.

### **8.8 Item 107.14 - Contractor's Responsibility For Work**

It shall be the responsibility of the Contractor to perform his work in such a manner as not to damage or destroy any existing feature (i.e., existing inlets, conduits, etc.), which is not marked for replacement or removal. The Contractor shall exercise due care during construction so as not to destroy any trees, plants, shrubs or structures not specifically marked for removal or relocation within the work limits. In some instances, the Contractor will be required to excavate under and around the existing utilities. Extreme care should be used not to damage the utility during this operation. The Contractor shall schedule his operations so that the improved areas have had sufficient time to cure, set and/or harden before the area is opened to traffic or use. The Contractor shall be responsible for the immediate repair of the improved area if any damage is done by traffic. The Contractor shall also be responsible for the immediate rectification of problems created in areas outside of the improved areas which are attributable to the failure of the improved area, i.e., the tracking of materials into unimproved areas.

The Contractor shall be responsible for the protection of areas outside of the designated work limits, but which may be adjacent to those work limits. This will include those areas used by construction traffic for access to and from the work areas. Where the Engineer and/or the Owner determine that the Contractor's operations have been responsible for damage to areas outside of the work limits, the Contractor shall be responsible for the repair of the area subject to the approval of the Engineer. No additional compensation will be due to the Contractor for any such repairs as described above.



## **8.9 Item 112 – Maintaining Traffic**

Local traffic must be maintained at all times in conformance with Item 112. Removal and replacement of the pavement shall occur in a maximum of 500' sections (one side of the road). Contractor may be allowed to replace pavement in longer sections at the discretion of the Engineer. The Contractor shall adequately mark, through the use of barrels, flashing lights, portable gates and/or other devices approved by the Engineer, the limits of the project area and those areas of the site which are temporarily closed to traffic.

During the course of the normal working day, the Contractor shall insure the safety of the public by providing a sufficient number of flaggers to assist the traffic flow through the construction area. If, at the completion of the normal working day, any trench for pavement construction and/or construction of proposed sewer has not been completely backfilled and restored, a temporary cover, such as a metal plate or another approved device, shall be placed over that portion of the trench remaining open.

### Temporary Driveway Blockage During the Work Day:

The Contractor shall notify the residents and businesses at least 48 hours in advance of when their drives will be blocked during construction. In those areas where existing pavement is to be removed and replaced, the Contractor shall conduct his operations so as to maintain driveway traffic through the construction area. If two approved access points serve the same parking area, and traffic flow permits, the Contractor will be permitted to close one access at a time. The Contractor will be permitted to close paved areas to traffic for a minimum period of time, consistent with the requirements of the specifications for the protection of completed asphalt concrete courses. If business property is involved, an alternate access must be provided if blockage exceeds one (1) hour. Repeated blocking must allow at least a 15-minute interval of traffic access every hour. Length of residential driveway closures shall be kept to a minimum.

### Extended Driveway Closure Due to Pavement Replacement:

When the pavement is to be removed and replaced in front of a driveway, the contractor shall notify the resident or business 48 hours in advance of the closure and advise them to find alternative parking for a period of at least 10 calendar days to allow for the removal and replacement of the roadway pavement and/or driveway pavement and an appropriate 7 day cure time. Alternative parking shall include "on street" parking with access to the property. Temporary sidewalks etc. may be necessary to prevent persons from walking in mud in order to enter their property. Temporary bridges, railing etc. will become necessary in order to cross formed curb lines, excavated areas behind curb lines and walkways etc. The Contractor will be responsible for barricading off and signing portions of the street sufficient in length to park all of the residents' cars whose driveways will be blocked.

### Extended Driveway Closure Due to Replacement of Driveway Apron or Sidewalk Through Driveway:

When a portion of the driveway pavement or sidewalk through a driveway is to be removed and replaced the contractor shall notify the resident or business 48 hours in advance of the closure and advise them to find alternative parking for a period of at least 5 calendar days to allow for the removal and replacement of the driveway pavement and an appropriate 72 hour cure time. The Contractor shall place new driveways within 24 hours of removal. The Contractor shall keep driveways closed for a 72-hour period after concrete placement to permit the curing of concrete curbs, driveway aprons, or sidewalk across driveways. The Contractor will be responsible for barricading off and signing portions of the street sufficient in length to park all of the residents' cars whose driveways will be blocked.

The Contractor shall provide temporary stone for maintenance of driveway access during construction. The Contractor shall note that any interim material used for providing driveway ingress and egress will



not be a separate pay item, and the cost of said interim material shall be included in the lump-sum price bid for Item 112.

### **8.10 Temporary Traffic Control Devices**

Temporary traffic control devices and facilities shall be furnished, erected maintained and paid for in accordance with the provision of Section 112 – Maintenance and Control of Traffic During Construction. All traffic control devices shall conform to the current standards found in the Manual of Uniform Traffic Control Devices for Streets and Highways. The provisions of this item and this section shall not in any way relieve the Contractor of any of his legal responsibilities or liabilities for the safety of the public.

### **8.11 Stake Out**

Construction stakeout shall be provided by the **Contractor** to establish line and grade as shown on the plans.

### **8.12 Testing**

In addition to material testing by the supplier, on-site material and soil testing will be required to insure the work meets the specifications established as part of this project. The Contractor shall bear the cost and provide all materials and supplies to facilitate the testing and shall be responsible for coordinating all testing with the selected testing agency. The Contractor shall bear the cost of all other testing and provide all required materials, labor, apparatus, services, and facilities in connection therewith.

All testing shall be done in the presence of the Engineer by an approved testing laboratory and one copy of the test shall be sent directly to him.

When questions arise as to whether the requirements of the Contract have been fulfilled, the Contractor shall engage an independent testing laboratory to perform any tests necessary to establish the acceptability of the work.

Should such additional tests show in the judgment of the Owner the work or materials to be defective or otherwise not meeting the requirements of the Contract, the Contractor shall, immediately upon notification by the Owner, remove, replace or reconstruct same, as the case may require and shall if directed by the Owner, make such further tests as may be necessary to determine fulfillment of the Contract requirements. The cost of all re-tests shall be deducted from the Contractor's fee for said work.

All tests shall be made under the supervision and direction of the Owner or Engineer except those required by a public authority shall be under the supervision and direction of such authority.

### **8.13 Testing Requirements**

Minimum testing requirements shall be as follows:

Soil Testing: Excavation and embankment construction shall be constructed in accordance with the Kentucky Standard Specification for Road and Bridge Construction Item 204, 205 206 and 207. The



testing agency shall test all embankments per the Kentucky Standard Specification for Road and Bridge Construction Item 206.03.03.

Subgrade shall be prepared in accordance with the Kentucky Standard Specification for Road and Bridge Construction Item 207. Following visual inspection, CONTRACTOR shall demonstrate to the Engineer or his representative, that the exposed subgrade does not contain previously unidentified soft areas by proof rolling. Proof rolling shall consist of rolling the entire surface with approved mechanical equipment while observing the subgrade for displacement or deformation. Areas marked for repair shall be addressed per the details provided in the plans.

Flexible Pavement: Shall be tested as per the latest edition of the KENTON County Subdivision Regulations.

Portland Cement Concrete: Shall be tested as per the latest edition of the KENTON County Subdivision Regulations.

#### **8.14 Items 202 / 203 Removals**

When a bid item is to include the cost of removal of a classified or unclassified material, it shall be the responsibility of the Contractor to verify in the field the type of material and the thickness of the material to be removed prior to submitting his bid. No additional allowance will be due the Contractor for added expense of removals due to unknown materials or thickness.

Cost shall also include excavation to proposed subgrade elevation.

#### **8.15 Items 202 / 203 - Debris Removal**

The Contractor will be responsible for removal of all construction debris from the site. All debris shall be disposed of in a proper manner and shall be as directed by all applicable local, state, or federal regulations.

#### **8.16 Item 202 – Clearing And Grubbing**

Clear grub, remove and dispose of all vegetation, building and foundations not removed by others, and debris within designated limits inside the right-of-way and easement areas. Do not remove objects designated to remain or to be removed according to other provisions of the Contract. Also, protect from injury or defacement all vegetation and objects designated to remain. All planters and plant materials other than grass and trees marked for removal shall be salvaged and set aside in a location conveniently accessed by the property owner. During final restoration it shall be the Contractor's responsibility to replace the planters and plant materials to match the existing locations and dimensions. This item shall also include all labor, equipment and personnel to remove, salvage and reinstall all signs, mailboxes and fences not specifically noted for relocation on the construction plans. Portions of the fence that are damaged during work operations, or are in a condition such that they cannot be reused, shall be replaced with new, like material at no additional cost to the Owner. Whenever work is not taking place, all fence areas that have been removed shall be provided with temporary fencing to close off the opening until such time as the fence can be replaced with permanent materials. All work shall be in accordance with Kentucky Transportation Cabinet Standard Specifications Section 202. Payment shall be one lump sum.



### **8.17 Item 204 – Excavation To Proposed Subgrade**

Excavation outside of the pavement area required to bring yards or driveways to the proposed curb elevation shall be incidental to this item.

### **8.18 Item 206 / 207 / 302 / 701 - Testing Of Compacted Materials**

Compaction testing of embankment, granular backfill, and/or subgrade shall be done by an independent qualified testing laboratory under a contract with the Contractor. Testing shall be done in the presence of the Engineer at locations specified by the Engineer and shall meet standards as specified in Items 206, 207, 302 and 701. The Contractor shall include the cost of all required tests in the unit price bid for the pertinent item and no separate compensation is to be made for said testing.

### **8.19 Item SPL - Yard Restoration (4" Topsoil, Seed And Mulch)**

The Contractor shall provide all labor, materials, tools, and equipment required to grade, fertilize, seed, and mulch in good, workmanlike manner the areas where shown on the plans or where directed by the Engineer and as specified herein. All yard areas disturbed during construction shall be restored per this section.

Payment shall be made on a per Square Yard Basis for the following:

#### **A. Materials**

1. **Topsoil** – Topsoil shall be per ASTM D5268 with a Ph range of 5.5 to 7. Topsoil shall not contain more than 40% clay in that portion passing a No.10 sieve, shall contain not less than 5% or more than 20% organic matter as determined by loss on ignition of samples oven dried to constant weight at 212 degrees Fahrenheit, and shall be free of rock and other foreign material greater than 1 inch in any dimension and other extraneous materials harmful to plant growth.
2. **Fertilizer** –
  - a. Fertilizer shall be lawn or turf grade 12-12-12
  - b. Agricultural ground limestone when used shall have a minimum total neutralizing power of 90 and at least 40 percent passing a No. 100 sieve, and at least 95% passing a No. 8 sieve.

3. **Seed** – All areas to be seeded shall be seeded with the following mixture:

| By Weight | Name of Grass                        | Purity | Germination |
|-----------|--------------------------------------|--------|-------------|
| 40%       | Fine Lawn Turf-Type Fescue           | 95%    | 90%         |
| 40%       | Creeping Red Fescue (Festuca Rubra)  | 95%    | 90%         |
| 20%       | Annual Ryegrass (Lolium Multiflorum) | 95%    | 90%         |

Weed seed content not over 0.25 percent and free of noxious weeds.

4. **Mulch** – Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat,



rye, oats or barley.

5. Asphalt Emulsion – ASTM D977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

B. Installation

1. Preparation of Seed Bed

- a. Topsoil – If suitable topsoil is available as part of the excavated material it shall be removed, stored and used to backfill the top 4 inches of the excavation. If sufficient material is not available on site it shall be imported on site at no additional cost to the Owner. All grass, weeds, roots, sticks, stones, and other debris are to be removed and the topsoil carefully brought to the finish grade by **hand raking**. The topsoil shall be sufficiently compacted, by tracking in the material, to prevent significant settlement. Promptly and thoroughly remove topsoil and other materials dropped on pavement surfaces before being compacted by traffic. Before any fertilizer or seed is placed the topsoil shall be inspected and approved by the Engineer.
2. Fertilizing – Fertilizing shall be uniformly applied to all areas to be seeded at the rate of 1 pound per 100 square. The fertilizer shall be thoroughly disked, harrowed or raked into the soil to a depth of not less than 2 inches. Immediately before sowing the seed, the Contractor shall rework the surface until it is a fine, pulverized, smooth seed bed, varying not more than 1 inch in 10 feet. A second application of fertilizer shall be applied at the same rate once the grass has been established or within 6 weeks of seeding.
3. Seeding – Immediately after the preparation and fertilization of the seed bed the Engineer shall inspect and approve the site prior to seeding. The seed shall be thoroughly mixed and then evenly sown over the prepared areas at the rate of 3 to 4 pounds per 1000 square feet. Seed shall be sown dry or hydraulically. After sowing, the area shall be raked, dragged, or otherwise treated to cover the seed to a depth of approximately ¼ inch.
4. Mulching – Within 24 hours after any given area is seeded, mulching material shall be evenly placed over all seeded areas at the rate of approximately 2 tons per acre, when seeding is performed between the dates of March 15 and October 15, and at the approximate rate of 3 tons per acre when seeding is performed between the dates of October 15 and March 15 of the succeeding year. Mulching material shall be removed once a good turf has been established.
  - A. Emulsion – Mulching materials shall be kept in place with asphalt emulsion applied at a minimum rate of 10 to 13 gallons per 1000 square feet of mulch or by methods as approved or may be otherwise required to prevent displacement of material. Mulching which is displaced shall be replaced at once but only after the seeding or other work which preceded the mulching and which work was damaged as a result of displacement of mulching material has been acceptably repaired.
5. Maintenance – Contractor shall water, mow, weed and otherwise maintain all seeded areas as necessary to secure a good turf. Settled areas shall be filled, graded, and re-seeded. Seeded areas shall be free of weeds and other debris. The Contractor shall be responsible



for the condition of the seeded areas for a period of 1 year from the date of Final Acceptance. A satisfactory lawn shall consist of a healthy uniform, close stand of grass, free of weeds, rocks and surface irregularities, with coverage exceeding 95% over any 10 square feet, and bare spots not exceeding 2 by 2 inches.

### **8.20 Item 212 / 213 - Erosion Control And Water Pollution Control**

The Contractor shall take extreme care to prevent unnecessary erosion, water pollution and siltation at all points of the project. Temporary seeding and mulching, straw bales, slope drains, etc., shall be used as necessary or as directed by the Engineer. The cost of all temporary erosion control measures shall be paid for as a lump sum bid item.

### **8.21 Item 214 – Woven Geotextile**

Payment for Woven Geotextile will be made at the contract unit price per square yard for all materials, equipment and labor to complete the work per Kentucky Standard Specification for Road and Bridge Construction Section 214 to furnish and install Mirafi 600X or approved equal to the manufacturer's specifications and these plans and specifications. **The Contractor shall supply the City with the specifications prior to beginning work. The measurement area is based on the area between the edge of the underdrains. No additional payment will be made for required overlaps.**

### **8.22 Full-Depth Pavement Sawing**

All existing pavement to be widened and/or removed shall be sawed full depth at the limits of removal, using a diamond saw blade to provide a uniform edge and prevent damage to pavement that is to remain in place. The cost of the sawing shall be incidental to the contract.

### **8.23 Item 302 / SPL – Gravel Base, DGA For Subgrade Repair**

A contingency amount of Item 302/SPL – Gravel Base, DGA for Subgrade Repair has been included for repair of soft and yielding, unsuitable subgrade material and should be used only when directed by the engineer. The cost of all labor, equipment, and material necessary to excavate and dispose of unsuitable material, place and compact the aggregate as per plan shall be included in the unit price bid for item 302/SPL – Gravel Base, DGA for Subgrade Repair.

### **8.24 Item 302 / SPL – Crushed Stone Base For Subgrade Repair**

A contingency amount of Item 302/SPL – Crushed Stone for Subgrade Repair has been included for repair of soft and yielding, unsuitable subgrade material and should be used only when directed by the engineer. The cost of all labor, equipment, and material necessary to excavate and dispose of unsuitable material, place and compact the aggregate as per plan shall be included in the unit price bid for item 302/SPL – Crushed Stone Base for Subgrade Repair.



### **8.25 Item SPL – Geogrid Reinforcement For Subgrade Repair**

A contingency amount of Item SPL – Geogrid Reinforcement for Subgrade Repair has been included for repair of soft, yielding and unsuitable subgrade material and should be used only when directed by the Engineer. The cost of all labor, equipment, and materials necessary to place the geogrid (Tensor BX 1200 or equivalent) as per plan shall be included in the Unit price bid for Item SPL – Geogrid Reinforcement for Subgrade Repair.

### **8.26 Item 403 - Sealing Edges**

All edges of the asphalt concrete surface course constructed under this Contract shall be sealed with asphalt cement as directed by the Engineer and meeting the same specifications as used in Item 403, the cost of same to be included in the unit price bid for Item 403, Asphalt Concrete. After completion of the surface course, gutters shall be sealed with asphalt cement as directed by the Engineer. The material shall be applied at a uniform width of approximately 4 inches and at a rate just sufficient to fill surface voids. Sealing edges at building walls, foundations, existing curbs or other visible surfaces shall be done neatly and without more than one-half (1/2) inch of the sealant being visible on the surface. Any extra sealant applied to visible surfaces shall be carefully and thoroughly removed by the Contractor at no additional cost to the Owner.

### **8.27 Item 403 - Brooming And Cleaning**

The existing surface shall be cleaned and prepared in accordance with Item 403.03. The cost for such work is to be included in the unit price bid for Item 403, Asphalt Concrete.

### **8.28 Item 505 – Concrete Sidewalk Replacement**

The unit price bid for Item SPL shall include all labor, material, and equipment necessary for the removal and disposal of the existing concrete walk and placement of the new concrete walk. The walk shall be four (4) inches in thickness, except in walk areas through the driveway aprons and curb ramps, where the thickness shall be increased to six (6) inches.

Preformed expansion joint material, 1/2-inch thick, shall be placed at maximum 40 feet spacing and / or adjacent to all existing remaining walk or structures.

Curb ramp construction shall conform to National ADA Standards. Curb ramp standard dimensions will be adjusted as required by the Engineer in the field to provide adequate access for handicapped persons in the vicinity of poles or other fixed objects behind the curb. Curb ramps in new concrete walks will be measured as the number of each complete and shall include the cost of any additional materials, grading, forming and finishing not included in the concrete walk item (separate), which is measured through the curb ramp area.

It is the Contractor's responsibility to protect the new surface until it cures.

All sidewalks shall be constructed in accordance with KYTC Requirements.

Cost shall include any additional fill or excavation necessary to bring the sidewalk to grade, including areas outside of the sidewalk.



### **8.29 Item SPL - Sidewalk And/Or Driveway Apron Finish**

The finish applied to the Portland Cement concrete surface used as a sidewalk or driveway apron shall be a broom finish. All joints and outside edges of the pavement shall be tooled with an edger or joint tool after brooming the final finish. Final finish, joints, and edges shall be subject to the approval of the Engineer.

It is the Contractor's responsibility to protect the new surface until it cures.

### **8.30 Item SPL - Walks, Curb Ramps, and Steps**

The unit price bid for this item shall include all labor, material, and equipment necessary for the removal and disposal of the existing concrete walk, excavation to proposed subgrade, in all areas where the proposed walk is to be placed, and placement of the new concrete walk. The walk shall be four (4) inches in thickness, except in walk areas through the driveway aprons and curb ramps, where the thickness shall be increased to six (6) inches.

In the event the walk has settled, a stone fill leveling course shall be added to bring the walk back to the grade of the existing sidewalk or curb, and shall be incidental to the walk replacement item.

Preformed expansion joint material, 1/2-inch thick, shall be placed at maximum 40 feet spacing and / or adjacent to all existing remaining walk or structures.

Curb ramp construction shall conform to National ADA Standards. Curb ramp standard dimensions will be adjusted as required by the Engineer in the field to provide adequate access for handicapped persons in the vicinity of poles or other fixed objects behind the curb. Curb ramps in new concrete walks will be measured as the number of each complete and shall include the cost of any additional materials, grading, forming and finishing not included in the concrete walk item (separate), which is measured through the curb ramp area.

It is the Contractor's responsibility to protect the new surface until it cures.

Yard restoration to be included in cost.

### **8.31 Item SPL – Concrete Driveway Replacement**

The unit price bid for Item SPL – Concrete Driveway Replacement shall include all labor, material, and equipment necessary for the removal and disposal of the existing concrete or asphalt driveway, excavation to proposed subgrade, subgrade compaction and the placement of the new concrete driveway.

In the event the driveway has settled, a stone fill leveling course shall be added to bring the driveway back to the grade of the existing sidewalk or curb and shall be incidental to the driveway replacement item.

The finish applied to the concrete driveways shall be a light broom finish. All joints and outside edges of the pavement shall be tooled with an edger or joint tool after brooming or hand finishing of the final finish.

Preformed expansion joint material, 1" thick, shall be placed between the proposed walk and curb. The joint shall be sealed using an asphalt sealant. Cost of expansion material and sealant shall be included in the unit price



The Contractor must notify the affected residents in writing at least 48-hours prior to closing driveways. If the residents and businesses have not been notified 48-hours in advance of the anticipated drive closure, the contractor will be prohibited from making these closures until such time as the proper advance notification is made.

The maximum time period for driveway closure shall be ninety-six (96) hours. The contractor shall place new driveways twenty-four (24) hours after removal.

The contractor shall keep driveways closed for a seventy-two (72) hour period after concrete placement to permit the curing of concrete curbs and driveways.

No concrete removal may take place on a Thursday or Friday unless the contractor will pour concrete on a Saturday.

It is the Contractor's responsibility to protect the new concrete surface until it cures.

The areas indicated on the plans may not be the final replacement areas and are subject to adjustments in the field by the Engineer.

Driveways shall be constructed in accordance with the Kenton County Subdivision regulations.

Expansion joints shall be sealed with a gray self-levelling sealant (Sika Flex or approved alternate).

### **8.32 Item SPL - Concrete Curb Replacement**

The unit price bid for this item shall include all labor, equipment and material necessary for removal and disposal of the existing concrete curb and the construction of the new curb. All concrete for curbs shall be in accordance with the KENTON County Subdivision Regulations.

The maximum spacing between contraction joints shall be ten (10) feet. Expansion joints shall be constructed on a maximum spacing of forty (40) feet. Where new curb begins or ends at an existing structure or curb, the Contractor shall install new expansion joint material, the cost of which is to be included in the unit price bid for the curb replacement. Finish of the new curb shall be a light brush finish.

Contractor shall adjust curb elevation to provide a consistent slope without any sudden dips or high points. To raise the curb elevation, a stone fill leveling course shall be placed under the proposed curb and shall be considered incidental to the curb and gutter installation. Additional fill required behind the curb to bring the adjacent yard area flush with the proposed curb shall be incidental to this item.

It is the Contractor's responsibility to protect the new surface until it cures.

Quantity of the curb shall be measured along the top (back) of curb.

### **8.33 Item SPL – Concrete Curb and Gutter**

Concrete curb and gutter shall be as per the latest edition of the KENTON County Subdivision Regulations. Quantity of curb shall be measured along the top (back) of curb. Payment shall included all curb and gutter including drop curb and gutter as per the plan and depressed curb at driveway entrances.



### **8.34 Item SPL – Asphalt Driveway Replacement**

The unit price bid for Item SPL Asphalt Driveway shall include all labor, material, and equipment necessary for the removal of existing pavement, excavation to proposed subgrade, subgrade compaction and the placement of the new asphalt driveway.

In the event the driveway has settled, a stone fill leveling course shall be added to bring the driveway back to the grade of the existing sidewalk or curb, and shall be incidental to the driveway replacement item.

Where curbs are indicated along the proposed driveway, curbs shall be replaced to match existing. Cost of curbs shall be included in the unit price for driveway replacement.

All new asphalt abutting existing driveways, sidewalks or curbs shall be sealed using a hot poured elastic sealant.

The Contractor must notify the affected residents in writing at least 48-hours prior to closing driveways. If the residents and businesses have not been notified 48-hours in advance of the anticipated drive closure, the contractor will be prohibited from making these closures until such time as the proper advance notification is made.

The maximum time period for driveway closure shall be ninety-six (96) hours. The contractor shall place new driveways twenty-four (24) hours after removal.

The contractor shall keep driveways closed for a seventy-two (72) hour period after asphalt placement to permit the curing of concrete curbs and driveways.

No removal may take place on a Thursday or Friday unless the contractor will place the new material on a Saturday.

It is the Contractor's responsibility to protect the new surface until it cures.

The areas indicated on the plans may not be the final replacement areas and are subject to adjustments in the field by the Engineer.

Driveways shall be constructed in accordance with the KENTON County Subdivision regulations.

### **8.35 Item SPL – Asphalt Pavement**

Asphalt pavement shall be per the latest edition of the KENTON County Subdivision Regulations. All asphalt edges shall be sealed with asphalt cement.

Surface course shall be mixed with Aramid Fibers per the manufacturer's recommendations (use Forta-Fi, Ace Fibers, or approved equal).

### **8.36 Item 601 – Concrete General**

All concrete for roadway paving, curbs, sidewalks, drive aprons, and steps shall be in accordance with the KENTON County Subdivision Regulations with the following exceptions:

Concrete Roadway Pavement:

- Expansion for joint filler material shall consist of a flexible foam material such as Ceramar by W.R. Meadows or approved equal.



- Pavement lugs may be omitted.
- Contractor may substitute No. 57 crushed limestone for No. 467 crushed limestone.

### **8.37 Utility Adjustments**

Utility adjustments including but not limited to water meters, valves, catch basins, gas valves, telephone manholes, storm and sanitary manholes, and gas meters shall be incidental to Item 402/403 and/or “8” PCC Pavement” and shall be completed in accordance with the requirements of the appropriate utility company. Contractor to coordinate with the appropriate utility company for adjustments.

### **8.38 Existing Pipe**

The location, size, type and depth of all existing pipes are shown as nearly exact as available information will permit. The Engineer will not be responsible for any variations found during construction.

Where the plans provide for conduit to be connected to, or to cross either over or under, or close to an existing underground structure, it shall be the responsibility of the Contractor to locate the existing structure, both as to line and grade, before he starts to lay the proposed conduit, in order to assure compatibility of line and grade of the proposed conduit.

Payment for all operation described above shall be included in the unit price bid for the pertinent conduit item.

### **8.39 Item 701 – Grading At Inlets And Outfalls Of Proposed Conduits**

The cost of the necessary reconstruction and/or regrading of swales or disturbed areas at the inlets and outfalls of all proposed conduits shall be included in the price bid for the pertinent conduit and inlet items.

### **8.40 Item 701 – Review of Drainage Facilities**

Before any work is started on the project and again before final acceptance by the Owner, the Contractor, with the Engineer, shall make an inspection of the existing sewers within the work limits, which are to remain in service and which may be affected by the work. The condition of the existing conduits and their appurtenances shall be determined from field observations. Written records of the inspection and/or photographic documentation shall be kept by the Engineer.

All existing sewers inspected initially by the above-mentioned parties shall be maintained and left in a condition reasonably comparable to that determined by the original inspection. Any change in the condition resulting from the Contractor’s operations shall be corrected by the Contractor to the satisfaction of the Engineer. All existing and/or new conduits, inlets, catch basins, and manholes constructed and/or cleaned as a part of the project shall be free of all foreign matter and in a clean condition before the project will be accepted by the Owner. Payment for all operations described above shall be included in the unit prices bid for the pertinent item.



#### **8.41 Item 701 – Removal of Water**

The Contractor shall keep all excavations free from water while the excavation for or the construction of conduits is in progress; shall build all dams, bulkheads, underdrains, sumps, and other work necessary for this purpose; and shall provide and keep the excavation dry and free from water at all times.

The Contractor shall provide for the disposal of all water removed from the excavations in such manner as to prevent injury to the public, the public health, public or private property, or to any portion of the work completed or in progress, or the surface of the streets, and to prevent any inconvenience to the public. No ground and/or surface water shall be diverted into existing sanitary sewers.

No conduits shall be laid or built in water, and waste shall not be allowed to flow over to rise upon any concrete, brick masonry or conduit until the work has been observed and has set for at least twenty-four (24) hours.

**The flow of water in all existing sewers, drains, gutters, or watercourses encountered during the construction period shall be adequately maintained by the Contractor at his expense.**

#### **8.42 Item 704 – Under Drain**

Payment for Item 704 - Under Drain will be made at the contract unit price per linear foot for all materials, equipment and labor to complete the work per Kentucky Standard Specifications for Road and Bridge Construction Section 704 and these plans and specifications.

Payment for underdrain shall include 4" rigid perforated PVC pipe, Non-Woven Geotextile (Mirafi 140N or Approved Equal), No. 57 Stone backfill and trench as shown and noted on the provided plans/details.

Payment for edge drain extension shall include excavation, 4" solid PVC pipe, bedding and backfill. Yard Restoration to be paid under a separate bid item.

Payment shall also include any connections/taps to drainage structures.

#### **8.43 Item SPL - 6" Downspout Collection Line**

Payment for 6" Downspout Collection Line will be made at the contract unit price per linear foot for all materials, equipment and labor to complete the work per Kentucky Standard Specifications for Road and Bridge Construction Section 704 and these plans and specifications. Pipe to consist of smooth walled PVC. Fitters and tees shall be PVC. **This payment shall include trenching, bedding, backfill and connections to the curb inlet. Trenching, bedding and backfill as per the plan details.**

#### **8.44 Item SPL – Downspout Connection To Existing Underdrain**

Existing downspout leaders that are to connect to the Underdrain shall be replaced as per the detail "Downspout Connection to Existing Underdrain". The cost for labor, equipment and materials necessary to remove and dispose of the existing downspout leader and install new pipe from the end of the existing pipe to the proposed underdrain connection point, including bends, green plastic pop-up cleanout cap (NDS 420C or approved equal), tee and connection to the downspout collection line shall be included for each downspout placed. Payment shall include trenching, bedding and backfill.



It is the intention that the existing pavement is not disturbed.

#### **8.45 Item SPL – Downspout Connection To Downspout Collection Line**

Existing downspout leaders that are to connect to the downspout collection line shall be replaced as per the detail “Downspout Connection to Downspout Collection Line”. The cost for labor, equipment and materials necessary to remove and dispose of the existing downspout leader and install new pipe including bends, green plastic pop-up cleanout cap (NDS 420C or approved equal), tee and connection to the downspout collection line shall be included for each downspout placed. Payment shall include trenching, bedding and backfill.

#### **8.46 Item SPL – Conduit, Drainage and Utility Items**

Unless otherwise specified on the plans, the unit price bid for the pertinent conduit, drainage and/or utility item shall include the cost of all necessary appurtenances, connections, fittings, plugs, tees, collars, etc.

Unless otherwise noted on the plans, the unit price for the pertinent conduit, drainage and/or utility item is to include the costs involved in the excavation of the trench in unclassified material, the supplying and placing of the required bedding material and the backfilling of the trench with the specified material to the appropriate subgrade elevations.

Any additional fill required due to the relocation of storm sewer shall be included in the storm sewer unit price. All backfill in pavement areas shall consist of flowable fill.

#### **8.47 Item 610/710 – Conduit End Treatment**

Immediately after placement of any conduits, the Contractor shall construct the end treatments required by the plans at both the outlet and inlet ends. This shall include headwalls, concrete riprap, rock channel protection, sodding, etc. The cost of the necessary reconstruction and/or regrading of swales or disturbed areas at the inlets and outfalls of all proposed conduits shall be included in the price bid for the pertinent conduit and inlet items.

#### **8.48 Item SPL – Storm Sewer, Manholes, Inlets, Catch Basins and Headwalls**

Storm sewer manholes, inlets and catch basins shall be constructed as per the details on the construction drawings and conforming to the requirements of SD1 Specifications Section 02630. All castings for manholes, catch basins and inlets shall conform to those specified in the standard construction drawings. Grated inlet tops shall be placed as specified on the plans. Tops of casting elevations are subject to final adjustments as approved by the Engineer. All castings used shall be subject to the final approval of the Engineer. Payment for these items shall include connection to proposed or existing storm sewer conduit.

Any additional backfill required due to the removal of an existing storm structure and relocation of the proposed storm structure shall be incidental to the manhole, inlet or catch basin. All backfill in pavement areas shall consist of flowable fill.



### **8.49 Shoring and Trench Box**

Trenches and excavations for appurtenances shall be adequately shored and braced or a trench box utilized whenever the trenches and excavations cannot be opened up to a sufficient width to maintain natural soil stability and sloped per current OSHA regulations. All shoring shall meet safety codes in effect at the time of the work; and, if none are in effect, they shall meet the requirements of Employers Mutual, Factory Mutual, Associated General Contractors safety manuals or OSHA guidelines.

The Contractor is fully responsible at all times for the safety of their excavators and total compliance with OSHA regulations.

Shoring and sheeting, when used, that does not extend below the top of the sewer pipes may be removed at the Contractor's option after the trench backfill has been placed and compacted to a point one foot above the top of the pipes. Following removal of the shoring and sheeting, the space left shall be filled immediately with backfill material and compacted.

Shoring and sheeting that extends below the top of the sewer pipes shall be left in place below a point one foot above the top of the pipes and not be disturbed. The Contractor may remove the portion of shoring and sheeting above this point at his option.

When shoring and sheeting is not removed, the portion to a point two feet (2') below finished grade shall be removed. Bracing shall not be removed until after the trench backfill has been placed and compacted to a point one foot (1') above the top of the sewer pipes.

The cost for shoring and trench boxes shall be incidental to the overall contract and no additional payment will be made specifically for this item unless otherwise specified.

### **8.50 Item SPL – Sheeting and Shoring**

The Contractor shall furnish, put in place, and maintain such piling, sheeting, bracing, etc., as is required by the State of Kentucky. The Contractor shall furnish, put in place, and maintain and remove such sheeting, shoring, planking and bracing as may be required to support the sides of the excavations and to prevent any movement which could in any way injure the work, human life, or adjacent structures and property, obstruct surface drainage channels or waterways, or otherwise injure or delay the work. If required at any time by the Engineer, the Contractor shall furnish and install such additional sheeting, shoring and bracing as may be necessary to protect the work, but compliance with such orders or failure on the part of the Engineer to give such orders shall in no case release the Contractor from liability for any damages or injuries caused by weak or insufficient sheeting, shoring and bracing, nor from his responsibility to protect the work or adjacent property.

Except when ordered left in place, all wood sheeting above the top of the pipe, steel sheet piling, braces, shoring, walers or stringers, shall not be withdrawn until the backfill is practically complete. As the backfill progresses to the elevation of a set of walers and braces, such bracing shall be removed. All sheeting and bracing specified, shown on the plans, or directed by the Engineer to be left in place shall not be removed. All sheeting left in place shall be cut off at least two (2) feet below final finish grade. During the removal of sheeting, care must be taken to prevent movement of the sides of the excavation. All voids left by the withdrawal of sheeting shall immediately be carefully refilled by ramming with tools adapted to the purpose, pneumatic or other approved type, or by flushing sand into the voids.

The cost for sheeting and shoring shall be incidental to the overall contract and no additional payment will be made specifically for this item unless otherwise specified.



### **8.51 Control Of Work**

**Construction work shall take place between the hours of 7:00 A.M. to 7:00 P.M., Monday through Saturday unless otherwise restricted by the Encroachment Permit.**

### **8.52 "Or Approved Equal" Items**

In the preparation of these documents and plans, several proprietary products may have been specified. In all such cases, it is to be understood that the Contractor may offer a substitute for the specified product, as indicated by the words "Or Approved Equal." However, the Contractor must be aware that, before commencement of construction, he must provide information to the Engineer concerning the substituted product, and that the Engineer must approve in writing the offered product as being equal to the specified product before use or incorporation into the work.

Unless otherwise modified by the Engineer, proprietary products are to be installed and/or constructed in strict compliance with the pertinent Manufacturer's specifications.

### **8.53 Payment**

**No adjustments to unit prices shall be due to the Owner or the Contractor for increases or decreases in the Engineer's approximate unit quantities shown in the proposal resulting from changes in the amount of work performed.**

THE OWNER RESERVES THE RIGHT TO AWARD OR DELETE ANY OR ALL COMBINATIONS.



## 9. Supplemental Specifications Section

- 9.1 **SD1 Specifications Section 02606 – Sanitary & Storm Structures**
- 9.2 **SD1 Specifications Section 02610 - Pipe & Fittings**



## SECTION 02606

### SANITARY & STORM STRUCTURES

#### PART 1 – GENERAL

##### 1.1 SUMMARY

- A. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown on the Design Drawings, specified herein and required to furnish and install all sanitary and storm structures including but not limited to precast and cast-in-place manholes, air release manholes, bypass pumping vaults, drainage structures, headwalls, outfalls, etc.

##### 1.2 RELATED WORK

- Division 2, Sections on Earthwork
- Section 02607, Sanitary Sewer Lining System
- Section 03300, Cast-In-Place Concrete
- Section 05501, Miscellaneous Metal Fabrications
- Section 05536 Floor Access Hatch Covers
- Section 05540, Castings
- Division 15, Sections on Piping

##### 1.3 REFERENCES

- A. KY Standard Specifications and Drawings: In this section, reference is made to the current Kentucky Transportation Cabinet (KYTC) Standard Specifications for Road and Bridge Construction and the KYTC Standard Drawings. In addition, construction requirements and material specifications not specifically covered in this section or in the referenced SD1 Technical Specifications shall conform to KYTC Standards. The ENGINEER or CONTRACTOR of a storm sewer project is responsible for obtaining a current edition of the KYTC Standard Specifications and the latest edition of the KYTC Standard Drawings when designing or performing work that either involves SD1 funding or is to be accepted by SD1.
- B. Reference Standards:
1. ASTM C 33, Standard Specification for Concrete Aggregate.
  2. ASTM C 76, Class III Reinforced Concrete Pipes.
  3. ASTM C 443, Specifications for Joints for Circular Concrete Sewer and Culvert Pipe, using Rubber Gaskets.
  4. ASTM C 478, Specification for Precast Reinforced Concrete Manhole Sections.
  5. ASTM C 579, Standard test method for compressive strength of chemical resistant mortars, grouts, monolithic surfacing and polymer concretes.
  6. ASTM C 857, Standard Practice for Minimum Structural Design Loading for underground Precast Concrete Utility Structures.

7. ASTM C 891, Standard Practice for Installation of Underground Precast Concrete Utility Structures
8. ASTM C 913, Standard Specification for Precast Concrete Water and Wastewater Structures
9. ASTM C 923, Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
10. ASTM D 695, Standard Test Method for Compressive Properties of Rigid Plastics.
11. ASTM D 790, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
12. ASTM C 990, Standard Specification for Joints for Concrete Pipe, Manholes, Precast Box Sections Using Preformed Flexible Joint Sealants.
13. ASTM C 1244, Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
14. ASTM C 1478, Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Storm Sewer Structures, Pipes and Laterals
15. ASTM D 1737, Test Method for Elongation of Attached Organic Coatings with Cylindrical Mandrel Apparatus
16. ASTM D 2240, Standard Test Method for Rubber Property
17. ASTM D 412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers Tension
18. ASTM D 4161, Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.
19. ASTM D 6783, Standard Specification for Polymer Concrete Pipe.
20. ASTM F 477, Specification for Elastomeric Seals (gaskets) for Joining Plastic Pipe.
21. ASTM 4060, Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
22. ASTM 4541, Standard Test Method for Pull Off Strength of Coatings using Portable Adhesion Testers
23. AWWA C 110, Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids.
24. AWWA C 111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings. AWWA C 115, Flanged Ductile-Iron Pipe with Threaded Flanges.
25. AWWA C 151, Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
26. AWWA C 302, Reinforced Concrete Pressure Pipe, Noncylinder Type, for Water and Other Liquids.

#### 1.4 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
  1. Design Drawings showing design and construction details of all precast concrete and cast-in-place manholes including details of joints between the manhole bases and riser sections and stubs or openings for the connection of sewers. Design Drawings shall show invert elevations of all pipe connections entering and leaving the manhole along with flowline slope across the base. Shop Drawings shall show the delta angles for all points of intersection, except where more than

one line intersects at the same manhole. Where more than one line intersects, the angles relating all lines shall be shown. All angles shall be shown to the nearest second.

2. Manufacturer's name for all precast structures.
- B. For the following submit:
1. Manholes: Include plans, elevations, sections, details, and frames and covers.
  2. Drainage Structures: Include plans, elevations, sections, details, and frames, covers, and grates.
  3. Cast-in-place and Precast Structures: Include plans, elevations, reinforcing, concrete mix design, and structural calculations stamped by a Professional Engineer, registered in the State of Kentucky, competent in structural design.
  4. Pipe material and layout for prefabricated sections
  5. Any other items as requested by the ENGINEER or SD1.
- C. Comply with all the requirements of Section 01340.

## PART 2 – STRUCTURES

### 2.1 GENERAL

- A. Concrete for all cast-in-place storm drainage structures (including channels and benches) shall conform to Section 03300 of the SD1 Technical Specifications including a minimum 28-day compressive strength of 4,000 psi.
- B. Grout shall consist of a mixture of water and cement or cement with fly ash, one part cement or cement with fly ash to two parts mortar sand as defined in Section 601.03.03B of the KYTC Standard Specifications, by volume.
- C. Non-shrink grout shall be an approved non-shrink, non-staining grout consisting of either a mixture of hydraulic cement, water, fine aggregate, and an approved nonferrous expansive admixture, or a packaged commercial product and shall meet the requirements of Section 601.03.03B of the KYTC Standard Specifications.
- D. Round precast structures shall conform to ASTM C 478. Square and rectangular precast structures shall meet the requirements of ASTM C 913. Structural calculations shall be provided for all precast structures as requested by SD1.
- E. Benching is required in the bottom of all structures (curb inlets, yard drains, standard inlets, manholes) per SD1 standard details. Cast-in-place benches shall be of 4,000 psi concrete. The invert channels shall be constructed as to cause the least possible resistance to flow. The shapes of invert channels shall conform uniformly to inlet and outlet pipes. Smooth and uniform finishes will be required. Inverts may also be precast into the structure.

## 2.2 PRECAST CONCRETE MANHOLES, AIR RELEASE MANHOLES, AND BYPASS PUMPING VAULTS

### A. General:

1. Precast manholes shall conform to the details shown on the Standard Details.
2. Concrete shall be minimum 4,000 psi compressive strength.
3. Except where otherwise specified precast manhole components shall consist of reinforced concrete pipe sections especially designed for manhole construction and manufactured in accordance with ASTM C 478 except as modified herein.
  - a. Standard Manholes shall be six (6) feet or more in depth, measured from the base of the cover frame to the invert of the outlet and shall be concentric cone-type, top construction as shown on the Design Drawings.
  - b. Shallow Manholes shall be less than six (6) feet in depth, measured from the base of the cover frame to the invert of the outlet and shall be of flat-top construction as shown on the Design Drawings.
4. Precast, reinforced concrete manhole bases, riser sections, flat slabs and other components shall be manufactured by wet cast methods only, using forms which will provide smooth surfaces free from irregularities, honeycombing or other imperfections.
5. All precast manhole components shall be of approved design and of sufficient strength to withstand the loads imposed upon them. They shall be designed for a minimum earth cover loading of 130 pounds per cubic foot, an H-20 wheel loading, and an allowance of 30% in roadways and 15% in rights-of-way for impact.
6. Precast concrete manhole sections (including eccentric and concentric cones, risers and rings) shall conform to ASTM C 478 except sections deeper than 12-ft. shall have reinforcing equal to that of ASTM C76 Class III reinforced concrete pipes, unless otherwise noted on the Design Drawings.
7. Lifting holes, if used in manhole components, shall be tapered, and no more than two shall be cast in each section. Tapered, solid rubber plugs shall be furnished to seal the lifting holes. The lifting holes shall be made to be sealed by plugs driven from the outside face of the section only. If lifting holes do not protrude completely through the wall, no sealing is required.
8. Mark date of manufacture, manhole number as shown on the Design Drawings, and name or trademark of manufacturer on outside of barrel.

### B. Manholes downstream of force mains

1. Where a force main connects to a new or existing manhole, that manhole shall be lined with a corrosion resistant monolithic lining conforming to SD1's Technical Specifications. SD1 may also require existing manholes up to four manholes downstream of the new force main discharge be similarly lined on a case-by-case basis. The cover on the force main discharge manhole shall be a solid lid (not vented). SD1 may require that additional downstream vented manhole lids be replaced on a case-by-case basis.

2. Any existing manholes to be lined shall be inspected by the DESIGN ENGINEER and SD1 to determine the conditions of the manholes and confirm if the manholes are suitable for lining. If in the opinion of SD1, the existing manholes cannot be lined, then the manholes shall be replaced.

C. Manhole Bases Sections:

1. Precast concrete manhole base sections shall be "monolithic", consisting of base slab and base riser (barrel) section.
  - a. If floatation is found to occur based on the Design Engineer's review, the engineer shall specify thickness of precast base. Precast base sections shall be furnished with an integral anti-flotation footing, thickness as specified hereinafter, extending trench bank-to-bank as shown in the Standard Details (minimum 8" projection).
  - b. Precast concrete manhole base slab thickness shall comply with the following schedule:

|               |                 |            |
|---------------|-----------------|------------|
| 0.0' – 15.0'  | Vertical Height | - 8" Slab  |
| 15.1' – 20.0' | Vertical Height | - 10" Slab |
| 20.1' – 25.0' | Vertical Height | - 12" Slab |
| 25.1' – 30.0' | Vertical Height | - 14" Slab |
  - c. Manholes over 30feet shall be designed by a Professional Engineer registered in the State of Kentucky. Submittals shall be provided to SD1 for review & approval.
  - d. Manhole bases shall have two cages of reinforcing steel in their walls, each of the area equal to that required in the riser sections. Wall thickness shall not be less than 5 inches.
  - e. There should be a minimum of 12 inches between the outside diameters of all pipe penetrations in the base section. The maximum inside diameter (or horizontal dimension) of pipe to be used with a given size manhole shall be as specified on SD1 standard detail.
  - f. Base riser shall extend a minimum twelve (12) inches above the top of the highest pipe in the base.
2. Flow channel (invert) and apron (bench) shall be poured separately at the point of manufacture to the dimensions shown on the Design Drawings.
  - a. The flow channel through manholes should be made to conform in shape and slope to that of the sewers.
  - b. Invert shall be smooth and semi-circular in cross-section of the same diameter of the pipe leaving the manhole.
  - c. Changes of direction of flow or sewer centerline within the manhole shall be made by forming the flow channel along a smooth curve with as long radius as the inside of the manhole will allow.
  - d. Bench shall slope toward invert at not less than one (1) inch per foot.
3. All precast base sections with pipe openings shall fulfill the connection requirements identified hereinafter in 2.6 Flexible Pipe Joint Seal & Connections.

D. Manhole Barrel Sections:

1. Manhole barrel sections shall have reinforcing steel in their walls, Wall thickness shall not be less than 5 inches.

2. The barrel of the manhole shall be constructed of various lengths of riser pipe manufactured in increments of one foot to provide the correct height with the fewest joints. Openings in the barrel of the manholes for sewers or drop connections will not be permitted closer than one foot from the nearest joint. Special manhole base or riser sections shall be furnished as necessary to meet this requirement.
  3. The barrel sections shall be of the height required, but not less than one (1) foot in height. No opening shall be cut into a barrel section, the maximum dimension of which exceeds one-half (1/2) the section height.
  4. Joints between manhole components shall be the tongue and groove. The circumferential and longitudinal steel reinforcement shall extend into the tongue and groove ends of the joint without breaking the continuity of the steel.
  5. Precast manhole section joints shall be joined with one of the following products:
    - a. ASTM C 443, a single, continuous rubber O-ring gasket and shall conform to AWWA C302.
    - b. ASTM C-990, flexible butyl resin sealant such as Conseal CS-102, CS-202 as manufactured by Concrete Sealants, Inc.
    - c. Hamilton-Kent "Kent-Seal No. 2"
    - d. Press Seal Gasket "E-Z Stik"
    - e. Or Equal
- E. Cone Sections and Top Slab:
1. A precast concentric cone or precast top slab shall be provided at the top of the manhole barrel to receive the cast iron frame and cover or floor access hatch cover as shown on the Design Drawings. Eccentric cones will be evaluated on a case-by-case basis or where directed by SD1
  2. Cone sections and top slabs shall be designed for an H-20 wheel loading.
  3. Cone sections for standard manholes shall have a minimum 8" thick upper walls and shall not exceed 3'-0" in height.
  4. Concrete top slabs shall not be less than 8 inches thick.
- F. Drop Manhole:
1. Drop Manholes shall conform to all provisions specified herein, with the additional requirements for the drop pipe as shown on the Design Drawings.
  2. The drop pipe shall be of the same material and diameter as the inlet sewer pipe used.
  3. Drop pipe shall be totally enclosed in concrete, formed, with a minimum covering dimension of 6 inches.
  4. No drop pipes shall be allowed inside of the manholes, unless otherwise approved by SD1.
  5. Base shall be cast to support drop connection.
- G. Acceptable Manufacturers
1. KOI
  2. Hanson
  3. or equal

### 2.3 MANHOLE RISERS

- A. Manhole risers (adjusting rings) 6” to 10” height shall be concrete.
- B. Manhole risers 2” to 5” height shall be high density polyethylene as manufactured by Ladtech, Inc or equal. Manholes that will be raised more than 10 inches will use 1-foot barrel section on inside of manhole.
- C. Or other method approved by SD1 on a case-by-case basis.

### 2.4 PRECAST STORM CURB INLETS, STANDARD INLETS, CATCH BASINS & YARD DRAINS

- A. Precast storm drainage structures with knockout panels shall only be used for curb inlets (catch basins) and yard drains no greater than 6-ft in depth, unless load calculations are supplied. For pre-cast rectangular structures (other than those with knockout panels), at least 6 inches of wall (measured from the interior corner) is required on each side of the pipe beyond the precast opening for the pipe. This rule is not applicable for structures which have pipe installed in opposite walls or where one outlet reinforced concrete pipe is utilized. Less than 6 inches of wall may be approved by SD1 with the submittal of design calculations.
- B. Base and riser sections shall be custom-made with openings to meet indicated pipe alignment conditions. The minimum distance allowed between precast holes, measured from edge to edge in a standard inlet section shall be 6 inches.
- C. Joints between yard drains and standard inlet sections in the roadway or yard areas shall be sealed with one of the following:
  - 1. ASTM C 443, a single, continuous rubber O-ring gasket and shall conform to AWWA C302.
  - 2. ASTM C-990, flexible butyl resin sealant such as Conseal CS-102, CS-202 as manufactured by Concrete Sealants, Inc.
  - 3. Hamilton-Kent “Kent-Seal No. 2”
  - 4. Press Seal Gasket “E-Z Stik”.
  - 5. Or equal
- D. Joints between riser sections for curb inlets (catch basins) are not required to have gaskets or butyl sealant between sections. These joints can be stacked dry as long as there are no holes or gaps in the joints. All holes or gaps shall be filled with non-shrink grout.
- E. For precast structures with openings cast into the unit, the minimum vertical distance from the pipe openings to the top of the structure or segment wall shall be 12 inches. If this distance is less than 12 inches, then additional reinforcing steel shall be furnished for this section. All pipe openings shall not be in joints between two precast sections unless specifically approved by SD1. The top slab must be designed for HS-20 loading in paved areas only.

- F. All standard inlets shall conform to the appropriate Standard Drawings No. STM-08 through STM-11. All storm drains outside of the right-of-way shall be Standard Drawing No. STM-07, unless specifically approved otherwise by SD1. All curb inlets and catch basins shall conform to the appropriate Standard Drawings No. STM-01.1, STM-01.2, STM-04 and STM-12.

## 2.5 HEADWALLS AND OUTFALLS

- A. Headwalls and outfalls shall be constructed of either cast-in-place or precast reinforced concrete that conforms to KTC Standard Specifications for Road and Bridge Construction.
- B. Safety guards and railings: Safety guards and railings shall be provided along the top and sloped/winged sidewalls on all headwall inlet and outlet structures having a vertical drop of 4'-0" or greater. Such guards or railings shall be at least 42-inches in height measured vertically above the wall. Guards or railings shall not have an ornamental pattern that would provide a ladder effect. Vinyl coated chain link fencing and galvanized materials are an acceptable guard type.
- C. Grates: Grates shall be provided on inlet headwalls for all pipes.
- D. All headwalls and outfalls shall conform to the appropriate Standard Drawings, including but not limited to, No. STM-15, STM-16, STM-17.1, STM-18.1 and STM-19.

## 2.6 FLEXIBLE PIPE JOINT SEAL & CONNECTIONS

- A. For sanitary structures and manholes:
  - 1. A flexible pipe joint seal shall be provided in the connection of pipe to manholes and other miscellaneous structures. The rubber seal shall meet the requirements given in ASTM C 923. The seal shall be of a size specifically designed for the pipe size and material.
  - 2. All connecting elements of the seal shall be Type 304 stainless steel.
  - 3. Flexible pipe joint seal shall allow for pipe alignment of up to 15 degrees deflection.
  - 4. Pipes entering manholes that do not have existing flows and have slopes greater than ten (10) percent may have fittings (22.5- or 11.25-degree bends) installed immediately outside the manhole. This is to be evaluated on a case-by-case basis by SD1 or ENGINEER.
  - 5. Acceptable Products:
    - a. Kor-N-Seal by NPC, Inc.
    - b. A-Lok by A-LOK Products, Inc.
    - c. Dura-Seal III by Dura-Tech
    - d. Or equal.

- B. For storm structures and manholes with flexible pipe joint seals:
1. CONTRACTOR may use flexible connections at storm manholes which shall be elastomeric gaskets or couplings, manufactured in accordance with ASTM C 1478, Standard Specification for Storm Drain Resilient Connectors between Reinforced Concrete Structures, Pipes, and Laterals.
  2. CONTRACTOR may use a concrete collar for opening around the pipe. The pipe shall be encased with minimum 6-inch collar of concrete from the inside face of the wall to 1'-0" outside the outer face of the wall. The pipe shall be adequately supported to prevent settling while the concrete encasement is curing. The inside faces of the structure walls shall be finished with a trowel. If a concrete collar is used, the collar shall be allowed to cure to 75% of its design strength before backfilling. The diameter of the opening shall be no more than 8 inches greater than the outside diameter of the pipe.
  3. For precast structures with knockout panels, all holes for pipes shall be via a controlled cut and shall not be cut into the structural members (i.e., top beams and corner columns) and non-shrink grout shall not be allowed to be placed around the pipes without prior approval from SD1 or its Engineer. The pipes shall be encased with a minimum 6-in. concrete collar all around the outside of pipe or a minimum of 3 inches beyond the hole knocked in the wall, whichever is greater. Also, the concrete encasement shall extend from the inside face of the wall to 1'-0" outside the outer face of the wall. The collar shall be allowed to cure to 75% of its design strength before backfilling.

## 2.7 STORM LATERAL CONNECTIONS

- A. Roof downspouts, footing or foundation drains, and sump pumps shall discharge in accordance with the local governing subdivision regulations. All storm lateral connections (downspouts, footing or foundation drains, sump pumps, etc.) to the storm sewer shall be prohibited unless explicitly reviewed and approved by SD1 due to uncommon circumstances (i.e. inadequate discharge distances from foundations, narrow side yards, etc.).

## 2.8 MANHOLE, CATCH BASIN & STRUCTURE STEPS

- A. Reinforced Polypropylene Manhole Steps: 1/2-inch Grade 60 steel reinforcing rod, ASTM A-615, encapsulated in copolymer polypropylene, ASTM D 2146-68 under Type II, Grade 16906. Steps shall be PS1-PF (Press Fit polypropylene plastic) as manufactured by MA Industries, or equal. Steps shall be epoxy grouted into specially sized holes cast into the manhole section. Holes shall be formed in the manhole section using an insert plug that is removed upon curing.
- B. No steps shall be aligned over the flow channel. Step spacing shall be 16 inches as shown the Standard Detail Drawing.
- C. Omit steps for structures that are less than 4-ft deep unless otherwise shown on the plans.

## 2.9 EXTERNAL SLEEVE FOR STRUCTURE (SANITARY ONLY)

- A. Provide external sleeve around all manhole joints as designated on the plans. Any manholes located within 50-ft. or less of a creek/stream or within a floodplain shall have an external sleeve. External sleeve shall be a wraparound heat shrinkable sleeve that creates a barrier to water infiltration and protects support of the structure and frame from ground moisture prevents corrosion and freeze-thaw damage. The system shall be compatible with and bond to concrete, metal, and fiberglass using an adhesive-type primer. The sleeve shall have the following physical properties:

|                     |                        |              |
|---------------------|------------------------|--------------|
| Softening Point     | 212 degrees Fahrenheit | ASTM E-28    |
| Lap Shear Strength  | 12 PSI                 | DIN 30 672   |
| Tensile Strength    | 2900 PSI               | ASTM D-638   |
| Elongation          | 600%                   | ASTM D-638   |
| Hardness            | 46 Shore D             | ASTM D-2240  |
| Abrasion Resistance | 45 mg                  | ASTM D-1044  |
| Peel Strength       | 9PLI                   | ASTM D-1000  |
| Water Absorption    | 0.05%                  | ASTM D-570   |
| Low Temperature     | -40 degrees Fahrenheit | ASTM D-2671D |
| Minimum Width       | 12 inches              |              |

- B. System shall accommodate ground movement and resists soil stress.
- C. Acceptable Products:
1. WrapidSeal – Manhole Encapsulation System by Canusa –CPS.
  2. Link- Seal Riser- Wrap Heat Shrink System.
  3. Or Equal.

## 2.10 PVC STORM DRAINAGE STRUCTURES AND CATCH BASINS

- A. PVC storm drainage structures and catch basins shall be approved on a case-by-case basis by SD1.

## PART 3 – EXECUTION

### 3.1 MANHOLE BASES

- A. General
1. Manholes shall be installed at the locations shown on the Design Drawings.
  2. The dimensions shall be as shown on the detail sheets and the depths shall be as indicated by either finished top elevation given or depth dimension given on the plans.
  3. Perform Site work as per the requirements of Specifications Sections 02050 Demolitions, 02110 Clearing and Grubbing, 02220 Excavation and Backfill, and 02222 Rock Removal.
  4. Excavation for manholes and other underground structures shall be of sufficient size to adequately accommodate installation and proper centering.

5. The bases shall be placed directly on an 8-in. to 12-in. deep pad (compacted thickness) of pipe bedding material as specified in Section 02220 Excavation and Backfill, placed to proper elevation and leveled, unless a deeper excavation is required to remove any loose sandy soils or soft to medium stiff, clayey soils down to a soil stratum suitable for support of the manhole and base.
    - a. The excavated soils shall be replaced with an appropriate structural backfill material or with controlled, low-strength material (CLSM), lean concrete, or an extra thickness of manhole base concrete.
  6. The excavation shall be kept free of water while the manhole is being constructed and manhole shall not be backfilled until inspected by the SD1.
  7. CONTRACTOR will be required to compact bedding material around the entire circumference of the manhole and manhole excavation area to at least 12-inches above the highest incoming or outgoing pipe.
  8. Compacted backfill as specified on the Design Drawings or Section 02220 Excavation and Backfill shall then be placed above the compacted bedding material up to finished grade.
- B. Pre-Cast Bases
1. The SD1 reserves the right to inspect precast manhole base sections at the construction site and to reject the use of such sections if the SD1 determines the products unsuitable for SD1's installation.
  2. Doghouse manholes shall not be permitted unless written approval by SD1 or SD1 representative.
- C. Cast-in-Place Bases
1. Cast-in-Place Bases shall be used when installing a doghouse manhole over an existing sewer or as approved by the ENGINEER.
    - a. Cast-in-place bases shall be placed on suitable foundations after the pipes are laid as specified in 3.1A.5.
  2. The base shall be cast monolithically to an elevation at least 12 inches above the top of the highest pipe entering the manhole, except where a drop connection is to be installed.
    - a. Base thickness shall be as per 2.2C.1.
    - b. Base, walls and bottom shall be at least of the thickness shown and reinforced to withstand the loads to be expected.
    - c. Connections for sewer pipes shall conform to SD1's Standard Detail.
    - d. The base of the bell or groove end at joints between components shall be buttered with 1:2 cement-sand mortar to provide a uniform bearing between components.
    - e. All joints shall be sealed with cement mortar inside and out and troweled smooth to the contour of the wall surface.
    - f. Raised or rough joint finishes will not be accepted.

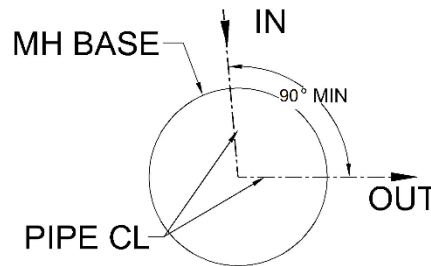
### 3.2 PRECAST MANHOLE SECTIONS

- A. Set sections vertical with steps and sections in true alignment.

- B. Install sections, joints and gaskets in accordance with manufacturer's recommendations.

### 3.3 STRUCTURE CHANNELS

- A. All invert channels through structures shall be constructed of 4,000 psi concrete.
- B. For precast bases, the flow line (channel) and benches shall be cast separately from the floor and side wall at the place of manufacture, unless otherwise approved by SD1.
- C. Channels shall be properly formed to the sizes, cross sections, grades and shapes shown or as ordered.
- D. Benches shall be built up to the heights shown or as ordered and given a uniform wood float finish.
- E. Care shall be taken to slope all benches for proper drainage to the invert channel.
- F. All flow channel angles between any new incoming pipe and new outgoing pipe shall be at least 90 degrees in the direction of flow as seen in the figure below. For any pipe with velocities exceeding 5 ft/s consult SD1 engineer for the required angle or for the need of an oversized manhole.



### 3.4 STORM CURB INLETS, STANDARD INLETS, CATCH BASINS, YARD DRAINS, HEADWALLS & OUTFALLS

- A. Inlets, catch basins, drains, junction structures, and other drainage structures shall be neatly and accurately built in accordance with the plans or SD1 Standard Drawings. The structure shall be either of cast-in-place concrete or precast concrete. Precast structure sections shall be installed in accordance with ASTM C 891.
- B. All cast-in-place structures shall be built using 4,000 psi concrete as described in 2.1. The structures shall be built on prepared foundations and conform to the dimensions and shapes shown on the Plans and SD1 Standard Drawings. The construction shall conform to the methods, forms, placement, protection, and curing for concrete as specified in accordance with KTC and SD1 Standards. Any required reinforcement shall conform to the Plans and SD1's Standard Drawings. Installed concrete reinforcing shall be inspected and approved by SD1 before any concrete is placed.

- C. Headwalls and outfalls shall be constructed of either cast-in-place or precast reinforced concrete in conformance with SD1's Standard Drawings and KTC Standard Specifications for Road and Bridge Construction. All headwalls and outfalls built into slopes shall be properly seated as to avoid disconnection from the adjoined pipe.

### 3.5 DOGHOUSE MANHOLES

- A. For joining new pipe to existing pipe, refer to 3.1B.2, for requirements. Doghouse manholes shall only be used for connections to sewer mains with high flows, as determined by the ENGINEER. Doghouse manholes must be approved by SD1. For applications using doghouse manholes, refer to 3.1C Cast-in-Place Bases and SD1 Standard Detail No. SD-106 for requirements.

### 3.6 PIPE CONNECTIONS TO NEW STRUCTURES

- A. For connections to new structures:
  - 1. A flexible pipe-to-manhole joint connector shall be used for joining piping to manholes and other miscellaneous structures. The rubber seal shall meet the requirements given in ASTM C 923. The seal shall be of a size specifically designed for the pipe size and material and be as specified herein.
    - a. If a Kor-N-Seal joint seal or equal with a stainless steel tightening band is used, CONTRACTOR shall tighten the band to the proper torque as specified by the manufacturer.
    - b. If the slope of the incoming sewer exceeds 10% from the horizontal, a fitting may be used outside the manhole wall to facilitate a more perpendicular connection to the manhole wall. The use of this fitting is to be evaluated on a case-by-case basis by SD1.
  - 2. All pipe connections to manholes shall match crowns. If matching crowns is not possible, a drop manhole may be approved by SD1.
  - 3. All drop manholes shall be approved by SD1. Drop manholes may be acceptable under the following conditions:
    - a. If the slope of the influent sewer is greater than or equal to 5%, SD1's drop connection detail No. SD-114 shall be followed. All other influent sewer slopes and drop connections will be evaluated on a case-by-case basis.
    - b. All other drop manhole requests shall be approved on a case-by-case basis including but not limited to pipe realignments, connections to existing manholes, etc.
    - c. If the total height of the drop is greater than sixteen (16) feet, a drop shaft assembly shall be specifically designed for the hydraulic conditions present by a licensed professional engineer in the Commonwealth of Kentucky for the hydraulic and shall be approved by SD1.
  - 4. Slide manholes shall not be used, unless otherwise approved by SD1.

### 3.7 PIPE CONNECTIONS TO EXISTING STRUCTURES

- A. Perform by core drilling in accordance with Section 01045.

- B. The connection to the structure shall be in accordance with the materials specified herein.
- C. The flow channel and bench for the new connection shall be constructed onsite or the existing flow channel and bench modified to accept the new piping.
- D. New connections to existing structures need to be greater than ninety (90) degrees to the existing flow channel in the direction of the flow.
- E. Where new flows joining an existing 8-in. sewer that is flowing half pipe or greater, or the existing pipe is 12-in. or greater, an oversized manhole shall be installed to allow a smooth, sweeping flow transition. Consult SD1 for required manhole diameter.
- F. For sanitary applications, perform all connections in accordance with 3.8 and 3.10 herein.

### 3.8 SANITARY SEWER STUBS FOR FUTURE CONNECTIONS

- A. Installation of stubs for future connections shall be evaluated on a case-by-case basis and approved by SD1. If stubs are approved, PVC, ductile iron, or fiberglass pipe stubs with approved watertight plugs shall be installed in manholes. SD1 requires that future connections to existing manholes be cored and the benching modified to accept the new connection. Where pipe stubs, sleeves or couplings for future connections are shown or ordered, CONTRACTOR shall provide all materials and work for their construction.
- B. If stubs are approved by SD1, stubs out of manholes shall be a two (2) to five (5) foot stick of pipe with sealed caps. When future connections are made to these manholes, the stubs shall be removed and a full stick of pipe shall be installed at the proper slope.
- C. Where connections are made to existing manholes installed after May 15, 2000, the existing manhole shall be vacuum tested prior to the connection being made. If the manhole is vacuum tested prior to alterations and fails, it is the responsibility of SD1 to repair or replace the manhole. If the manhole passes the vacuum test prior to connection, but fails the vacuum test after the connection is made, then the CONTRACTOR shall repair or replace the manhole per SD1's direction and approval.

If the CONTRACTOR fails to vacuum test the manhole prior to any connections being made, and the manhole fails the vacuum test after the connection, the CONTRACTOR shall repair or replace the manhole per SD1's direction and approval.

- D. If the connection to an existing manhole is cored, the connection shall be booted and the existing manhole shall pass a vacuum test after all work is complete, if the existing manhole was installed after May 15, 2000.

- E. If the elevation or grade of an existing manhole is altered, the existing manhole shall pass a vacuum test after all work is complete, if the existing manhole was installed after May 15, 2000.

### 3.9 GRADING AT MANHOLES & STRUCTURES

- A. Manholes shall be installed to conform to the following convention unless otherwise called for on the plans. The ground surface shall be graded to drain away from the manhole. Final dimensions shall be determined after grading has taken place.
  - 1. Manholes in roads, parking lots, paved areas and lawns shall be installed flush with the surrounding area.
  - 2. Manholes in wooded or other inaccessible areas shall be installed twelve (12) inches above the final grade.
  - 3. Confirm with landowner prior to installation of manholes in cultivated fields, hay fields and pastures. If landowner agrees manhole shall be installed with the cone section flush with the final grade. After installation of the casting, a slope fill 1:5 (1 vertical to 5 horizontal) shall be installed to provide surface drainage away from the manhole.
- B. Manholes in paved areas shall be constructed to meet the final surface grade. In paved areas on State Highways, all manholes shall be 1/2 inch below final wearing surfaces. Manholes shall not project above finished roadway pavements to prevent damage from snowplows.
- C. CONTRACTOR shall be solely responsible for the proper height of all manholes necessary to reach the final grade at all locations. CONTRACTOR is cautioned that ENGINEER'S review of Shop drawings for manhole components will be general in nature and CONTRACTOR shall provide an adequate supply of random length precast manhole riser sections to adjust any manhole to meet field conditions for final grading.

### 3.10 MANHOLE WATERTIGHTNESS (SANITARY ONLY)

- A. All manholes shall be free of visible leakage. Each manhole shall be tested for leaks and inspected. If the manhole fails a visual leakage inspection and/or vacuum testing, SD1 will consider the manhole defective and the Contractor shall provide the Engineer a plan for leak repairs for approval or replace the manhole and make any necessary reconnections to the new or existing pipelines at no additional cost to the SD1. No leak repairs shall be performed without the ENGINEER'S approval.
- B. Vacuum test manholes to ASTM C 1244. Testing to be witnessed by SD1. Manholes not subject to vacuum testing must be in writing from SD1. This specification shall govern the negative air pressure (vacuum) testing of sanitary sewer manholes and structures and shall be used as a method of determining acceptability by the SD1, in accepting maintenance of a sanitary sewer manhole or structure on behalf of the public. Other forms of testing of some manholes may be required, as deemed necessary by the SD1.

- C. Manholes shall be tested after installation with all connections in place along with the following completed prior to testing:
  1. Lift holes, if any, shall be plugged with an approved, non-shrinkable grout prior to testing.
  2. Drop connections shall be installed prior to testing.
  3. The vacuum test shall include testing of the seal between the cast iron frame and the concrete cone, slab or grade rings.
  4. The manholes shall be backfilled and finished to design grade prior to test.
  5. Test pressure requirements of ASTM C-923 shall be met.

D. Test Procedure:

1. Temporarily plug, with the plugs being braced to prevent the plugs or pipes from being drawn into the manhole, all pipes entering the manhole at least eight inches into the sewer pipe(s). The plug must be inflated at a location past the manhole/pipe gasket.
2. The test head shall be placed inside the frame at the top of the manhole and inflated, in accordance with the manufacturer's recommendations.
3. A vacuum of 10" of mercury shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and disconnect the vacuum line.
4. The pressure gauge shall be liquid filled, having a 3.5-inch diameter face with a reading from zero to thirty inches of mercury.
5. The manhole shall be considered to pass the vacuum test if it holds at least 9 inches of mercury for the following time durations:

| Time (Minutes)  | 4' Diameter | 5' Diameter | 6' Diameter |
|-----------------|-------------|-------------|-------------|
| 20 Feet or Less | 1           | 2           | 3           |
| 20.1 to 30 Feet | 2           | 3           | 4           |

Note: Consult SD1 on manhole diameters larger than six (6) feet. These test pressures exceed what is in ASTM C-1244

6. If a manhole fails the vacuum test, SD1 will consider the manhole defective and the CONTRACTOR shall provide the Engineer a plan for leak repairs for approval or shall replace the manhole and/or defective components and make any necessary reconnections to the new or existing pipelines at no additional cost to the SD1. No repairs shall be made to the manhole unless approved by the ENGINEER.
7. All temporary plugs and braces shall be removed after each test.
8. Manholes will be accepted as having passed the vacuum test requirements if they meet the criteria stated above.

### 3.11 STRUCTURE ABANDONMENT

- A. Structure abandonment shall be per SD1 Standard Drawings and consist of removing structure frames, covers, grates, cone section of manholes, and similar items. All connecting pipes shall be bulk headed. The walls shall be lowered to 2 feet below final grade if in earth or to 12 inches below subgrade if in pavement. The remaining structure shall be filled with crushed stone or sand compacted to match all backfill requirements here-in or shall be filled with controlled density fill.

++ END OF SECTION ++

## SECTION 02610

### PIPE & FITTINGS

#### PART 1 – GENERAL

##### 1.1 SUMMARY

- A. CONTRACTOR shall provide all labor, materials, equipment, incidentals, and services as shown, specified, and required for furnishing, installing, and testing all buried piping, fittings, and specials specified herein. Piping herein specified includes force main & gravity sewer for sanitary and storm applications. Remove and replace all existing piping that interferes with installation of new pipe or structures or that is damaged by new installations in a manner approved by the ENGINEER.
- B. The work includes, but is not limited to, the following:
1. Piping beneath structures.
  2. Supports and restraints.
  3. Pipe encasements.
  4. Work on or affecting existing piping.
  5. Testing.
  6. Cleaning and disinfecting.
  7. Installation of all jointing and gasketing materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, tie rods, and all other work required to complete the buried piping installation.
  8. Incorporation of valves, meters and special items shown or specified into the piping systems as required.
  9. Unless otherwise specifically shown, specified, or included under other Sections, all buried piping work required, beginning at the outside face of structures or structure foundations and extending away from structure.
- C. Review installation procedures under other Sections and other contracts and coordinate with the work that is related to this Section.

##### 1.2 RELATED WORK

- Section 02110. Clearing and Grubbing
- Section 02220. Excavation and Backfill
- Section 02606. Sanitary & Storm Structures
- Section 03300, Cast-In-Place Concrete
- Section 09900, Painting
- Division 15, Sections on Piping, Valves & Appurtenances
- Section 15052, Exposed Piping Installation
- Section 15100, Valves and Appurtenances
- Section 15121, Wall Pipes, Floor Pipes and Pipe Sleeves
- Section 15122, Piping Specialties
- Section 15140, Pipe Hangers and Supports

### 1.3 LIMITATIONS

- A. All existing piping as shown on the Design Drawings is based on the best information available, but SD1 and the ENGINEER makes no guarantees as to the accuracy of the locations or type of piping depicted. All new piping which ties into existing lines must be made compatible with that piping. So that piping conflicts may be avoided, CONTRACTOR shall open up his trench well ahead of the pipe laying operation to confirm exact locations and sizes of existing piping before installing any new piping. CONTRACTOR shall provide all fittings and adapters necessary to complete all connections to existing piping as approved by SD1.

### 1.4 QUALITY ASSURANCE

Requirements of Regulatory Agencies:

- A. Comply with requirements of UL, FM and other jurisdictional authorities, where applicable.
- B. Refer to the General and Supplementary Conditions regarding permit requirements for this Project.

### 1.5 REFERENCES

Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

- AWWA C104, Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- AWWA C105, Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
- AWWA C110, Standard for Ductile-Iron and Gray-Iron Fittings, 3 In.-48 In. (76 mm-1,219 mm), for Water.
- AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- AWWA C115, Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
- AWWA C150, Standard for Thickness Design of Ductile-Iron Pipe.
- AWWA C151, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
- AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances.
- AWWA C606, Grooved and Shouldered Joints.
- AWWA C800, Underground Service Line Valves and Fittings.
- AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In.-12 In. (100 mm-300 mm), for Water Dist.
- AWWA M23, PVC—Design and Installation
- ASTM A 27, Standard Specification for Steel Castings, Carbon, for General Application.
- ASTM A 82, Standard Specification for Steel Wire, Plain for Concrete Reinforcement.
- ASTM A 185, Welded Steel Wire Fabric for Concrete Reinforcement.
- ASTM A 496, Deformed Steel Wire for Concrete Reinforcement.

- ASTM A 497, Steel Welded Wire Fabric, Deformed for Concrete Reinforcement.
- ASTM A 1011, Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- ASTM A 615, Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- ASTM C 14, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe.
- ASTM C 76, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
- ASTM C 118, Concrete Pipe for Irrigation or Drainage.
- ASTM C 150, Standard Specification for Portland Cement
- ASTM C 361, Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
- ASTM C 443, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- ASTM C 478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
- ASTM D 1238, Measuring Flow Rates of Thermoplastics by Extrusion Plastometer.
- ASTM D 1598, Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.
- ASTM D 1599, Short Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings.
- ASTM D 1784, Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- ASTM D 1785, Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- ASTM D 2122, Determining Dimensions of Thermoplastic Pipe and Fittings
- ASTM D 2412, Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
- ASTM D 2464, Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- ASTM D 2467, Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- ASTM D 2564, Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
- ASTM D 2774, Practice for Underground Installation of Thermoplastic Pressure Piping.
- ASTM D 3034, Bell and Spigot-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- ASTM D 3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
- ASTM D 3261, Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

- ASTM D 3262, Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
- ASTM D 3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- ASTM D 3754, “Fiberglass” (Glass-Fiber-Reinforced-Thermosetting-Resin) Sewer and Industrial Pressure Pipe.
- ASTM D 4161 Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.
- ASTM D 5685, “Fiberglass” (Glass-Fiber-Reinforced-Thermosetting-Resin) Pressure Pipe Fittings.
- ASTM F 437, Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- ASTM F 439, Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- ASTM F 441, Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- ASTM F 493, Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- ASTM F 714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
- ASCE MOP No. 37, Design and Construction of Sanitary and Storm Sewers
- ASTM C 507, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
- ASTM F 679, Standard Specification for Polyvinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
- ASTM F 794, Standard Specification for Polyvinyl Chloride (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
- ASTM F 949, Standard Specification for Polyvinyl Chloride (PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings
- ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- ASTM F 2306, Standard Specification for 12-60 inch Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications
- ASTM D 2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

## 1.6 SUBMITTALS

- A. In addition to the requirements of Section 01340, provide the following:
  1. Size, class and other details of pipe to be used.
  2. Full details of piping, specials, joints, harnessing, and connections to existing piping, structures, equipment and appurtenances.
- B. Tests: Submit description of proposed testing methods, procedures and apparatus. Prepare and submit report for each test.

- C. Certificates: Submit certificates of compliance with referenced standards.
- D. As requested by SD1, all pipe manufacturers that supply pipe for the project shall provide a detailed structural design taking in account the depth of burial, highway loads, bedding and backfill requirements, water elevation, soil conditions and installation procedures. All designs submitted shall have a Professional ENGINEER's stamp from Kentucky. Such design shall be received, reviewed, and approved prior to manufacture.
- E. As requested by SD1, pipe manufacturer for each pipe type used shall be present and instruct CONTRACTOR on proper installation technique per shop drawings and manufacturer's recommended procedures. As requested by SD1, pipe manufacturer's representative shall visit job site to monitor progress of pipe installation and shall notify in writing the CONTRACTOR and SD1 of any discrepancy, changes, or incorrect procedures that would prevent the pipe from performing as designed.
- F. Record Drawings: Submit record drawings in accordance with Section 01721.

**PART 2 – PRODUCTS**

**2.1 MATERIALS**

- A. Piping herein specified includes force main & gravity sewer. Refer to the pipe material schedule shown below to determine which pipe materials are acceptable for each application.

| <b>Type</b>                             | <b>Size</b> | <b>Depth</b>     | <b>Acceptable Materials</b>   |
|---|-------------|------------------|---|
| Sanitary - Aerial                       | Any         |                  | Ductile Iron; PVC SDR 35 inside casing pipe   |
| Sanitary - Gravity                      | Any         | Less than 20'    | PVC SDR 35; Fiberglass Polymer Mortar Pipe SN 46; Ductile Iron; HDPE; RCP, polypropylene (HDPP) |
| Sanitary - Gravity                      | Any         | 20.1' to 30'     | PVC SDR 26; Ductile Iron; Fiberglass Polymer Mortar Pipe SN 72                                  |
| Sanitary - Gravity                      | Any         | 30.1' or greater | Fiberglass Polymer Mortar Pipe; Ductile Iron  |
| Sanitary - Horizontal Directional Drill | Any         | Any              | HDPE ; Ductile Iron; Restrained Joint PVC C-900   |

|                                    |                 |                  |   |
|------------------------------------|-----------------|------------------|---|
| Sanitary - Force Main              | Any             | Any              | HDPE; Ductile Iron; PVC C-900   |
| Sanitary – Low Pressure Force Main | Smaller than 4” | Any              | PVC SDR 21, PVC Schedule 40, HPDE   |
| Sanitary – Low Pressure Force Main | 4”and Larger    | Any              | PVC C900, HDPE, Ductile Iron  |
| Storm – Gravity                    | Any             | Less than 20’    | RCP; CMP; Ductile Iron; PVC SDR 35; HDPE Corrugated; Polypropylene (HDPP), Fiberglass Polymer Mortar Pipe SN 72 |
| Storm – Gravity                    | Any             | 20.1’ or greater | RCP; CMP; Ductile Iron; PVC SDR 26; HDPE Corrugated; Polypropylene (HDPP), Fiberglass Polymer Mortar Pipe SN 72 |

**Note:** Pipe selected shall be designed for the cover and loading requirements to each project. Design calculations for pipe wall thickness and structural design shall be provided by the ENGINEER, as requested by SD1. Restrained joint calculations for force mains shall be provided for all projects. Depth is based on maximum cover to top of pipe between structures or manhole runs. Pipe shall be the same thickness between structures or manholes.

B. Refer to applicable Sections for material specifications.

C. General:

1. Marking Piping:

- a. Cast or paint material, type and pressure designation on each piece of pipe or fitting 4 inches in diameter and larger.
- b. Pipe and fittings smaller than 4 inches in diameter shall be clearly marked by manufacturer as to material, type and rating.

## 2.2 DUCTILE IRON PIPE AND FITTINGS

A. Piping furnished hereunder shall be complete with all joint gaskets, bolts, and nuts required for installation of valves and equipment furnished by others for installation under this contract.

B. Pipe Manufacturer's Experience and Field Services.

1. All ductile iron pipe, fittings, and specials shall be fabricated, lined and coated by the pipe manufacturer. Minimum required experience shall include manufacture of a similar pipeline in length to this contract, of equal or larger diameter than the pipe to be provided with joints, lining, and coating suitable for the same or greater pressure rating specified herein, which has performed satisfactorily for the past 5 years.
2. An experienced, competent, and authorized field service representative shall be provided by the pipe manufacturer to perform all pipe manufacturer's field services specified herein. The field service representative's minimum required experience qualifications shall include 5 years of practical knowledge and experience installing ductile iron pipe with joints, lining, and coating of the pipe to be provided.
3. All ductile iron pipe shall be installed in accordance with the pipe manufacturer's recommendations. The pipe manufacturer's field service representative shall visit the site and inspect, check, instruct, guide, and direct CONTRACTOR's procedures for pipe handling and installation at the start of the pipe installation. The pipe manufacturer's field service representative shall coordinate his services with CONTRACTOR.
4. Each joint, including all restrained joints, shall be checked by CONTRACTOR as instructed by the pipe manufacturer's field service representative to determine that the joint and the restraints are installed properly.
5. As requested, the pipe manufacturer's field service representative shall furnish to SD1, through ENGINEER, a written report certifying that CONTRACTOR's installation personnel have been properly instructed and have demonstrated the proper pipe handling and installation procedures. The pipe manufacturer's field service representative shall also furnish to SD1, through ENGINEER, a written report of each site visit. The pipe manufacturer's field service representative shall revisit the site as often as necessary until all trouble is corrected and the pipeline installation and operation are satisfactory in the opinion of the ENGINEER.
6. All costs for these services shall be included in the Contract Price.

C. Materials

1. Where ductile iron pipe is required, it shall conform to ANSI/AWWA C151/A21.51, Table 1 or Table 3. Pressure class 350 shall be used for all piping, unless otherwise shown on the drawings or specified. Fittings shall conform to ANSI/AWWA C110/A21.10, or ANSI/AWWA C153/A21.53, with a minimum working pressure rating of 350 psi. All fittings shall be suitable for a test pressure as specified herein without leakage or damage.
2. All buried pressure piping shall be push-on joint or mechanical joint. Restrained joint pipe shall be installed at the station locations shown on the Contract Drawings. All above ground piping or piping in vaults shall be flanged.
3. All gravity sewer piping shall be push-on joint or mechanical joint.
4. Push-on joints and mechanical joints shall be in accordance with ANSI/AWWA C111/A21.11.

5. As requested, restrained joint pipe shall be fabricated to the lengths required as determined by the laying schedule to be submitted as specified herein. If deviations from the approved laying schedule are required in the field as approved by SD1 and ENGINEER and field-cuts are required, CONTRACTOR shall provide restraint on the field-cut piping using, EBAA Iron “Megalug” restrained joints as specified below.
6. Field cuts shall be minimized and will be limited to only locations as necessary to install pipe, when no other alternative to using factory provided joint restraint exists.

D. Joints

1. Certification of joint design shall be provided in accordance with ANSI/AWWA C111/A21.11-90, Section 4.5, Performance Requirements, as modified herein.
2. The joint test pressure for each type of joint used on this project shall be 1-1/2 times the working pressure at the lowest elevation of the pipeline for a duration of two hours or as specified by the design engineer. The same certification and testing shall also be provided for restrained joints. For restrained joints, the piping shall not be blocked to prevent separation and the joint shall not leak or show evidence of failure.
3. It is not necessary that such tests be made on pipe manufactured specifically for this project. Certified reports covering tests made on other pipe of the same size and design as specified herein and on the drawings and manufactured from materials of equivalent type and quality may be accepted as adequate proof of design.
4. Nuts, bolts, and tie -rods used on buried pressure pipe and fittings shall be low alloy steel T- bolts with Zinc anode caps for all T-bolts and rods. The entire installation shall be wrapped in one layers of polyethylene encasement. Nuts, bolts and stiffener plates which will be in contact with sewage shall be stainless steel Type 316.

E. Material Schedule

|  |  |
|--|--|
| Push-on Joints and Mechanical Joints   | ANSI/AWWA C111/A21.11  |
| Restrained Push-on Joints<br>Positive locking segments and/or rings (4 inch through 64 inch) | American “Flex-Ring”, or “Lok-Ring”; U.S. Pipe “TR Flex”; Clow Corp., “Super-Lock”, or equal         |
| Restrained Push-on Joints, (field-cut spigot) locking wedge type                             | EBAA Iron “Megalug” Series 1700, or equal. Shall only be used in locations approved by the ENGINEER. |
| Restrained Mechanical Joints (Factory prepared spigot) (4 inch through 48 inch)              | American “MJ coupled Joints”   |

|   |  |
|---|--|
| Restrained Mechanical Joints (field cut spigot) | EBA Iron “Megalug” Series 1100, without exception. Shall only be used in locations approved by the ENGINEER.   |
| Fittings  | ANSI/AWWA C110/A21.1, or ANSI/AWWA C153/A21.53, all with minimum working pressure of 350 psi, and suitable for the test pressure based on the project design without leakage or damage.  |
| Flanged Joints & Fittings                       | Ductile Iron, ANSI/AWWA C115/A21.5 suitable for the test pressure based on the project design without leakage or damage. Faced and drilled, ANSI B16.1 125-pound flat face. Threaded conforming to AWWA C115/A21.15.   |
| Bolting   | 125-pound flat-faced flange: ASTM A 307, Grade A carbon steel hex head bolts and ASTM A563 Grade A carbon steel hex head nuts  |
| Gaskets   | Restrained Push-on and Mechanical Joints: Synthetic rubber conforming to AWWA C111/A21.11. Natural rubber is not acceptable.<br><br>Flanged: 1/8 inch thick, red rubber (SBR), hardness 80 (Shore A), rated to 200 degrees F., conforming to ANSI B16.21, AWWA C207, and ASTM D1330, Grades 1 and 2. Full face for 125-pound flat-faced flanges, or specially designed gaskets with required properties per ANSI/AWWA C111/A21.11 to meet the test pressure rating. Blind flanges shall be gasketed covering the entire inside face with the gasket cemented to the blind flange.<br><br>Gasket pressure rating to equal or exceed the system hydrostatic test pressure. |
| Joint Lubricant                                 | Manufacturer’s standard  |

|                         |  |
|-------------------------|--|
| Tapping Sleeves         | 316 SS, with 316 SS body and bolting, and rubber sealing gasket, suitable for the test pressure specified herein. JCM Industries, Model JCM 452 or approved equal. |
| Polyethylene Encasement | Seamless, ANSI/AWWA C105/A21.5; LLD-8 mil or HDCL-4 mil  |

F. Lining and Coating Ductile Iron Pipe and Fittings (For Sanitary Sewers Only)

1. All buried ductile iron pipe and fittings shall have manufacturers outside standard asphaltic coating and ceramic epoxy lining inside, factory applied. Ceramic epoxy lining shall be Protecto 401 as manufactured by Vulcan Painters, Inc. of Birmingham, AL, or NovoCoat SP-2000W as manufactured by NovoCoat Protective Coatings, of Addison, Texas, or equal, and as specified herein. Flange faces shall be coated externally with a suitable manufacturer’s standard rust-preventative compound.
2. Application of Lining:  
The interior of the pipe exposed to liquids and gases shall be blasted and cleaned to remove all loose oxides and rust. After cleaning, the lining material shall be applied to yield 40 mils for the complete system using a centrifugal lance applicator. No lining shall take place over grease, oil, etc., that would be detrimental to the adhesion of the compound to the substrate. The compound shall not be applied when the substrate temperature is below 40 degrees F., or in adverse atmospheric conditions which will cause detrimental blistering, pinholing or porosity of the film.
3. Lining Material  
The material shall be a two-component epoxy with the following minimum Requirements:
  - a. A permeability rating of 0.0 perms when measured by ASTM E96-66, Procedure A. Duration of test - 6 weeks.
  - b. A direct impact resistance of 125 in-lbs with no cracking when measured by ASTM-D-2794.
  - c. The ability to build at least 50 mils dry in one coat.
  - d. The material shall be recoatable with itself for at least seven days with no additional surface preparation when exposed to direct summer sun and a temperature of 90 degrees F.
  - e. The material shall contain at least 20% by volume of ceramic quartz pigment.
  - f. A test and service history demonstrating the ability of the material to withstand the service expected.
  - g. Each requirement of 2.2F.3 Lining Material above must be certified by the material supplier.
4. Field Cuts
  - a. All manufacturer’s procedures and recommendations shall be followed when making field cuts. Note proper field preparations and curing time of the coating.

- G. All items used for jointing pipe shall be furnished with the pipe and tested before shipment. The joints shall be made with tools and lubricant in strict conformity with the manufacturer's instructions. If requested, three (3) copies of such instructions shall be delivered to the ENGINEER at start of construction.
- H. Encasement
1. Polyethylene encasement shall be provided for all buried ductile iron pipe, including all straight pipe, bends, tees, wyes, adapters, closure pieces, field restraint devices, valves and other fittings or specials, in accordance with ANSI/AWWA C105/A21.5, Method A. Preparation of the pipe shall include, but not be limited to: removing lumps of clay, mud, cinders, etc., prior to installation.
  2. Where ductile iron pipe is also embedded or encased in concrete the polyethylene encasement shall be installed over the ductile iron pipe prior to concrete placement. Polyethylene encasement is only required in a casing pipe, if grouting of the annular space is required.
  3. The pipe shall be wrapped with 8-mil thickness polyethylene tube wrap, using the recommended minimum flat tube widths for the specified pipe sizes. The polyethylene tube wrap shall be of virgin polyethylene as produced from DuPont Alathan resin or equal.
  4. The polyethylene tube seams and overlaps shall be wrapped and held in place by means of 2-inch-wide plastic backed adhesive tape. The tape shall be Polyken Number 900, Scotchrap Number 50, or equal. The tape shall be such that the adhesive shall bond securely to both metal surfaces and polyethylene film.
  5. The polyethylene film supplied shall be clearly marked at a minimum of 2-ft along its length, containing the following information:
    - a. Manufacturer's name or trademark
    - b. Year of Manufacture
    - c. ANSI/AWWA C105/A21.5
    - d. Minimum film thickness and material type (LLDPE or HDCLPE)
    - e. Applicable range of nominal pipe diameter size(s)
    - f. Warning--Corrosion Protection--Repair any Damage

## 2.3 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS (GRAVITY LINES)

- A. Polyvinyl Chloride (PVC) and Chlorinated Polyvinyl Chloride (CPVC) Piping – Schedule Rated Pipe:
1. Pipe and Fitting Material:
    - a. Standard: ASTM D 1784.
    - b. Type: Type I, Grade 1, rigid (12454-B).
  2. Pipe:
    - a. PVC:
      - 1) Standard: ASTM D 1785.
      - 2) Designation: PVC 1120.
    - b. CPVC:
      - 1) Standard: ASTM F 441.

3. Joints:
  - a. General: Connect pipe by solvent cementing except where flanged or threaded fittings are required at expansion joints, valves, flow meters, equipment connections or otherwise shown or directed.
  - b. Flanged Joints:
    - 1) Use flanges joined to pipe by solvent cementing.
    - 2) Flange Drilling and Dimensions: Comply with ANSI B16.1.
    - 3) Flange Gaskets: Viton full face.
    - 4) Bolts, Nuts and Washers: Type 316 stainless steel.
    - 5) Provide washers on each face of the bolted connection.
  - c. Threaded Joints:
    - 1) Taper Pipe Threads: ANSI B2.1.
    - 2) Joint Preparation: Teflon tape.
    - 3) Use PVC dies for taper pipe threads.
  - d. Primer and Solvent Cement:
    - 1) Standard:
      - a) PVC: ASTM D 2564.
      - b) CPVC: ASTM F 493.
4. Fittings:
  - a. Socket-Type:
    - 1) PVC:
      - a) Standard: ASTM D 2467.
      - b) Designation: PVC I.
    - 2) CPVC:
      - a) Standard: ASTM F 439.
      - b) Threaded Type:
        - i. PVC:
          - (a) Standard: ASTM D 2464.
          - (b) Designation: PVC I.
        - ii. CPVC:
          - (a) Standard: ASTM F 437.

B. Polyvinyl Chloride (PVC) Piping – Gravity Sewer Pipe and Fittings:

1. Pipe and Fitting Material:
  - a. Standard: ASTM D 1784.
2. Pipe and Fittings:
  - a. Standard:
    - 1) 4-in. through 15-in. diameter: ASTM D 3034.
    - 2) 18-in. through 27-in. diameter: ASTM F 679.
  - b. Thickness Class: As shown in 2.1B.1a.
3. Joints:
  - a. Push On Joints: Connect pipe with integral wall bell and spigot joints. The bell shall consist of an integral wall section with a solid cross section rubber gasket, factory assembled, securely locked in place to prevent displacement during assembly. Joints shall be assembled in accordance with the pipe manufacturer's recommendations and ASTM D 3212.

- b. Gaskets: Rubber gaskets shall be in compliance with ASTM F 477 and shall be suitable for the service specified.
- C. Profile Wall Polyvinyl Chloride (PVC) Piping (For Storm Sewers Only)
  - 1. PVC open or closed profile pipe meeting the requirements of ASTM F 794, Standard Specification for Polyvinyl Chloride (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
  - 2. Joints for PVC pipe shall be gasket, bell and spigot, push-on types which meet the requirements of ASTM D 3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals. Gaskets shall meet the requirements of ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- D. Corrugated Polyvinyl Chloride (PVC) Piping (For Storm Sewers Only)
  - 1. Corrugated PVC pipe meeting the requirements of ASTM F 949, Latest Revision, "Polyvinyl Chloride (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings".
  - 2. Joints for PVC pipe shall be gasket, bell and spigot, push-on types which meet the requirements of ASTM D 3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals. Gaskets shall meet the requirements of ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

#### 2.4 POLYVINYL CHLORIDE (PVC) PIPE – C900 PIPING (FORCE MAINS)

- A. This pipe shall meet the requirements of AWWA C900-75 for Polyvinyl Chloride (PVC) Pressure Pipe. The pipe shall be PVC 1120 pipe with cast iron pipe equivalent ODs. See Table 1 below for pipe material depth and pressure limitations.
- B. Provisions must be made for expansion and contraction at each joint with a rubber ring. The bell shall consist of an integral wall section with a solid cross-section rubber ring which meets the laboratory performance of ASTM D3139. The bell section shall be designed to be at least as strong as the pipe wall.
- C. Standard laying lengths shall be 20-ft. ± for all sizes. At least 85 percent of the total footage of pipe of any class and size shall be furnished in standard lengths, the remaining 15% in random lengths. Random lengths shall not be less than 10 feet long. Each standard and random length of pipe shall be tested to four times the class pressure. The integral bell shall be tested with the pipe.
- D. Fittings for all lines 4 inches in diameter or larger shall be restrained ductile iron and in accordance with AWWA C153 and have a body thickness and radii of curvature conforming to ANSI A21.10 or ANSI A21.53 for compact fittings.
- E. Fittings for all lines less than 4 inches in diameter shall be PVC gasketed push on type or socket glue-type manufactured specifically for the pipe class being utilized. All socket-glue type connections shall be joined with PVC solvent cement conforming to

ASTM D2564. Product and viscosity shall be as recommended by the pipe and fitting manufacturer to assure compatibility. Solvent cement joints shall be made up in accordance with the requirements of ASTM D2855.

- F. Appropriate restraint shall be provided for all fittings. Fittings shall be restrained with EBAA Iron Mega-Lugs, or equal. Pipe joints on either side of the fittings shall also be restrained to the distance required by the restrained joint calculations with the appropriate EBAA Iron Mega- Lug. The appropriate restraints are listed below:
1. Series 2000SV& 2000PV: MEGALUG Restraint for existing C900 PVC Pipe at DIP
  2. Series 2800: MEGALUG Restraint Harness for C900
  3. Series 2200: MEGALUG Restraint for C900 at DIP Mechanical Joint fitting
- G. Pipe material depth and pressure limitations (Table 1)

**Table 1 – Pipe Material Depth and Pressure Limitations**

| <b>Pipe Material</b>     | <b>Minimum Depth of Bury<sup>1,2</sup></b> | <b>Maximum Depth of Bury<sup>1,2</sup></b> | <b>Pressure Class / Rating</b> | <b>Maximum Surge Pressure Capacity</b> |
|--------------------------|--|--|--------------------------------|--|
| Pressure Class 350 – DIP | 3 ft.                                      | 30 ft.                                     | 350 psi                        | 450 psi                                |
| DR 25 – C900 PVC         | 3 ft.                                      | 10 ft.                                     | 165 psi. <sup>3</sup>          | 264 psi <sup>5</sup>                   |
| DR 18 – C900 PVC         | 3 ft.                                      | 20 ft.                                     | 235 psi. <sup>3</sup>          | 376 psi <sup>5</sup>                   |
| DR 14 – C900 PVC         | 3 ft.                                      | 30 ft.                                     | 305 psi. <sup>3</sup>          | 488 psi <sup>5</sup>                   |

Table Notes:

1. Depth of bury limitations are provided as a general rule. At the discretion of SD1, greater depths may be allowed provided special pipe bedding is provided. Under some combinations of pipe material, soil type and bedding conditions, maximum acceptable depths may be reduced. For all applications where depth of bury is greater than or equal to thirty (30) feet, DIP shall be used.
2. Design ENGINEER shall consult appropriate references to ensure selected pipe material is suitable for each application. Such references may include the DIPRA *Design of Ductile Iron Pipe brochure*, *Uni-Bell Handbook of PVC Pipe Design and Construction*, PWEagle Technical Bulletins TB-D5 and TB-D8 (for PVC pipe), or Performance Pipe Bulletin PP 503 and PP 508 (for HDPE pipe) or other appropriate sources.
3. Total System Pressure (i.e. maximum working pressure plus any routine pressure surge) shall be less than the Pressure Class, as defined by AWWA C900-07 (values given in the above table are at 73.4°F). “Maximum working pressure” is the maximum steady-state, sustained operating pressure applied to the pipe exclusive of transient pressures.

4. Maximum working pressure shall be less than the Pressure Class, and Total System Pressure (i.e. maximum working pressure plus any routine pressure surge) shall be less than 1.5 times the Pressure Class, as defined by AWWA C906-07 (values given in the above table are at 73.4°F). “Maximum working pressure” is the maximum steady-state, sustained operating pressure applied to the pipe exclusive of transient pressures.
5. For C900 PVC pipe, maximum working pressure plus occasional or “emergency” surges shall not be greater than the Maximum Surge Pressure Capacity (1.6 times the Pressure Class of the pipe) as defined by AWWA C900(2007).

## 2.5 HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

### A. Smooth Wall

1. Qualification of Manufacturers: Qualified manufacturers shall be firms regularly engaged in the manufacture of HDPE pipe and pipe fittings of the same size, type, and joint configuration specified, and whose products have been in satisfactory use for not less than 5 years.
2. Heat Fusion Training/Certification: The CONTRACTOR shall ensure and certify that persons making heat fusion joints have received training in the manufacturer’s recommended procedure not more than 12 months prior to commencing construction.
  - a. An experienced, competent, and authorized field service representative shall be provided by the pipe manufacturer to perform all pipe manufacturer’s field services specified herein. The field service representative’s minimum required experience qualifications shall include 5 years of practical knowledge and experience in making heat fusion joints and installing HDPE pipe.
  - b. All HDPE pipe shall be installed in accordance with the pipe manufacturer’s recommendations. The pipe manufacturer’s field service representative shall visit the site and inspect, check, instruct, guide, and direct CONTRACTOR’s procedures for pipe handling and installation at the start of the pipe installation. The fusion pipe manufacturer’s field service representative shall coordinate his services with CONTRACTOR.
  - c. Each joint shall be checked by CONTRACTOR as instructed by the pipe manufacturer’s field service representative to determine that the pipe is properly fused.
  - d. As requested, the pipe manufacturer’s field service representative shall furnish to SD1, through ENGINEER, a written report certifying that CONTRACTOR’s installation personnel have been properly instructed and have demonstrated the proper pipe handling, fusion, and installation procedures. The pipe manufacturer’s field service representative shall also furnish to SD1, through ENGINEER, a written report of each site visit. The pipe manufacturer’s field service representative shall revisit the site as often as necessary until all trouble is corrected and the pipeline installation and operation are satisfactory in the opinion of the ENGINEER.
  - e. All costs for these services shall be included in the Contract Price.
3. Interchangeability of Pipe and Fittings: Within Contract limits, pipe and fittings from different approved manufacturers shall not be interchanged.

4. HDPE shall be manufactured in accordance with ASTM F 714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter, and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, percent carbon, (from pipe) dimensions and ring tensile strength.
5. Materials used for the manufacture of HDPE pipe and fittings shall be PE3408 HDPE, meeting cell classification 345434C or 345434E per ASTM D 3350 and meeting Type III, Class B or Class C, Category 5, Grade P34 per ASTM D 1248; and shall be listed in the name of the pipe and fitting manufacturer in Plastics Pipe Institute (PPI) TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1,600 psi at 73° F. The manufacturer shall certify that the materials used to manufacture pipe and fittings meet those requirements.
6. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe. Directional fittings 16-inch IPS and larger such as elbows, tee, etc., shall have a plain end inlet for butt fusion and flanged directional outlets.
7. Molded fittings shall be manufactured in accordance with ASTM D 3261, Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing, and shall be so marked. Each production lot of molded fittings shall be subjected to the test required under ASTM D 3261.
8. Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small V-shaped grooves to provide gasketless sealing, or to restrain the gasket against blow-out.
9. Flange adapters shall be fitted with back-up rings pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.
10. Joints between HDPE pipes and between HDPE fittings and pipes shall be fusion bonded as described in 3.4A.1.
11. The exterior of the HDPE pipe shall be color coded and striped in a way to identify the difference in pipe service, size and application.
12. HDPE pipe shall be black.
13. All piping used for horizontal directional drilling shall be permanently striped.
14. Internal 316 stainless steel stiffeners as manufactured by JCM Industries, Inc., or approved equal shall be used at all locations where external connectors or restraint clamps are installed. MJ adapters as manufactured by Central Plastics Company or equal, with creation of positive restraint to the pipe from heat fusion of the adapter to the pipe, and creation of positive restraint at the connection through bolting of the backup ring to the MJ valve or fitting, can be used in lieu of the JCM internal stainless steel stiffeners and external restraint clamps.
15. Except as noted in 2.5A.14 above, all mechanical connections shall be stiffened and restrained. Restraints shall be as manufactured by JCM Industries, Inc., or approved equal.

16. External restraint clamps utilized for transition from ductile iron pipe to polyethylene pipe shall be as manufactured by JCM Industries, Inc., or approved equal. Restraints must be compatible with stiffeners and pipe. JCM restraints shall not be used with HDPE pipe in locations where test pressures will exceed 150 psi. In locations where HDPE pipe will have test pressures exceeding 150 psi, provide an MJ adapter as described in 2.5A.14 above.
17. The Dimension Ratios (DR's) are shown on the table (Table 2) below:

**Table 2 – Pipe Material Depth and Pressure Limitations**

| <b>Pipe Material</b> | <b>Minimum Depth of Bury<sup>1,2</sup></b> | <b>Maximum Depth of Bury<sup>1,2</sup></b> | <b>Pressure Class / Rating</b> | <b>Maximum Surge Pressure Capacity</b> |
|----------------------|--|--|--------------------------------|--|
| DR 17 – HDPE         | 3 ft.                                      | 10 ft.                                     | 100 psi <sup>4</sup>           | 200 psi <sup>6</sup>                   |
| DR 13.5 – HDPE       | 3 ft.                                      | 15 ft.                                     | 128 psi <sup>4</sup>           | 256 psi <sup>6</sup>                   |
| DR 11 – HDPE         | 3 ft.                                      | 20 ft.                                     | 160 psi <sup>4</sup>           | 320 psi <sup>6</sup>                   |
| DR 9 – HDPE          | 3 ft.                                      | 25 ft.                                     | 200 psi <sup>4</sup>           | 400 psi <sup>6</sup>                   |
| DR 7.3 – HDPE        | 3 ft.                                      | 25 ft.                                     | 254 psi <sup>4</sup>           | 508 psi <sup>6</sup>                   |

Table Notes:

1. Depth of bury limitations are provided as a general rule. At the discretion of SD1, greater depths may be allowed provided special pipe bedding is provided. Under some combinations of pipe material, soil type and bedding conditions, maximum acceptable depths may be reduced. For all applications where depth of bury is greater than or equal to 30-ft, DIP shall be used.
2. Design ENGINEER shall consult appropriate references to ensure selected pipe material is suitable for each application. Such references may include the DIPRA *Design of Ductile Iron Pipe brochure*, *Uni-Bell Handbook of PVC Pipe Design and Construction*, PWEagle Technical Bulletins TB-D5 and TB-D8 (for PVC pipe), or Performance Pipe Bulletin PP 503 and PP 508 (for HDPE pipe) or other appropriate sources.
3. Total System Pressure (i.e. maximum working pressure plus any routine pressure surge) shall be less than the Pressure Class, as defined by AWWA C900-07 (values given in the above table are at 73.4°F). “Maximum working pressure” is the maximum steady-state, sustained operating pressure applied to the pipe exclusive of transient pressures.
4. Maximum working pressure shall be less than the Pressure Class, and Total System Pressure (i.e. maximum working pressure plus any routine pressure surge) shall be less than 1.5 times the Pressure Class, as defined by AWWA C906-07 (values given in the above table are at 73.4°F). “Maximum working pressure” is the maximum steady-state, sustained operating pressure applied to the pipe exclusive of transient pressures.

5. For C906 HDPE pipe, maximum working pressure plus occasional or “emergency” surges shall not be greater than the Maximum Surge Pressure Capacity (2.0 times the Pressure Class of the pipe) as defined by AWWA C906(2007).
    - a. The DR’s shall be verified by the Design ENGINEER and the manufacturer for the laying and pressure conditions shown on the drawings, including full consideration of vacuum, with calculations submitted to SD1 for review. NOTE: Manufacturers who do not comply with this requirement will not be considered an equal. The CONTRACTOR shall be liable if the pipe fails or pulls apart. The minimum DR shown above shall be used unless a thicker wall DR is recommended by the manufacturer during his verification. For horizontal directional drilling (HDD), pipe installed at depths from 0’-15’ deep shall have a minimum DR 9 rating or manufacturer’s minimum recommended DR, whichever is more conservative. HDD pipe installed at depths greater than 15’ shall also have a minimum DR 9 rating or manufacturer’s minimum recommended DR, whichever is more conservative. **CONTRACTOR shall note that depending on the wall thickness of the pipe to be furnished, an increase in pipe size may be required to provide comparable internal diameter to ductile iron pipe.**
  18. Mechanical joint ductile iron fittings for DIP sized HDPE pipe meeting all requirements of ANSI A211.11 (AWWA C111) may be used in lieu of HDPE pipe fittings. Restraints shall be Sur-Grip as manufactured by JCM Industries, Inc., or approved equal.
  19. Nuts, bolts, and tie -rods used on buried pressure pipe and fittings shall be low alloy steel T- bolts with Zinc anode caps for all T-bolts and rods. The entire installation shall be wrapped in two layers of polyethylene encasement. Nuts, bolts and stiffener plates which will be in contact with sewage shall be stainless steel Type 316.
  20. HDPE pipe shall have OD of ductile iron pipe.
  21. HDPE pipe shall be as manufactured by CP Performance Pipe, or equal.
- B. Corrugated HDPE (For Storm Sewer Only)
1. Corrugated polyethylene pipe with an integrally formed smooth interior shall meet the requirements of AASHTO M 294, Standard Specification for Corrugated Polyethylene Pipe, 12-to-36-inch diameter, for Type S pipe. SD1 will consider the use of large diameter HDPE on a case-by-case basis; approval shall be at SD1's discretion.
  2. HDPE pipe shall be joined using an inline bell (IB) & spigot joint or fitting meeting AASHTO M294 or ASTM F2306. The joint or fitting shall be soil-tight and gaskets shall meet the requirements of ASTM F477.

## 2.6 FIBERGLASS REINFORCED POLYMER MORTAR (FIBERGLASS) PIPE AND FITTINGS (GRAVITY LINES)

- A. Fiberglass reinforced polymer mortar (fiberglass) pipe and fittings for gravity sewers shall conform to the requirements of ASTM D-3262, current approval, “Standard Specification for ‘Fiberglass’ (Glass-Fiber-Reinforced Thermosetting Resin) Sewer Pipe.”

## B. Materials

1. Resin Systems: The manufacturer shall use only polyester resin systems with a proven history of performance in this particular application. The historical data shall have been acquired from a composite material of similar construction and composition as the proposed product.
2. Glass Reinforcements: Chopped glass reinforcement fibers used to manufacture the components shall be of highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins. Continuous circumferential glass reinforcement fibers, where utilized, shall be of grade ECR-glass with binder and sizing compatible with impregnating resins.
3. Silica Sand: Sand shall be a minimum of 98% silica with a maximum moisture content of 0.2%.
4. Additives: Resin additives, such as curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally affect the performance of the product.
5. Elastomeric Gaskets: Gaskets shall be supplied by qualified gasket manufacturers and be suitable for the service intended.

## C. Manufacture and Construction

1. Pipes: Manufacture pipe by a process that will result in a dense, non-porous, corrosion-resistant, consistent composite structure.
2. Joints: Unless otherwise specified, the pipe shall be field connected with fiberglass couplings that utilize elastomeric EPDM or REKA sealing gaskets as the sole means to maintain joint watertightness. The joints shall meet the performance requirements of ASTM D4161. Additionally, the joints shall be rated to a pressure of 80% of -14.7 psi as installed. Joints at tie-ins, when needed may utilize fiberglass, gasket-sealed closure couplings.
3. Fittings: Flanges, elbows, reducers, tees, wyes, laterals and other fittings shall be capable of withstanding all operating conditions when installed. They must be made and delivered from Manufacturer. All fittings and couplings shall be pressure rated for a minimum of 50 psi.
4. End Coating: Protective spigot end resin coating shall be applied at the time of manufacture. CONTRACTOR shall similarly coat the ends of all field cut pipes if the wall of the pipe is completely de-aerated during the production process and glass and sand are not impregnated with 100% pure resin to form a wall that cannot be penetrated by water.
5. Fiberglass pipe shall be as manufactured by: Hobas Pipe USA, Inc., or approved equal.
6. For bury depths greater than 20 feet, CONTRACTOR shall comply with special trench construction requirements recommended by the manufacturer.

## D. Dimensions:

1. Diameters: The actual outside diameter of the pipe barrel shall be in accordance with ASTM D3262. The internal diameters of all pipes shall be as specified on the Contract Drawings for each pipe diameter.

2. Lengths: Pipe shall be supplied in nominal lengths of 20 feet. Actual laying length shall be nominal +1, -4 inches. At least 90% of the total footage of each size and class of pipe, excluding special order lengths, shall be furnished in nominal length sections.
  3. Wall Thickness: The minimum wall thickness shall be the required design thickness for the laying conditions. Manufacturer shall provide information in writing to SD1 per the submittal requirements.
  4. End Squareness: Pipe ends shall be square to the pipe axis with a maximum tolerance of 1/4".
- E. Testing:
1. Pipes: Pipes shall be manufactured and tested in accordance with ASTM D3262.
  2. Joints: Joints shall meet the requirements of ASTM D4161.
  3. Stiffness: As tested in accordance with ASTM D2412. Any fiberglass pipe run that exceeds 20 feet, but less than 30 feet, in depth to invert anywhere along the run length from one manhole or structure to a second manhole or structure shall be a minimum stiffness of 72 psi for the entire run.
- F. Customer Inspection
1. SD1 or other designated representative shall be entitled to inspect pipes at the factory or witness the pipe manufacturing.
  2. Manufacturers Notification to Customer: Should SD1 request to see specific pipes during any phase of the manufacturing process, the manufacture must provide SD1 with adequate advance notice of when and where the production of those pipes will take place.
- G. Packaging, Handling, and Shipping shall be done in accordance with the manufacturer's instructions.

## 2.7 REINFORCED CONCRETE PIPE (RCP)

- A. Circular reinforced concrete pipe shall meet the requirements of ASTM C 76, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Storm Pipe. Elliptical reinforced concrete pipe shall meet the requirements of ASTM C 507, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe.
- B. Rubber and plastic joints, or approved equal, shall be the jointing method for RCP and shall meet the requirements of AASHTO M 315 / ASTM C 443. Other methods of joining RCP will only be allowed upon explicit approval from SD1.
- C. When RCP is used under pavement or driveways, a minimum of Class III RCP shall be required, or higher class as noted on drawings.

## 2.8 CORRUGATED METAL PIPE (CMP) (FOR STORM SEWERS ONLY)

- A. Corrugated steel pipe shall meet the requirements of AASHTO M36. Corrosion protection shall be provided through an aluminized coating conforming to AASHTO M274. Aluminum alloy spiral pipe shall meet the requirements of AASHTO M196.

Coating materials shall be evaluated on a per project basis. Asphalt coatings shall not be permitted for corrugated metal pipe.

- B. Joints for CMP shall be made using coupling bands and gaskets meeting the requirements of AASHTO M 36 and AASHTO M 274.

## 2.9 HIGH-PERFORMANCE POLYPROPYLENE PIPE

- A. For sanitary sewer applications, high-performance polypropylene pipe shall meet the requirements of ASTM F2736 for 12”-30” pipe, and ASTM F2764 for 30”-60” pipe.
- B. For sanitary sewer applications, pipe shall be joined with an extended reinforced integral bell & double gasketed spigot to provide a watertight seal in accordance with ASTM D3212.
- C. For storm sewer application, high-performance polypropylene pipe shall meet the requirements of ASTM F2881 and AASHTO M330.
- D. For storm sewer application, pipe shall be joined with an extended reinforced integral bell & gasketed spigot in accordance with ASTM D32212.2.9.

## 2.10 TRACER WIRE

- A. All pressure pipe shall have marking tape 6” wide. Marking tape for the manhole shall be green with the words “Sanitary Sewer” installed approximately twelve (12) inches above the pipe and shall continue for the length of the pipe installation.
- B. All pipe for sanitary force mains shall be installed with a 12-gauge solid copper (PVC coated) tracing wire taped to the top of the pipe every five 5 feet. No tracing wire length shall exceed 1,500 feet between air release valves and/or discharge manhole, where system becomes gravity, without terminating in a curb stop box marked with “Sewer”. Tracing wire must run continuously through air release valves and made accessible from ground level. Sanitary force mains that end in a discharge manhole, at which point system becomes gravity, shall terminate tracing wire in a curb stop box next to the discharge manhole. Curb stop boxes shall not be located in pavement areas. Splices in the tracing wire shall be kept to a minimum and approved by SD1. If splices are required, they shall be made with copper split bolt (IlSCO #1K-8 or approved equal) and taped with electrical tape. Tracer wire shall be tested to confirm it is functioning properly after installation.

## 2.11 PIPE COUPLINGS

- A. For new pipe installation, transition between two differing pipe materials must be done at manhole terminations, unless another method is approved by SD1. For connections to existing sewers of differing pipe material, Franco “flexible couplings” or equal shall be used.

- B. For any other field cut connection, the pipe couplings shall be of a gasketed, sleeve-type with diameter to properly fit the pipe. Each coupling shall consist of one (1) stainless steel middle ring, of thickness and length specified, two (2) stainless steel followers, two (2) rubber-compounded wedge section gaskets and sufficient track-head steel bolts to properly compress the gaskets. The couplings shall be assembled on the job in a manner to insure permanently tight joints under all reasonable conditions of expansion, contraction, shifting and settlement, unavoidable variations in trench gradient, etc. The coupling shall be Dresser, Style 38, as manufactured by Dresser Manufacturing Division, Bradford, PA, or equal.

## 2.12 WYE BRANCH FITTINGS AND LATERALS FOR NEW CONSTRUCTION

- A. Tee or wye branch fittings shall be used for household or service connection lines to the sewer collector line. The fittings shall meet the requirements of the mainline pipe materials as specified herein. The wyes and tees shall be located as shown on the Contract Drawings or as directed by the ENGINEER. The wyes and tees shall be positioned as to require the least number of fittings per lateral connection. Regular wye connections shall be in accordance with Standard Drawing No. 120. Stack wye connections shall include vertical piping, elbows, wye, and concrete encasement in accordance with Standard Drawing No. 108. If a single sweep tee connection is used, the sweep must be in the direction of sanitary sewer main
- B. Inserta Tee pipe fittings are permitted as an alternate lateral tap connection in lieu of wye fittings when main pipe nominal diameter is greater than 12" or on a case-by-case basis for new construction. Inserta Tee type shall be compatible for the pipe type be tapped. Contractor shall be responsible for supplying the proper Tee. Install Inserta Tees using procedures and equipment as referenced in the manufacturer's written installation instructions and in accordance with Standard Drawing No. 102.
- C. Lateral extensions shall be installed from the end of the regular or stack wye connection to the limit of easement or public right-of-way in accordance with Standard Drawing No. 120.

## 2.13 CONNECTIONS TO EXISTING SEWERS

- A. Connections to existing public sewers shall be made at the nearest wye or tee available on the public sewer. Connections to existing sewers where wyes or tees are not available shall be made by one of the following methods:
  1. Install a wye or tee branch fitting per the manufacturer's recommendations or an approved method by SD1.
  2. Inserta Tee Pipe Fittings: Install Inserta Tees using procedures and equipment as referenced in the manufacturer's written installation instructions and in accordance with Standard Drawing No. 102.
  3. Tapping Saddles: Tapping saddles shall only be used with the explicit approval of SD1 on a case-by-case basis. If approved install per manufacturer's recommendations.

## 2.14 STORM LATERAL CONNECTIONS

- A. Roof downspouts, footing or foundation drains, and sump pumps shall discharge in accordance with the local governing subdivision regulations. All storm lateral connections (downspouts, footing or foundation drains, sump pumps, etc) to the storm sewer shall be prohibited unless explicitly reviewed and approved by SD1 due to uncommon circumstances (i.e. inadequate discharge distances from foundations, narrow side yards, etc).

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. Contractor shall refer to Section 02220 Excavation and Backfill for all excavation, trench preparation, bedding and backfill requirements.
- B. After being delivered alongside the trench, the pipe, fittings, and specials shall be carefully examined for cracks, soundness, or damage, or other defects while suspended above the trench before installation. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. Before each piece of pipe is lowered into the trench, it shall be thoroughly cleaned out. Each piece of pipe shall be lowered safely and separately in the trench. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.
- C. The bell and spigot of the joint shall be thoroughly wire brushed and cleaned of dirt and foreign matter immediately prior to jointing. The contact surfaces shall be coated with the lubricant, primer or adhesive recommended by the manufacturer, and then the pipe shall be pushed together until the joint snaps distinctly in place. The pushing together of the pipe may be done by hand or by the use of a bar.
- D. Place pipe to the grades and alignment indicated, runs of pipe between manholes shall be within 95% of the slope shown on the plans unless otherwise directed by the ENGINEER. Remove and relay pipes that are not laid correctly. Slope piping uniformly between elevations shown.
- E. Trenches shall be kept dry during pipe laying. Before pipe laying is started, all water that may have collected in the trench shall be removed. Ensure that ground water level in trench is at least 12 inches below bottom of pipe before laying piping. Do not lay pipe in water. Maintain dry trench conditions until jointing and backfilling are complete and protect and keep clean water pipe interiors, fittings and valves.
- F. All pipe shall be laid starting at the lowest point and proceed towards the higher elevations, unless otherwise approved by ENGINEER. Place bell and spigot pipe so that bells face the direction of laying, unless otherwise approved by ENGINEER.

- G. When laying of the pipe is stopped, the end of the pipe shall be securely plugged or capped. Plugging shall prevent the entry of animals, liquids, or persons into the pipe or the entrance or insertion of deleterious material.
  - 1. Install standard plugs into all bells at dead ends, tees or crosses. Cap all spigot ends.
  - 2. Fully secure and block all plugs and caps installed for pressure testing to withstand the specified test pressure.
  - 3. Where plugging is required for phasing of the Work or for subsequent connection of piping, install watertight, permanent type plugs.
- H. As required by SD1, pipe manufacturer for each pipe type used shall be present and instruct CONTRACTOR on proper installation technique per shop drawings and manufacturer's recommended procedures prior to the start of the Work.
- I. Install piping as shown, specified and as recommended by the manufacturer. If there is a conflict between manufacturer's recommendations and the Drawings or Specifications, request instructions from SD1 before proceeding.
- J. Deflections at joints shall not exceed 75% of the amount allowed by the pipe manufacturer.
- K. Field cut pipe, where required, with a machine specially designed for cutting piping. Make cuts carefully, without damage to pipe or lining, and with a smooth end at right angles to the axis of pipe. Cut ends on push-on joint shall be tapered and sharp edges filed off smooth. Flame cutting will not be allowed.
- L. Touch up protective coatings in a satisfactory manner prior to backfilling. See pipe material section for specific requirements.
- M. Place concrete pipe containing elliptical reinforcement with the minor axis of the reinforcement in a vertical position.
- N. Laying Pipe and Service Laterals
  - 1. Conform to manufacturer's instructions and requirements of the standards listed below, where applicable:
    - a. Ductile Iron Pipe: AWWA C600, AWWA C105.
    - b. Concrete Pipe: AWWA M9, Concrete Pipe Handbook.
    - c. Thermoplastic Pipe: ASTM D 2774.
    - d. ASCE Manual of Practice No. 37.

### 3.2 PIPE INSTALLATION – GENERAL

- A. Excavation for Pipeline Trenches: Refer to Section 02220 Excavation and Backfill. Trenches in which pipes are to be laid shall be excavated to the depths shown on the Drawings or as specified by the ENGINEER. Minimum cover for all pipelines shall be 36 inches minimum cover as measured from top of pipe, unless otherwise shown on the Drawings or approved by the ENGINEER. Trench excavations maybe inspected by ENGINEER prior to laying pipe. Notify SD1 48 hours in advance of all

excavating, bedding and pipe laying operations.

- B. Jointing: The types of joints described herein shall be made in accordance with the manufacturer's recommendations.
- C. Separation of Sanitary Sewers and Potable Water Pipe Lines:
  - 1. Horizontal Separation:
    - a. Wherever possible, existing and proposed potable water mains and service lines, and sanitary and storm sewers and service lines shall be separated horizontally by a clear distance of not less than 10 feet.
    - b. If local conditions preclude a clear horizontal separation of not less than 10 feet, the installation will be permitted provided the potable water main is in a separate trench or on an undistributed earth shelf located on one side of the sewer and at an elevation so the bottom of the potable water main is at least 18 inches above the top of the sewer.
    - c. Exception:
      - 1) Where it is not possible to provide the minimum horizontal separation described above, the potable water main must be constructed of cement lined ductile iron slip-on or mechanical joint pipe complying with the public water supply design standards of the governing agency. Sewer must be constructed of epoxy lined ductile iron slip-on or mechanical joint pipe complying with SD1's requirements.
  - 2. Crossings:
    - a. Provide a minimum vertical distance of 18 inches between the outsides of pipes.
    - b. Center one full length section of potable water main over the sewer so that the sewer joints will be equidistant from the potable water main joints.
    - c. Provide adequate structural support where a potable water main crosses under a sewer to maintain line and grade.
    - d. Exceptions:
      - 1) See requirements in 3.2C.1c.1) above.
      - 2) Concrete encase as directed by SD1.
- D. Permanent slope anchors shall be installed on all pipe with slopes over 20%. See the SD1's standard detail for Concrete Anchor Block. Consult with SD1 on spacing of the anchors.
- E. Reaction Anchorage (Pressure Pipe Only):
  - 1. All tees, Y-branches, bends deflecting 11-1/4 degrees or more, and plugs which are installed in buried piping shall be provided with proprietary restrained joint systems for preventing movement of the pipe and joints caused by the internal test pressure.
- F. Thrust Restraint
  - 1. Provide thrust restraint on pressure piping systems where shown and specified.
  - 2. Thrust restraint for DIP shall be accomplished by means of restrained pipe joints.

3. Thrust restraints shall be designed for the axial thrust exerted by the system design pressures as specified by the Design ENGINEER.

G. Dewatering and Ground Water

1. Discharging of sediment laden groundwater or rainwater from excavations directly to watercourses or storm sewers is prohibited. Failure of the CONTRACTOR to comply with the requirements of this specification may result in SD1 issuing a stop work order or non-approval of pay estimates until the CONTRACTOR puts measures in place to comply with this specification. All costs associated with the stop work or non-approval of pay estimates shall be at the CONTRACTOR's sole expense.
2. Pipe trenches and excavations for appurtenances shall be kept free from water during trench bottom preparation, pipe laying and jointing, pipe embedment and building of appurtenances in an adequate and acceptable manner.
3. Where the trench or excavation bottom is mucky or otherwise unstable because of ground water, or where the ground water elevation is above the bottom of the trench or excavation, the ground water shall be lowered by means acceptable to the ENGINEER to the extent necessary to keep the trench or excavation free from water while the trench or excavation is in progress. The discharge of ground water from the trench or excavation area shall be by the methods specified below to natural drainage channels, gutters, drains, or storm sewers which will conduct the water away from the trench or excavation area. Means of diverting any surface water away from the trench or excavation area shall be taken and surface water prevented from entering the trench or excavation area.
4. Dewatering equipment shall be provided to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during sub grade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.
5. All excavations for concrete structures or trenches which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level beneath such excavations a minimum of 6 inches or more below the bottom of the excavation.
6. Surface water shall be diverted or otherwise prevented from entering excavations or trenches to the greatest extent possible without causing damage to adjacent property.
7. Groundwater and rainwater removed during dewatering shall be discharged onto undisturbed ground where vegetative cover exists or through sediment and erosion controls and allowed to flow overland to filter out any sediments before discharging to any drain, storm sewer, or watercourse specified above. No such flows are permitted onto exposed soils, stream banks, or other areas subject to erosion.
8. Where overland flow on existing undisturbed ground is not sufficient to adequately remove all sediment from dewatering operations prior to discharge to any drain, storm sewer, or watercourse, or other erosion control measure acceptable to SD1 or ENGINEER shall be used to remove the sediment from the

water prior to discharge. The method of discharging ground water or rainwater from the trench or excavation area shall be such as to not create any erosion of existing ground.

9. All discharge locations shall be approved prior to construction by the ENGINEER and SD1.
10. CONTRACTOR shall take measures to prevent damage to properties, structures, sewers, and other utility installations and other work.
11. CONTRACTOR shall repair all damage, disruption, or interference resulting directly or indirectly from groundwater control system operations at no additional cost to SD1.
12. The CONTRACTOR shall maintain the components of the dewatering system and surface water erosion and sediment controls within the project site. Deficiencies identified during visual inspection by SD1, SD1's representatives, or the governing regulatory authority shall be remedied by the CONTRACTOR at no additional cost to SD1.
13. Dewatering system components shall be located where they will not interfere with construction activities adjacent to the work area.
14. The CONTRACTOR shall be responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipe or conduit shall be left clean and free of sediment.

#### H. Ground Water Barriers:

1. Where specified, continuity of bedding material shall be interrupted by low permeability groundwater barriers to impede passage of water through the bedding. Groundwater barriers for all pipelines shall be soil plugs of 3 feet in thickness, extending the full depth and width of the pipe bedding material in the trench, and spaced not more than 400 feet apart. The soil plugs shall be constructed from soil meeting ASTM D2487 classification GC, SC, CL, or ML, and compacted to 95% of maximum density at or near the optimum moisture content (ASTM D698).

#### I. Pipe Encasements:

1. Concrete Encasement
  - a. Wherever pipe encasement is called for on the plans or ordered in by SD1, the CONTRACTOR shall construct the encasement as shown on the drawings or in accordance with SD1's Standard Drawings.
  - b. Support the pipe sections on solid concrete blocks, being sure to keep the pipe sections on line and grade and then pour concrete, completely under each section, along each side and up to a point at least twelve (12) inches above the top of each section, making sure that all voids are filled. In lieu of blocks, the CONTRACTOR may use a bed of concrete, to initially support the pipe sections.
  - c. The minimum dimension of concrete under the pipe sections shall be six (6) inches and on each side of the sections shall be twelve (12) inches. This encasement shall be reinforced around the top and sides of the pipe as shown on the Contract Drawings for creek crossings and other locations. If the trench walls are nearly vertical from the bottom of the trench up to a point to

which the encasement is to be poured, forms for forming the encasement may be omitted and the concrete poured to and against the trench walls. Where trench walls are not nearly vertical, proper forms shall be set for forming the encasement, unless otherwise called for by SD1. The space between the trench walls and any formed encasement shall be filled and compacted with approved pipe bedding or backfilling material.

- d. Care shall be taken to assure that the pipe sections remain on line and grade during the placing of concrete and that the joints are not disturbed. Backfill shall not be placed for a minimum of six (6) hours after encasement is completed, unless otherwise approved by SD1.
- e. Exercise care to avoid flotation when installing pipe in cast-in-place concrete.

## 2. Casing Pipe

- a. Whenever casing pipe is called for on the plans, the CONTRACTOR shall install a casing pipe of the size and of the material called for on the plans by means of jacking, boring, or trenching.
- b. When the casing pipe is to be installed under a highway or railroad, and at other locations specifically designated on the Drawings, the method of installation shall be jacking or boring as specified in Section 02400, unless trenching is specifically allowed.
  - 1) For force mains inside casing pipe all pipe joints shall be restrained joint connections. Casing spacers shall be used to center the pipe in the casing. The annular space between the force main and casing pipe shall be completely filled with 500 psi or higher compressive strength grout.
  - 2) For gravity pipe inside casing pipe, casing spacers shall be used to center the pipe within the casing. The annular space does not have to be filled.
- c. Casing Spacers- Include in casing pipe. Centered/Restrained Casing spacers shall be installed to position the carrier pipe within the center of the casing pipe. The required spacing and installation shall be per the manufacturer's recommendation, except that for PVC carrier pipe, a minimum of 3 spacers shall be installed on each length of pipe with a maximum 6 feet spacing between spacers. All spacers shall be 316 stainless steel as manufactured by Cascade Waterworks MFG Co., Advance Products and Systems (APS) or other approved equal. Casing spacers shall also be provided with height field-adjustment capability for installation of gravity sewer on a constant slope.
- d. Casing pipe end seals shall be installed at each end of the casing pipe and shall consist of a proper sized rubber seal and attached to the carrier and casing pipe with stainless steel bands per the manufacturer's recommendation. Casing pipe end seals shall be manufactured by Cascade Waterworks MFG Co., Advanced Products and Systems (APS) or other approved equal.

## J. Work Affecting Existing Piping

### 1. Location of Existing Piping:

- a. Locations of existing piping shown should be considered approximate.

- b. CONTRACTOR shall determine the true location of existing piping to which connections are to be made, and location of other facilities which could be disturbed during earthwork operations, or which may be affected by CONTRACTOR'S Work in any way.
    - c. Conform to applicable requirements of Division 1 pertaining to cutting and patching, and connections to existing facilities.
  - 2. Taking Existing Pipelines Out of Service:
    - a. Do not take pipelines out of service unless specifically noted on the Drawings, or approved by SD1.
  - 3. Work on Existing Pipelines:
    - a. Cut or tap pipes as shown or required with machines specifically designed for this work.
    - b. Install temporary plugs to prevent entry of mud, dirt, water and debris.
    - c. Provide all necessary adapters, fittings, pipe and appurtenances required to complete the Work.
- K. Install service laterals per SD1's standard details and per the requirements specified in this specification.
- L. Bedding and backfilling of pipeline trenches shall be in accordance with the requirements set forth in Section 02220 Excavation and Backfill, and as shown on SD1's trench compaction detail.
- M. Before final acceptance, the CONTRACTOR will be required to level all trenches or to bring the trench up to grade. The CONTRACTOR shall also remove from roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction.

### 3.3 DUCTILE IRON PIPE INSTALLATION REQUIREMENTS

- A. Jointing Pipe:
  - 1. Ductile Iron Mechanical Joint Pipe:
    - a. Wipe clean the socket, plain end and adjacent areas immediately before making joint. Make certain that cut ends are tapered and sharp edges are filed off smooth.
    - b. Lubricate the plain ends and gasket with soapy water or an approved pipe lubricant, in accordance with AWWA C111, just prior to slipping the gasket onto the plain end of the joint assembly.
    - c. Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end.
    - d. Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.
    - e. Push gland toward socket and center it around pipe with the gland lip against the gasket.
    - f. Insert bolts and hand tighten nuts.

- g. Make deflection after joint assembly, if required, but prior to tightening bolts. Alternately tighten bolts 180 degrees apart to seat the gasket evenly. The bolt torque shall be as follows:

| <u>Pipe Size<br/>(inches)</u> | <u>Bolt Size<br/>(inches)</u> | <u>Range of Torque<br/>(ft-lbs)</u> |
|-------------------------------|-------------------------------|-------------------------------------|
| 3                             | 5/8                           | 45-60                               |
| 4-24                          | 3/4                           | 75-90                               |
| 30-36                         | 1                             | 100-120                             |
| 42-48                         | 1-1/4                         | 120-150                             |

- 2. Ductile Iron Push-On Joint Pipe:
  - a. Prior to assembling the joints, the last 8 inches of the exterior surface of the spigot and the interior surface of the bell shall be thoroughly cleaned and all mud, debris, etc. removed and joint recesses wiped clean.
  - b. Rubber gaskets shall be wiped clean and flexed until resilient. Refer to manufacturer's instructions for procedures to ensure gasket resiliency when assembling joints in cold weather.
  - c. Insert gasket into joint recess and smooth out the entire circumference of the gasket to remove bulges and to prevent interference with the proper entry of the spigot of the entering pipe.
  - d. Immediately prior to joint assembly, apply a thin film of approved lubricant to the surface of the gasket which will come in contact with the entering spigot end of pipe. CONTRACTOR may, at his option, apply a thin film of lubricant to the outside of the spigot of the entering pipe.
  - e. For assembly, center spigot in the pipe bell and push pipe forward until it just makes contact with the rubber gasket. After gasket is compressed and before pipe is pushed or pulled all the way home, carefully check the gasket for proper position around the full circumference of the joint. Final assembly shall be made by forcing the spigot end of the entering pipe past the rubber gasket until it makes contact with the base of the bell. When more than a reasonable amount of force is required to assemble the joint, the spigot end of the pipe shall be removed to verify the proper positioning of the rubber gasket. Gaskets which have been scoured or otherwise damaged shall not be used.
  - f. Maintain an adequate supply of gaskets and joint lubricant at the site at all times when pipe jointing operations are in progress.
- 3. Proprietary Joints:
  - a. Pipe which utilizes proprietary joints such as Fastite, by American Cast Iron Pipe Company, Tyton by U.S. Pipe Incorporated, restrained joints, or other such joints shall be installed in strict accordance with the manufacturer's instructions.

**B. Polyethylene Tube Wrap Installation**

The polyethylene tube wrap shall be installed on ductile iron pipe in accordance with AWWA C105 and the following:

- 1. Pick up the pipe by a crane at the side of the trench using either a sling or pipe tongs, and raise the pipe about three feet off the ground. Slip a section of the polyethylene tubing over the spigot end of the pipe and bunch up, accordion

- fashion, between the end of the pipe and the sling. The tubing should be cut to a length approximately 4 feet longer than the length of the pipe.
2. Lower the pipe into the trench, seat the spigot end in the bell of the adjacent installed pipe and then lower the pipe to the trench bottom. A shallow bell hole shall be provided in the trench bottom to facilitate the wrapping of the joint.
  3. Make up the pipe joint in the normal fashion.
  4. Remove the sling from the center of the pipe and hook into the bell cavity and raise the bell end 3 or 4 inches to permit the polyethylene tubing to be slipped along the full length of the barrel. Enough of the tubing should be left bunched up, accordion fashion, at each end of the pipe to overlap the adjoining pipe approximately 2 feet.
  5. To make the overlap joint, pull the tubing over the bell of the pipe, fold around the adjacent spigot and wrap with approximately three (3) circumferential turns of the 2-inch-wide plastic adhesive tape to seal the tubing to the pipe.
  6. The tubing on the adjacent pipe shall then be pulled over the first wrap on the pipe bell and sealed in place behind the bell using approximately three circumferential turns of the 2-inch plastic adhesive tape.
  7. The resulting wrap on the barrel of the pipe will be loose, and it should be pulled snugly around the barrel of the pipe and the excess material folded over at the top, and held in place by means of 6-inch strips of the 2-inch-wide plastic adhesive tape at intervals of approximately 3 feet along the pipe barrel.
  8. Fittings, valves, hydrants, etc., shall be hand wrapped, using polyethylene film that is held in place with the plastic adhesive tape.
    - a. Bends, reducers, and offsets can be wrapped with the polyethylene tubing in the same manner as pipe.
    - b. Valves can be wrapped by bringing the tube wrap on the adjacent pipe over the bells or flanges of the valve and sealing with a flat sheet of the polyethylene passed under the valve bottom and brought up around the body to the stem and fastened in place with the adhesive tape.
    - c. Hydrants can be wrapped with polyethylene tubing slipped over the hydrant to encase the hydrant from the lead-in valve to the ground level of the hydrant. To provide drainage of the hydrant, it is necessary to cut a small hole in the film and insert a short pipe nipple to drain the water to the soil outside the film wrap.
    - d. All fittings that require concrete backing should be completely wrapped prior to pouring the concrete backing block.

### 3.4 HDPE INSTALLATION REQUIREMENTS

#### A. Pipe Joining

1. Joints between plain end pipes and fittings shall be made by butt fusion, and joints between the main and saddle branch fittings shall be made using saddle fusion using only procedures that are recommended by the pipe and fittings manufacturer.
2. Butt fusion shall be performed between pipe ends, or pipe ends and fitting outlets, of like outside diameter and wall thickness (SDR or DR). Butt fusion jointing between like diameters, but unlike wall thickness, shall not be permitted.

Transitions between unlike wall thicknesses shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means.

3. Heat-joining of HDPE pipe shall conform to applicable portions of AWWA C-906.
4. HDPE pipe and fittings shall be joined together or to other materials by means of flanged connections (flange adapters and back-up rings) or mechanical couplings designed for joining HDPE pipe or for joining HDPE pipe to another material. Mechanical couplings shall be fully pressure-rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins. External joint restraints shall be used in lieu of fully restrained mechanical couplings.

#### B. Installation

1. Installation shall be in accordance with ASTM D 2321, manufacturer's recommendations, and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with all applicable safety codes and standards.
2. Mechanical joints and flange connections shall be installed in accordance with the manufacturer's recommended procedure. Flange faces shall be centered and aligned to each other before assembling and tightening bolts. In no case shall the flanged bolts be used to draw the flanges into alignment. Bolt threads shall be lubricated, and flat washers shall be fitted under the flange nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the manufacturer. At least one (1) hour after initial assembly, flange connections shall be re-tightened following the tightening pattern and torque step recommendations of the manufacturer. The final tightening torque shall be 100 ft.-lbs. or as recommended by the manufacturer.
3. Pipe shall be laid on grade and on a stable foundation in accordance with Section 02220 Excavation and Backfill.
4. When lifting with slings, only wide fabric choker slings shall be used to lift, move, or lower pipe and fittings. Wire rope or chain shall not be used.
5. CONTRACTOR shall be liable to correct any pipe installed off line or grade (whether by horizontal directional drilling or other means).

### 3.5 POLYVINYL CHLORIDE (PVC) GRAVITY PIPE INSTALLATION REQUIREMENTS

#### A. Push-on Joints

1. Bevel all field-cut pipe, remove all burrs and provide a reference mark the correct distance from the pipe end.
2. Clean the pipe end and the bell thoroughly before making the joint. Insert the O-ring gasket, making certain it is properly oriented. Lubricate the spigot well with an approved lubricant; do not lubricate the bell or O-ring. Insert the spigot end of the pipe carefully into the bell until the reference mark on the spigot is flush with the bell.

### 3.6 FIBERGLASS PIPE INSTALLATION REQUIREMENTS

- A. Pipe Handling: Use textile slings, other suitable materials or a forklift. Use of chains or cables is not permitted.
- B. Jointing:
  - 1. Clean ends of pipe and coupling components.
  - 2. Apply joint lubricant to pipe ends and elastomeric seals of coupling. Use only lubricants approved by the pipe manufacturer.
  - 3. Use suitable equipment and end protection to push or pull the pipes together.
  - 4. Do not exceed forces recommended by the manufacturer for coupling pipe.
  - 5. Join pipes in straight alignment then deflect to required angle. Do not allow the deflection angle to exceed the deflection permitted by the manufacturer.

### 3.7 SANITARY SEWER TESTING REQUIREMENTS

- A. General:
  - 1. Test all piping.
  - 2. All piping shall be tested prior to post-construction CCTV operations.
  - 3. Notify SD1 at least 48 hours in advance of testing.
  - 4. Conduct all tests in the presence of SD1.
  - 5. Remove or protect any pipeline-mounted devices which may be damaged by the test pressure.
  - 6. Provide all apparatus and services required for testing, including but not limited to, the following:
    - a. Test pumps, bypass pumps, hoses, calibrated gauges, meters, test containers, valves and fittings.
    - b. Temporary bulkheads, bracing, blocking and thrust restraints.
  - 7. Provide air if an air test is required and power if pumping is required.
  - 8. CONTRACTOR shall provide fluid required for testing.
- B. Force Mains Test Schedule:
  - 1. The required hydrostatic test pressures shall be as specified by the Design ENGINEER and approved by SD1.
  - 2. Unless otherwise specified, the required hydrostatic test pressures are at the lowest elevation of the pipeline.
- C. Pressure Test Procedure for Force Mains:
  - 1. Complete backfill and compaction of entire pipe before testing, unless otherwise required or approved by ENGINEER.
  - 2. Fill section to be tested slowly with water and expel all air. Install corporation cocks, if necessary, to remove all air.
  - 3. Apply specified test pressure for two hours and observe pressure gage. Check carefully for leaks while test pressure is being maintained.
  - 4. A successful test shall be defined as zero drop in the specified test pressure during the two-hour testing period.

D. Displacement of Pipe

1. The sewer pipe sections may be checked by SD1 to determine if any displacement of the pipe sections from alignment and grade have occurred as each portion of the sewer is completed between manhole locations. When the test is required by SD1, it shall be as follows:
  - a. Flashing a light beam by means of a strong flashlight or reflecting sunlight through the portion of the sewer between manhole locations or by utilizing a laser beam.
  - b. When viewed from the opposite end of the portion of the sewer from the light location, the light beam should be full throughout the sections, but not less than two-thirds full under any circumstances. There shall be no "dips" in the grade of the pipe invert.
  - c. If the pipe sections show any misalignment, displacement or any other defects in the sections or joints, the CONTRACTOR shall remedy the defect to the satisfaction of SD1.
  - d. This test may be done after the pipe sections have been laid, the joints completed and the bedding completed to 12 inches above the pipe sections, or after completion of the sewer and all backfilling has been undertaken or both.

E. Deflection of Pipe

1. A deflection test shall be performed on all gravity sanitary sewers using flexible pipe. The test shall be conducted after the final backfill has been in place at least thirty (30) days. No pipe shall exceed a deflection of five percent (5%). The deflection test is to be run by using a rigid mandrel, or equal means approved by SD1, and shall have a diameter equal to ninety-five percent (95%) of the inside diameter of the pipe, including the pipe manufacturer's tolerances. The test shall be performed without mechanical pulling devices. All tests must be witnessed and approved by a representative of SD1.

F. Air Test for Gravity Sewers 42" and Smaller

1. The CONTRACTOR shall test the tightness of the pipe sections, joints and appurtenances of all gravity sewers by means of the low-pressure air test.
2. No tests shall be made until the backfill is consolidated over the pipe and all service lines in the section to be tested have been connected and plugged.
3. The low-pressure air test shall be conducted in accordance with procedures outlined in UNIBELL Specification UNI B-6. If the section of sewer being tested is below the elevation of ground water in the trench, the test pressure shall be 0.5 psi for each foot of ground water above the invert of the pipe.
4. All tests must be witnessed and approved by a representative of SD1.
5. Any leaks determined from the air test shall be fixed by the CONTRACTOR using an SD1 approved method.
6. The minimum air test pressure for all gravity sewers shall be 4 psi.

G. Individual Pipe Joint Testing for Gravity Sewers 48" and Greater.

1. The CONTRACTOR shall test each individual joint of the gravity sewers using the following procedure:

- a. Center the joint tester over the joint. Using the manufacturers approved testing apparatus and other recommendations, Inflate the outer element filling the center of the joint tester cavity with water or air, dependent upon test used, until it flows evenly from the bleed off valve, which removes air from the outer cavity. The bleed off valve shall be located at the top of the joint tester assembly. Close the bleed –off valve and pressurize the cavity to 3.5 to 5.5 psig depending on groundwater back pressure. Allow pressure to stabilize for 10 to 15 seconds and turn off pressure source. If pressure holds or drops less than 1 psi for 1 minute the joint is acceptable. The pressure gage used shall read in one (1) psi increments.

### 3.8 STORM SEWER TESTING REQUIREMENTS

- A. Pipe shall be fully backfilled and compacted at least 30 days prior to testing.
- B. Deflection: Under normal circumstances, the CONTRACTOR shall test approximately 20% of all flexible storm sewer piping, as determined and at locations directed by SD1, by use of a calibrated mandrel or other device/method approved by SD1, to ensure that no pipe deflection has occurred greater than 5% of the inside diameter of the pipe. If, however, SD1 determines additional deflection testing is required based on the condition of the system or other circumstances, SD1 reserves the right to require such testing at no additional cost to SD1. The CONTRACTOR shall test the entire length of the sewer installed from structure to structure. Any pipe section exhibiting greater than 5% deflection shall be repaired in a manner approved and acceptable to SD1 and retested, at no additional cost to SD1. If the pipe fails a second deflection test, the pipe shall be replaced and retested at no additional cost to SD1.
- C. Displacement: Storm sewer pipe sections may be checked by SD1 to determine if any displacement of the pipe sections from alignment and grade has occurred as each portion of the sewer is completed between structure locations. When the test is performed, it shall be as follows:
  1. Flashing a light beam by means of a strong flashlight or reflecting sunlight through the portion of the sewer between structure locations or by utilizing a laser beam.
  2. When viewed from the opposite end of the portion of the sewer from the light location, the light beam should be full throughout the sections, but not less than two-thirds full under any circumstances. There shall be no "dips" in the grade of the pipe invert.
  3. If the pipe sections show any misalignment, displacement or any other defects in the sections or joints, the CONTRACTOR shall remedy the defect, at the CONTRACTOR'S sole cost, to the satisfaction of SD1.

### 3.9 REPAIR OF FAILED PIPE SECTIONS

- A. If a pipe section failed testing as outlined in Section 02610 3.7 & 3.8, the Contractor shall repair the failed pipe sections as follows:
  - 1. Contact SD1 24 hours prior to making any repairs to failed pipe sections. SD1 shall be present during the entire duration of time repairs are being made to failed sections of pipe.
  - 2. The CONTRACTOR shall remove and replace, at no extra cost to SD1 all sections of pipe which fail any of the tests specified in this section in accordance with the following procedures:
    - a. Excavate failed sections of pipe in accordance with Section 02220 Excavation and Backfill.
    - b. Cut out and/or remove failed sections and relay new pipe beginning at nearest joint.
    - c. Close pipe with pipe coupling per manufacturer's recommendation and approval of SD1.
  - 3. The CONTRACTOR shall provide all material, labor, and equipment necessary to remove and replace the failed pipe section.
  - 4. Retest the replaced sewer sections to meet the applicable requirements listed in Section 02610 3.7 & 3.8.

### 3.10 PIPE ABANDONMENT

- A. Pipe abandonment in non-paved roadway:
  - 1. Pipe abandonment under non-paved roadways shall be as outlined in SD1 Standard Detail No. 107 (SD-107). Ends of pipe shall be filled with minimum of 1' of concrete.
- B. Pipe abandonment in paved roadway:
  - 1. Pipe abandonment under paved roadways shall consist of completely filling the designated pipes with controlled density fill (CDF), grout or other approved materials. Appreciable deposits of debris shall be removed from other pipes prior to placement of CDF, grout or other approved materials. Pipes under roadways shall be filled completely
- C. On Pipe abandonment in for manholes that remain, re-work bench to eliminate invert.

### 3.11 CLEANING FOR SEWERS

- A. Cleaning:
  - 1. Thoroughly clean all piping and flush in a manner approved by ENGINEER, prior to placing in service.

3.12 CLEAN-UP

- A. Upon completion of the installation of the piping and appurtenances, the CONTRACTOR shall remove all debris and surplus construction materials resulting from the work. The CONTRACTOR shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line. Refer to Section 02900 Landscaping, for restoration.

++ END OF SECTION ++

## **10. APPENDIX “A”**

### **10.1 Geotechnical Investigation Report – Terracon March 9, 2026**



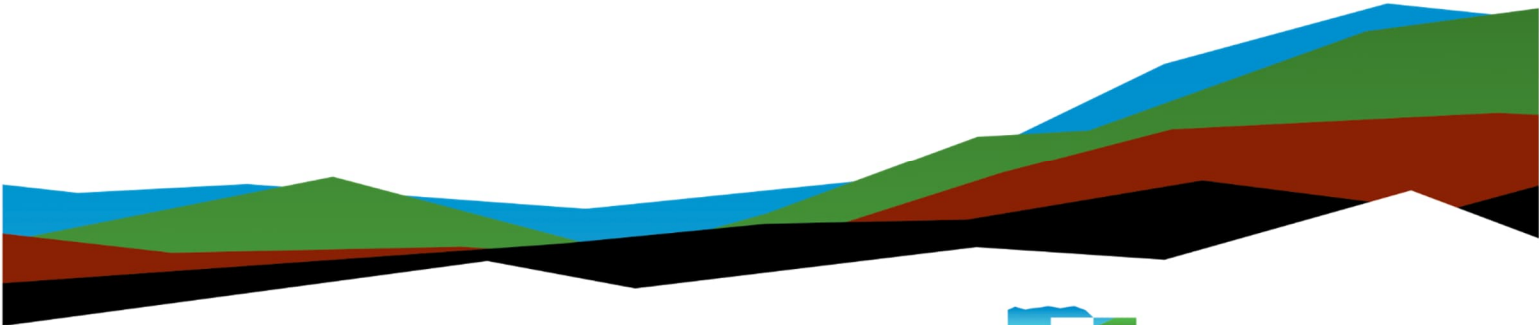
# Vincent Drive Storm Sewer Realignment

Geotechnical Engineering Report - Revised  
Taylor Mill, Kenton County, Kentucky

March 9, 2026 | Terracon Project No. N1255362

Prepared for:

Verdantas  
300 Buttermilk Pike, Suite 332  
Fort Mitchell, Kentucky, 41017



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March 9, 2026

Verdantas  
300 Buttermilk Pike, Suite 332  
Fort Mitchell, Kentucky, 41017

Attn: James Shumate, PE, PS  
P: (859) 534-9931  
E: [jshumate@verdantas.com](mailto:jshumate@verdantas.com)

Re: Geotechnical Engineering Report - Revised  
Vincent Drive Storm Sewer Realignment  
Vincent Drive  
Taylor Mill, Kenton County, Kentucky  
Terracon Project No. N1255362

Dear Mr. Shumate:

We have completed the scope of Geotechnical Engineering Report - Revised services for the above-referenced project in general accordance with Terracon Proposal No. PN1255362 dated November 6, 2025 and authorized via signature on December 11, 2025. This report supersedes the report dated March 6, 2026. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning excavation and backfilling associated with the installation of the proposed storm sewer and associated sewer structures (e.g., manholes, catch basins, and headwalls).

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.**

Ayanda T. Ncube, EIT  
Senior Staff Engineer

Joseph D. Hauber, PE  
Principal/Senior Engineer

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## Attachments

**Exploration and Testing Procedures**  
**Site Location and Exploration Plans**  
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**Supporting Information**

Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the  Terracon logo will bring you back to this page. For more interactive features, please view your project online at [client.terracon.com](http://client.terracon.com).

Refer to each individual Attachment for a listing of contents.

## Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed storm sewer realignment at Vincent Drive in Taylor Mill, Kenton County, Kentucky. The purpose of these services was to provide information and geotechnical engineering recommendations related to:

- Subsurface soil and bedrock conditions
- Short-term groundwater conditions
- Sewer pipe and sewer structure installation and subgrade preparation
- Temporary shoring considerations
- Trench and sewer structure backfilling, including abandonment of existing storm sewers

The geotechnical engineering Scope of Services for this project included the advancement of 4 test borings, laboratory testing, engineering analysis, and preparation of this report.

Drawings showing the site and boring locations are shown on the [Site Location Plan](#) and [Exploration Plan](#), respectively. The results of the laboratory testing performed on select soil and bedrock samples obtained from the site during our field exploration are included on the boring logs and/or as separate graphs in the [Exploration Results](#) Section.

## Project Description

Our initial understanding of the project was provided in our proposal and was discussed with the Verdantas 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 | An email request-for-proposal (RFP) was provided by Verdantas on October 24, 2025, which included 90% Plans for the proposed street reconstruction and storm sewer improvements along Vincent Drive. Additionally, Verdantas provided a shapefile of the proposed storm sewer alignment on October 29, 2025. |

| Item                | Description  |
|---------------------|--|
| Project Description | <p>The Vincent Drive Storm Sewer Improvements project is in a residential development along Vincent Drive in Taylor Mill, Kentucky. The residents in this area have experienced overland and damaging flood events on a frequent basis for several years, and the existing storm sewer is reportedly undersized. On December 5, 2024, Terracon issued a geotechnical engineering report (hereinafter referred to as the 2024 Geotechnical Report) for a previous version of the storm sewer alignment along Vincent Drive. Since issuing this report, the alignment has been revised and updated.</p> <p>Per the 90% Plans, there are three storm sewer alignments, which are described below. The new upsized storm sewer will replace the existing storm sewers, which generally vary from 12 to 36 inches in diameter and consist of reinforced concrete pipe (RCP), corrugated metal pipe (CMP), and polyvinyl chloride (PVC) pipes.</p> <p>Per the email request, the modification of the pipe alignment includes upsizing the existing pipes and adding new pipe runs. The downstream end of the alignment will be rerouted to outlet at the existing headwall in the backyard of 748 Vincent Drive. The upstream end will have a new pipe run extending in a northward direction between 718 and 716 Vincent Drive.</p> |
| Proposed Sewers     | <p>Per the 90% Plans, the proposed sewer pipe material is yet to be determined. For ease of reference, the proposed sewer alignments were subdivided into three alignments, which are listed below:</p> <p>Alignment 1:</p> <ul style="list-style-type: none"> <li>■ Sewer alignment extends from the existing headwall (HW #01) that is to be replaced in the rear yard of 748 Vincent Drive to proposed Manhole (MH) #04, where it takes a turn to the south and then roughly parallels the common property line between 748 and 746 Vincent Drive to the cul-de-sac at proposed MH #04C.</li> <li>■ Station 50+34 to 53+44 (i.e., Station 8+58 of Alignment 2)</li> <li>■ Length: 310± feet</li> <li>■ Diameter: 48 to 36 inches</li> <li>■ Invert Depth: 4± to 19± feet</li> <li>■ Invert El.: 776 to 802± feet</li> </ul>   |

| Item                        | Description   |
|-----------------------------|---|
| Proposed Sewers (continued) | <p>Alignment 2:</p> <ul style="list-style-type: none"> <li>■ Sewer alignment extends northeastwardly within the pavement of Vincent Drive, primarily within the westbound lane, between Curb Inlet DGI #04D and Curb Inlet DGI #13.</li> <li>■ Station 8+08 to 21+48</li> <li>■ Length: 1,340± feet</li> <li>■ Diameter: 15 to 36 inches</li> <li>■ Invert Depth: 5 to 13 feet</li> <li>■ Invert El.: 801± to 830± feet</li> </ul> <p>Alignment 3:</p> <ul style="list-style-type: none"> <li>■ Sewer alignment extends northwards from proposed Curb Inlet DGI #12 within the pavement of Vincent Drive, crossing between 718 and 716 Vincent Drive to proposed catch basin #12C.</li> <li>■ Station 10+27 to 11+67</li> <li>■ Length: 140± feet</li> <li>■ Diameter: 24 inches</li> <li>■ Invert Depth: 6 to 8 feet</li> <li>■ Invert El.: 825± to 832± feet</li> </ul> <p>We understand that the new upsized sewers and associated sewer structures (e.g., manholes, catch basins, etc.) are proposed to be installed using open-cut methods, including beneath Vincent Drive. Trenchless installations are not planned.</p> |

Terracon should be notified if any of the above information is inconsistent with the planned construction, as modifications to our recommendations may be necessary.

## Site Conditions

The following description of site conditions is derived from our site visit in association with field exploration, 90% Plans, and our review of publicly available geologic and topographic maps.

| Item                              | Description  |
|-----------------------------------|--|
| Project Site Information          | <ul style="list-style-type: none"> <li>■ The project is located within the residential community along Vincent Drive in Taylor Mill, Kenton County, Kentucky.</li> <li>■ Proposed Storm Sewer Upsizing ~ 1,790 linear feet</li> <li>■ Latitude/Longitude (approximate): 38.9882°N, 84.5075°W</li> <li>■ See <a href="#">Site Location Plan</a></li> </ul>  |
| Existing Improvements/ Conditions | <p>Based on the 90% Plans provided by Verdantas, the basement finished floors for the two houses at 748 and 746 Vincent Drive that Alignment 1 parallels are at El. 803.3 and 807.8 feet, respectively. Foundations are anticipated to consist of shallow spread footings that bear between 1 and 2.5 feet below finished floor elevation. Foundation walls are anticipated to be unreinforced concrete.</p> <p>At the existing outlet headwall that is to be replaced, the streambed that the headwall discharges into appeared to consist of limestone floaters over soil. Additionally, there were no signs of slope instability on the relatively steep slopes surrounding the headwall.</p> <p>Alignment 2 is located beneath the pavement of Vincent Drive. Alignment 3 runs between 718 and 716 Vincent Drive. The basement finished floors for the two houses are at El. 832.1 and 834 feet, respectively. Similar to the houses along Alignment 1, foundations are anticipated to consist of shallow spread footings that bear between 1 and 2.5 feet below finished floor elevation. Foundation walls are anticipated to be unreinforced concrete.</p> |
| Existing Topography               | <p>Grades across the site generally vary from El. 840± feet at the upstream end of Alignment 2 to El. 776± feet at the outfall behind 748 Vincent Drive.</p> <p>In general, the storm sewers appear to follow valley/ridgetop terrain that has been modified for the construction of the existing residences and their lots along Vincent and Bonnie Drives.</p> <p>According to available topographic maps from 1963 that are published by the Northern Kentucky Area Planning Commission (NKAPC), which is illustrated on the Exploration Plan with 1963 NKAPC Topography in <a href="#">Site Location and Exploration Plans</a>, the downstream-most 175± feet of Alignment 1 and the upstream-most 950± feet of Alignment 2 generally follow a pre-existing valley, whereas the upstream portion of Alignment 1</p>  |

| Item                            | Description  |
|---------------------------------|--|
| Existing Topography (continued) | <p>and the downstream portion of Alignment 2 are located along the nose of a ridge. Alignment 3 is located at the upstream end of the pre-existing valley where it splits into multiple tributary valleys.</p> <p>According to 90% Plans, the grades are predominantly gently to strongly sloping (i.e., gentler than 10 percent); however, there are some moderately steep to steep slopes with grades as steep as 2H:1V (2 horizontal to 1 vertical), particularly at the outlet headwall that is to be replaced behind 748 Vincent Drive.</p> |

## Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration data, laboratory data, and geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the [Exploration Results](#), and the GeoModel can be found in the [Figures](#) attachment of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

| Model Layer | Layer Name         | General Description   |
|-------------|--------------------|---|
| 1           | Surface Material   | Topsoil, pavements, and aggregate base  |
| 2           | Existing Fill      | Lean clay to fat clay, with shale and limestone fragments, varying amounts of sand, brown and dark gray           |
| 3           | Natural Overburden | Lean clay to fat clay, varying amounts of sand and gravel, brown and gray, stiff to very stiff                    |
| 4           | Residuum           | Lean clay with shale bedding planes and varying amounts of limestone floaters, brown and gray, very stiff to hard |
| 5           | Bedrock            | Interbedded shale and limestone   |

In general, these GeoModel layers match up with those on the logs from the 2024 Geotechnical Report (i.e., Borings B-101 through B-105), except for GeoModel Layer 3. In the 2024 Geotechnical Report, GeoModel Layer 3 consisted of gray and brown, stiff

fat clay alluvium with shale and limestone fragments and organics and were encountered near the center of the pre-existing valley beneath the existing fill and overlying the bedrock.

According to the 1969 United States Geological Survey (USGS) Geologic Map of the Independence Quadrangle, Kenton and Boone Counties, Kentucky,<sup>1</sup> the bedrock underlying the overburden soils at the site belongs to the Bull Fork, Bellevue Tongue of the Grant Lake Limestone, and Fairview Formation. The contact between the Bull Fork Formation and the underlying Bellevue Tongue of the Grant Lake Formation is around El. 840 to 850 feet, while the contact between the Bellevue Tongue of the Grant Lake Limestone Formation and the underlying Fairview Formation is around El. 820 to 830 feet.

The referenced USGS map describes the bedrock formations as follows:

- The Bull Fork Formation consists of interbedded limestone and shale, with the limestone comprising more than 50 percent of the formation. The limestone is irregularly to evenly bedded and is generally thinly bedded; locally beds are more than 6 inches thick. The shale is commonly calcareous and less fossiliferous than the limestone and contains siltstone interbeds.
- The Bellevue Tongue of the Grant Lake Limestone consists of rubbly weathering, irregularly bedded to lenticular limestone with very thin discontinuous shale partings. The limestone predominantly consists of whole and coarsely broken fossils in a fine-grained argillaceous limestone matrix.
- The Fairview Formation consists of interbedded limestone and shale, with the limestone comprising 45 to 65 percent of the formation. The limestone is irregularly to evenly bedded, with beds generally less than 8 inches thick, but locally as thick as 15 inches. The shale is fissile, calcareous, silty, and laminated to thinly bedded.

## Groundwater Conditions

The borings were advanced in the dry using a hollow-stem auger drilling technique that allows short-term groundwater observations to be made while drilling. Groundwater was encountered during drilling where noted on the attached boring logs. In general, groundwater was encountered in the borings within the existing fill layer and near the

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<sup>1</sup> Luft, S.J. (1969). "Geologic Map of the Independence Quadrangle, Kenton and Boone Counties, Kentucky," United States Geological Survey.

bedrock surface or within the bedrock. However, since long-term groundwater levels were not obtained, these observations are not necessarily representative of the long-term static groundwater levels. Long-term groundwater monitoring was outside the scope of services for this project. The water levels observed in the 2026 boreholes and 2024 boreholes can be found on the boring logs in the [Exploration Results](#) and are summarized below.

| Boring No.   | Approximate Groundwater Depth (ft.) <sup>1,2</sup> |               | Approximate Groundwater El. (ft.) <sup>2</sup> |               |
|--------------|--|---------------|--|---------------|
|              | During Drilling                                    | At Completion | During Drilling                                | At Completion |
| 2026 Borings |  |               |  |               |
| B-201        | 6, 23.5  | NE            | 794, 776.5                                     | 794           |
| B-202        | 17   | 16            | 787.9  | 788.9         |
| B-203        | NE   | NE            | NE   | NE            |
| B-204        | NE   | NE            | NE   | NE            |
| 2024 Borings |  |               |  |               |
| B-101        | NE   | NE            | NE   | NE            |
| B-102        | NE   | NE            | NE   | NE            |
| B-103        | 13.5   | NE            | 799.9  | NE            |
| B-104        | 10   | NE            | 818.5  | NE            |
| B-105        | NE   | NE            | NE   | NE            |

1. Depths are measured from the existing ground surface.
2. NE = not encountered

From experience, groundwater seepage is anticipated along the fill/natural soils interface, along the overburden soil/bedrock interface, along limestone layers and cracks and fissures within the bedrock, and in the saturated zones of fill or natural soils that are within the perched groundwater zones, or that are below the groundwater table. Locally concentrated flow may occur due to saturated layers of fill or natural soils (particularly the natural alluvium within the filled valley) or along fractures in the bedrock. Overall, groundwater conditions will change because of seasonal variations in rainfall, runoff, and other conditions not apparent at the time of drilling.

### Archival Boring Records

To supplement the new borings, boring logs from the 2024 geotechnical exploration are included in the [Exploration Results](#) Section. The approximate locations of these archival borings are also illustrated on the Exploration Plans in the [Site Location and Exploration Plans](#).

## Geotechnical Overview

The subsurface materials generally consisted of cohesive clay fill soils and natural cohesive overburden soils of alluvial and residual origin overlying interbedded shale and limestone bedrock. The fill soils encountered in the borings consisted of a mixture of lean and fat clay soils with traces of sand, root hairs, oxide stains, and shale and limestone fragments. The natural overburden soils encountered in the borings consisted of lean clay and fat clay with varying amounts of limestone fragments and floaters. Groundwater seepage was encountered in four of the borings (2026 and 2024 borings combined) at depths ranging from 6 to 23.5 feet and was encountered within the existing fill (GeoModel Layer 2), near the soil/bedrock interface, or within the bedrock (GeoModel Layer 5).

As previously mentioned, a review of topographic data in the corridor of the proposed sewer alignment reveals that the alignment follows the valley/ridgetop terrain that has been modified for the construction of the existing residences and their lots. The above-mentioned subsurface conditions corroborate this by the presence of fill soils over alluvial soils. At the design invert elevations of the proposed alignment, the sewer will likely encounter existing fill, natural overburden soil, residuum, and bedrock (GeoModel Layers 2 through 5 in the 2026 borings), as well as alluvium (GeoModel Layer 3 from the 2024 borings). Bedrock (GeoModel Layer 5) may be encountered along each of the three alignments. Examples include in the proximity of the drop manhole MH#04 of Alignment 1, and along the upstream and downstream ends of Alignment 2 where it is outside of the center of the pre-existing filled valley. Field variations in encountered conditions and transition between materials should be expected.

The existing fill and native clay overburden soils, when exposed to moisture fluctuations, could become unstable with typical earthwork and construction traffic, especially after precipitation events. Effective drainage should be completed early in the construction sequence and maintained after construction to avoid potential issues. Surface water should be directed away from the trench excavation and any stockpiled soils, and groundwater seepage should be immediately pumped out from the trench excavation. If possible, trenching and backfilling should be performed during the warmer and drier times of the year, in the summer and early fall months.

With directing additional stormwater flow to the existing headwall that is to be replaced at Station 50+35, the existing streambed and streambanks may need to be armored to protect the streambed and streambanks from scour and erosion. Additionally, we recommend that the streambanks and the 2H:1V slope at the outfall be periodically inspected for scour and slope instability in order to address such issues if they occur after construction.

Additional site preparation, excavation, and backfill recommendations are provided in the [Earthwork](#) Section.

Generally, temporary shoring should be used wherever the bottoms of trench excavations will be within 1H:1V outward and downward projections from the outside edge of foundations of existing structures or existing utilities or infrastructure. However, along Alignment 1, trench excavations varying from approximately 10 to 20 feet deep are planned through existing undocumented fill between the houses at 746 and 748 Vincent Drive. Due to these excavation depths, the undocumented fill, and the likelihood that the house foundations are bearing in the undocumented fill, we recommend temporary shoring be used where the bottoms of trench excavations for Alignment 1 will be within a 2H:1V outward and downward projections from foundations of these buildings. Where possible, we recommend that the alignment and profile of the sewer be adjusted to eliminate or reduce the amount of temporary shoring needed for the project.

Based on the 90% Plans, portions of Alignment 1 are within 1.6H:1V and 1.4H:1V of the existing houses at 748 and 746 Vincent Drive, respectively, which encroaches on the 2H:1V criteria described above and necessitates temporary shoring.

Where the existing sewer pipes will be abandoned in place, we recommend that these abandoned pipes be completely filled by safe-loading with flowable fill.

Pre-construction and post-construction surveys of structures and infrastructure within 50 feet of the proposed sewer alignment should be completed, and vibration monitoring should be completed when excavating and backfilling near structures along with periodic monitoring of the following three houses: 748, 746, and 718 Vincent Drive. Refer to the [Construction Assessment](#) section for additional information.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the [Exploration Results](#)), engineering analyses, and our current understanding of the proposed project. The [General Comments](#) Section provides an understanding of the report limitations.

## Earthwork

Earthwork is anticipated to include excavation, temporary stockpiling, and trench backfill 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 sewer installation.

## Construction Assessment

The conditions encountered at the borings indicate that excavations for sewer installations and associated manholes/inlet structures will be within existing lean and fat clay fill and natural overburden soils and will occasionally penetrate the interbedded

shale and limestone bedrock. The natural overburden soils include existing alluvial soils and residual soils formed by the complete weathering of the underlying parent bedrock (interbedded shale and limestone). The residual overburden soils may include limestone floaters and seams that are remnants of the parent bedrock. Field variations should be expected in encountered conditions.

The field exploration method employed for this study is inadequate to determine the quantity and size of floaters. Based on the conditions encountered at the exploratory borings and our experience with similar soil profiles, it is anticipated that the trench excavations can be performed with conventional heavy-duty excavation equipment. Rippers or hoe rams may be beneficial in residual soils and bedrock to break up limestone layers. The Contractor is solely and completely responsible for selecting the appropriate means and methods. The Contractor should submit an excavation plan to the design team prior to the start of construction. This submittal should at a minimum include the Contractor's plan for trench excavations, stockpiling and disposal of spoils, groundwater control, and backfilling of trenches. The Design Team's review of this submittal does not relieve the Contractor of their responsibility for satisfactory excavation and backfilling.

In general, the placement of the sewer within the soil profile will not add a significant load to the underlying bearing material. However, it is important to have relatively uniform subgrade support to maintain the proper line and grade of the sewer and to prevent the sewer from becoming over-stressed. Per the referenced 90% Plans prepared by Verdantas, the proposed invert depths of the sewers range from about 4 to 19 feet below existing site grades. Based on the conditions encountered in the exploratory borings, the sewer subgrade is anticipated to consist of clay soils from the existing fill, alluvium, or residuum or the interbedded shale and limestone bedrock.

If soft or unstable soils are encountered at the bottoms of the proposed sewer trench excavations, we recommend that the soft or unstable materials be removed from below pipe invert for the full trench width, as necessary, and replaced with compacted crushed stone to provide a stable trench bottom. Similarly, soft or unstable soils below manhole/inlet structures, where encountered, should be removed from the bearing elevation across the entire footprint of the structures plus a 1-foot-wide buffer area around the footprint and replaced with compacted crushed stone.

The compacted crushed stone should be wrapped with a non-woven drainage geotextile (e.g., Mirafi 140N) to reduce the migration of fine-grained soils and fine granular bedding into the crushed stone. The depth of the undercut and crushed stone fill below the pipe invert/structure will vary with the soft/unstable soil conditions encountered; however, the depth of undercut below the pipe invert/structure bearing elevation can be limited to a maximum of 24 inches. The crushed stone backfill should be placed and compacted in accordance with the recommendations for backfilling presented in the [Fill Compaction Requirements](#) Section of this report. The specified pipe bedding should be

placed over the compacted crushed stone and geotextile. We recommend that the Contract Documents include an item for the recommended undercutting of the soft or unstable soils, as deemed necessary.

Alternatively, consideration may be given to stiffening the soft or unstable soils in the bottom of the sewer trench by pushing crushed No. 2 stone into the soils until they are sufficiently stable to permit the placement of the pipe bedding and pipe. With this alternative, at least 12 inches of granular bedding should be provided between the stone-stiffened subgrade and the invert of the pipe to reduce the risk of pipe damage. For this option, we recommend that the Contract Documents include an item for crushed stone placement.

Trench excavations for the installation of the sewer are expected to cross existing operational utilities at multiple locations. It is important that the location of existing utilities be clearly marked and information regarding their depth be obtained prior to excavation. The presence of previously placed trench backfill should be expected within new trench excavations. The existing utilities should be supported and monitored, as required, during trench excavations, sewer installation, and trench backfilling. The Contractor is completely responsible for developing the appropriate temporary utility supports and means and methods for these utility crossings.

We recommend that a pre-construction survey of the roadway, utilities, and structures (including residences, fences, and retaining walls) within 50 feet of the proposed sewer alignment be performed prior to the start of construction. These surveys should include photographs and video recordings, confirmation of foundations of existing structures and locations of existing utilities to remain operational, and baseline surveys as appropriate. Vibration monitoring and periodic monitoring should be completed when installing shoring and when excavating and backfilling near structures. Where vibration monitoring is performed, we recommend that the monitoring commence 2 weeks prior to construction to establish a baseline. Upon completion of work, post-construction surveys should be completed of structures/infrastructure for which pre-construction surveys were completed.

## Trench Excavations

All temporary cut slopes greater than 4 feet of depth should, at a minimum, be made in accordance with current OSHA Excavation Regulations. Between 748 and 746 Vincent Drive, the proposed sewer inverts will range from approximately 6 to 10 feet below basement elevations for these structures. We anticipate that trench boxes will be utilized along the existing roadways and in close proximity to existing physical features. It is important to recognize that trench boxes are “shields” typically used for worker safety but may not provide adequate lateral support for adjacent structures, pavements, or utilities. Trench boxes should not be considered for use as temporary shoring for open-cut excavations that encroach into the zone of influence of existing structures (e.g.,

houses, sheds, etc.) and infrastructure where lateral resistance to prevent deflections must be provided.

Where sewer installations will be made on sloping terrain and/or near the toes of existing slopes (e.g., the headwall to be replaced at Station 50+35), the Contractor should complete the trench excavations in short sections to limit the length of unbackfilled trenches, as needed, to maintain slope stability and should backfill soon after completion of pipe installation. Excavation support should be implemented, where necessary.

Based on the proposed sewer invert depths and subsurface conditions encountered at the exploratory borings, the trench excavations are expected to primarily be within existing fill and natural soils, consisting of mostly cohesive lean and fat clays, and penetrate into the interbedded shale and limestone bedrock in some areas. From experience with similar soils, it is anticipated that the overburden soils can be excavated using conventional heavy-duty excavators. A ripper, hoe ram, or other percussion attachment tools can be used to break down limestone layers. To control excavation width and rock overbreak, the use of line drilling, rock saws, etc. can be used. Limestone fragments, floaters, and layers encountered in the trench excavation may result in trench widths greater than anticipated. Additionally, loose limestone floaters should be removed from the bottoms and sides of the excavations that may otherwise damage the pipe.

The Contractor is completely responsible for selecting the appropriate excavation equipment, means, and methods. The Contractor's OSHA competent person should establish a minimum lateral distance from the edge of the trench excavation for all spoil piles and equipment. The excavated bedrock is not considered to be directly suitable for reuse as backfill and should be hauled off-site. Excessive limestone may need to be culled from the residual soils before they can be reused as backfill. The excavated spoils should not be stockpiled or wasted on existing slopes as they may trigger landslides. Furthermore, periodic inspections of the ground surface along excavations for tension cracks, undermining of sidewalls, etc. should be completed and addressed appropriately by the Contractor.

We recommend that the engineering specifications state that the Contractor be responsible for the temporary shoring, bracing, and sheeting designs if required, and for the protection of roadways, streams, utilities, fences, existing slopes, and any other structures.

## Bedding and Backfill

The sewer bedding and backfill material and placement should be in general accordance with Sanitation District No. 1 (SD1) Standard Specifications.

The remaining backfill above the granular zone previously described can consist of on-site cohesive soils. As an exception, any open-cut roadway crossings (including private driveways) should have a controlled low-strength mortar (CLSM, also known as flowable fill) placed up to the subgrade for the replacement pavement design profile to reduce the risk of post-construction trench settlement. It is our experience that reduced labor costs associated with flowable fill make the use of this material an attractive alternative. Consideration should be given to using flowable fill for backfilling trench excavations, particularly where these excavations are within the zone of influence of existing structures and infrastructure. Additionally, as previously stated, all abandoned sewers left in-place should be completely backfilled (safe-loaded) with flowable fill. Flowable fill for this project should have a design strength of at least 50 psi for stability and not greater than 100 psi for potential future excavatability.

Any excavated shale and limestone bedrock is not considered suitable for trench backfill and should be hauled offsite, along with any excess excavated spoils. The suitability of excavated soils as backfill should be further evaluated in the field during construction. Moisture conditioning of excavated soils, as well as culling of limestone floaters or other deleterious material, should be anticipated. Proper placement and compaction of trench backfill is important to reduce post-construction settlements and trapped water. Alternately, flowable fill can be considered for backfill.

Any proposed backfill material (on-site or imported) should be properly tested to determine its optimum moisture content and moisture-density characteristics and then be pre-approved prior to use. All backfill material shall be free of organics, topsoil, debris, and other deleterious substances. Maximum solid particle size (rock fragments, etc.) should be less than about 4 inches. The following table provides general material requirements for engineered fill/trench backfill.

| Soil Type <sup>1</sup>           | USCS Classification                          | Acceptable Parameters (for Engineered Fill/Trench Backfill)   |
|----------------------------------|--|---|
| Low Plasticity Cohesive (Import) | CL (LL<45, PI<24)                            | All locations and elevations above the required granular zone <sup>2</sup>  |
| Granular (Import)                | GW, GW-GM, SW, SW-SM                         | Less than 12% passing No. 200 sieve (fines). Less than 5% fines is recommended for drainage media.  |
| On-Site Soils                    | Varies, Predominantly CL and Occasionally CH | The on-site soils typically appear suitable for use; some culling of limestone floaters and deleterious substances may be necessary. Appropriate moisture conditioning should be anticipated. |

| Soil Type <sup>1</sup> | USCS Classification | Acceptable Parameters (for Engineered Fill/Trench Backfill) |
|------------------------|---------------------|---|
|------------------------|---------------------|---|

1. Engineered fill/trench backfill 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. As an exception, CLSM must be used for all open-cut roadway crossings and areas sensitive to settlements.

We recommend that backfill be placed and compacted close behind the installation of the pipe to limit the length of unbackfilled trenches, as needed, to maintain stability and to prevent damage to adjacent ground, slopes, structures, and infrastructure.

### Fill Compaction Requirements

Engineered fill/trench and manhole/inlet structure backfill should meet the following compaction requirements.

| Item   | Engineered Fill/Trench Backfill   |
|--|---|
| Maximum Lift Thickness                         | <ul style="list-style-type: none"> <li>■ 4 to 6 inches in loose thickness when hand-guided equipment (i.e., jumping jack or plate compactor) is used</li> </ul>   |
| Minimum Compaction Requirements <sup>1,2</sup> | <ul style="list-style-type: none"> <li>■ 98% of max. dry density within the zones of influence (2H:1V projections along Alignment 1 and 1H:1V projections along Alignments 2 and 3) of existing structures (e.g., houses, sheds, pools, etc.)<sup>3</sup></li> <li>■ 95% of max. dry density in landscaped areas provided long-term plans do not require a structure or pavement above sewer alignment</li> </ul> |
| Water Content Range <sup>1</sup>               | <ul style="list-style-type: none"> <li>■ Low plasticity cohesive: -2% to +3% of optimum</li> <li>■ High plasticity cohesive: 0 to +3% of optimum</li> <li>■ Granular: -3% to +3% of optimum</li> </ul>  |

1. Maximum dry density and optimum water content as determined by the standard Proctor test (ASTM D698).
2. High plasticity cohesive fill should not be compacted to more than 100% standard Proctor maximum dry density.
3. Consideration should be given to backfilling areas within the zones of influence of existing structures, including up to basement elevation between the houses at 748 and 750 Vincent Drive, with flowable fill. In yard areas, the flowable fill (where used) should be held down 12 inches below final grades to allow for the placement of soil and revegetating the area.

All materials to be used as engineered fill/trench backfill should be tested in the laboratory to determine their suitability and compaction characteristics.

## Drainage and Groundwater Considerations

Four of the nine exploratory borings (2026 and 2024 boring combined) encountered groundwater seepage either in the existing fill soils, near the soil/bedrock interface, or within the bedrock. Groundwater conditions during construction and the design life of the sewer can be different from the short-term observations during the field exploration program and may be influenced by stream flow, discharge at the headwall to be replaced, rainfall, and regional hydrogeology. From experience, seepage is commonly encountered as perched water within fill soils, at the interface between the overburden soils and the bedrock surface, as well as within the bedrock bedding planes, cracks, and fissures. In addition, perched water could be encountered within existing pipe bedding materials.

Effective control of seepage and groundwater into the utility excavations is important to reduce subgrade softening/undercutting and facilitate proper placement of backfill. Water should not be allowed to collect in the bottom of the excavation or on prepared subgrades of the construction area. Undercut or excavated areas should be sloped toward one corner to facilitate the removal of any collected rainwater, groundwater, or surface runoff. The bottom of the trench should be sloped to promote positive drainage of water trapped with the sewer bedding. Uncontrolled seepage within the trench excavation face can cause collapse and widening of the trench. Appropriate measures should be employed (including soil berms or drainage ditches) to divert surface water away from the trench excavations.

Based on the predominantly cohesive soil types and observed short-term groundwater conditions during the field exploration program, minor seepage is generally anticipated within trench excavations. However, seepage conditions can be impacted by rainfall and other inclement weather conditions immediately before and during construction. Minor seepage can likely be removed with typical sump and gravity drainage methods. The presence of and handling of groundwater should be further evaluated at the time of construction. The Contractor is completely responsible for effective groundwater control during construction. The Contractor's Excavation Plan submittal should include a groundwater control plan.

As previously stated, at Station 50+35 where the existing headwall will be replaced for the upsized storm sewer pipe, we recommend that the outfall be periodically inspected for scour and slope instability (particularly the very steep streambanks and 2H:1V slope) in order to address scour and slope instability issues if they occur after construction.

## General Comments

Our analysis and opinions are based on our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. 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 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 on 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 affect excavation cost. Any parties charged with estimating excavation costs should seek their 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. Construction and site development have the potential to affect adjacent properties. Such impacts can include damage due to vibration, modification of groundwater/surface water flow during construction, and foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The Owner and Contractor should consider a preconstruction/precondition survey of surrounding development. 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.

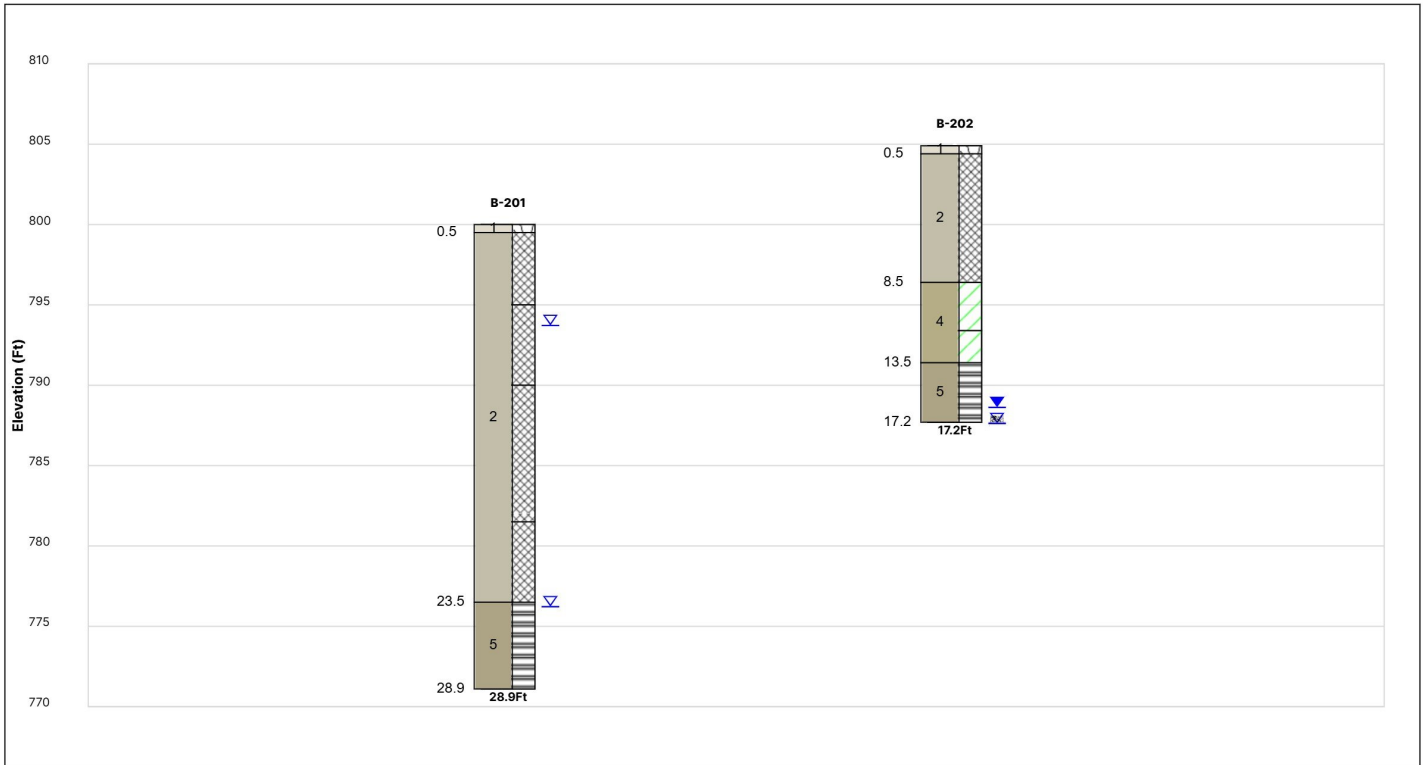
## Figures

### Contents:

2026 GeoModel (2 pages)

2024 GeoModel

### GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions

| # | Layer Name          | General Description  |
|---|---------------------|--|
| 1 | Surficial Materials | Topsoil, pavements, and aggregate base   |
| 2 | Existing Fill       | Lean clay to fat clay, with shale and limestone fragments, varying amounts of sand, brown and dark gray            |
| 4 | Residium            | Lean clay, with shale bedding planes and varying amounts of limestone floaters, brown and gray, very stiff to hard |
| 5 | Bedrock             | Interbedded Shale and Limestone  |

| Legend |           |
|--------|-----------|
|        | Topsoil   |
|        | Lean Clay |
|        | Fill      |
|        | ARG       |

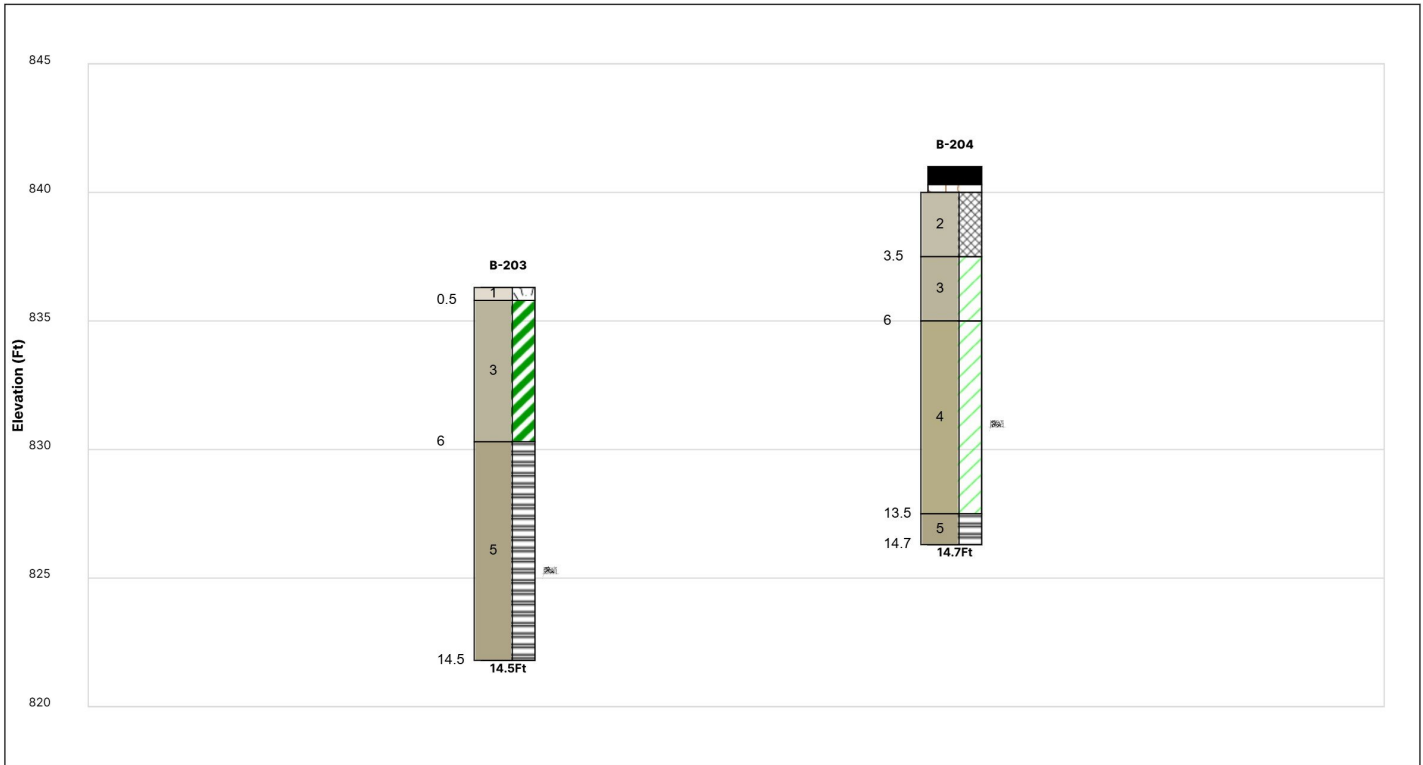
Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.  
 Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. 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.

- First Water Observation
- Second Water Observation
- Third Water Observation

## GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions

| # | Layer Name                 | General Description  |
|---|----------------------------|--|
| 1 | <b>Surficial Materials</b> | Topsoil, pavements, and aggregate base   |
| 2 | <b>Existing Fill</b>       | Lean clay to fat clay, with shale and limestone fragments, varying amounts of sand, brown and dark gray            |
| 3 | <b>Overburden</b>          | Lean clay and fat clay, varying amounts of sand and gravel, brown and gray, stiff to very stiff                    |
| 4 | <b>Residium</b>            | Lean clay, with shale bedding planes and varying amounts of limestone floaters, brown and gray, very stiff to hard |
| 5 | <b>Bedrock</b>             | Interbedded Shale and Limestone  |

| Legend |         |  |                       |
|--------|---------|--|-----------------------|
|        | Asphalt |  | Aggregate Base Course |
|        | ARG     |  | Topsoil               |
|        | Fill    |  | Fat Clay              |
|        |         |  | Lean Clay             |

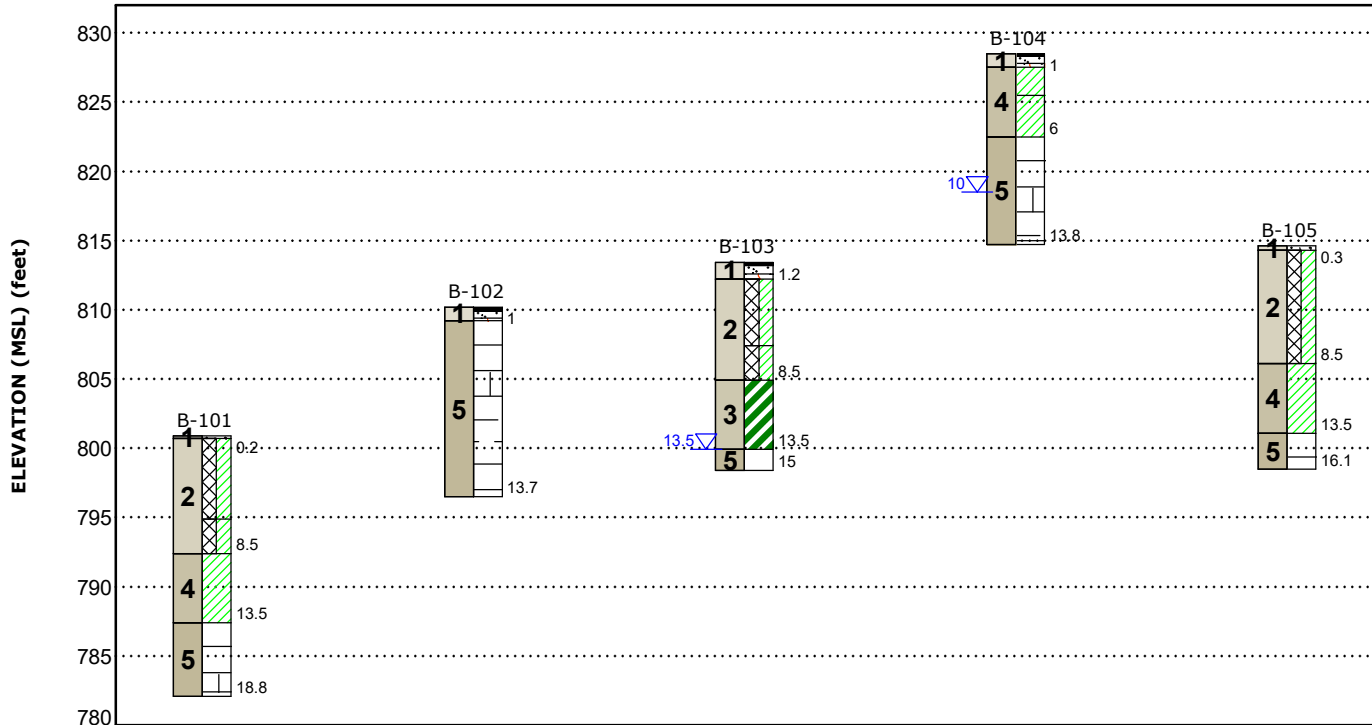
Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.  
 Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. 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.

- First Water Observation
- Second Water Observation
- Third Water Observation

## GeoModel



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  | Legend                          |                       |
|-------------|----------------------------|--|---------------------------------|-----------------------|
| 1           | <b>Surficial Materials</b> | Topsoil, pavements, and aggregate base   | Topsoil                         | Lean Clay             |
| 2           | <b>Existing Fill</b>       | Lean clay with shale and limestone fragments, sand, brown and gray   | Interbedded Limestone and Shale | Asphalt               |
| 3           | <b>Alluvium</b>            | Fat clay with shale and limestone fragments, organics, gray and brown, stiff   | Concrete                        | Aggregate Base Course |
| 4           | <b>Residuum</b>            | Lean clay with remnant shale beds/bedding planes and limestone floaters, brown and gray, stiff to hard   | Fat Clay                        |                       |
| 5           | <b>Bedrock</b>             | Interbedded highly to slightly weathered, extremely to very weak shale and fresh to slightly weathered, medium strong to very strong limestone |                                 |                       |

**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.

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.

## Attachments

# Exploration and Testing Procedures

## Field Exploration

| Number of Borings | Approximate Boring Depth (ft.) <sup>1</sup> | Location <sup>2</sup> |
|-------------------|---|-----------------------|
| 4                 | 14.5 to 28.9                                | Along sewer alignment |

1. Depths are measured from the existing ground surface.
2. Refer to the Exploration Plan in [Site Location and Exploration Plans](#).

Boring Layout and Elevations: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about  $\pm 10$  feet). Approximate ground surface elevations were obtained by interpolation from the 90% Plans from Verdantas or from the GPS equipment (refer to notes on the boring logs). The location and surface elevations of the test borings should only be considered accurate to the degree implied by the means and methods used to define them. Terracon notified Kentucky 811, SD1, and Northern Kentucky Water District to mark public utilities on-site and used GPR and electromagnetic scanning for private utilities around the boring locations before performing the boreholes. If more precise elevations and boring layout are desired, we recommend borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with a track-mounted, rotary drill rig using hollow-stem continuous-flight augers. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. Soil sampling was typically performed using split-barrel sampling procedures and occasionally using thin-walled (Shelby) tubes. 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. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the cohesive soil to obtain a relatively undisturbed sample. Where bedrock was encountered within exploration depth, limited bedrock sampling was attempted by overdriving the split-barrel sampler; rock coring was not performed. We observed and recorded short-term groundwater levels in the boreholes during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion. Existing pavement at borehole locations were patched with asphalt concrete.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring logs. The samples were placed in appropriate containers

and/or sealed and then taken to our soil laboratory for testing and classification by a geotechnical engineer or a geologist, under the direction of 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 observed 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 Geotechnical Engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Water content
- Atterberg limits
- Unconfined compressive strength of soil

Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System (USCS).

Rock classification was conducted using locally accepted practices for engineering purposes. Boring log rock classification was determined using Terracon's Rock Classification Notes.

## Site Location and Exploration Plans

### Contents:

Site Location Plan  
Exploration Plan  
Exploration Plan with 1963 NKAPC Topography

Note: All attachments are one page unless noted above.

## Site Location Plan

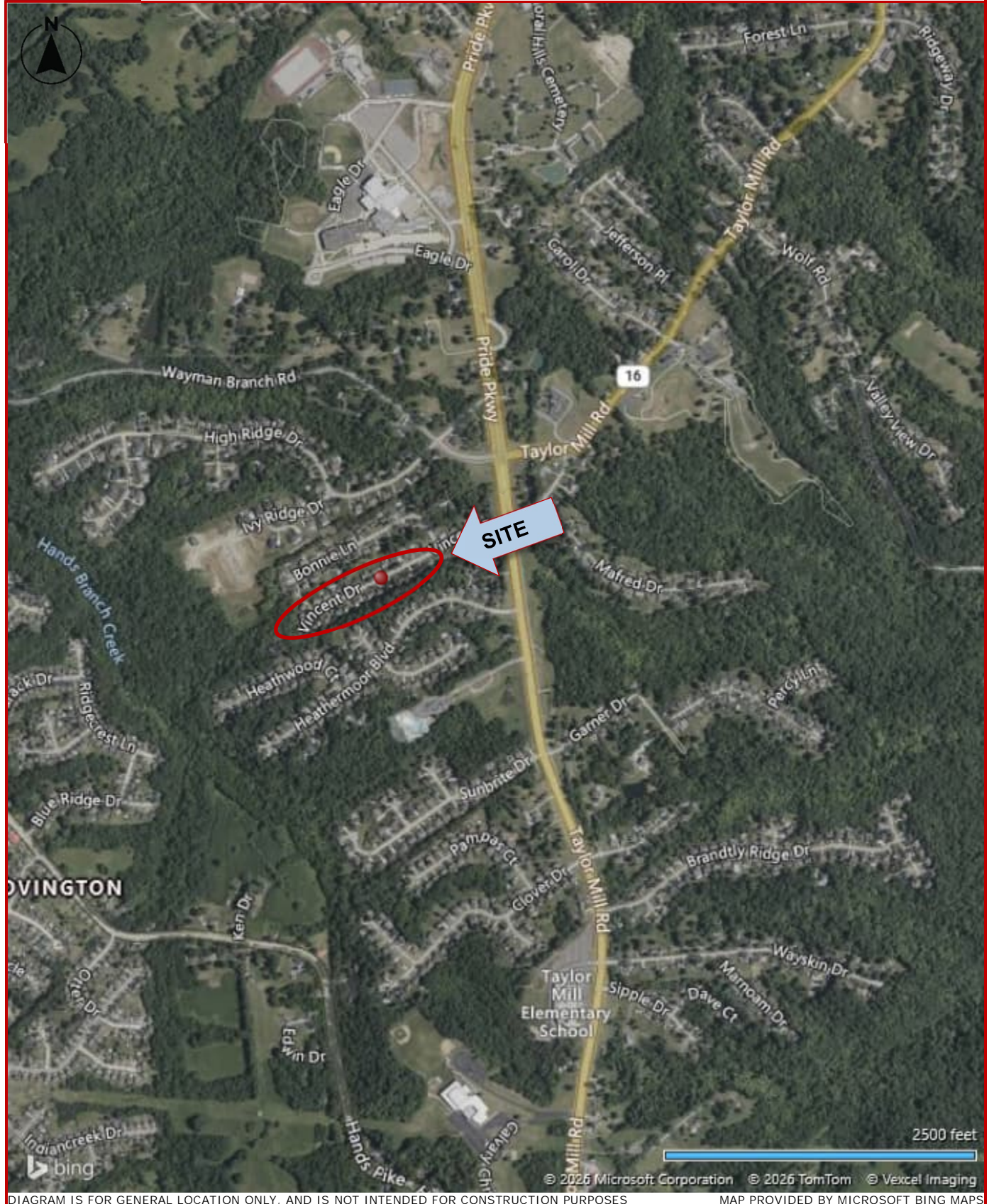


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES MAP PROVIDED BY MICROSOFT BING MAPS

### Exploration Plan

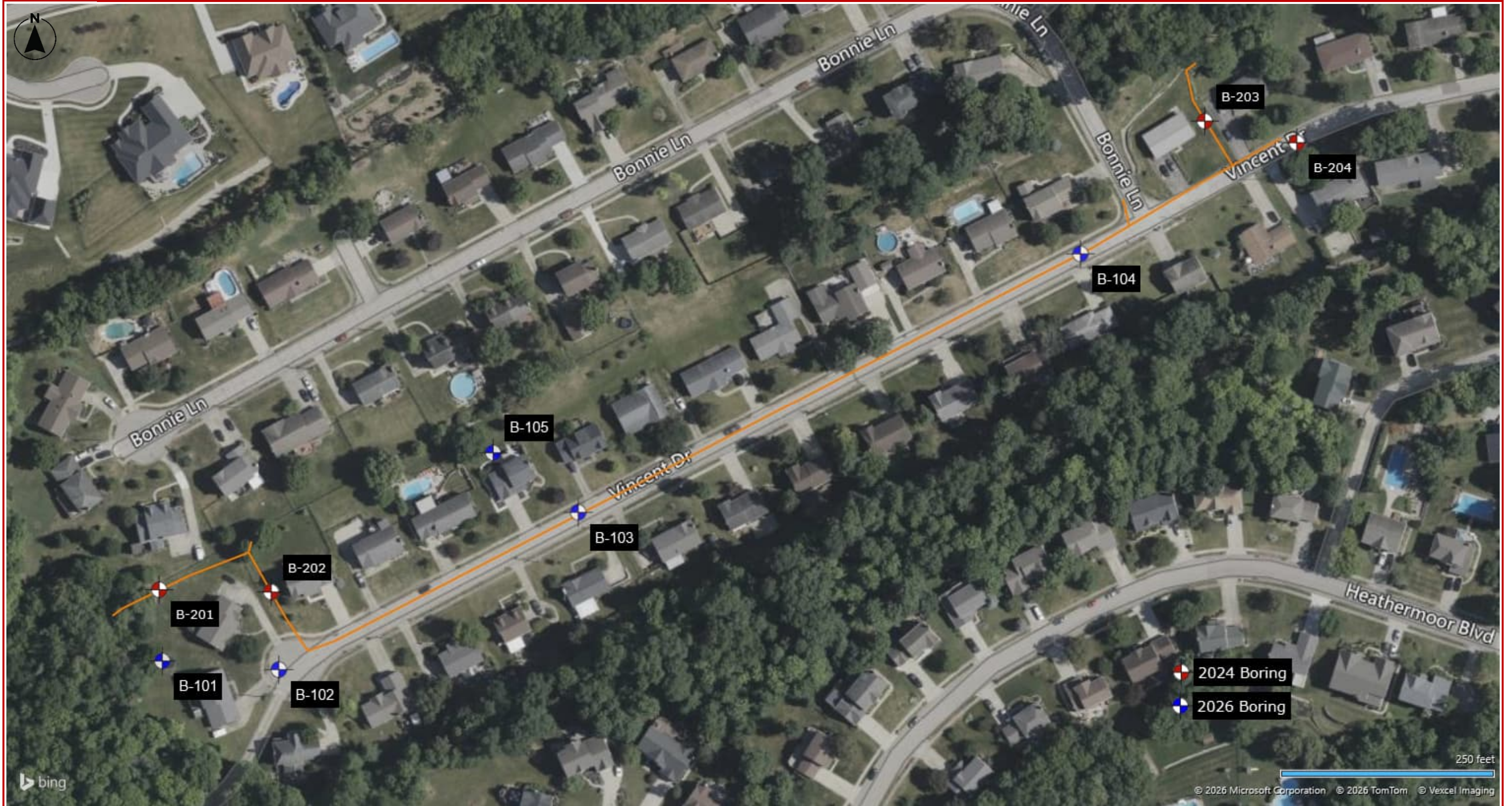


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

### Exploration Plan with 1963 NKAPC Topography



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

## Exploration and Laboratory Results

### Contents:

- 2026 Boring Logs (B-201 through B-204)
- 2024 Boring logs (B-101 through B-105)
- 2026 Atterberg Limit (5 pages)
- 2024 Atterberg Limits
- 2026 Unconfined Compressive Strength
- 2024 Unconfined Compressive Strength (2 pages)

Note: All attachments are one page unless noted above.

### BORING LOG NO. B-201

| Model Layer | Graphic Log | Lithology Depth (Ft.) | Material Description   | Depth (Ft.) | Elevation (Ft.) | Sample Type | Recovery (In.) | Water Level Observations | Field Test Results | Hand Penetrometer (tsf) | Strength Test              |                   | Atterberg Limits |    |    |  |
|-------------|-------------|-----------------------|--|-------------|-----------------|-------------|----------------|--------------------------|--------------------|-------------------------|----------------------------|-------------------|------------------|----|----|--|
|             |             |                       |  |             |                 |             |                |                          |                    |                         | Compressive Strength (tsf) | Water Content (%) | LL               | PL | PI |  |
| 1           |             | 0.5                   | <b>TOPSOIL</b> , (6 Inches)  |             | 800.0           |             |                |                          |                    |                         |                            |                   |                  |    |    |  |
| 2           |             | 5.0                   | <b>FILL- LEAN TO FAT CLAY</b> , brown and gray, trace limestone floaters/fragments, trace wood fragments<br><br>grinding on limestone floaters at 5 feet |             | 799.5           | 7           |                |                          | 7-50/5"            | 1.25                    |                            | 21                |                  |    |    |  |
|             |             |                       |  |             | 795.0           | 12          |                | 2-4-5<br>N = 9           | 0.75               |                         | 25                         |                   |                  |    |    |  |
|             |             |                       |  |             |                 | 10          |                | 3-3-3<br>N = 6           | 0.5                |                         | 26                         |                   |                  |    |    |  |
|             |             |                       |  |             |                 | 13          |                | 1-2-3<br>N = 5           | 0.25               |                         | 29                         |                   |                  |    |    |  |
|             |             |                       |  |             |                 | 18          |                |                          |                    |                         | 1.64                       | 23.6              | 51               | 21 | 30 |  |
| 5           |             | 18.5                  | <b>FILL- LEAN CLAY</b> , brown and gray, trace limestone fragments, trace wood fragments   |             | 781.5           | 16          |                |                          | 3-4-6<br>N = 10    | 2.0                     |                            | 25                | 42               | 21 | 21 |  |
|             |             |                       |  |             | 776.5           | 11          |                | 14-15-34<br>N = 49       | 4.5                |                         | 18                         |                   |                  |    |    |  |
|             |             |                       |  |             |                 | 2           |                | 50/5"                    |                    |                         |                            |                   |                  |    |    |  |
|             |             |                       | <b>Boring Refusal at 28.9 Ft</b>   |             |                 |             |                |                          |                    |                         |                            |                   |                  |    |    |  |

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.

**Notes**  
 Elevation Reference: NAVD88; Coordinates estimated from field measurements off existing site features and elevations interpolated from site topographic plan from Verdantas Hammer ETR = 85.0% (Calibrated 12/30/2024)

**Water Level Observations**  
 23.5 Ft. While drilling  
 6 Ft. While drilling  
 Groundwater not encountered upon completion

**Advancement Method**  
 0-28.9 Ft. 3.25" Hollow Stem Auger

**Abandonment Method**  
 Boring backfilled with auger cuttings. Surface capped with concrete upon completion.

**Drill Rig**  
 932/Diedrich D-50  
**Hammer Type**  
 Automatic  
**Driller**  
 P. Pennesi  
**Logged By**  
 J. Hauber  
**Boring Started**  
 01/29/2026  
**Boring Completed**  
 01/29/2026

## BORING LOG NO. B-202

| Model Layer | Graphic Log | Lithology Depth (Ft.) | Material Description   | Depth (Ft.) | Elevation (Ft.) | Sample Type | Recovery (In.) | Water Level Observations | Field Test Results | Hand Penetrometer (tsf) | Water Content (%) | Atterberg Limits |    |    |  |
|-------------|-------------|-----------------------|--|-------------|-----------------|-------------|----------------|--------------------------|--------------------|-------------------------|-------------------|------------------|----|----|--|
|             |             |                       |  |             |                 |             |                |                          |                    |                         |                   | LL               | PL | PI |  |
| 1           |             | 0.5                   | <b>TOPSOIL</b> , 6 inches  | 0.5         | 804.9           |             |                |                          |                    |                         |                   |                  |    |    |  |
| 2           |             |                       | <b>FILL - LEAN CLAY</b> , trace sand, trace gravel, brown with grayish brown   |             | 804.4           |             | 8              |                          | 4-3-3<br>N = 6     | 1.25                    | 26                | 43               | 20 | 23 |  |
| 4           |             | 8.5                   | <b>LEAN CLAY (CL)</b> , brown and olive brown with gray, very stiff to hard, trace limestone floaters/layers, (Residuum)   | 8.5         | 796.4           |             | 13             |                          | 2-7-18<br>N = 25   | 4.5                     | 18                |                  |    |    |  |
|             |             | 11.5                  | 6-inch thick limestone layer at 11.5 feet  | 11.5        | 793.4           |             |                |                          |                    |                         |                   |                  |    |    |  |
| 5           |             | 13.5                  | <b>INTERBEDDED SHALE AND LIMESTONE</b><br>Shale: brown with gray, highly weathered, extremely weak<br>Limestone: gray, slightly weathered, medium strong to strong | 13.5        | 791.4           |             | 8              |                          | 24-24-43<br>N = 67 | 4.5                     | 11                |                  |    |    |  |
|             |             |                       | <b>Boring Refusal at 17.2 Ft</b>   | 17.2        |                 |             | 2              |                          | 50/2"              |                         | 5                 |                  |    |    |  |

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.

**Notes**  
 Elevation Reference: NAVD88; Coordinates estimated from field measurements off existing site features and elevations interpolated from site topographic plan from Verdantas  
 Hammer ETR = 85.0% (Calibrated 12/30/2024)

**Water Level Observations**  
 17 Ft. While drilling  
 16 Ft. At completion of drilling  
 17 Ft. Wet cave In

**Advancement Method**  
 0-17.7 Ft. 3.25" Hollow Stem Auger

**Abandonment Method**  
 Boring backfilled with auger cuttings. Surface capped with concrete upon completion.

**Drill Rig**  
 932/Diedrich D-50  
**Hammer Type**  
 Automatic  
**Driller**  
 P. Pennesi

**Logged By**  
 J. Friend  
**Boring Started**  
 01/23/2026  
**Boring Completed**  
 01/23/2026

## BORING LOG NO. B-203

| Model Layer | Graphic Log | Lithology Depth (Ft.) | Material Description   | Depth (Ft.) | Elevation (Ft.) | Sample Type | Recovery (In.) | Water Level Observations | Field Test Results | Hand Penetrometer (tsf) | Water Content (%) | Atterberg Limits |    |    |  |
|-------------|-------------|-----------------------|--|-------------|-----------------|-------------|----------------|--------------------------|--------------------|-------------------------|-------------------|------------------|----|----|--|
|             |             |                       |  |             |                 |             |                |                          |                    |                         |                   | LL               | PL | PI |  |
| 1           |             | 0.5                   | <b>TOPSOIL</b> , (6 Inches)  |             | 836.3           |             |                |                          |                    |                         |                   |                  |    |    |  |
| 3           |             |                       | <b>FAT CLAY (CH)</b> , trace sand, brown, very stiff, trace concretions  |             | 835.8           |             | 9              |                          | 4-4-5<br>N = 9     | 2.75                    | 23                |                  |    |    |  |
|             |             |                       |  |             |                 |             | 12             |                          | 2-3-5<br>N = 8     | 2.75                    | 25                | 52               | 23 | 29 |  |
| 5           |             | 6.0                   | <b>INTERBEDDED SHALE AND LIMESTONE</b><br>Shale: brown, highly weathered, extremely weak<br>Limestone: gray, slightly weathered, medium strong to strong |             | 830.3           |             | 12             |                          | 25-21-23<br>N = 44 | 4.5                     | 5                 |                  |    |    |  |
|             |             |                       |  |             |                 |             | 4              |                          |                    |                         | 19                |                  |    |    |  |
|             |             |                       |  |             |                 |             | 3              |                          | 44-50/2"           |                         | 9                 |                  |    |    |  |
|             |             |                       |  |             |                 |             | 2              |                          | 50/3"              |                         |                   |                  |    |    |  |
|             |             |                       | <b>Boring Refusal at 14.5 Ft</b>   |             |                 |             |                |                          |                    |                         |                   |                  |    |    |  |

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.

**Notes**  
 Elevation Reference: NAVD88; Coordinates and Elevations by Emlid GPS Equipment  
 Hammer ETR = 85.0% (Calibrated 12/30/2024)

**Water Level Observations**

Groundwater not encountered while drilling  
 Groundwater not encountered upon completion  
 11 Ft. Dry cave in

**Advancement Method**  
 0-14.5 Ft. 3.25" Hollow Stem Auger

**Abandonment Method**  
 Boring backfilled with auger cuttings. Surface capped with concrete upon completion.

**Drill Rig**  
 932/Diedrich D-50

**Hammer Type**  
 Automatic

**Driller**  
 P. Pennesi

**Logged By**  
 J. Friend

**Boring Started**  
 01/23/2026

**Boring Completed**  
 01/23/2026

## BORING LOG NO. B-204

| Model Layer | Graphic Log | Lithology Depth (Ft.) | Material Description   | Depth (Ft.) | Elevation (Ft.) | Sample Type | Recovery (In.) | Water Level Observations | Field Test Results | Hand Penetrometer (tsf) | Water Content (%) | Atterberg Limits |    |    |  |
|-------------|-------------|-----------------------|--|-------------|-----------------|-------------|----------------|--------------------------|--------------------|-------------------------|-------------------|------------------|----|----|--|
|             |             |                       |  |             |                 |             |                |                          |                    |                         |                   | LL               | PL | PI |  |
|             |             | 0.7                   | <b>ASPHALT</b> , 8 inches  |             | 841.0           |             |                |                          |                    |                         |                   |                  |    |    |  |
|             |             | 1.0                   | <b>AGGREGATE BASE COURSE</b> , 4 inches  |             | 840.3           |             |                |                          |                    |                         |                   |                  |    |    |  |
| 2           |             |                       | <b>FILL - LEAN CLAY</b> , trace sand, dark gray with brown, trace petroleum odor, moderately plastic   |             | 840.0           |             | 12             |                          | 2-4-8<br>N = 12    | 1.25                    | 29                | 33               | 17 | 16 |  |
| 3           |             |                       | <b>LEAN CLAY (CL)</b> , trace sand, brown with brownish gray, stiff, moderately plastic  |             | 837.5           |             | 12             |                          | 2-2-5<br>N = 7     | 1.5                     | 31                |                  |    |    |  |
|             |             | 6.0                   | <b>LEAN CLAY (CL)</b> , brown and gray, very stiff, trace limestone floaters/layers, (Residuum)  |             | 835.0           |             | 16             |                          | 6-10-15<br>N = 25  | 3.75                    | 23                |                  |    |    |  |
| 4           |             |                       |  |             |                 |             | 3              |                          |                    |                         | 10                |                  |    |    |  |
|             |             | 13.5                  | <b>INTERBEDDED SHALE AND LIMESTONE</b><br>Shale: brown with gray, highly weathered, extremely weak<br>Limestone: gray, slightly weathered, medium strong to strong |             | 827.5           |             | 12             |                          | 17-49-50/2"        | 4.5                     | 3                 |                  |    |    |  |
|             |             |                       | <b>Boring Refusal at 14.7 Ft</b>   |             |                 |             |                |                          |                    |                         |                   |                  |    |    |  |

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.

**Notes**  
 Elevation Reference: NAVD88; Coordinates by Emlid GPS Equipment and elevations interpolated from site Topographic plan from Verdantas  
 Hammer ETR = 85.0% (Calibrated 12/30/2024)

**Water Level Observations**

Groundwater not encountered while drilling  
 Groundwater not encountered upon completion  
 10 Ft. Dry cave in

**Advancement Method**  
 0-14.7 Ft. 3.25" Hollow Stem Auger

**Abandonment Method**  
 Boring backfilled with auger cuttings. Surface capped with concrete upon completion.

**Drill Rig**  
 932/Diedrich D-50

**Hammer Type**  
 Automatic

**Driller**  
 P. Pennesi

**Logged By**  
 J. Friend

**Boring Started**  
 01/22/2026

**Boring Completed**  
 01/22/2026

## Boring Log No. B-101

| Model Layer | Graphic Log  | Location: See <a href="#">Exploration Plan</a><br>Latitude: 38.987454° Longitude: -84.509977°<br>Depth (Ft.) Elevation.: 800.9 (Ft.) | Depth (Ft.) | Water Level Observations | Sample Type | Recovery (%) | Field Test Results | HP (tsf)    | Unconfined Compressive Strength (tsf) | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits |
|-------------|--|--|-------------|--------------------------|-------------|--------------|--------------------|-------------|---------------------------------------|-------------------|-----------------------|------------------|
|             |  |  |             |                          |             |              |                    |             |                                       |                   |                       | LL-PL-PI         |
| 1           | TOPSOIL (2 INCHES)   |  | 0.2         |                          |             |              |                    |             |                                       |                   |                       |                  |
| 2           | FILL - LEAN CLAY, with shale and limestone fragments, trace sand, trace mineral oxide concretions, brown to gray brown   |  | 5           |                          |             | 56           | 3-13-12<br>N=25    | 4.5<br>(HP) |                                       | 12.2              |                       | 39-21-18         |
|             | FILL - LEAN CLAY, trace limestone fragments, sand, mineral oxide concretions, trace organics, gray and brown   |  | 6.0         |                          |             | 33           | 6-3-6<br>N=9       | 4.0<br>(HP) |                                       |                   |                       |                  |
|             | FILL - LEAN CLAY, trace limestone fragments, sand, mineral oxide concretions, trace organics, gray and brown   |  | 8.5         |                          |             | 100          | 4-3-4<br>N=7       | 4.0<br>(HP) |                                       | 18.8              |                       |                  |
| 4           | LEAN CLAY (CL), trace limestone floaters, root hairs, mineral oxide concretions, remnant bedding, brown and gray, very stiff, (RESIDUUM)   |  | 10          |                          |             | 72           | 4-15-9<br>N=24     | 2.5<br>(HP) |                                       | 25.5              |                       |                  |
| 5           | INTERBEDDED SHALE AND LIMESTONE<br>SHALE, brown with gray, highly weathered, extremely weak<br>LIMESTONE, gray, slightly weathered, medium strong to very strong                                     |  | 15          |                          |             | 67           | 14-49-43<br>N=92   |             |                                       | 4.8               |                       |                  |
|             | INTERBEDDED SHALE AND LIMESTONE<br>SHALE, gray, slightly weathered, very weak, fissile<br>LIMESTONE, gray, slightly weathered, medium strong to very strong<br><b>Boring Terminated at 18.8 Feet</b> |  | 18.8        |                          |             | 100          | 50/4"              |             |                                       | 4.9               |                       |                  |

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.  
 Elevation Reference: Elevations surveyed with handheld GPS unit. Elevation Datum: NAVD88

**Water Level Observations**

Water was not encountered during drilling  
 Water was not encountered at completion of drilling  
~~9.6~~ Dry Cave-in at 9.6 feet

**Drill Rig**  
CME 55 - DR 595

**Hammer Type**  
Automatic

**Driller**  
C. Knisley

**Notes**

ETR = 92.3% (Calibration Date: 11/30/2022)

**Advancement Method**

3.25 inch Continuous-Flight Hollow-Stem Auger  
 2 inch Split-Barrel Sampler

**Abandonment Method**

Boring backfilled with auger cuttings upon completion.

**Logged by**  
J. Friend

**Boring Started**  
08-15-2024

**Boring Completed**  
08-15-2024

## Boring Log No. B-102

| Model Layer                           | Graphic Log | Location: See Exploration Plan<br>Latitude: 38.987427° Longitude: -84.509496°   | Depth (Ft.) | Water Level Observations | Sample Type     | Recovery (%) | Field Test Results | HP (tsf) | Unconfined Compressive Strength (tsf) | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits |  |
|---------------------------------------|-------------|---|-------------|--------------------------|-----------------|--------------|--------------------|----------|---------------------------------------|-------------------|-----------------------|------------------|--|
|                                       |             |   |             |                          |                 |              |                    |          |                                       |                   |                       | LL-PL-PI         |  |
| 1                                     | 5           | 0.3 <b>ASPHALT CONCRETE (3 INCHES)</b> <span style="float: right;">Elevation.: 810.2 (Ft.)<br/>809.9</span>   |             |                          |                 |              |                    |          |                                       |                   |                       |                  |  |
|                                       |             | 0.8 <b>PORTLAND CEMENT CONCRETE (6 INCHES)</b> <span style="float: right;">809.4</span>   |             |                          |                 |              |                    |          |                                       |                   |                       |                  |  |
|                                       |             | 1.0 <b>AGGREGATE BASE (3 INCHES)</b> <span style="float: right;">809.2</span>   |             |                          |                 |              |                    |          |                                       |                   |                       |                  |  |
|                                       |             | <b>INTERBEDDED SHALE AND LIMESTONE</b><br><b>SHALE</b> , brown and gray, moderately to highly weathered, extremely weak<br><b>LIMESTONE</b> , gray, fresh to slightly weathered, medium strong to very strong | 5           | 67                       | 9-11-32<br>N=43 | 6.4          |                    |          |                                       |                   |                       |                  |  |
|                                       |             | - 9.5': clay seams within bedrock   | 10          | 100                      | 50/5"           |              |                    |          |                                       |                   |                       |                  |  |
|                                       |             |   | 10          | 100                      | 8-49-50/5"      | 15.0         |                    |          |                                       |                   |                       |                  |  |
|                                       |             |   | 10          | 100                      | 10-50/4"        | 3.75 (HP)    |                    |          |                                       |                   |                       |                  |  |
|                                       |             |   | 13.7        | 796.5                    | 100             | 50/2"        |                    |          |                                       |                   |                       |                  |  |
| <b>Boring Terminated at 13.7 Feet</b> |             |   |             |                          |                 |              |                    |          |                                       |                   |                       |                  |  |

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.  
 Elevation Reference: Elevations surveyed with handheld GPS unit. Elevation Datum: NAVD88

**Notes**  
 ETR = 92.3% (Calibration Date: 11/30/2022)

**Water Level Observations**

Water was not encountered during drilling  
 Water was not encountered at completion of drilling  
 Dry Cave-in at 8.8 feet

**Drill Rig**  
 CME 55 - DR 595

**Hammer Type**  
 Automatic

**Driller**  
 C. Knisley

**Advancement Method**  
 3.25 inch Continuous-Flight Hollow-Stem Auger  
 2 inch Split-Barrel Sampler

**Logged by**  
 J. Friend

**Abandonment Method**  
 Boring backfilled with Auger Cuttings  
 Surface capped with asphalt

**Boring Started**  
 08-12-2024  
**Boring Completed**  
 08-12-2024

## Boring Log No. B-103

| Model Layer                         | Graphic Log | Location: See Exploration Plan<br>Latitude: 38.987930° Longitude: -84.508259°                               | Depth (Ft.)                                | Elevation.: 813.0 (Ft.) | Water Level Observations | Sample Type | Recovery (%) | Field Test Results | HP (tsf)     | Unconfined Compressive Strength (tsf) | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits |  |
|-------------------------------------|-------------|---|--|-------------------------|--------------------------|-------------|--------------|--------------------|--------------|---------------------------------------|-------------------|-----------------------|------------------|--|
|                                     |             |   |  |                         |                          |             |              |                    |              |                                       |                   |                       | LL-PL-PI         |  |
| 1                                   |             | 0.2   | <b>ASPHALT CONCRETE (2 INCHES)</b>         | 812.8                   |                          |             |              |                    |              |                                       |                   |                       |                  |  |
|                                     |             | 0.8   | <b>PORTLAND CEMENT CONCRETE (8 INCHES)</b> | 812.2                   |                          |             |              |                    |              |                                       |                   |                       |                  |  |
|                                     |             | 1.2   | <b>AGGREGATE BASE (4 INCHES)</b>           | 811.8                   |                          |             |              |                    |              |                                       |                   |                       |                  |  |
| 2                                   |             | <b>FILL - LEAN CLAY</b> , trace shale fragments, brown  |  |                         |                          |             | 39           | 2-3-3<br>N=6       | 1.25<br>(HP) |                                       | 25.2              |                       |                  |  |
|                                     |             |   |  |                         |                          |             | 39           | 5-7-7<br>N=14      | 2.5<br>(HP)  |                                       |                   |                       | 42-19-23         |  |
|                                     |             | 6.0   | <b>FILL - LEAN CLAY</b> , grayish brown    | 807                     |                          |             |              | 61                 | 2-3-3<br>N=6 | 0.5<br>(HP)                           |                   | 24.1                  |                  |  |
| 3                                   |             | <b>FAT CLAY (CH)</b> , trace shale and limestone fragments, and organics, gray and brown, stiff, (Alluvium) |  | 8.5                     | 804.5                    |             |              |                    |              |                                       |                   |                       |                  |  |
|                                     |             |   |  |                         |                          |             | 61           | 4-7-10<br>N=17     | 2<br>(HP)    |                                       | 27.7              |                       | 54-22-32         |  |
| 5                                   |             | <b>INTERBEDDED SHALE AND LIMESTONE</b>  |  | 13.5                    | 799.5                    |             |              |                    |              |                                       |                   |                       |                  |  |
|                                     |             | <b>SHALE</b> , brown and gray, highly weathered, extremely weak   |  |                         |                          |             |              | 100                | 49-30-50/1"  |                                       |                   |                       |                  |  |
|                                     |             | <b>LIMESTONE</b> , gray, fresh to slightly weathered, medium strong to very strong                          |  | 15.0                    | 798                      |             |              |                    |              |                                       |                   |                       |                  |  |
| <b>Boring Terminated at 15 Feet</b> |             |   |  |                         |                          |             |              |                    |              |                                       |                   |                       |                  |  |

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.  
 Elevation Reference: Elevations were surveyed by the client. Elevation Datum: NAVD88

**Notes**  
 ETR = 92.3% (Calibration Date: 11/30/2022)

**Water Level Observations**  
 Water observed at 13.5 feet during drilling  
 Water was not encountered at completion of drilling  
 Dry Cave-in at 7 feet

**Drill Rig**  
 CME 55 - DR 595  
**Hammer Type**  
 Automatic  
**Driller**  
 C. Knisley

**Advancement Method**  
 3.25 inch Continuous-Flight Hollow-Stem Auger  
 2 inch Split-Barrel Sampler

**Logged by**  
 J. Friend  
**Boring Started**  
 08-12-2024  
**Boring Completed**  
 08-12-2024

**Abandonment Method**  
 Boring backfilled with Auger Cuttings  
 Surface capped with asphalt

## Boring Log No. B-104

| Model Layer | Graphic Log | Location: See Exploration Plan<br>Latitude: 38.988761° Longitude: -84.506185°<br>Depth (Ft.) Elevation.: 827.7 (Ft.)  | Depth (Ft.) | Water Level Observations | Sample Type | Recovery (%) | Field Test Results | HP (tsf)    | Unconfined Compressive Strength (tsf) | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits |  |
|-------------|-------------|---|-------------|--------------------------|-------------|--------------|--------------------|-------------|---------------------------------------|-------------------|-----------------------|------------------|--|
|             |             |   |             |                          |             |              |                    |             |                                       |                   |                       | LL-PL-PI         |  |
| 1           |             | 0.2 <b>ASPHALT CONCRETE (2 INCHES)</b> 827.5  |             |                          |             |              |                    |             |                                       |                   |                       |                  |  |
|             |             | 0.7 <b>PORTLAND CEMENT CONCRETE (6 INCHES)</b> 827  |             |                          |             |              |                    |             |                                       |                   |                       |                  |  |
|             |             | 1.0 <b>AGGREGATE BASE (4 INCHES)</b> 826.7  |             |                          |             |              |                    |             |                                       |                   |                       |                  |  |
| 4           |             | <b>LEAN CLAY (CL)</b> , trace mineral oxide concretions, gray and brown, stiff to very stiff, (RESIDUUM)<br>3.0 824.7   |             |                          | X           | 89           | 3-3-3<br>N=6       | 2.5<br>(HP) |                                       | 26.2              |                       |                  |  |
|             |             | <b>LEAN CLAY (CL)</b> , with remnant bedding, trace mineral oxide concretion stains, brown with gray, medium stiff to stiff, (RESIDUUM)<br>6.0 821.7  |             |                          | ■           | 58           |                    | 4.5<br>(HP) | 0.84                                  | 22.8              | 102                   |                  |  |
| 5           |             | <b>INTERBEDDED SHALE AND LIMESTONE</b><br><b>SHALE</b> , gray and brown, highly weathered, extremely weak<br><b>LIMESTONE</b> , gray, slightly weathered, medium strong to very strong<br>13.5 814.2  |             |                          | X           | 89           | 27-22-28<br>N=50   |             |                                       | 16.2              |                       |                  |  |
|             |             |   |             |                          | X           | 100          | 11-15-50/5"        |             |                                       |                   |                       |                  |  |
|             |             |   |             |                          | X           | 100          | 50/4"              |             |                                       | 2.8               |                       |                  |  |
|             |             | <b>INTERBEDDED SHALE AND LIMESTONE</b><br><b>SHALE</b> , gray, slightly weathered, extremely weak to very weak<br><b>LIMESTONE</b> , gray, fresh to slightly weathered, medium strong to very strong<br><b>Boring Terminated at 13.8 Feet</b><br>13.8 813.9 |             |                          | X           | 100          | 50/4"              |             |                                       | 2.8               |                       |                  |  |

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.

Elevation Reference: Elevations were surveyed by the client. Elevation Datum: NAVD88

**Notes**

ETR = 92.3% (Calibration Date: 11/30/2022)

**Water Level Observations**

Water observed at 10 feet during drilling

Water was not encountered at completion of drilling

Dry Cave-in at 7 feet

**Drill Rig**

CME 55 - DR 595

**Hammer Type**

Automatic

**Driller**

C. Knisley

**Advancement Method**

3.25 inch Continuous-Flight Hollow-Stem Auger  
 2 inch Split-Barrel Sampler  
 3 inch Shelby Tube

**Abandonment Method**

Boring backfilled with Auger Cuttings  
 Surface capped with asphalt

**Logged by**

J. Friend

**Boring Started**

08-12-2024

**Boring Completed**

08-12-2024

## Boring Log No. B-105

| Model Layer | Graphic Log | Location: See Exploration Plan  |                         | Depth (Ft.) | Water Level Observations | Sample Type | Recovery (%) | Field Test Results | HP (tsf)     | Unconfined Compressive Strength (tsf) | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits |
|-------------|-------------|---|-------------------------|-------------|--------------------------|-------------|--------------|--------------------|--------------|---------------------------------------|-------------------|-----------------------|------------------|
|             |             | Latitude: 38.988121° Longitude: -84.508610°   | Elevation.: 813.8 (Ft.) |             |                          |             |              |                    |              |                                       |                   |                       | LL-PL-PI         |
| 1           | 0.3         | <b>TOPSOIL (3 INCHES)</b>   |                         | 813.5       |                          |             |              |                    |              |                                       |                   |                       |                  |
|             | 2           | <b>FILL - LEAN CLAY</b> , with limestone fragments and trace root hairs, greenish brown and gray  |                         |             | X                        |             | 6            | 6-9-10<br>N=19     |              |                                       |                   |                       |                  |
|             | 5           |   |                         |             |                          |             | 42           |                    | 3.75<br>(HP) | 3.13                                  | 19.0              | 109                   | 43-23-20         |
|             | 8.5         |   |                         |             | X                        |             | 83           | 2-1-3<br>N=4       | 0.5<br>(HP)  |                                       | 30.0              |                       |                  |
|             | 4           | <b>LEAN CLAY (CL)</b> , trace shale and limestone fragments, mineral oxide concretions, trace bedding, brown and gray, very stiff, (RESIDUUM)                                 |                         |             | X                        |             | 100          | 8-3-6<br>N=9       | 2.75<br>(HP) |                                       | 21.6              |                       |                  |
|             | 13.5        |   |                         |             | X                        |             | 100          | 35-49-50/5"        |              |                                       | 15.3              |                       |                  |
|             | 5           | <b>INTERBEDDED SHALE AND LIMESTONE</b><br><b>SHALE</b> , brown, highly weathered, extremely weak<br><b>LIMESTONE</b> , gray, slightly weathered, medium strong to very strong |                         |             | X                        |             | 100          | 50/1"              |              |                                       |                   |                       |                  |
|             | 16.1        | <b>Boring Terminated at 16.1 Feet</b>   |                         | 797.7       |                          |             | 100          | 50/1"              |              |                                       |                   |                       |                  |

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.  
 Elevation Reference: Elevations were surveyed by the client. Elevation Datum: NAVD88

**Notes**  
 ETR = 92.3% (Calibration Date: 11/30/2022)

**Water Level Observations**

Water was not encountered during drilling  
 Water was not encountered at completion of drilling

Dry Cave-in at 7 feet

**Drill Rig**  
 CME 55 - DR 595

**Hammer Type**  
 Automatic

**Driller**  
 C. Knisley

**Advancement Method**

3.25 inch Continuous-Flight Hollow-Stem Auger  
 2 inch Split-Barrel Sampler  
 3 inch Shelby Tube

**Abandonment Method**

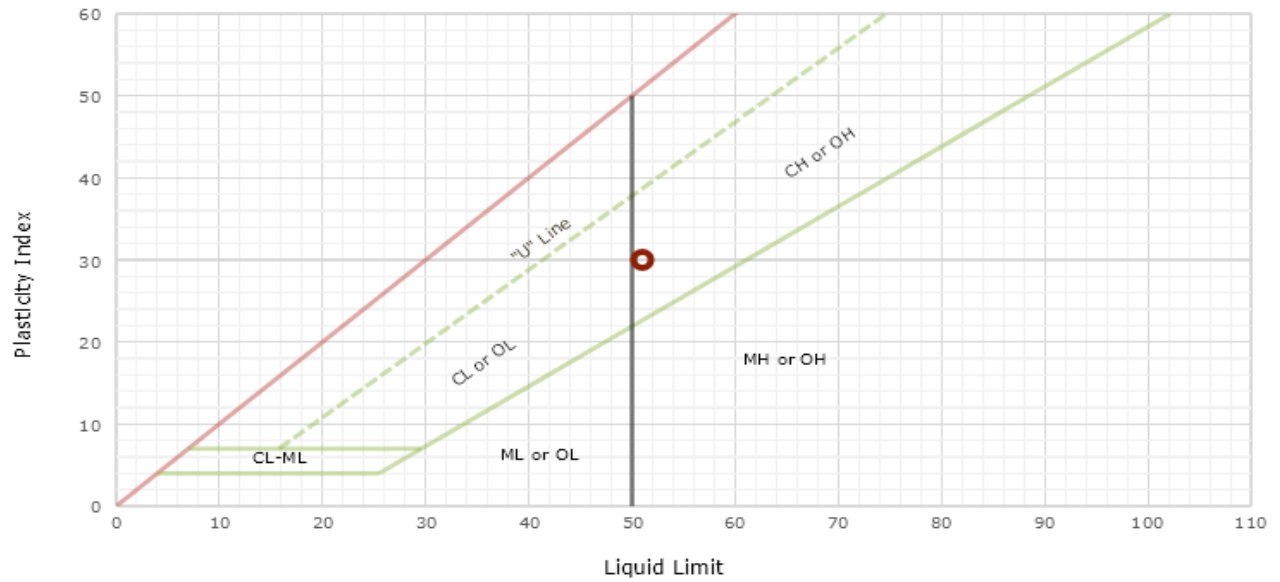
Boring backfilled with auger cuttings upon completion.

**Logged by**  
 J. Friend

**Boring Started**  
 08-15-2024

**Boring Completed**  
 08-15-2024

### Liquid Limit, Plastic Limit and Plasticity Index of Soils ASTM D4318



| Boring ID | Depth (Ft) | LL | PL | PI | Fines (%) | Description | USCS |
|-----------|------------|----|----|----|-----------|-------------|------|
| B-201     | 10-12      | 51 | 21 | 30 |           | Fat Clay    | CH   |

**Remarks**

**Vincent Drive Storm Sewer Realignment**

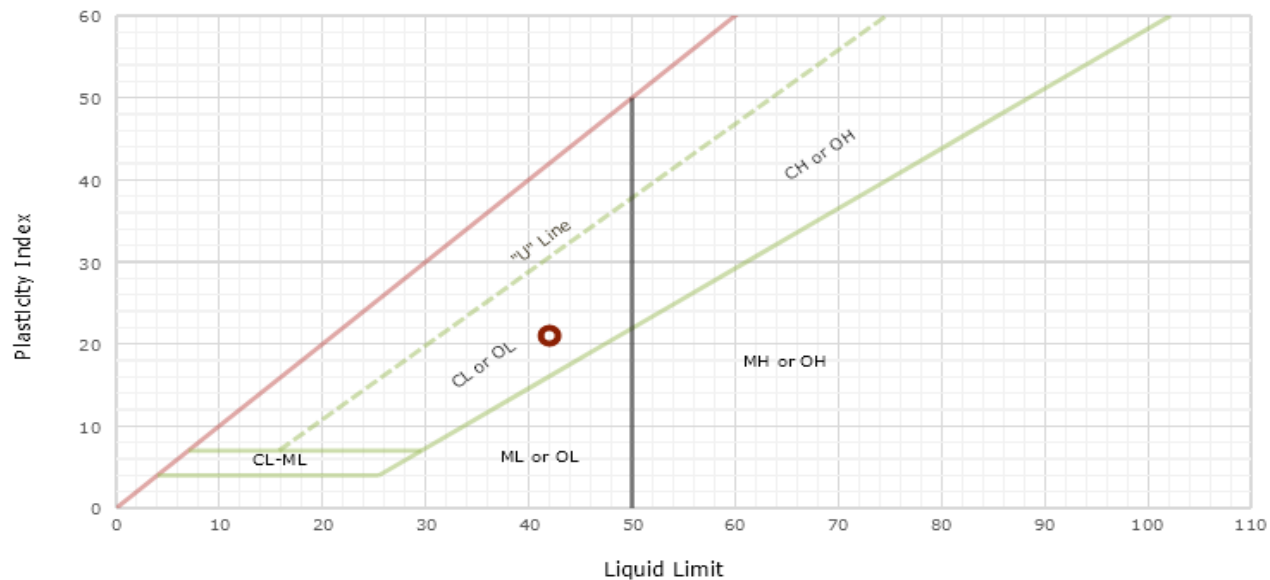
Vincent Drive | Taylor Mill, KY 41015

Terracon Project No. N1255362



611 Lunken Park Dr  
Cincinnati, OH 45226-1813

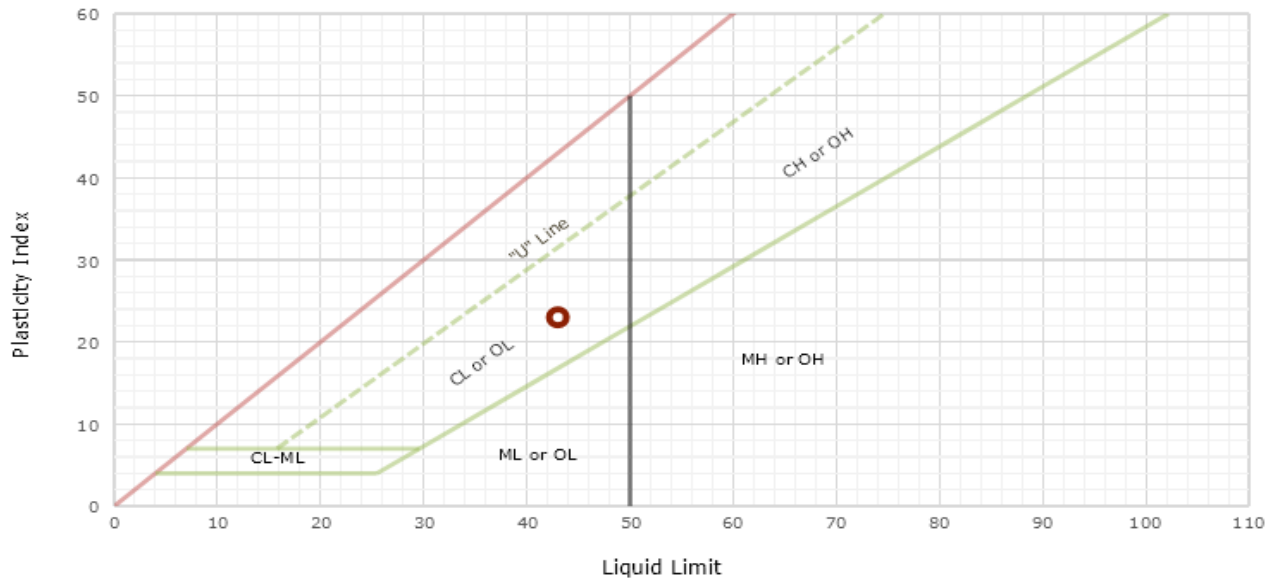
**Liquid Limit, Plastic Limit and Plasticity Index of Soils**  
**ASTM D4318**



| Boring ID | Depth (Ft) | LL | PL | PI | Fines (%) | Description | USCS |
|-----------|------------|----|----|----|-----------|-------------|------|
| B-201     | 18.5-20    | 42 | 21 | 21 |           | Lean Clay   | CL   |

**Remarks**

### Liquid Limit, Plastic Limit and Plasticity Index of Soils ASTM D4318



| Boring ID | Depth (Ft) | LL | PL | PI | Fines (%) | Description | USCS |
|-----------|------------|----|----|----|-----------|-------------|------|
| B-202     | 1-2.5      | 43 | 20 | 23 |           | Lean Clay   | CL   |

**Remarks**

**Vincent Drive Storm Sewer Realignment**

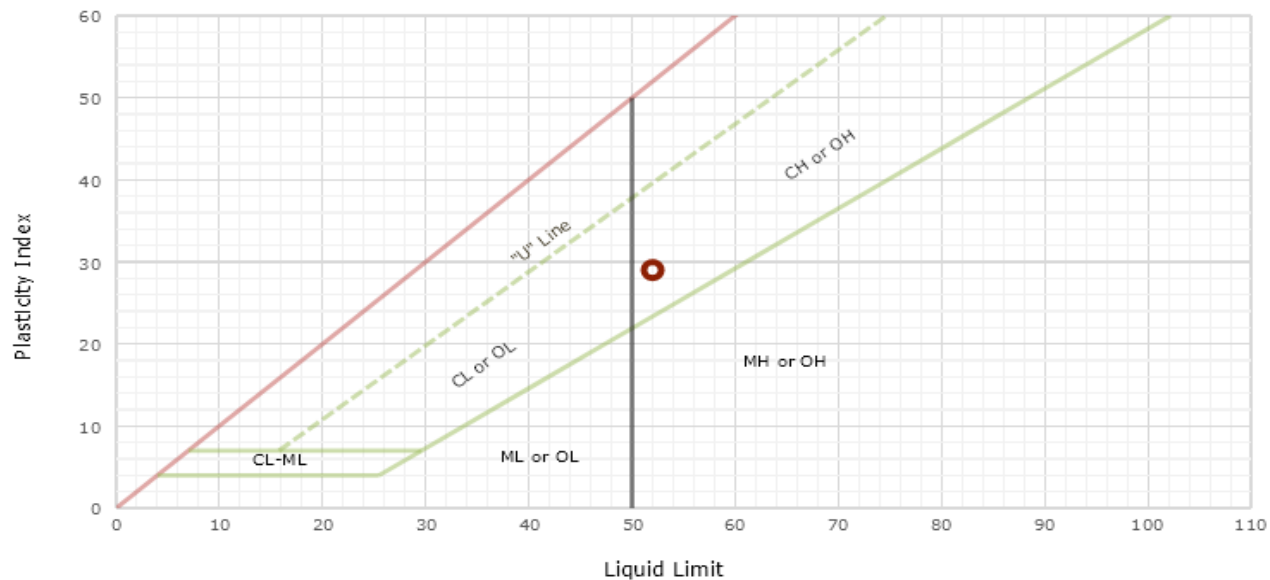
Vincent Drive | Taylor Mill, KY 41015

Terracon Project No. N1255362



611 Lunken Park Dr  
Cincinnati, OH 45226-1813

**Liquid Limit, Plastic Limit and Plasticity Index of Soils**  
**ASTM D4318**



| Boring ID | Depth (Ft) | LL | PL | PI | Fines (%) | Description | USCS |
|-----------|------------|----|----|----|-----------|-------------|------|
| B-203     | 3.5-5      | 52 | 23 | 29 |           | Fat Clay    | CH   |

| Remarks |
|---------|
|         |

**Vincent Drive Storm Sewer Realignment**

Vincent Drive | Taylor Mill, KY 41015

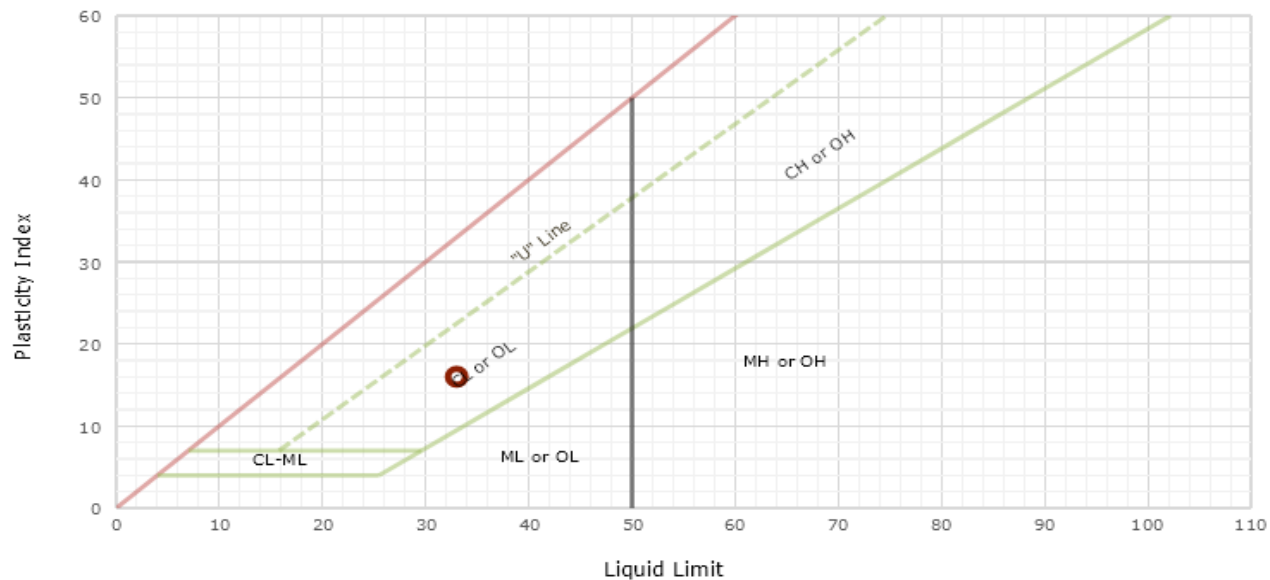
Terracon Project No. N1255362



611 Lunken Park Dr  
Cincinnati, OH 45226-1813

**Liquid Limit, Plastic Limit and Plasticity Index of Soils**

**ASTM D4318**

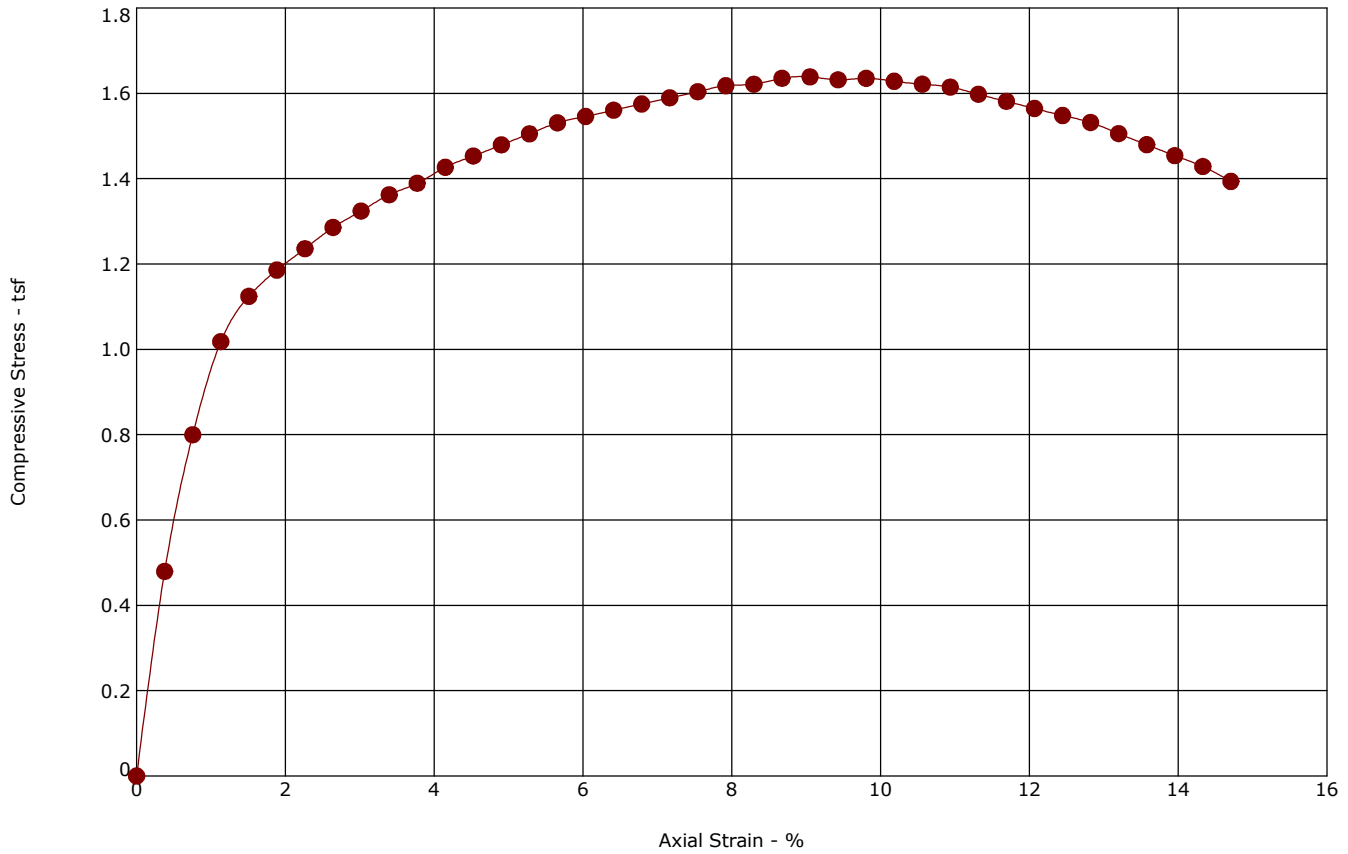


| Boring ID | Depth (Ft) | LL | PL | PI | Fines (%) | Description | USCS |
|-----------|------------|----|----|----|-----------|-------------|------|
| B-204     | 1-2.5      | 33 | 17 | 16 |           | Lean Clay   | CL   |

**Remarks**



## Unconfined Compression Test ASTM D2166



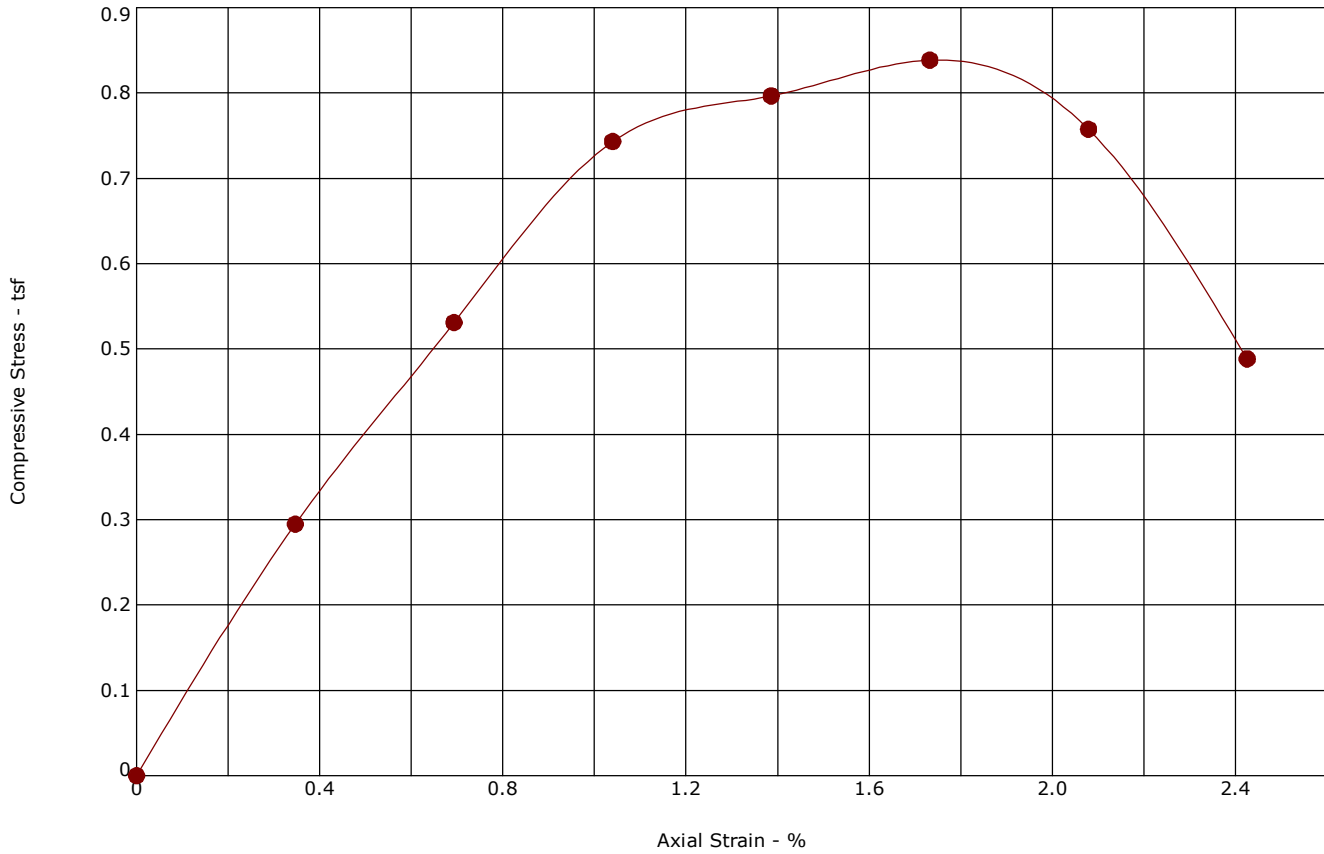
| Boring ID | Depth (Ft) | Sample type | LL | PL | PI | Fines (%) | Description |
|-----------|------------|-------------|----|----|----|-----------|-------------|
| B-201     | 10         |             | 51 | 21 | 30 |           | Fat Clay    |

| Specimen Failure Mode | Specimen Test Data |
|-----------------------|--------------------|
|-----------------------|--------------------|



|  |      |
|--|------|
| Moisture Content (%):                  | 23.6 |
| Dry Density (pcf):                     | 105  |
| Diameter (in.):                        | 2.86 |
| Height (in.):                          | 5.30 |
| Height / Diameter Ratio:               | 1.85 |
| Calculated Saturation (%):             |      |
| Calculated Void Ratio:                 |      |
| Assumed Specific Gravity:              |      |
| Failure Strain (%):                    | 9.05 |
| Unconfined Compressive Strength (tsf): | 1.64 |
| Undrained Shear Strength (tsf):        | 0.82 |
| Strain Rate (in/min):                  |      |
| Remarks:                               |      |

## Unconfined Compression Test ASTM D2166



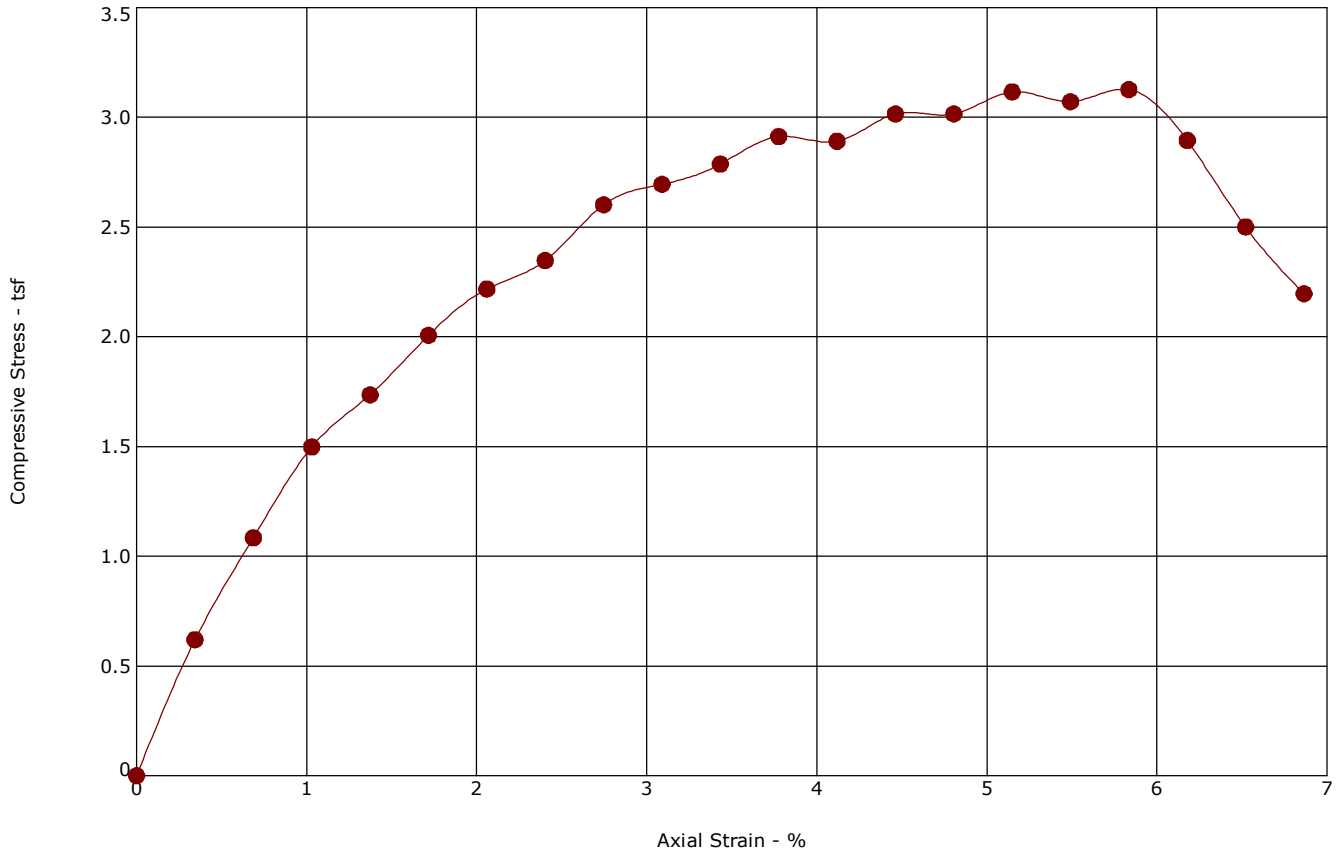
| Boring ID | Depth (Ft) | Sample type | LL | PL | PI | Fines (%) | Description |
|-----------|------------|-------------|----|----|----|-----------|-------------|
| B-104     | 3 - 5      | Shelby Tube |    |    |    |           | LEAN CLAY   |

| Specimen Failure Mode | Specimen Test Data |
|-----------------------|--------------------|
|-----------------------|--------------------|



|  |        |
|--|--------|
| Moisture Content (%):                  | 22.8   |
| Dry Density (pcf):                     | 102    |
| Diameter (in.):                        | 2.84   |
| Height (in.):                          | 5.77   |
| Height / Diameter Ratio:               | 2.03   |
| Calculated Saturation (%):             | 94.62  |
| Calculated Void Ratio:                 | 0.65   |
| Assumed Specific Gravity:              | 2.7    |
| Failure Strain (%):                    | 1.73   |
| Unconfined Compressive Strength (tsf): | 0.84   |
| Undrained Shear Strength (tsf):        | 0.42   |
| Strain Rate (in/min):                  | 0.0577 |
| Remarks:                               |        |

## Unconfined Compression Test ASTM D2166



| Boring ID | Depth (Ft) | Sample type | LL | PL | PI | Fines (%) | Description |
|-----------|------------|-------------|----|----|----|-----------|-------------|
| B-105     | 3 - 5      | Shelby Tube | 43 | 23 | 20 |           | LEAN CLAY   |

| Specimen Failure Mode | Specimen Test Data |
|-----------------------|--------------------|
|-----------------------|--------------------|



|                                       |        |
|---------------------------------------|--------|
| Moisture Content (%)                  | 19.0   |
| Dry Density (pcf)                     | 109    |
| Diameter (in.)                        | 2.80   |
| Height (in.)                          | 5.83   |
| Height / Diameter Ratio               | 2.08   |
| Calculated Saturation (%)             | 93.68  |
| Calculated Void Ratio                 | 0.55   |
| Assumed Specific Gravity              | 2.7    |
| Failure Strain (%)                    | 5.84   |
| Unconfined Compressive Strength (tsf) | 3.13   |
| Undrained Shear Strength (tsf)        | 1.56   |
| Strain Rate (in/min)                  | 0.0582 |
| Remarks:                              |        |

## Supporting Information

### Contents:

- General Notes
- Unified Soil Classification System
- Rock Classification Notes

Note: All attachments are one page unless noted above.

## General Notes

| Sampling                  |                                     |                           | Water Level   |  | Field Tests |  |
|---------------------------|-------------------------------------|---------------------------|---|--|-------------|--|
| Auger Cuttings            | Modified California Ring Sampler    | Rock Core                 | Water Initially Encountered   |  | N           | Standard Penetration Test Resistance (Blows/Ft.) |
| Dynamic Cone Penetrometer | Modified Dames & Moore Ring Sampler | Dual Sampler SPT          | Water Level After a Specified Period of Time  |  | (HP)        | Hand Penetrometer                                |
| Grab Sample               | GeoProbe Macro Core or Large Bore   | No Recovery               | Water Level After a Specified Period of Time  |  | (T)         | Torvane  |
| Ring Sampler              | Shelby Tube                         | Standard Penetration Test | Cave In Encountered   |  | (DCP)       | Dynamic Cone Penetrometer                        |
| Split Spoon               | Texas Cone Penetrometer             | Vane Shear                | 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. |  | 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<br>(More than 50% retained on No. 200 sieve.)<br>Density determined by Standard Penetration Resistance |   | Consistency of Fine-Grained Soils<br>(50% or more passing the No. 200 sieve.)<br>Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance |  |   |
|---|---|---|--|---|
| Relative Density  | Standard Penetration or N-Value (Blows/Ft.) | 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                             | 5 - 8                                       |
| Dense   | 30 - 50                                     | Stiff   | 1.00 to 2.00                             | 9 - 15                                      |
| Very Dense  | > 50  | Very Stiff  | 2.00 to 4.00                             | 16 - 30                                     |
|   |   | Hard  | > 4.00                                   | > 30  |

### Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

## Unified Soil Classification System

| Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup> |  |   |  | Soil Classification                                       |  |
|--|--|---|--|---|--|
|  |  |   |  | Group Symbol  | Group Name <sup>B</sup>  |
| Coarse-Grained Soils:<br>More than 50% retained on No. 200 sieve                         | Gravels:<br>More than 50% of coarse fraction retained on No. 4 sieve | Clean Gravels:<br>Less than 5% fines <sup>C</sup>           | $Cu \geq 4$ and $1 \leq Cc \leq 3$ <sup>E</sup>              | GW  | Well-graded gravel <sup>F</sup>  |
|  |  | Gravels with Fines:<br>More than 12% fines <sup>C</sup>     | $Cu < 4$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ <sup>E</sup> | GP  | Poorly graded gravel <sup>F</sup>  |
|  |  |   | Fines classify as ML or MH                                   | GM  | Silty gravel <sup>F, G, H</sup>  |
|  |  | Sands:<br>50% or more of coarse fraction passes No. 4 sieve | Clean Sands:<br>Less than 5% fines <sup>D</sup>              | Fines classify as CL or CH                                | GC   |
|  | $Cu \geq 6$ and $1 \leq Cc \leq 3$ <sup>E</sup>                      |   |  | SW  | Well-graded sand <sup>I</sup>  |
|  | Sands with Fines:<br>More than 12% fines <sup>D</sup>                |   | $Cu < 6$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ <sup>E</sup> | SP  | Poorly graded sand <sup>I</sup>  |
|  |  |   | Fines classify as ML or MH                                   | SM  | Silty sand <sup>G, H, I</sup>  |
|  | Fine-Grained Soils:<br>50% or more passes the No. 200 sieve          | Silt and Clays:<br>Liquid limit less than 50                | Inorganic:   | PI > 7 and plots above "A" line <sup>J</sup>              | CL   |
| PI < 4 or plots below "A" line <sup>J</sup>  |  |   |  | ML  | Silt <sup>K, L, M</sup>  |
| Organic:   |  |   | $\frac{LL \text{ oven dried}}{LL \text{ not dried}} < 0.75$  | OL  | Organic clay <sup>K, L, M, N</sup><br>Organic silt <sup>K, L, M, O</sup> |
|  |  |   | Silt and Clays:<br>Liquid limit 50 or more                   | Inorganic:  | PI plots on or above "A" line  |
| PI plots below "A" line  |  | MH  |  |   | Elastic silt <sup>K, L, M</sup>  |
| Organic:   |  | $\frac{LL \text{ oven dried}}{LL \text{ not dried}} < 0.75$ |  | OH  | Organic clay <sup>K, L, M, P</sup><br>Organic silt <sup>K, L, M, Q</sup> |
|  |  | Highly organic soils:                                       |  | Primarily organic matter, dark in color, and organic odor |  |

<sup>A</sup> Based on the material passing the 3-inch (75-mm) sieve.

<sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup> 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.

<sup>D</sup> 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.

<sup>E</sup>  $Cu = D_{60}/D_{10}$      $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

<sup>F</sup> If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup> If fines are organic, add "with organic fines" to group name.

<sup>I</sup> If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup> If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

<sup>K</sup> If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup> If soil contains  $\geq 30\%$  plus No. 200 predominantly sand, add "sandy" to group name.

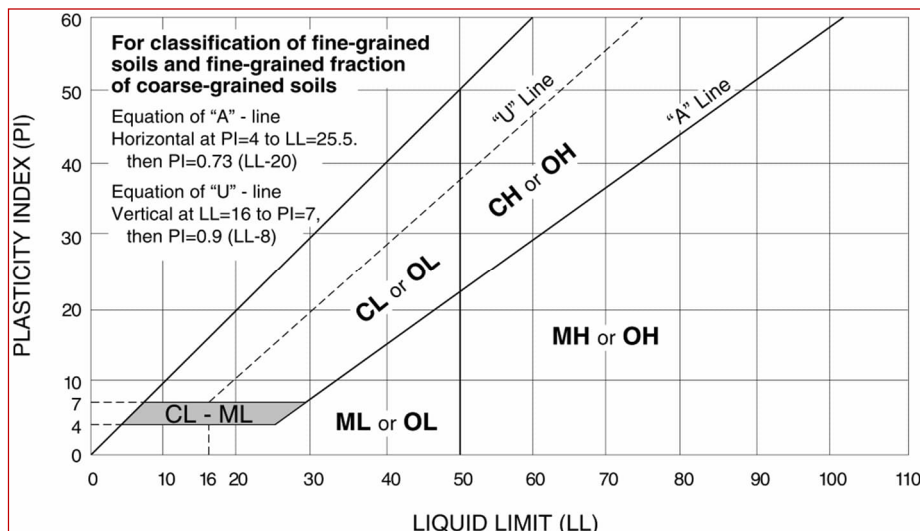
<sup>M</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup> PI  $\geq 4$  and plots on or above "A" line.

<sup>O</sup> PI < 4 or plots below "A" line.

<sup>P</sup> PI plots on or above "A" line.

<sup>Q</sup> PI plots below "A" line.



## Rock Classification Notes

| WEATHERING           |   |
|----------------------|---|
| Term                 | Description   |
| Fresh                | Mineral crystals appear bright; show no discoloration. Features show little or no staining on surfaces. Discoloration does not extend into intact rock.                                       |
| Slightly weathered   | Rock generally fresh except along fractures. Some fractures stained and discoloration may extend <0.5 inches into rock.   |
| Moderately weathered | Significant portions of rock are dull and discolored. Rock may be significantly weaker than in fresh state near fractures. Soil zones of limited extent may occur along some fractures.       |
| Highly weathered     | Rock dull and discolored throughout. Majority of rock mass is significantly weaker and has decomposed and/or disintegrated; isolated zones of stronger rock and/or soil may occur throughout. |

| STRENGTH OR HARDNESS |   |                                    |
|----------------------|---|------------------------------------|
| Description          | Field Identification  | Uniaxial Compressive Strength, psi |
| Extremely strong     | Can only be chipped with geological hammer. Rock rings on hammer blows. Cannot be scratched with a sharp pick. Hand specimens require several hard hammer blows to break.   | >36,000                            |
| Very strong          | Several blows of a geological hammer to fracture. Cannot be scratched with a 20d common steel nail. Can be scratched with a geologist's pick only with difficulty.  | 15,000-36,000                      |
| Strong               | More than one blow of a geological hammer needed to fracture. Can be scratched with a 20d nail or geologist's pick. Gouges or grooves to ¼ inch deep can be excavated by a hard blow of a geologist's pick. Hand specimens can be detached by a moderate blow.  | 7,500-15,000                       |
| Medium strong        | One blow of geological hammer needed to fracture. Can be distinctly scratched with 20d nail. Can be grooved or gouged 1/16 in. deep by firm pressure with a geologist's pick point. Can be fractured with single firm blow of geological hammer. Can be excavated in small chips (about 1-in. maximum size) by hard blows of the point of a geologist's pick. | 3,500-7,500                        |
| Weak                 | Shallow indent by firm blow with geological hammer point. Can be gouged or grooved readily with geologist's pick point. Can be excavated in pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.  | 700-3,500                          |
| Very weak            | Crumbles under firm blow with geological hammer point. Can be excavated readily with the point of a geologist's pick. Pieces 1 in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.   | 150-700                            |
| Extremely Weak       | Indented by thumbnail.  | 40-150                             |

| DISCONTINUITY DESCRIPTION                             |                    |   |                    |
|---|--------------------|---|--------------------|
| Fracture Spacing<br>(Joints, Faults, Other Fractures) |                    | Bedding Spacing<br>(May Include Foliation or Banding) |                    |
| Description   | Spacing            | Description   | Spacing            |
| Intensely fractured                                   | < 2.5 inches       | Laminated   | < ½ inch           |
| Highly fractured                                      | 2.5 to 8 inches    | Very thin   | ½ to 2 inches      |
| Moderately fractured                                  | 8 inches to 2 feet | Thin  | 2 inches to 1 foot |
| Slightly fractured                                    | 2 to 6.5 feet      | Medium  | 1 to 3 feet        |
| Very slightly fractured                               | > 6.5 feet         | Thick   | 3 to 10 feet       |
|   |                    | Massive   | > 10 feet          |

| ROCK QUALITY DESIGNATION (RQD) <sup>1</sup> |               |
|---|---------------|
| 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.

# **BID FORMS**

The bid forms are not available online. The bid forms are available only by purchasing a set of plans and specifications at the location indicated in the Legal Notice – Invitation to Bid.