verdantas

CONTRACT DOCUMENTS AND SPECIFICATIONS

FOR

AJ JOLLY DAM REPAIR

Prepared for:
CAMPBELL COUNTY FISCAL COURT
1098 MONMOUTH STREET
NEWPORT, KENTUCKY 41071

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

Verdantas Project No: 242762
April 2026

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1. Project Information

PROJECT: **AJ JOLLY DAM REPAIR**

OWNER: **CAMPBELL COUNTY FISCAL COURT**
1098 MONMOUTH STREET
NEWPORT, KENTUCKY 41071
CAMPBELL, KENTUCKY

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

CONTACT:	**ROBERT SEITZINGER**
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WEB SITE:	**www.verdantas.com**

PROJECT #:	**242762**
BID OPENING DATE:	**FRIDAY, APRIL 24, 2026 @ 10:00 AM**
ADVERTISING DATE:	**APRIL 2, 2026**
COMMENCEMENT DATE:	**JUNE 1, 2026**
COMPLETION DATE:	**DECEMBER 15, 2026**

2. CAMPBELL COUNTY FISCAL COURT OFFICIALS

JUDGE EXECUTIVE

Steve Pendery

COMMISSIONER – DISTRICT 1

Brian Painter

COMMISSIONER – DISTRICT 2

Geoff Bescker

COMMISSIONER – DISTRICT 3

Tom Lampe

3. Legal Notice – Invitation to Bid

CAMPBELL COUNTY FISCAL COURT, KENTUCKY

LEGAL NOTICE

Sealed proposals will be received at the Finance Office, Campbell County Administration Building, **1098 MONMOUTH STREET, NEWPORT, CAMPBELL**, **KENTUCKY**, **41071** until **10:00 AM**. local time on**, FRIDAY, APRIL 24, 2026** for furnishing all labor, materials, and equipment necessary to complete project known as **AJ JOLLY DAM REPAIR** 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 Fifty Dollars ($150.00) 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 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.

All bidders are required to attend a **Mandatory** Pre-Bid Meeting on **Tuesday, April 14, 2026** at **2:00 PM** on **Microsoft Teams**

Join: https://teams.microsoft.com/meet/25388080361913?p=HVWLpHDmyclZye6988
Meeting ID: 253 880 803 619 13
Passcode: kx2V63wp

Failure to attend the Pre-bid Conference will subject the bidder's proposal to be considered non-responsive.

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 **DECEMBER 15, 2026**.

The County reserves the right to waive irregularities and to reject any or all bids.

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

By the order of the Members of the **CAMPBELL COUNTY FISCAL COURT**.

Publishing Date: Campbell County Website: **APRIL 2, 2026**

4. Instructions to Bidders

4.1 General

Sealed bids will be received until **APRIL 24, 2026. 10:00 AM**, at **CAMPBELL COUNTY FISCAL COURT**, at the Finance Office, Campbell County Administration Building, **1098 MONMOUTH STREET**, **NEWPORT**, **KENTUCKY**, **41071** for the furnishing of labor and materials required for the **AJ JOLLY DAM REPAIR**, all in accordance with these instructions, conditions, specifications, and on the enclosed forms. All shall be submitted in a sealed envelope addressed to the **CAMPBELL COUNTY FISCAL COURT** and shall be plainly marked on the outside of the envelope **AJ JOLLY DAM REPAIR**. 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.

All bidders are required to attend a **Mandatory** Pre-Bid Meeting on **TUESDAY, April 14, 2026** at **2:00 PM** on **Microsoft Teams**

Join: https://teams.microsoft.com/meet/25388080361913?p=HVWLpHDmyclZye6988
Meeting ID: 253 880 803 619 13
Passcode: kx2V63wp

Failure to attend the Pre-bid Conference will subject the bidder's proposal to be considered non-responsive.

All questions must be submitted to Verdantas' Engineer via email to ftwehues@verdantas.com by end of day, **WEDNESDAY, APRIL 15, 2026.** Questions will not be accepted or answered if received after Wednesday, April 15, 2026. Questions will be answered via an addendum that will be sent out no later than end of day, **TUESDAY, APRIL 21, 2026**.

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", "County" or "Owner" occurs, it shall mean the **CAMPBELL COUNTY FISCAL COURT**. The Judge Executive, 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 LLC, 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 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.

OR

A copy of the Bid Guaranty or cashier’s check shall be scanned and uploaded to the electronic bidding platform per its instructions. Upon request of the Owner, the bidder shall supply the original to the Owner.

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 it 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

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 **JUNE 1, 2026** (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 of 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.

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 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 form 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
		$1,000,000 per occurrence	
		$2,000,000 aggregate liability	
	(3)	Property Damage*	$1,000,000 per occurrence
		$2,000,000 aggregate liability	
B.	Comprehensive Automobile Liability:		
	(1)	Bodily Injury/Wrongful Death $1,000,000 aggregate liability	$1,000,000 per occurrence
	(2)	Property Damage*	$1,000,000 per occurrence
		$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 restrictions 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 Kentucky Division of Water and the US Army Corps.

It is anticipated that permits will be received by the commencement date of June 1, 2026. Should permits not be received by June 1, 2026, the completion date will be adjusted for each day past June 1, 2026 until the necessary permits are received.

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 defects caused by abuse, alterations, to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, 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 require 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 purposes 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 s 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 all utilities 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 always kept in satisfactory condition.

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 he 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:

1.Date photograph or video taken.
2.Title of Project.
3.]Description of view shown in photograph or video.
4.]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. 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 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.

5.43 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.

5.44 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".

5.45 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 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.

5.46 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.

5.47 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 Contact 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.

5.48 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, based on 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 County 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.

5.49 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.

5.50 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 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 it Sureties from any obligations under the Contract or the Contract Documents.

5.51 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 form 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.

5.52 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 corrections 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.

5.53 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.

5.54 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.

5.55 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 manufacturers' 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.

5.56 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.

5.57 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.

5.58 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.

5.59 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.

5.60 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.

5.61 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.

5.62 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 ensure 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.

5.63 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.

5.64 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 County income taxes due or payable under the provisions of the Codified Ordinances of the County for wages, salaries, and commission paid to its employees who will work within the County limits for more than 12 workdays and further agrees that any of its subcontractors shall be required to withhold any such County 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	Scott Pfefferman – Duke Energy 617 Todhunter Road Monroe, Ohio 45050
Electric	Matt Coleman 2010 Dana Ave-EF 324 Cincinnati, Ohio 45207
Water	Kyle Ryan P.O. Box 18640 Erlanger, Kentucky 41018
Telephone	Breck Cowan/Underground Jodi Geiman/Overhead Altafiber 221 E. Fourth St., M.L. 121-900 Cincinnati, Ohio 45201
Cable TV	Chris Gapinski 10920 Kenwood Road Cincinnati, Ohio 45252
Sanitary and Storm Sewer	Zach Atkerson 1045 Eaton Drive 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

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 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 for 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 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.

8.10 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.

8.11 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.

8.12 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.

8.13 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 Fescue	95%	90%
40%	Creeping Red Fescue (Festuca Rubra)	95%	90%
20%	Annual Ryegrass (Lolium Multiform)	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

A. Preparation of Seed Bed

1. 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.

8.14 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.

8.15 "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.

8.16 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 GEOTECH

9.1.1 SITE CLEARING (31 10 00)

Part 1: GENERAL

Description

A. This Section describes the work included in clearing, stripping, grubbing, and preparing the project site for construction operations.

Related Work Specified Elsewhere

A. 01 57 13: Temporary Environmental Management.

B. 31 22 00: Grading.

C. 32 23 01: Excavation and Fill.

D. 31 23 19: Control of Water.

Clearing

A. Remove and dispose of trees, snags, stumps, shrubs, brush, limbs, sticks, branches, and other vegetative growth and properly dispose.

B. Remove boulders and concrete rubble. Remove all evidence of their presence from the surface and properly dispose offsite.

C. Remove and dispose of trash piles, rubbish, and fencing. Properly dispose of these items in accordance with local regulations. Protect structures and piping above and below ground, trees, shrubs, and vegetative growth which are not designated for removal.

Stripping

A. Remove and dispose of organic sod. Remove topsoil to a minimum depth of three inches to include grass, grass roots, and other objectionable material remaining after clearing from the areas designated to be stripped.

   1. Topsoil shall be defined as the original surface soil typical of the area, capable of supporting native plant growth.

B. Retain and stockpile topsoil material onsite for dressing backfill areas before seeding and planting.

C. Remove existing gravel or improved surfaces only to the extent needed to facilitate construction.

Grubbing

A. After clearing and stripping, remove and dispose of wood and/or root matter, including stumps, logs, trunks, roots, or root systems greater than one-inch in diameter or thickness to a depth of 12-inches below the ground surface and properly dispose.

Part 2: MATERIALS

Trees and Shrubbery

A. All existing trees, shrubbery, and other vegetative material may not be shown in the Drawings. Inspect the site as to the nature, location, size, and extent of vegetative material to be removed or preserved, as specified herein.

Preservation of Trees, Shrubs, and Other Plant Material

A. Save and protect plant materials, e.g., trees, shrubbery, and plants, beyond the limits of clearing and grubbing from damage resulting from the Work. No filling, excavating, trenching, or stockpiling of materials will be permitted within the drip line of these plant materials.

1. The drip line is defined as a circle drawn by extending a line vertically to the ground from the outermost branches of a plant or group of plants. To prevent soil compaction within the drip line area, no equipment will be permitted within this area.

B. Carefully cut and remove tree branches where necessary for construction. Remove branches other than those required for a balanced appearance of any tree. Treat cuts with a tree sealant.

Part 3: EXECUTION

Clearing, Stripping, and Grubbing Areas and Limits

A. Clear, strip, and grub excavation and embankment areas associated with new cuts, fills, structures, slabs, walks, and roadways.

B. Limits of clearing, stripping, and grubbing:

1. Within the Construction Limits designated on the Drawings.

2. Excavation, Excluding Trenches: 5-feet beyond tops of cut slopes.

3. Trench excavation for piping: 3-feet from edge of trench.

4. Earth Fill: 5-feet beyond toe of permanent fill as indicated in the drawings.

5. Structures: 15-feet beyond footings.

6. Streets, Roadways, and Parking Areas: 10 from toe of fill or top of cut.

7. Sidewalks: 2-feet beyond edges.

8. Landscaped Areas: 2-feet beyond areas designated to receive landscaping.

Disposal of Clearing and Grubbing Debris

A. Do not burn combustible materials. Remove cleared and grubbed material from the worksite and dispose offsite.

B. Locate temporary waste piles in areas that will not interfere with stream or drainage channel flows, construction operations, existing access roads, or operations and maintenance access to the water delivery system

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Disposal of Strippings

A. Remove stripped material and dispose offsite except topsoil.

B. Locate temporary waste piles and topsoil stockpiles in areas that will not interfere with stream or drainage channel flows, construction operations, existing access roads, or operations and maintenance access to the water delivery system.

9.1.2 GRADING (31 22 00)

Part 1: GENERAL

Section Includes

A. Finish grading of the site as shown on the drawings.

B. Placement of topsoil for restoration of the graded areas.

Related Work Specified Elsewhere

A. 01 78 39: Record Documents.

B. 31 10 00: Site Clearing.

C. 32 23 01: Excavation and Fill.

D. 32 90 10: Site Restoration.

Quality Assurance

A. Grading tolerance: 0.1 feet plus/minus from required elevations.

Quality control

A. Survey the site following grading to document the finished grades in accordance with the Drawings and Section 32 90 10.

Part 2: MATERIALS

A. Topsoil: Refer to Section 31 10 00 and Section 32 90 10.

Part 3: EXECUTION

General

A. Do not place topsoil when Perform earthwork to the lines and grades shown in the drawings with proper allowance for topsoil as required.

B. Shape, trim, and finish slopes of channels to conform to the lines, grades, and cross sections shown on the Drawings.

C. Remove exposed roots and loose rocks exceeding 3 inches in any dimension.

D. Round tops of banks to circular curves of not less than a 6-foot radius.

E. Fill and smooth any rills, gullies, and depressions.

F. Neatly and smoothly trim rounded surfaces.

G. Evenly and properly compact graded surfaces as required.

H. Neatly blend grading into the surrounding, existing terrain.

I. Do not over-excavate and backfill to achieve the proper grade.

Placing Topsoil

A. Do not place topsoil when subgrade is wet enough to cause clodding.

B. Spread topsoil evenly over subgrade to an approximate thickness of three-inches.

Acceptance

A. Upon completion of finish grading, submit as-built survey and obtain acceptance from the Owner and engineer of the grading and topsoil placement.

END OF SECTION

9.1.3 EARTHWORK AND ROCK EXCAVATION (31 23 01)

Part 1: GENERAL

Description

A. This Section consists of the following activities:

1. Provide all management, equipment, tools, labor, materials, and accessories to perform all preparation, measurements and survey, excavation, grading, proof rolling, compaction, soil conditioning, earth handling, storage and disposal necessary for the Work. Establish all necessary controls for excavation safety and erosion and sedimentation management.

2. Rough grade and shim work areas at the site receiving new work under this Contract to create safe working platforms and transitions between abrupt grade changes. Manage excess cleared materials for reuse or off-site disposal; coordinate with the Owner.

3. Cut and completely remove any vegetation interfering with the proposed work.

4. Verify locations of all buried structures prior to any grading or excavation, including contacting the Owner, DigSafe, and local authorities to mark buried utilities. Also retain the services of a ground penetrating radar specialty subcontractor to identify and mark locations of potentially conflicting underground structures.

5. Strip all topsoil and organic subsoil to its full depth, from areas receiving new construction, and areas to be re-graded; and stockpile the removed topsoil at a designated location on Owner's property for potential reuse, as applicable.

6. Over-excavate all buried organic material, unacceptable fill material, disturbed natural material, and any other material identified by the Engineer to be unacceptable for temporary or permanent support of the new construction, as applicable.

7. Based upon a site benchmark identified by Owner's Representative, identify and establish construction benchmarks in the field to set the correct elevations of and layout and excavate as required for the following:

    a. New concrete foundations, footings, piers, walls, and slabs.

    b. New utility lines, utility structures, utility conduits, and for relocation of existing utility lines and utility structures.

c. New subgrades for the access roadway and for other non-specified site work.

d. Existing underground items designated on the Drawings to be removed.

e. Non-specified items for which accurate excavation is required.

8. Furnish, install, and maintain for duration of any period where soil instability may be present, sheet piling and/or other acceptable shoring, if necessary, to protect excavations against cave-in due to the earthwork performed under this Contract.

9. Proof-roll all disturbed and undisturbed surfaces which are to receive new foundations, footings, slabs, pavements, structural borrow, gravel base course, and other loadbearing elements, to ensure against any weak areas in the substrate.

10. Perform in a quality-controlled manner all excavation subgrade filling and backfilling for exterior and interior work, including specified compaction thereof, and provide all specified borrow materials for such purposes, except as otherwise specified herein.

11. Perform all operations and provide such equipment and materials, as necessary, for proper erosion control around excavated areas.

12. Coordinate all work with Owner's Representative and that of other trades.

References

A. Work performed and material supplied under this Section shall conform to the requirements of the following specifications, latest edition. Requirements specifically enumerated in this Section or shown on the Drawings supersede the referenced specifications. In case of disagreement between specifications, the more stringent requirements shall govern unless a written clarification is issued.

B. American Society for Testing and Materials International (ASTM):

1. C136: Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

2. D422: Standard Test Method for Particle-Size Analysis of Soils.

3. D698: Laboratory Compaction Characteristics of Soil Using Standard Effort (Standard Proctor).

4. D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

5. D2216: Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

C. Perform excavation work in compliance with applicable ordinance of governing authorities having jurisdiction including, but not limited to:

1. Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) Part 1926, Subpart P.

Site Conditions

A. Subsurface investigations have been performed for the Project. Geotechnical data on subsurface conditions observed in exploratory borings are presented in a Geotechnical Report provided as a Supplement A to these specifications and as boring logs shown on the Drawings.

B. Methods of construction pursued by the Contractor and its subcontractors shall be such as to ensure safe operation, the safety of the workers, project participants, the public, third parties, and adjacent property, whether public or private. All work shall comply with all applicable Federal, State and local codes, laws, regulations and ordinances. The Contractor is solely responsible for maintaining safe working conditions at the construction site at all times.

C. Acceptance or rejection by the Engineer of temporary support of excavation shall not relieve the Contractor of any responsibility for the adequacy and safety of the excavation

Quality Assurance

A. Codes and Standards: Comply with all applicable local, State and Federal rules, regulations and ordinances concerning sloping of excavation, trenching, and safety of workers, including the latest OSHA requirements.

B. All subgrades shall be inspected and approved by the Engineer prior to placing fill or new concrete structures.

C. Borrow materials shall comply with this specification and be subject to initial testing and testing during installation by Owner.

D. Borrow sources shall be selected that provide a consistent, adequate supply for the volumes anticipated by the project Work, including on-site materials identified for reuse. No borrow shall be placed prior to the written approval of material, locations, and methods by the Engineer. If the material on site from the Contractor's source of borrow material is visually identified by the Engineer to be significantly different from the materials previously approved, the Contractor shall perform at no additional expense to Owner, additional sieve

and proctor testing on the materials as requested by the Engineer to verify compliance with this Section.

E. Use adequate numbers of personnel who are trained and experienced in the activities to be performed and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section.

F. Use equipment of adequate size, capacity, and quantity to accomplish the work of this Section in a safe and timely manner.

G. Place materials and manage materials placed to preserve their quality and the quality of underlying and adjacent materials.

H. Testing Service: The Contractor shall employ and pay for a qualified independent geotechnical testing laboratory to perform soil and compaction testing during earthwork operations. The Contractor will coordinate scheduling and provide necessary means to assure cooperation with the testing firm. Work and/or materials which are defective shall be repaired and re-tested at the Contractor's expense. Provide an electronic copy of independent soil and compaction testing to the Engineer.

Quality Control

A. Provide adequate survey control to establish all lines and grade work not presently established at the site in accordance with the Drawings and Specifications. Establish permanent benchmarks necessary for the work under this Contract. Maintain all established bounds and benchmarks during the Work and replace as directed at no expense to Owner any that are destroyed or disturbed.

B. Verify all locations, property lines, work lines, and other dimensioned points indicated on the Contract Drawings for the existing site.

C. Submit to the Engineer, a written confirmation of locations of all lines, and any discrepancies between conditions and locations as they actually exist and those indicated on the Contract Drawings.

Weather Limitations

A. Material excavated when frozen or when air temperature is less than 32°F shall not be used as structural fill, embankment fill, or backfill until material has completely thawed.

B. Material excavated and exposed to excessive precipitation shall not be used as structural fill, embankment fill, or backfill until material has drained and dried sufficiently for use.

Excavation Support

A. The Contractor shall provide suitable slopes, benches, and or support of excavation systems in accordance with the applicable regulations to provide safe excavations and means for egress. Dewatering structures erected for work with the river or tailrace shall conform to applicable requirements of Section 31 23 19 Water Control Measures.

Dewatering

A. The Contractor shall maintain dewatered excavations throughout construction. Dewatering operations on the island are anticipated to be feasible through the use of open trenches and/or sumps and pumping. Dewatering of excavations within the river or tailrace shall conform to applicable requirements of Section 31 23 19 Water Control Measures.

Protection

A. Comply with all safety requirements of Federal, State and local authorities, including OSHA.

B. Protect existing structures, pipelines, and facilities designated to be protected and any such facilities under construction during excavation. Damage to structures, facilities, and other items designated to be protected that resulted from the Contractor's excavation activities shall be repaired by the Contractor at no cost to the Owner and to the satisfaction of the Engineer.

C. Protect existing trees, shrubs and other vegetation outside the limits of site disturbance.

D. Blasting will not be allowed for the excavation as required under these Specifications.

Submittals

A. Submittals shall at a minimum include the following.

B. Temporary Excavation and Support Plan

1. Submit a Temporary Excavation and Support Plan (Plan) to the Engineer at least 21 calendar days prior to starting any onsite construction work for excavation(s) and temporary supports. If the Contractor purchases, rents, installs, or mobilizes to the site any elements of any temporary support systems prior to the Engineer's review and response to the submittal, it does so at its own risk, and will not be due any additional compensation from Owner if such elements are not subsequently used.

2. The Plan shall include:

    a. Drawings showing locations, dimensions, and relationships of elements and sequencing/staging of the proposed temporary excavation(s) and any proposed temporary support system(s).

    b. Details regarding the type(s) of support system(s) and methods of excavation and support construction for both soil and rock excavation.

    c. Design calculations and assumptions required to substantiate the Plan.

d. Proposed locations of stockpiled excavated material.

e. The minimum lateral distance from the crest of slopes for vehicles, equipment and stockpiled excavated materials.

f. Anticipated difficulties and proposed contingency resolutions.

3. Design calculations and designs completed as part of the Plan shall be stamped, signed, and dated by the Contractor's professional engineer, and have demonstrated competence and experience in relevant aspects of geotechnical and structural engineering.

4. For temporary excavation(s), the Plan shall include, but not be limited to, plan and section drawings clearly showing the location, extent and orientation of excavation slopes and other excavation support measures, and sequencing/staging of excavations.

5. For any proposed temporary support system(s), the Plan shall include type, location, size, and arrangement of all elements of the system; include plan and section drawings and details as necessary to fully illustrate the proposed temporary support system(s). Submit data sheets for all materials proposed to be used for any temporary support system(s).

6. The Plan shall include a detailed description of the sequencing and coordination with other Work (including dewatering) of the temporary excavation and support work, including installation, maintenance, monitoring, and removal activities. The Plan shall also describe contingency activities to be undertaken in the event of unexpected performance issues associated with any excavation and/or shoring activities.

7. The Plan shall include an Erosion and Sediment Control Plan in coordination with the Owner and in compliance with the Contract Drawings and Section 01 57 13 Temporary Environmental Management that addresses sediment and erosion control measures and best management practices to protect downstream waterways.

8. Engineer review and response to the Plan proposed by the Contractor will only be with respect to the basic principles of the methods the Contractor intends to employ. Review of the Plan by the Engineer shall not relieve the Contractor of the full responsibility for the adequacy and safety of the temporary excavation(s) and support system(s).

9. If any aspect of the temporary excavation(s) or support system(s) is modified during installation or operation, revise or amend the appropriate drawings and calculations and resubmit the Plan for review by the Engineer.

C. Daily Shift Reports

1. Submit, in a form acceptable to the Engineer, complete daily shift report for the previous workday each morning by 10:00 am, with the following minimum information:

a. Type, location, and quantity of temporary support of excavation support installed.

b. Methods of excavation used and estimate volumes moved.

c. Description of ground behavior.

d. Crew size including identification of each employee by name, classification, and work assignment.

e. Water inflow quantities and removal methods.

f. Number and type of equipment used.

g. List of idle or inoperative equipment, times, durations, and reason for downtime.

h. Delay to work and reasons why.

i. Testing conducted and results.

j. Additional information required by the Engineer.

D. Borrow Material Testing by Contractor

1. Provide representative samples of borrowed materials (5-gallon pail, minimum) taken from the source. Tag, label, and package the samples and deliver to a certified independent geotechnical testing laboratory.

2. Provide access to the borrow site for field evaluation and inspection by the Engineer, if requested.

3. Provide sieve analysis (ASTM D422) from certified soils testing laboratories for all borrow materials and any materials from the site identified for reuse.

4. Provide modified Proctor analysis (ASTM D1557) from certified soils testing laboratories for all borrow materials and any materials from the site identified for reuse.

E. Certificates and Testing for the following:

1. Qualifications and certifications for the certified testing laboratory.

2. Subgrade inspection reports weekly, including verification that the soil conditions encountered, and subgrade preparation performed. Provide index property values equal or superior to the requirements herein and as indicated in the Drawings.

3. In-place density tests for compacted fill and backfill, and re-compacted scarified native material weekly.

F. Product data: Submit manufacturer's product literature for geotextile fabric and other proposed products.

G. The Contractor shall be responsible for tests to ascertain that material proposed to be incorporated into the work meets the requirements of the Contract Documents. Acceptance or rejection of fill materials and compaction of fill will be based on the results of laboratory testing.

H. Testing is to be performed by an independent testing laboratory and paid for by the Contractor.

Part 2: MATERIALS

2.01 Geosynthetics

A. Geotextile fabric for use for soil separation shall be Mirafi 160N, or approved equal.

B. Geosynthetics used for subsurface stabilization should consist of Mirafi BXG Geogrid overlain by Mirafi 160N geotextile, or approved equals.

2.02 Borrow Materials

A. General: All fill material must be clean and free from organic matter, roots, brush or other vegetation, trash, construction materials, debris, frozen material, rocks larger than 2 inches or unbroken lumps larger than 4 inches, obvious contamination, or other detrimental substances, and must be accepted by the Engineer prior to placement.

B. On-Site Materials: On-site soil meeting the requirements of Paragraph 2.02.C may be used as embankment fill or backfill in landscape areas, but shall not be used as fill or backfill below or adjacent to structures unless processed to meet the requirements of Paragraph 2.02.D.

C. Common Fill: Excavated inorganic, granular soil that is free of deleterious materials or other weak or compressible materials and can be adequately compacted. The maximum particle size is recommended to be 6 inches, and no more than 30 percent by weight should pass the No. 200 sieve.

D. Structural Fill: May be imported or processed on-site material. In addition to the requirements of Paragraph 2.02.A above, structural fill shall meet the following requirements and be accepted by the Engineer:

Structural Fill	
Gradation	**Percent Finer by Weight**
6-inch	100
1-inch	60-100
No. 4 Sieve	35-85
No. 10 Sieve	25-75
No. 20 Sieve	15-60
No. 40 Sieve	10-45
No. 100 Sieve	5-25
No. 200 Sieve	3-10

Maximum 3-inch particle size within 12 inches of foundation and slab subgrade elevations.

E. Engineered Streambed Materials (ESM): The material shall be of natural origin and consist of rounded to sub-rounded cobbles and stones within a soil matrix, similar in appearance and texture to the existing stream bed material in the project area. Material salvaged from the project site may be used if approved by the engineer. ESM shall be 18-inch nominal size (d_{50}) as shown in the Drawings, and shall have the following gradations:

Engineered Streambed Materials (ESM)	
% Finer	**Size (feet)**
D_{100}	3.00
D_{84}	1.88
D_{50}	1.50
D_{30}	1.25
D_{16}	0.15
D_{8}	0.03

F. Streambed Fine Sediment: streambed fine sediment shall meet the following requirements for grading. Material salvaged from the project site may be used if approved by the engineer.

Streambed Fine Sediment	
Gradation	**Percent Finer by Weight**
No. 4 Sieve	99-100
No. 10 Sieve	46-86
No. 40 Sieve	26-40
No. 200 Sieve	10-20
All percentages are by weight. The portion of sediment retained on No. 10 sieve shall not contain more than 0.2 percent wood waste.	

G. Streambed Sand: Streambed sand shall meet the following requirements for grading. Streambed sand shall consist of natural unwashed material, having hard, strong, durable particles free from adherent coating or deleterious matter.

Streambed Sand	
Gradation	**Percent Finer by Weight**
½-inch	99-100
3/8-inch	99-100
No. 4 Sieve	90 MAX
No. 8 Sieve	32-67
No. 200 Sieve	2-7
All percentages are by weight. The portion of sediment retained on No. 8 sieve shall not contain more than 0.2 percent wood waste.	

H. Clay Cap Fill: Material shall be imported from an approved borrow source meeting the following requirements:

1. Lean clay (CL) or fat clay (CH) soils meeting the following criteria:

- Greater than 50 percent fines (less than 0.003 inches);
- Less than 15 percent gravel-sized particles (0.1875 in.)
- No particle greater than 2 inches in maximum dimension

- Liquid limits in the range of 30 to 55 percent
- Plasticity indices in the range of 10 to 35 percent
- A maximum hydraulic conductivity of 10^{-7} centimeters per second when compacted to 95 percent of the standard Proctor maximum dry density (SPMDD).

2. Lab testing on borrow materials shall include:

- Moisture Content Determination (ASTM D2216)
- Atterberg Limits (ASTM 4318)
- Particle Size Analysis with Hydrometer (ASTM D422)
- Standard Proctor (ASTM D698)
- Flexible-Wall Permeability (ASTM D5084)

Lab testing on borrow materials shall be submitted to the Engineer for approval prior to transporting any materials to the site. ‘

3. If during review of the placement and compaction of the clay cap fills it is determined that the materials appear to differ from the approved materials; additional testing will be requested to confirm that the new material meets required standards.
4. Any differing materials may be stockpiled in approved areas but shall not be placed on site prior to receiving authorization from the Engineer. If unapproved materials are placed and are later determined by the Engineer to be unsuitable, they will be removed at no additional cost to the Owner.

I. Aggregate Base Course: Shall meet requirements of AASHTO M 43 Size No. 2 and be accepted by the Engineer.

J. Crushed stone: Hard durable crushed stone, free of organic matter, in 3/4 inch minus gradation that meets the requirements of KYTC, except as otherwise indicated on the Drawings.

K. Lean Concrete Fill: Refer to Section 03 30 00 Cast-in-Place Concrete (Class B Concrete).

L. Flowfill: Refer to Section 03 30 00 Cast-in-Place Concrete.

2.03 Confirmatory Testing

A. All materials used as new fill to support the project objectives must be formally assessed for conformance with Paragraph 2.02. This may include regular visual examination of materials, field testing, and/or laboratory testing. The nature of testing efforts must be commensurate with the significance of the material being used as follows.

1. All materials shall be visually examined at least once a day to assess consistency and also confirm that their intended properties have not been

adversely altered by site or environmental conditions. Significant changes noted must be addressed immediately by further testing or replacement/improvement of the materials. Owner may collect its own sample of materials for independent testing at any time during the construction.

2. Structural Fill conformance testing must be performed prior to being delivered to the site and include gradation and proctor test data. During the work, additional gradation and proctor test data must be obtained any time that visual observation or unexplained compaction data warrant. At a minimum, additional gradation and proctor test data must be provided for every 2,500 cubic yards of material delivered to the site.

3. For Gravel Fill, Drainage Fill, and Pipe Bedding, conformance must be performed prior to being delivered to the site and include gradation and proctor test data. At a minimum, additional gradation and proctor test data must be provided for every 5,000 cubic yards of material delivered to the site.

4. For Crushed Stone and Common Fill, conformance assessments may be achieved by visual methods only. If during the work, visual assessments indicate abnormal gradation or obvious include of unacceptable materials, additional gradation and proctor test data must be obtained to document the condition and correction of the material must be achieved.

Part 3 EXECUTION

3.01 General

A. Identify required excavation and fill lines, levels, contours and datum, as shown on the Drawings and as required to perform the Work.

B. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, to assure that the excavation, backfilling, and filling work performed hereunder is acceptable to such trades for the installation of their work.

C. Any damage to the Work caused by the Contractor's operations, including disturbance of the material beyond the required excavation, shall be repaired by the Contractor at no additional cost to Owner. Removal of materials beyond the indicated subgrade elevations, without authorization from the Engineer, shall be classified as unauthorized and shall be performed at no additional cost to Owner. Lean concrete fill may be used to bring elevations to proper positions, only when acceptable to the Engineer.

D. All repairs shall be as required by the Engineer.

E. The Contractor shall assume all responsibility for deductions and conclusions as to the nature of the materials to be excavated and the difficulties of making and maintaining the required excavations.

F. The Contractor shall take all necessary precautions to preserve the material below and beyond the established lines of all excavation. Any damage to the Work or the foundations due to the Contractor's operations shall be repaired as directed by the Engineer at the expense of and by the Contractor.

G. Protect existing surface and subsurface features on site and adjacent to site as follows:

1. Protect and maintain benchmarks, monuments or other established reference points and property corners. If disturbed or destroyed, replace at Contractor's expense as accepted by the Owner and the Engineer.

2. Verify location and existence of utilities. Omission or inclusion of utility items does not constitute non-existence or definite location, respectively. Secure and examine local utility records for location data.

   a. Take necessary precautions to protect existing utilities from damage due to any construction activity. Repair damages to utility items as a result of Contractor activities at Contractor's expense.

   b. Active Utilities: Do not interrupt existing utilities serving facilities and adjacent properties, except when permitted in writing by the Owner's Representative or local utility company, and then only after acceptable temporary utility services have been provided. Remove or relocate utilities only as indicated or specified.

   c. Inactive Utilities: Report inactive or abandoned utilities encountered in excavating or grading operations, and remove, plug, or cap as required. In the absence of specific requirements, plug or cap such utility lines as required by local rules or regulations.

3. Maintain existing structures free of damage. Any damaged items shall be repaired to original condition and to Owner's requirements at Contractor's expense.

4. Provide full access to facilities, premises, roadways, and other points to prevent interruption of travel or access for operations or maintenance.

5. Maintain stockpiles and excavation in such a manner to prevent inconvenience or damage to structures on site, coordinate with Owner's Representative.

6. Avoid surcharge or excavation procedures which can result in heaving, caving, or slides.

H. Protection of Structures: Prevent new and existing structures from becoming damaged due to construction operations. Prevent subgrade under new and existing foundations from becoming submerged or undermined during construction due to presence of surface or subsurface water or due to construction operations.

I. Dust Control: Employ all methods required to effectively control dust created by the work of this Section in accordance with the requirements of Section 01 50 00 Temporary Facilities.

J. Unanticipated Conditions: Notify the Engineer immediately upon finding evidence of obstructions, unsuitable subgrade materials below designated excavation elevations, or other conditions which are not shown, or which cannot be reasonably assumed from existing surveys and project documents. Obtain Engineer's written instruction before proceeding with further work in such areas.

K. During excavation, the Contractor will be responsible for maintaining safe, stable excavation slopes in accordance with all regulatory agency requirements.

3.02 Drainage and Dewatering

A. Upon entering the premises, assume responsibility for site and subsurface drainage and maintain such drainage during the duration of this Contract in a manner acceptable to the Engineer, at all times protecting and maintaining the existing conditions in adjacent areas.

B. Legally remove by pumping, draining or bailing all water which may accumulate or be found on the site within the Contract limits where excavation and grading are to be done and such water may adversely impact the work. Excavate, construct, and maintain all pump wells, sumps, dams, swales, channel, slopes or other necessary works to keep excavation areas clear of accumulated water. Newly constructed and existing concrete and masonry shall be protected from injury resulting from de-watering work by the use of canvas, tarpaulins, or by such other sufficient method as the Engineer may approve.

C. Maintain at all times upon the worksite sufficient and satisfactory pumping machinery, including standby equipment. Provide pump wells or well points and underdrains as may be required, where needed to properly handle the water. Maintain excavations free from water until all backfilling operations and new construction has been completed. The Contractor shall maintain groundwater at least 2 feet below excavation subgrades, or at the top of prepared bedrock surfaces. Provide sufficient sump configurations and filters to prevent the unintended removal and ejection of existing soils during pumping operations.

D. Where soil subgrades will be potentially exposed to precipitation place a thin layer of crushed stone (not more than four inches thick) along the bottom of the subgrade to provide a working surface and facilitate drainage of water. Combined layers of stone shall not exceed a thickness greater than 18 inches unless approved by the Engineer. Crushed stone greater than 12 inches in thickness that is placed below the water table must be wrapped with a non-woven filter fabric. Alternatively, a thin (2 to 3 inch) layer of weak concrete may also be placed as a mud slab on exposed subgrade surfaces provided, they are stable during placement of the concrete.

E. Water from excavations shall be disposed of in such a manner that will not cause injury to the environment and/or public health or negatively impact existing features or completed work. Under no circumstances place concrete, place borrow or install appurtenances in excavations containing free water.

3.03 Erosion Control

A. Starting with the clearing and grubbing operations performed hereunder, and continuing until final project closeout and restoration, institute erosion control measures in accordance with Section 01 57 13 Temporary Environmental Management to prevent migration of sediment from the work areas by wind, water, or machinery.

3.04 Stripping

A. Strip topsoil and organic subsoil to its entire depth from all areas which will be excavated, areas to be regraded, and from other areas where new construction would otherwise disturb the existing ground surfaces. Minimize mixing of organic soil with inorganic soil to preserve ability of organic soil to support new growth of vegetation when and if reused. Remove all clay deposits, large stones, peat, roots, and other objectionable matter from the topsoil, and stockpile the stripped topsoil on site for potential reuse, if and as directed. Protect the stockpile, as necessary, from erosion by wind and water.

3.05 Excavation Safety

A. Provide sloping, shoring, sheeting and/or bracing at excavations, as required, to assure complete safety against collapse of earth at excavation side and end walls. Dewatering structures erected for work with the river or tailrace shall conform to applicable requirements of Section 31 23 19 Water Control Measures.

B. Comply with local safety regulations or in the absence thereof, with the provisions of the Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc., as well as the safety regulations of OSHA, including having a Competent Person on site to evaluate sidewall stability conditions, as necessary.

C. Remove sheeting and shoring as backfilling operations progress, taking all necessary precautions to prevent collapse of excavation sides. Where sheeting is required to be left permanently in place due to unanticipated conditions, approval from the Engineer must be obtained and an appropriate adjustment to the Contract price will be made.

D. The depth and locations of areas to be excavated may have the potential to adversely impact adjacent existing foundations. The Contractor must take precautions during excavation and subgrade preparation activities to ensure that the integrity of the existing foundation and stability of existing bearing soils are maintained at all times. In particular, measures must be used to prevent undermining of any footings and any loss of strength to subgrades for existing foundations, footings, slabs, utilities and other loadbearing elements that might be identified.

3.06 Excavation

A. Excavate to lines, grades, and dimensions shown and as necessary to accomplish the Work.

B. Minimize disturbance to native soils at the bottom of excavations.

C. Excavation shall have support system(s) conforming to the requirements of Paragraph 3.05.

D. Excavations shall be completed in the dry. It is anticipated that this can be accomplished through a combination of cofferdams and flow diversion within the river.

E. The Contractor is responsible for maintaining safe excavation slopes at all times and for all conditions, in accordance with OSHA regulations and standards.

F. Size excavations to allow for support systems, forms, working space, granular base, filter and drain materials, structure backfill, topsoil, and similar items, where applicable.

G. Trim to neat lines where concrete is to be placed against foundation material.

H. Do not operate excavation equipment within 5 feet of existing structures or newly completed construction. Unless permitted by the Engineer, excavate by manual means in these areas.

I. Excavations for foundations shall be observed by the Engineer to verify that any uncontrolled manmade fill, loose, soft or otherwise undesirable materials are removed and that the footings will be on suitable prepared subgrade. At the time of such observation, it may be necessary for the Engineer to make hand auger borings and/or use a hand penetration device in the base of the foundation excavation to confirm that the soils below the base are satisfactory for foundation support. The necessary depth of penetration will be established during observation.

J. After the required excavation has been completed, the Engineer will observe the exposed subgrade to determine the need for additional excavation, if any. It is the intent that over-excavation is to be conducted in all areas within the influence of structures where unacceptable subgrade material exists at the exposed subgrade. Over-excavation shall include the removal of all such unacceptable material that exists directly beneath the structure or within a zone outside and below the structure defined by a line sloping at 1H:1V outside the edge of the footing. Backfill the over-excavated areas with structural backfill material in accordance with Paragraph 3.10.

K. Where the Engineer determines that foundation material is unsuitable through no fault of the Contractor, additional excavation and backfill will be ordered in writing. The Contractor will not be compensated for areas over-excavated without written authorization from the Engineer. Such areas shall be backfilled to the proper grade and limits shown on the Drawings in accordance with Paragraph 3.10.

L. If soft/loose pockets or undesirable materials are encountered in the excavation at the bottom of footing elevation, the proposed bottom of footing elevation may be reestablished by backfilling after the unsatisfactory material has been removed with structural fill in accordance with Paragraph 3.10.

M. Soils exposed in the base of foundation excavations, including subgrade and/or structural fill, shall be prepared and compacted in accordance with Paragraphs 3.09. and 3.10., respectively, and shall be protected against any detrimental change in conditions such as disturbance from rain and freezing.

N. Maintain excavations free of water until after structures have been cured and backfilled.

1. Dewater excavations below the groundwater elevation and control water in accordance with Paragraph 3.02.

2. Surface runoff water shall be directed or drained away from the excavation and not allowed to pond. Take measures to provide protection from surface runoff entering the excavation areas. Examples include constructing berms and grading the area at the top of excavation slopes to drain away from the excavated area.

O. Place foundations as soon as possible after excavation is completed, inspected, and approved.

1. Until concrete or fill material is placed, protect approved subgrade from becoming loose, submerged, or soft.

2. If subgrade becomes loose, submerged, or soft before the structure or backfill is placed thereon, remove unacceptable material and replace with accepted compacted material or place geotextile fabric as directed by Engineer.

3.07 Rock Excavation

A. Refer to the boring logs on the Drawings for description of the rock conditions encountered.

B. The condition of the bearing surfaces and the excavated faces will be dependent on the method of excavation. An excavator equipped with a ripping tooth or a pneumatic hammer in conjunction with line drilling will likely be sufficient to excavate the rock on site, as the near-surface bedrock is generally expected to be weathered/highly fractured.

C. The use of line drilling should be used where necessary to create a relatively clean face and prevent overbreak, given the close proximity of the excavations to the existing structures.

D. The Contractor is fully responsible for the safe execution of its excavations including potential of damage to the existing facilities and/or disruption to operations.

E. Blasting shall not be used due to the proximity of the proposed excavations to the existing dam.

F. Rock excavations should be completed to create a relatively horizontal surface without any open faces, and care should be taken to prevent overbreak beneath the footing bearing elevation.

3.08 Stockpiling Excavated Material

A. Stockpile excavated material that is suitable for use as structural fill, fill, or backfill until material is needed. Materials that are deemed suitable by the Engineer for structural fill, fill, or backfill shall be stockpiled separately from each other and from other materials.

B. Confine stockpiles to within areas approved by Owner. Do not obstruct roads, facilities, or other ongoing work in the area.

C. Do not stockpile excavated material adjacent to excavations unless excavation side slopes and excavation support systems are designed by the contractor's engineer, constructed, and maintained for stockpile surcharge loads.

D. Do not stockpile excavated materials near or over existing facilities, adjacent property, or completed Work unless otherwise allowed by Owner.

3.09 Subgrade Preparation

A. Clear, grub, and strip area to receive fill in accordance with Paragraph 3.04.

B. Excavate as required in accordance with Paragraph 3.06 and 3.07.

C. Obtain inspection and approval of the prepared subgrade by Engineer prior to proceeding with foundation construction.

D. Prior to placing concrete footings on bedrock, the bedrock surface shall be cleaned using high-pressure air or water to remove all soil and loose, decomposed, highly weathered and fractured bedrock and approved by the Engineer. Where the nature of the prepared rock surface contains cavities that are not suitable for the receipt of normal concrete, the cavities shall be infilled with a flowable grout with a minimum compressive strength of 4,500 psi, and the grouted surface shall be rough-brushed to prevent formation of smooth interfaces.

E. If exposed, the bearing condition of the existing structures should be evaluated and protected, if necessary, to limit undermining during preparation of the bearing surface for new and existing footings.

F. If the exposed bedrock surface is steeper than 5 horizontals to 1 vertical (5H:1V), then anchoring, doweling, benching or other means should be employed to improve sliding resistance. Notify Engineer if this condition is encountered.

G. Subgrades should be aggressively proof-rolled with at least six passes (three each way in perpendicular directions) of a minimum 10-ton vibratory roller in open areas, or a 1ton vibratory roller or large plate compactor in trenches. During the proof-rolling process, the subgrades should be reviewed to identify soft or unstable areas. Unsuitable areas (e.g., high fines, saturated soils, and organics) should be over-excavated to more competent material and be replaced with compacted structural fill, as described in Paragraph 3.06. Where exposed native soils are observed to be saturated, proof-rolling should not include the use of vibration.

3.10 Fill Placement

A. Provide approved fill material. Do not place material in layers greater than 8-inches loose thickness where compacted self-propelled vibratory rollers, nor 6 inches where compacted by hand-operated vibratory plate compactors.

B. Soil materials used as backfill for should be compacted in lifts to 9 percent of maximum dry density +/- 3% of optimum moisture content in accordance with ASTM D698 (Standard Proctor).

C. Place layers horizontally and compact each layer in a methodical and consistent manner. Achieve the property compaction of each layer prior to placing additional fill. Control moisture for each layer as necessary to meet requirements of compaction.

D. All fill material shall be placed and compacted "in-the-dry". The Contractor shall dewater excavated areas as required to perform the work and in such a manner as to preserve the undisturbed state of existing soil subgrades.

E. The Contractor shall not place a layer of compacted fill on snow, ice or soil that was permitted to freeze prior to compaction. Removal of these unsatisfactory materials will be required as directed by the Engineer, at no additional expense to Owner.

F. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of a day's operation. Prior to terminating operations for the day, the final layer of fill, after compaction shall be rolled with a hand operated compactor or a smooth-wheeled roller to eliminate ridges of soil left by tractors, trucks and compaction equipment.

G. Do not start backfilling until concrete forms have been removed, construction debris and trash removed from excavations, concrete finishing has been completed.

H. Do not backfill against walls or other earth retaining structures until concrete has reached specified 28-day compressive strength and all load bearing supports, upper slabs, and footings are in place and cured to specified 28-day compressive strength.

I. Place fill evenly on all sides of grade beams, walls, and structures or provide bracing.

J. Flowfill may be used for filling voids as approved by the Engineer. Flowfill shall NOT be placed against the dam or retaining walls.

3.11 Disposal of Excess Spoil and Waste Materials

A. Remove waste materials daily, including materials not allowed for fill or backfill, trash, and debris, and properly dispose of off Owner’s property.

3.12 Field Quality Control

A. All subgrades shall be approved by the Engineer prior to placing concrete structures and/or soil backfill.

B. During the placement of any materials that will be structurally significant, a representative number of in-place field density tests must be performed. This shall apply to compacted structural borrow below slabs, foundations, pavements, pads, and aprons, and also including backfill of select material against structures for lateral support and installation of fill used to construct new slopes.

C. The minimum number of compaction tests in each lift of structural fill or backfill shall adhere to the frequencies described in the table below.

Recommended Field Density Test Frequencies	
Area	**Recommended Minimum Density Test Frequency**
Individual Column Footings	One test per 50 sf per lift of structural fill
Continuous (Strip) Footings	One test per 50 lineal feet per lift of structural fill
Roadway Subgrade Soils	One test per 10,000 sf of compacted existing soils and in each lift of structural fill
Foundation Backfill	One test per 50 cy of fill

D. If, in the opinion of the Engineer based on the report of testing and inspections, the subgrade or backfill has been placed at less than the required density, additional compaction and testing shall be provided at no additional expense to Owner.

END OF SECTION

9.1.4 WATER CONTROL MEASURES (31 23 19)

Part 1: GENERAL

Description

A. The work includes designing, installing, maintaining, and later removing temporary bulkheads, stop logs, cofferdams, and other temporary structures and pumping systems.

B. The purpose of the dewatering structures is to allow construction of project structures under dry conditions, which might otherwise be submerged. All construction work which forms a part of the permanent project structures shall be done in areas free from water unless otherwise authorized in writing by the Engineer.

C. When no longer required for the intended purposes, the Contractor shall remove all temporary dewatering structures and equipment and shall leave the work areas neat and orderly and in as good or better condition. All waste materials shall be legally disposed of offsite except as authorized for relocation or reuse in writing by the Owner and the Property Owner. No temporary construction materials will be permitted to remain or be spoiled in the bottom of any body of water.

D. The Owner shall be informed prior to installation of any dewatering structures. Removal of dewatering structures shall not begin until the Owner’s approval of the completed work is obtained.

E. The Contractor shall comply with all local, state, and federal laws, rules, and regulations.

Responsibility For Dewatering Structures

A. The Contractor shall be fully and solely responsible for the structural design, adequacy, safe construction, maintenance, repair, removal, and disposal of all dewatering structures and related facilities required for protecting the work to river elevations. If water elevations increase to the extent that the dewatering structures are overtopped and construction areas are flooded, the Owner will assume no responsibility for costs, delays, or damages from overtopping.

B. The Contractor shall perform all concrete work within the excavations and within the spillway free from water. Provide, furnish, install, maintain, and operate all necessary diversions, pumping and other equipment or methods necessary for dewatering the work area.

C. The Contractor shall be responsible for providing power, equipment, and labor needed to dewater the work area, including pumps, hoses, etc.

D. All dewatering equipment shall be maintained and operated at the efficiency and capacity necessary for maintaining the area behind the bulkhead free from standing water or wet conditions that prevent proper construction.

E. Contractor shall provide dewatering facilities with stand-by pumps with 100 percent standby capacity. Pumps shall be routinely tested and maintained or replaced by the Contractor as needed to ensure 100 percent standby capacity.

F. The Contractor shall comply with all applicable environmental regulations during operation of the water control systems.

G. Geotechnical information is included as supplements to these Specifications.

Emergency Action Plan and Warning System

A. The Contractor must install and rehearse the established Temporary Construction Emergency Action Plan (TCEAP).

B. The Temporary Construction Emergency Action Plan will include the following items:

1. A warning system to be installed by the Contractor to alert workers of dangerous or impending conditions in sufficient time to evacuate the site.

2. Any construction personnel working over or near water will be required to wear life jackets. Life rings will be located immediately around the dam and spill crest, and near the outlet structure and will remain in place for the duration of the construction period. The life rings will be used only in the event of an emergency situation.

3. The Contractor will be required to hold an informal and document formal safety meetings, prior to initiating any construction activity, to inform workers of the actions to be followed should any of the alarms be activated. The workers will be instructed to exit the work area via one of the several routes from the work area and will be informed of the “safe areas”, which areas are providing maximum safety for workers.

4. In case of an emergency, the construction superintendent will be responsible for immediately notifying the appropriate personnel and emergency response organizations.

5. A designated individual shall be responsible for coordinating the safety program and rescue operations.

6. Other State or Federal OSHA-required equipment, or any equipment or procedures which will enhance and improve the overall safety of the Contractor’s personnel.

7. None of the above shall be constructed to imply that the Owner or the Engineer assume responsibility for the Contractor’s safety measures.

Dewatering Scheme and Materials Submittals

A. Construction Submittal: At least 30 days prior to start of the demolition, the Contractor shall submit dewatering plans to the Owner and the Engineer for review.

B. Plans shall show the method and equipment proposed for dewatering and maintaining the dewatered areas.

C. Dewatering plan shall include details for discharging dewatering water and measures for monitoring and limiting turbidity.

D. A review by the Owner and the Engineer of the Contractor's plans and/or comments on them will in no way relieve the Contractor of responsibility as stated above.

Part 2: PRODUCTS (not used)

Part 3: EXECUTION

General

A. The Contractor shall at all times during construction, provide ample means and devices to remove promptly and dispose of properly all water entering excavations and keep the bottoms of the excavations firm and free of standing water.

B. The Contractor shall not allow discharged water to cause siltation, erosion, flooding, or other negative environmental impact on natural waterways or other property; such discharge shall be in accordance with applicable Federal, State, and local regulations. At dewatering discharge locations, sediment ponds, hay bales, silt barriers or other control measures shall be installed as necessary to control and prevent siltation.

C. The Contractor shall operate water control systems continuously, including weekends and holidays and during Work stoppages, as necessary to prevent flotation of partially installed structures, and prevent any other surface or groundwater related damage to structures, facilities, subgrades, slopes, or other Work.

D. The Contractor shall remove all elements of water control systems from the site at the completion of the Work.

9.1.5 GROUT CURTAIN (31.43.13)

Part 1: GENERAL

Description

A. This work shall consist of providing and installing a grout curtain as shown on the Contract Drawings and the Contractor designed system and as specified herein. This work consists of advance drilling and grouting through concrete, natural soils, and shale. The total depth of the grout curtain varies between 15 to 18 feet. Drill and grout production grout holes as required.

Summary

A. Section includes:

1. Material for grout curtain wall.

2. Submittal requirements

Reference Standards

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

1. C31/C31M: Standard Practice for Making and Curing Concrete Test Specimens in the Field.

2. C109/C109M: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-In. or [50-mm] Cube Specimens).

3. C150/C150M: Standard Specifications for Portland Cement.

4. C494/C494M: Standard Specification for Chemical Admixtures for Concrete.

5. C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

6. C937: Grout Fluidifier for Preplaced-Aggregate Concrete.

7. C989/C989M: Standard Specification for Slag Cement for Use in Concrete and Mortars.

8. C1240: Standard Specifications for Silica Fume Used in Cementitious Mixtures.

9. C1602: Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

10. C1603: Standard Test Method for Measurement of Solids in Water.

B. U.S. Army Corps of Engineers (USACE)

1. EM 1110-2-3506: Engineering and Design - Grouting Technology.
2. ER 1110-1-1807: Drilling in Earth Embankment Dams and Levees.

Submittals

A. Submit the following:

1. Grout Curtain Wall Design
2. Preconstruction Submittals
    a. Contractor shall submit the Grout Curtain Wall Installation Plan that is designed and stamped by a professional engineer or professional geologist.
    b. Grout Curtain Wall Installation Plan shall provide the following:
        1) Number of Grout Ports
        2) Spacing of Grout Ports
        3) Total Grout Port Length
    c. Grouting Data Collection System
    d. Drilling and Invasive Program Plan
    e. Plan describing how surface water, drill flush, and excess waste grout will be controlled and properly disposed.
3. Shop Drawings
    a. Grouting Progress Drawings updated as the work is completed
    b. Grout Mix Design
        1) Include data for the grout/concrete as delineated in Section 03 30 00. This includes the mix design, constituent quantities per cubic yard, and the water/cement ratio.
        2) Product Data
    c. Drilling Rigs and Equipment
    d. Grouting Equipment
    e. Borehole Alignment and Deviation Equipment
4. Laboratory Test Reports

a. Grout Material Test Reports

b. Mixing Water Tet Reports

c. Drill Logs

d. Grouting Reports

Site Conditions

A. The Contractor shall review the pre-existing subsurface information and boring logs which are provided in Geotechnical Evaluation Report by Terracon Consultants, Inc. Dated July 29, 2020 and visit the site to assess the site topography, geometry, equipment access conditions, and location of existing structures.

B. The program for the grout curtain wall shown and described is based on currently available information. Conditions encountered during construction may require additions or deletions as approved by the Engineer.

C. Prior to the start of any drilling construction activity, the Contractor, the Owner, and the Engineer shall jointly inspect the site to observe and document the pre-construction condition of the site, existing structures and facilities.

Quality Assurance

A. Qualifications and Duties:

1. Lead Grouting Geologist or Lead Grouting Geotechnical Engineer and Grout Curtain Wall Designer

    a. Submit the qualifications at least 30 days prior to commencement of drilling activities. The lead oversees all grouting and equipment calibrations. The grout curtain wall designer prepares the Grout Curtain Wall Installation Plan.

    b. The lead grouting geologist/leading grout geotechnical engineer and grout curtain wall designer must be licensed as a PE or PG. The professional must have 3 years of experience over the past 10 years specific to foundation drilling and grouting. There must be one approved grout lead per shift on-site during all grouting operations.

2. Drilling Inspector Qualifications

    a. Submit the qualifications at least 30 days prior to commencement of drilling activities.

    b. The Drilling Inspector must be a geologist or geotechnical engineer with a four-year degree from an accredited university. The Drilling Inspector must

have a minimum of 6 months of drill inspection experience and 1 year of similar experience.

3. Drilling Rig Operator

    a. Submit the qualifications at least 30 days prior to commencement of drilling activities.

    b. The Drilling Rig Operator must have 3 years of experience over the past 10 years specific to foundation drilling and grouting.

4. Grout Manufacturer

    a. Submit the qualification at least 30 days prior to commencement of drilling activities. Grout Manufacturer to have a minimum of 5 years of experience in the production and use of the type of grout proposed for the Work.

B. Field Testing:

1. The Contractor shall employ an independent testing laboratory to perform field testing. The Contractor shall be responsible for all grout testing costs. Comply with the applicable ASTM Standards for testing.

2. Take compression test specimens from the first placement of each type of grout to ensure compliance with these Specifications.

    a. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C109 at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at one, seven, and 28 days.

C. Grout Curtain Preparatory Meeting:

1. Prior to commencing any work on the grout curtain, the Contractor, including all field personnel to be involved in drilling and installation of the grout curtain, shall meet with the Engineer to review the Contract Drawings and specifications, work plans, and submittals. Drilling may commence upon approval of the grout curtain installation plan and procedures and after conducting the Preparatory Meeting.

Responsibilities

A. The Contractor and their designer are ultimately responsible for the grout curtain wall design and installation. Submittal review by the Owner and the Engineer does not relieve the Contractor of their design responsibility.

B. The cost of laboratory tests on grout will be by the Contractor. Where test results show the grout to be defective, the Contractor shall pay for the tests, removal and replacement of defective work, and re-testing all at no cost to Owner.

Delivery, Storage and Handling

A. Transport and store cements in accordance with manufacturer's recommendation and as required herein. Total storage time from date of manufacture to date of installation shall be limited to six months or the manufacturer's recommended storage time, whichever is less. Store enough cement, and constituent components of grout, at or near the site to ensure grouting operations are not delayed by shortages.

B. If cement is found to contain lumps or contaminants that may be deleterious to the grouting operation, screen the cement through a standard No. 16 mesh screen, or else replace the cement. Reject material that becomes damp or otherwise unacceptable and immediately remove from the site and replace with acceptable material at no cost to the Owner.

C. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers, and printed instructions.

D. Deliver non-shrink cement based grouts as pre-blended, prepackaged mixes requiring only the addition of water.

Part 2: PRODUCTS

General

A. Provide materials produced by one manufacturer or supplier in order to provide standardization of performance.

Grouting Materials

A. Provide grout composed of water and cement. Store enough cement, water, and ancillary grout mix components at or near the site of the work to ensure that grouting operations are not delayed by shortage of grout materials or water. Submit grout mixes in the Grout Mix Design submittal.

B. All materials must conform to the basic specifications listed below and include test results in the Grout Materials Test Reports submittal. Ensure all grouting materials are compatible.

C. Grouting Materials Test Reports

1. Submit material test reports showing that all grouting materials listed in the specification, or proposed substitution, meet the quality and soundness requirements specified.

D. Water for Grout

1. Water is not available on-site. Provide potable water for grout including transportation of water to the site. Withdrawing water from the lake requires a permit and testing. Potable water does not need to be tested.

2. If non-potable water is utilized for the grouting, conduct testing and submit mixing water test reports in accordance with ASTM C1602/C1602M and ASTM C1603, and then submit Mixing Water Test Report to the Engineer within 72 hours of ASTM test completion. Begin sampling no later than 7 days after Notice to Proceed is given. Perform testing of samples within ASTM time requirements for the sample, or 24 hours of sampling, whichever is less.

E. Cements

1. The grout mixes must contain at least 30 percent Portland Cement by dry weight of the mixture.

2. Cement used in grout must be in accordance with ASTM C150/C150M Type III.

3. The Grouting Material Submittal must include the source of cement, 6 months of mill tests, and an ASTM C150/C150M compliance certification. Storage of cement must be in accordance with paragraph Delivery, Storage, and Handling.

F. Fly Ash

1. If used, fly ash must be in accordance with ASTM C618. Fly Ash may be provided in paper sacks or in bulk. Transport, handle, and store so as to avoid damage, waste, or absorption of moisture. Use of reclaimed ash and alternatives to Class F and Class C ash are not permitted.

G. Ground-Granulated Blast Furnace Slag

1. Ground-Granulated Blast Furnace Slag, if used, must be in accordance with ASTM C989. Transport, handle, and store so as to avoid damage, waste, or absorption of moisture.

H. Silica Fume

1. If used, Silica Fume must be in accordance with ASTM C1240. Use of pelletized Silica Fume is not permitted. Transport, handle, and store so as to avoid damage, waste, or absorption of moisture.

I. Admixtures

1. Provide admixtures in adequate containers suitable volume to allow measure and dispensing on a production basis without delay or error. Allowed additives include but are not limited to the following: superplasticizers, water-reducing admixtures, viscosity modifiers, and anti-washout admixtures.

2. If use of an additive that is not specified is desired, propose the additive in writing to the Engineer and include in the proposal material quality and property data, and applicable literature.

3. Provide certification from the manufacturer for all admixtures. When multiple admixtures are used in a grout mix, all of the admixtures must be demonstrated

to be compatible with each other and the other ingredients in the mix by testing and other applicable date.

4. Superplasticizer: If used, it must meet the requirements of ASTM C494/C494M, Type F.

5. Water-Reducing Admixture: If used, it must be in accordance with ASTM C494/C494M, Type A.

6. Viscosity Modifier: If used, it must be in accordance with ASTM C494/C494M Type S

7. Fluidifier: If used, it must be in accordance with ASTM C937.

Drilling Equipment

A. The Contractor shall select appropriate drilling equipment which meets the access requirements for the dam/spillway and the Specifications.

B. Drilling equipment shall be capable of advancing the grout holes to the required depth through soil and shale.

C. Use drilling equipment of a type suitable for the depth, diameter, and material to be drilled. Use equipment capable of maintaining the required alignment.

D. Prior to shipment of drilling and grouting equipment to the site, Contract Drawings and general descriptions of equipment proposed for use in the Work, including drills, pumps, mixers, agitators, etc., shall be submitted to the Engineer. All equipment will be subject to approval by the Engineer and shall be maintained in good working condition. Equipment which does not produce the quality or quantity of Work required by these Specifications shall be replaced at no additional cost to Owner. Provide dust suppression on equipment as needed to comply with local regulatory requirements.

Grouting Equipment

A. The grout mixing system shall be capable of precisely proportioning the mix constituents and blending them into a homogeneous grout of uniform consistency. It shall be capable of continuously batching and mixing the grout in sufficient quantity, without interruption due to inadequate batching or mechanical limitations.

B. Use a high-speed, high-shear, colloidal type grout mixer capable of continuous mechanical mixing that will produce uniform and thoroughly mixed grout which is free of lumps and undispersed cement.

1. The mixer shall be a commercial grade mixer, specifically designed for foundation grouts and shall be subject to approval by the Engineer.

2. The mixer shall be equipped with suitable water and admixture measuring devices calibrated to read in cubic feet with a precision of at least $1/10^{th}$ of a cubic foot, and that can be reset to zero after mixing each batch of grout.

3. Mixer shall be equipped with grout screens between the mixer and sump.

C. Provide suitable injection ports. All grouting equipment should be of a type, capacity, and mechanical condition suitable for doing the grout Work. The equipment should be maintained in proper working order at all times.

D. Two helical-screw rotor type pumps (one used for standby). Pumps shall be commercial grade products specifically designed for grouting service and capable of handling cement grout and shall be subject to the approval of the Engineer.

E. Provide valves, pressure gauges, pressure hose, supply lines, and small tools as may be necessary to provide a continuous supply of grout and to accurately control pressures at the pump and at the hole being grouted.

F. The arrangement of the grouting equipment shall provide a continuous circulation of grout throughout the grout conveyance system and shall permit accurate pressure control at the hole by use of a valve on the grout return line. Pressure gauges and adequate valves shall be provided at each hole. The equipment and lines shall be prevented from becoming fouled by continuous circulation of grout and by the periodic flushing of the system with grout or water as necessary.

Part 3: EXECUTION

Grout Curtain wall Installation Plan

A. At least 30 days prior to the commencement of drilling foundation grout holes, submit the Grout Curtain Wall Installation Plan that includes but is not limited to details of the following.

1. List, details, and data on the drilling equipment demonstrating equipment meets all functional specifications; and example drilling logs

2. List, details, and data on the grouting equipment and grout monitoring equipment demonstrating equipment meets all functional specifications, and example grouting data.

3. The overall sequence and schedule of work including the anticipated staffing and shifts. Include a personnel chart identifying key personnel, points of contact and their responsibilities.

4. Layout for equipment and grout plant on detail drawings.

5. The proposed grout hole layout and naming convention.

6. Grouting progress drawing proposed format.

7. Contingency plan in the event of early stoppage of grouting. (i.e., equipment breakdown, severe weather stand downs, end-of-work shift, or other factors that could cause early cessation of grouting activities)

8. Coring grout hole procedures for existing concrete apron.

9. Details of the sequence of casing installation (if needed
10. Detailed plans for the care and disposal of soil and grout cuttings, wastewater, and waste grout. List any environmental permits/compliance, and details of required clean up including procedures, locations, and time intervals.

11. Proposed format for records of injected volume, pressure, and rate of flow during grouting for each stage.

12. General guidelines and procedures for identifying and isolating zones and stages of high grout takes, and procedures to be followed in the event of communication in grout holes.

13. Grout mix changes, including the procedures, protocols, means, and methods for changing grout mixes expeditiously to the grout hole during production.

14. Grout testing protocols, time frames and procedures, frequency of testing, including a plan that identifies quality control procedures and the individual responsible for management of each grouting stage and the quality control measures that must be implemented.

15. Production estimates including the identification of steps in communications and decision- making process that impact the progress of work.

16. A sample of grouting progress drawings with drilling and grouting work progress.

17. A sample of measurement while drilling outputs.

18. A detailed description of the proposed activities associated with embankment and overburdened drilling including the proposed methods of dealing with the instance of grout hole drilling encountering zones of karst features, boulders, cobbles, or gravels in the embankment and foundation soils, and at the rock interface during the grout hole drilling process.

Equipment

A. Using drilling, testing, and grouting equipment of a type, capacity, and mechanical condition suitable to perform the work including but not limited to the desired depths, angles, diameters, pressures, and volumes as determined and approved by the Engineer.

B. Regardless of grout take, grouting equipment arrangement is required to provide a continuous circulation of grout throughout the system, and to permit accurate pressure control by operation of a valve on the grout return line. Prevent equipment and lines from becoming fouled by maintaining the constant circulation of grout, and by performing the periodic flushing out of the system with water. Complete flushing with the grout intake valve closed, the water supply valve open, and the pump running at full speed.

C. The drilling equipment must be capable of drilling a borehole at the required angle from vertical to the required drill depth, to the required drill depth, and produce a grout hole suitable for accepting grout. Supplies include all coring and non-coring bits, drill

rods, tools, core barrels, casing, piping, pumps, and other equipment, water and power to accomplish the required drilling. All drilling equipment used must be of a type, capacity, and mechanical condition suitable for performing the work, as determined by the Engineer.

D. Submit the proposed drilling equipment to include:

1. Manufacturer and model number of the drill rig

2. The manufacturer, model, designation, and diameter of the drill rods

3. The bit type, bit manufacturer, but model, and diameter.

E. Grout Equipment

1. The grout plant must be capable of supplying, mixing, stirring, and pumping the grout and additives to the satisfaction of the Engineer.

Hole Sequences

A. Perform drilling and grouting in 2 lines as shown on the Contract Drawings. Drill and grout the downstream line first, followed by the upstream line.

B. Perform drilling and the grouting by stages, using the split spacing, single-stage grouting method as described herein.

C. Execute all primary holes to full depth before starting secondary holes. Do not perform any rock drilling and water pressure testing adjacent to any hole where grouting is ongoing until after grout stage has reached the final set time.

D. Single stage Grouting Sequence

1. Drill the grout hole to full depth and wash to remove drill cuttings

2. Flush and water pressure holes, as directed

3. Place packer at top of hole and grout the hole.

E. Hole Series Sequence

1. Primary Holes

a. Drill primary holes for foundation grouting to the bottom of the deepest zone. The depths are stated on the Contract Drawings.

2. Secondary Holes

a. After the primary holes are completed, for the grout line, complete the secondary grout holes next.

Grouting Procedures

A. Except as otherwise specified, no grouting is permitted within 5 feet of installed perforated pipe or gravel filters for foundation drains. Monitor water flow through drains for early indications of communication. In case leakage of grout into drains does occur, immediately stop the grouting operations, and remove all grout from the drains affected by washing to the satisfaction of the Owner. During grouting operations, take all necessary precautions to prevent drill cuttings, equipment exhaust oil, equipment hydraulic oil, wash water, and grout, from defacing or damaging the permanent structure. Perform daily maintenance along grout lines to facilitate inspection of interconnected holes and breakouts. Provide any pumps and ponding equipment necessary to care for wastewater and grout from these operations, and to be in compliance with all applicable environmental regulations. Upon completion of these operations, clean up all resulting waste that is unsightly, creates a safety hazard, impedes transportation, or would interfere with the efficient operation of the project as designed.

B. During grouting operations, keep the work area clean, and continually clean any areas where grout is placed on permanent project features. Repair any damage to project features from drilling and grouting operations. No additional payment will be made for cleanup or repair.

Grout Injection

A. The actual depth of the open grout hole shall be confirmed by measuring immediately prior to connection of the grout delivery line. The measured depth shall be noted. If it is less than the planned depth, the hole shall be re-drilled to proper depth prior to grouting.

B. Grout shall be placed through an injection pipe extending into the drilled hole. Supply, mix, stir, and pump at a rate to maintain a continuous circulation of grout.

C. If the grout hole readily takes grout and the grout take does not decrease with time, the Contractor shall gradually increase the cement content until the grout take decreases.

D. Grouting pressures shall be varied as directed with conditions encountered in the respective holes. If it is found the required pressure cannot be reached after pumping a reasonable volume of grout at the minimum workable water to cement ratio, a sanded grout mix shall be used, the pumping speed shall be reduced, or pumping stopped temporarily and intermittent grouting shall be performed, allowing sufficient time between grout injections for the grout to stiffen. If the desired results are not obtained with this mix, grouting in the hole shall be discontinued, if so directed.

E. All grout shall be flushed out of the circulating lines and injection lines, pipes and upon completion of grouting a stage, and/or whenever the grouting of that stage continued longer than two hours. No grout shall be held in the agitator longer than two hours.

F. Clean all adjacent areas of excess material, powder, grout, waste and/or droppings. Chemicals used for cleaning should be non-hazardous and non-flammable.

9.1.6 FILL PLACEMENT AND SITE RESTORATION (31.90.10)

Part 1: GENERAL

Description

A. This Section describes materials, installation, and procedures for surface restoration at the Site including surface conditions, reseeding, and weed control.

Related Work Specified Elsewhere

A. 01 40 00: Quality Requirements.

B. 31 23 01: Earthwork and Rock Excavation.

Submittals

A. Submit in accordance with plans and specifications.

B. Submit copies of the seed mixes to be used.

C. Submit manufacturers' product data and MSDS sheet of herbicides to be used to control weeds.

Performance Standards

A. Surface restoration shall be considered successful when there are indications that the native vegetation from the topsoil and applied seed is recovering. In addition, the site shall show resistance to invasive weed species.

B. Project surface restoration shall be considered successful when more than 70 percent is covered by vegetation specified herein, i.e., not weeds, invasive species, etc.

Part 2: MATERIALS

Clay Backfill

A. Clay backfill shall meet the following index and material specifications:

1. Minimum dry unit weight of 100pcf
2. Liquid Limit Max of 45% and a PI<20
3. No particles bigger than 6" in maximum dimension, remove limestone floaters

4. Samples of each source or visually distinct clayey fill material need to be collected and subject to the following tests:

    a. Atterberg Limits (ASTM D4318)
    b. Standard Proctor (ASTM D698)

Dense Graded Aggregate (DGA), Crushed Stone Base (CSB), and #57 Stone

A. All stone shall meet all requirements for the specified gradation provided in the KYTC Standard Specifications (2019)

    1. Samples of each distinct source for stone shall collected and subject to the following tests:

        a. D GA and CSB: Standard Proctor

        b. #57 Stone: Standard Proctor OR Relative Density (ASTM D4254-16)

Seed Mixes

A. A vegetation survey in the area that will be affected by construction will be completed by the Contractor and reviewed by Owner prior to construction.

B. Seed mixes shall be selected to match the conditions where they will be used. Seed mixes for vegetative reclamation can be determined using the vegetation survey, by using pre-made mixes intended for use in specific areas, or by using the property owner's requested blend.

Weed Management

A. Utilize the Integrated Weed Management (IWM) concept to control weeds. IWM is a comprehensive management concept that utilizes a combination of weed control techniques to control weeds as appropriate. These methods could include manual removal, mechanical control, and chemical control.

Chemical Weed Control

A. Only herbicides that are U.S. Environmental Protection Agency (EPA) approved for aquatic environments shall be used. These herbicides shall include unrestricted glyphosate without a surfactant, such as Dow AgroSciences Rodeo® and Accord®, Monsanto AquaMaster™, or 2,4-D Amine. Contractor shall apply all herbicides in accordance with applicable laws.

Part 3: EXECUTION

Restoration of Non-Paved Areas

A. General

1. The Contractor shall remove excess soil and rock from the site, rough-grade disturbed areas, and replace topsoil within two weeks of final grading.

2. Regrade as necessary to match existing contours and to promote proper drainage.

B. Subgrade Preparation

1. The Contractor shall rip subsoil and/or till the subgrade prior to placement of new fill soils to a depth of 3 inches

C. Placement of Fill

1. New clayey backfill soils shall be compacted in lifts having a loose lift thickness of 6 to 8 inches Each lift should be moisture-conditioned to within the acceptable moisture content range and compacted to at least the minimum percent compaction for the specified material.

    a. Clay Backfill, Dense Graded Aggregate (DGA) or Crushed Stone Base (CSB) shall be compacted to 98% Standard Proctor Maximum Dry Density at -2% to +3% of optimum moisture content.

    b. #57 Stone shall be compacted to no less than 80% Relative Density, or 95% Standard Proctor Maximum Dry Density (Method C)

    c. Slopes shall be overbuilt by a minimum of 12 inches to allow for proper compaction of the surficial soils, then cut to rough/final grade.

D. Topsoil Placement

1. All disturbed areas requiring topsoil replacement, shall have the subgrade tilled to a depth of six-inches. Tilling shall consist of loosening the subgrade by scarifying and/or disking.

2. After tilling the subgrade, surface rocks three-inches and larger shall be removed by a rock picker or other mechanical means, e.g., manually. Areas that have also been ripped, shall have surface rocks three-inches and larger removed by a rock picker or other mechanical means.

3. After subgrade tilling and rock removal, the topsoil shall be replaced and lightly compacted.

4. The topsoil shall be mechanically screened or picked of rocks two-inches and greater. Hand selecting rocks from the topsoil as it is placed will not be permitted in lieu of mechanical means of removal.

5. The depth of topsoil to be replaced shall be the same depth as determined during the preconstruction meeting with the property owner or six- inches, minimum.

Topsoil shall be imported to replace the quantity of material removed during the rock screening process in order to achieve the original topsoil depth. If the original topsoil depth is less than six-inches, topsoil shall be imported to obtain the six - inch minimum depth.

6. A Standard Proctor Density of 85 percent for the top three-inches of topsoil is acceptable. The depth of topsoil replacement and soil amendment requirements, as deemed necessary by qualified soil technicians.

7. All disturbed and bare soil areas shall be reseeded with a suitable seed mix to ensure the establishment of revegetation.

Seeding

A. Prior to seeding, the seeding surface shall be scarified. Raking may be necessary. Seed shall be divided out by area and hand broadcast evenly over the impacted area. After broadcasting, the seed shall be lightly-raked into the soil with a landscape rake, or equivalent.

B. Seeding mixtures shall be sewn at the time of year specified for the mixture used. Seeding efforts shall be coordinated to occur within this window.

Mulching

A. Mulch shall consist of wheat seeding straw and shall be placed after seeding is complete.

Irrigation

A. Although the restored plant community may not require irrigation, supplemental irrigation, via a water truck or other approved means, shall be applied if seasonal precipitation is below average or the revegetation is showing indications of stress.

Weed Control Methods

A. Weeds shall be reviewed monthly during the growing season and treated to achieve the performance standards.

B. Weeds shall either be chemically- or mechanically controlled. In areas where there is risk of damage establishing native species by chemical or mechanical methods, weeds shall be manually removed.

C. Chemical Control
   1. Recommendations for the use of restricted herbicides shall be submitted to the appropriate jurisdictional entity, in writing, by a licensed Commercial Applicator or Qualified Supervisor. All restricted herbicide applications shall be approved by the jurisdictional entity prior to use. All herbicides shall be applied in

accordance with KTC regulations and label requirements. The following timing targets shall be used:

2. If chemical treatment is used, wick application or spot spraying shall be used to minimize effects to surrounding non-target species. If resistance to chemical control is determined, an alternate method of control shall be used.

3. Broadcast spraying shall be used with target selective herbicides when weed density is heavy and no non-target species are at risk of damage from drift.

4. Spot spraying shall be used when focus spraying can treat weeds without incidental damage.

5. Wicking shall be used in areas where highly aggressive weeds are among natives.

D. Mechanical Control

1. The mechanical control method used for this project shall consist of mowing with a weed whip. Mowing shall only be used on annual weed species at locations where weeds are relatively dense and are predominantly taller than the other native species.

E. Manual Removal

1. Weeds shall be manually removed when chemical or manual control methods are impractical or could cause damage to surrounding native vegetation. All material resulting from manual removal shall be legally disposed of offsite. Special care shall be taken to make sure that all potentially viable seed heads are carefully bagged and removed from the site.

Other Reclamation Maintenance Items as Required by Owner

A. These items may include reseeding in areas where vegetation efforts are suffering, regrading due to heaving or settling, and erosion, and erosion and sedimentation control maintenance.

9.1.7 MATERIAL TESTING AND CONSTRUCTION OBSERVATION *(THIRD-PARTY)* (32 90 10)

Part 1: GENERAL

Description

A. This Section describes requirements for field testing of granular and clay soils, and concrete.

Related Work Specified Elsewhere

A. Earthwork and Rock Excavation.

B. Fill Placement and Site Restoration

Submittals

A. Submit in accordance with plans and specifications.

Performance Standards

A. Material testing shall be performed by a third-party inspector to be hired by the Owner.

   1. The Third-Party Inspector shall provide part- or full-time general construction observation to verify that the project is completed per the plans and specifications.

   2. Construction observation reports shall be prepared daily and submitted to the Engineer within 24 hours of the dated report.

B. Compaction testing shall be performed by nuclear density gage. Gages shall be calibrated on-site daily prior to beginning any testing.

C. Contractor shall, upon request by the third-party inspector, provide a prepared surface or material sample for testing.

D. Third-part inspector shall submit soil compaction reports to Owner and Engineer within 24 hours.

E. Daily concrete testing shall be performed prior to placement of any concrete. Concrete not meeting the specified slump and air entrainment percentage shall be rejected.

Part 2: MATERIALS

Unused

Part 3: EXECUTION

Compaction Testing of Clayey Fill Soils

A. General
   1. The third-party inspector shall perform a minimum of 2 soil density tests per lift per fill area where clayey backfill is placed.

   2. If any failing soil compaction tests occur, a corresponding passing test is required prior to placement of the next fill lift.

Concrete Materials Testing

A. Field Testing

   1. Concrete shall be tested no less than once per day per mix design or every 100 cubic yards per mix, whichever is most frequent.

   2. Concrete shall be tested in the field for slump and air entrainment based on the concrete specifications provided in KTC Specifications and shall include a minimum of (5) five 4”x8” concrete cylinders

      a. Concrete cylinders shall be subject to compressive strength testing at the following intervals and number of tests:

         i. (1) 7-day compressive strength test

         ii. (3) 28-day compressive strength tests

         iii. (1) 56-day compressive strength test

   3. Field tests of concrete shall be submitted to the Engineer within 24 hours. Any concrete trucks which do not meet the slump or air entrainment requirements shall be rejected and the Engineer shall be notified.

   4. Compressive strength test results shall be submitted to the Engineer within 24 hours.

      a. Any concrete compressive strength tests which do not meet the specified strength shall be identified separately from the standard submittals.

END OF SECTION

9.1.8 WINGWALL STABILIZATION/VOID FILL/WATER CUT-OFF

Utilizing a Two-Part, 1:1 by Volume, Water-Resistant, High-Density Polyurethane (HDPF)

Description:

This work shall consist of furnishing and injecting expansive polyurethane material beneath the wingwall foundations through holes, as shown on the plans or as directed by the Engineer, while monitoring for movement at the surface.

Material:

1. High Density Polyurethane Foam.

   Certify that the material conforms to the following requirements listed in this section:

PROPERTY	TEST	RESULTS
• Density, lbs./cu. ft.	ASTM D1622	3.5 - 4.5
• Compressive Strength, psi (min.)	ASTM D1621	55
• Tensile Strength, psi (min.)	ASTM D1623	90
• Shear Strength, psi (min.)	ASTM C273	45
• Flexural Strength, psi (min.)	ASTM D790	90
• Closed Cell content (%)	ASTM D6226	+85

   HDPF shall reach 90% compressive strength within 30 minutes of injection. The material used shall be a two-part 1:1 by volume HDPF, such as URETEK 486 STAR. Other polyurethanes submitted must meet all of the required specifications and be preapproved by the Owner. The material shall be water blown, not chemically blown. The material shall be a polyurethane-forming mixture, having water insoluble diluents, which permits the formation of polyurethanes in the presence of water. Water insoluble diluents shall provide polyurethane foam with improved dimensional stability properties. The presence of water insoluble diluents and the characteristics and properties listed above must be certified by the manufacturer (paragraph 3). The certification from the polyurethane manufacturer must be submitted with the bid documents

2. Aquatic and Terrestrial Toxicity Testing.

   Polyurethane must pass aquatic and terrestrial toxicity testing and chemical analysis (RCRA metals, TOC, and COD). The polyurethane must show a lack of toxicity at 200 ppm TCLP

leachate and show non-toxic for all test species. Testing must have been performed by an independent third-party testing laboratory. The certification from the independent third-party testing laboratory must be submitted with the bid documents.

3. Panel Test for Hydro-Insensitivity of High-Density Polyurethane Grout.

Polyurethane must pass the Panel Test for Hydro-Insensitivity of High-Density Polyurethane Grout (see the attached testing protocol). The Panel Test must be performed by an independent third-party testing laboratory, under the supervision and review of a licensed Professional Engineer, and must certify that the polyurethane material meets or exceeds the limits set forth in the panel test specification. The certification from the independent third-party testing laboratory must be submitted with the bid documents.

4. Non-shrink grout to patch drill holes.

Non-shrink grout must be supplied by a manufacturer on the approved products list and must be used within the shelf life and temperature limitation set by the manufacturer.

Pre-Bid Site Visit:

All proposals and responses require the contractor to conduct a site visit prior to submitting a bid. The pre-bid site visit must be coordinated by the Owner's Representative.

Equipment:

1. Pumping Units.

Ensure that all pumping units used are equipped with certified flow meters to precisely measure the amount of each component injected, so that the 1:1 ratio by volume is maintained for quality control and a certified volume of injected polyurethane material is obtained for proper payment. Flow meters must be recertified annually (once every 12 months) to ensure accuracy. Certifications from the manufacturer (or an independent third party) demonstrating that each flow meter intended for use has been tested within the past 12 months must be submitted with the bid documents.

Quality Management:

1. Drilling Holes.

Drill injection holes in the pattern shown on the Standard Drawings, or as indicated on the approved field Quality Control (QC) plan, as approved by the Owner's Representative. Drill 5/8" diameter holes, vertical and round, and to a depth indicated on the approved field QC plan.

2. Injection of the HDPF.

Inject the HDPF through holes to fill voids beneath the concrete to the prescribed injection depth(s). Continuously monitor for movement of the structure. Concrete is sufficiently stabilized when movement of the structure is detected.

3. Hole Patching.

Install a rapid set, non-shrink patching material into the drilled-out hole and strike patches flush with the surface of the surrounding concrete.

Experience:

Have a minimum 3 years of experience injecting 1:1 by volume, two-part, expansive polyurethane through holes or tubes into soils while monitoring at the surface for movement to demonstrate sufficient densification of the soils. Evidence of prior experience must be submitted with the bid documents: 5 awarded public contracts using two-part, expansive polyurethane within each of the previous 3 years.

Have as an employee of the company, a licensed Professional Engineer (P.E.) with a minimum of 3 years of experience in stabilization of foundation soils by injecting 1:1 by volume, two-part, expansive polyurethane through holes or tubes into soils while monitoring at the surface for movement to demonstrate sufficient densification of the soils. The name, hire date, license number, and resume of the licensed Professional Engineer must be submitted with the bid documents.

Measurement And Payment:

HDPF will be measured to the nearest pound as displayed by the certified flow meter and paid for at the contract unit price per pound of polyurethane injected, including all materials, tools, equipment, labor, warranty, and incidentals necessary to perform the work. Mobilization will be paid under a separate line item.

DOCUMENT SUBMITTALS - to be included in the Bid Submission:

1. Certification by the manufacturer that the polyurethane to be used meets all the requirements in the MATERIAL section, including that it is a 1:1 by volume, two-part, water blown polyurethane.
2. Toxicity Testing Results by an independent laboratory demonstrating that the polyurethane shows a lack of toxicity at 200 ppm TCLP leachate and show non-toxic for all test species.
3. Certification by a third-party testing lab that the polyurethane has passed the Panel Test for Hydro-Insensitivity of High-Density Polyurethane Grout confirming that the polyurethane is effective in wet or dry conditions.
4. Certifications from the manufacturer (or an independent third party) demonstrating that each flow meter intended for use has been tested within the past 12 months.
5. Evidence of prior experience: 5 awarded public contracts within each of the previous 3 years injecting 1:1 by volume, two-part, expansive polyurethane through holes or tubes into soils while monitoring at the surface for movement to demonstrate sufficient densification of the soils.
6. Name, hire date, license number, and resume of the licensed Professional Engineer (P.E.) employed by the Contractor with a minimum of 3 years of experience in injecting 1:1 by volume, two-part, expansive polyurethane through holes or tubes into soils while monitoring at the surface for movement to demonstrate sufficient densification of the soils.

9.2 STRUCTURAL

9.2.1 SELECTIVE DEMOLITION (02.41.00)

Part 1: GENERAL

Description

A. Demolition of portions of the spillway and intake riser to accommodate the construction of dam repairs.

Reference Drawings

A. Reference drawings of the existing structures are available upon request.

B. The Contractor is responsible to obtain, at his own expense, any additional information necessary to construct the Work required under these Specifications.

Submittals

A. Submit Demolition Plan.

Quality Assurance

A. Demolition Plan:

1. Identify each item to be removed.
2. Provide description of marking items to be demolished, sequence, methods, and equipment used for demolition.
3. Provide a demolition schedule; include coordination/check points with the Owner and Engineer.
4. Include containment and disposal measures to prevent debris from entering the lake.
5. Identify off-site disposal locations.
6. Describe measures to protect items to be retained and items in proximity to those to be demolished.

Part 2: MATERIALS (Not Used)

Part 3: EXECUTION

General

A. Prior to beginning demolition work and concrete removal, coordinate all items of demolition with the Owner and the Engineer. Implement all measures to protect items to be retained.

B. Perform demolition and removal work specified herein and indicated in the Drawings in a manner that will not damage parts of the existing structure or systems not intended to be removed. If, in the opinion of the Owner and the Engineer, the method of demolition used may endanger or damage parts of the existing structure and systems or affect the satisfactory operation of the existing facilities, promptly change the method when so notified by the Owner and the Engineer.

C. Contractor shall replace in kind all damaged existing facilities not intended to be removed, including concrete and other facilities.

D. Prepare remaining concrete surfaces to receive new concrete and grout in accordance with Section 03 30 00.

E. Blasting of any kind will not be permitted.

F. Dispose of demolished materials off-site in accordance with applicable laws, ordinances, rules, and regulations.

G. The Contractor must dispose of demolished materials at their cost and supply documentation as necessary to the Owner.

Noise

A. Noise levels resulting from demolition activities shall comply with all local, state, and federal regulations. Noise producing Contractor activities shall not occur before 7:00 A.M. or after 7:00 P.M. without the written approval of the Owner.

Control Of Dust and Debris

A. Control dust generated from demolition work. Provide labor, equipment, and materials, and use efficient methods wherever and whenever required to prevent construction operations from producing dust nuisance or damage to persons, property, or activities.

B. Prevent dust control water, pollutants, and debris generated from demolition work from entering the river or adjacent areas.

Removal of Existing Concrete

A. Remove portions of existing concrete structures within the limits indicated in the Drawings. Do not perform concrete removal beyond limits shown in the Drawings without the written approval from the Engineer.

B. Saw cut concrete along straight lines at the perimeter of the removal areas to the depth shown in the Drawings. Make each cut perpendicular to the concrete surface.

C. Take care to avoid damage to existing concrete to remain in place.

D. After removal of concrete to the specified limits, clean the surface to which new concrete will be bonded to remove dust, debris, and laitance. Perform final cleaning immediately prior to placement of the new concrete.

E. Concrete rubble removed within the limits of the demolition shall be disposed offsite. Do not reuse material from concrete demolition work on this project.

END OF SECTION

9.2.2 CONCRETE REPAIR (03.01.30)

Part 1: GENERAL

Description

A. Provide materials labor and equipment necessary to repair new concrete construction in coordination with the Engineer. Repairs to new concrete shall be at no additional cost to the Owner.

B. Complete repair mortar system installation in accordance with these specifications and the mortar system manufacturer's instructions regarding surface preparation, application, curing, inspection and requirements for safety.

C. Complete crack repair work in accordance with these specifications and the crack repair material manufacturer's instructions.

D. Complete joint repair work in accordance with these specifications and the joint repair material manufacturer's instructions.

E. The location, extent and repair system used for areas of concrete repair shall be coordinated with the Engineer. These include but are not limited to locations where acidic attack of the concrete surfaces has reached a depth of ½" or deeper and at any air voids, bugholes or poorly consolidated concrete areas where the specified filler/surfacer materials cannot be used for filling or surfacing of the concrete.

F. The repair work specified herein is intended to cover the requirements for repair of new concrete only, to a maximum depth of approximately 3-inches. If after surface preparation and cleaning, an area is discovered that requires a repair greater than 3-inches deep, or an area is discovered that requires repair or replacement of reinforcing steel notify the Engineer so that details may be provided to the Contractor for completion of repairs in these locations.

References

A. American Concrete Institute (ACI):
   1. 503.4: Standard Specification for Repairing Concrete with Epoxy Mortars.

B. American Society for Testing and Materials (ASTM):
   1. C33: Standard Specifications for Concrete Aggregates.
   2. C150: Standard Specification for Portland Cement.
   3. C321: Standard Test Method for Bond Strength of Chemical-Resistant Mortars.
   4. C882: Test Method for Bond Strength of Epoxy Resin Systems.

5. D570: Test Method for Water Absorption of Plastics.

6. D638: Test Method for Tensile Properties of Plastics.

7. D695: Test Method for Compressive Properties of Rigid Plastics.
8. D790: Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

9. D4262: Standard Test Method for pH of Chemically Cleaned or Acid Etched Concrete Surfaces.

10. E337: Standard Practice Test Method for Measuring Humidity with a Psychrometer.

Submittals

1. Repair drawings or photos referenced to redlined drawings showing the areas of planned repair and methods to be employed.

2. Procedures proposed for the accomplishment of repair work. Include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations to be coordinated with other works in progress.

3. Manufacturer's recommendations and product data sheets for all repair materials including performance criteria, surface preparation, ambient condition requirements and applications, curing requirements, volatile organic compound (VOC) data, and safety requirements.

4. Material Safety Data Sheets (MSDS) for any materials brought on-site including all repair system materials, solvents and abrasive blast media.

5. Design Mixes: Provide concrete and cement mortar in conformance with Section 03 30 00 and as specified herein.

Quality Assurance

A. Furnish the names of all subcontractors proposed for use for this work including necessary evidence and/or experience records to ascertain their qualifications in the application of epoxy, polyurethane, polymer-modified and cement-based compounds.

B. Include in accepted applicator qualifications:

1. A minimum of five years' experience in applying epoxy, polyurethane and polymer-modified and cement-based compounds similar to those specified in this Section.

2. A letter from the manufacturer of the specified materials, on the manufacturer's letterhead, signed by an officer of the company, stating that the subcontractor/applicator has been trained in the proper techniques for the preparation of the surface, and proper methods for mixing, placing, curing, and caring of the manufacturer's products. This letter shall further state that the subcontractor/applicator is on the manufacturer's approved list of contractors.

C. Adhere strictly to the manufacturer's recommendations regarding temperature at time of application for all work. Do not use epoxy materials when either the temperature of the concrete to be repaired or the ambient temperature is below 50 degrees F for a period of 24 hours before, during, or for a period of 48 hours after the completion of the repair. Temporary heat may be used to meet the specified requirements.

D. Use new epoxy, repair materials and use within the shelf-life limitations set forth by the manufacturer. Clearly mark the shelf-life limitations of each container.

E. The Contractor is ultimately responsible for the concrete repair work. Inspections by the Engineer or others do not limit the Contractor's responsibility.

F. Make all parts of the work accessible for inspections by the Engineer. Correct any conditions not in conformance with the specifications at no additional cost to the Owner
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G. Allow changes in the specified repair work methods only with the permission of the Engineer.

H. Provide technical field support or training services required by the accepted material manufacturers at no additional cost to the Owner.

I. Provide materials from a single manufacturer for all components of a single repair.

Services Of Manufacturers Representatives

A. Provide the services of a qualified manufacturer's technical representative to instruct the Contractor's personnel in the mixing, proper use and application of the epoxy, polyurethane, polymer-modified and cement-based compounds.

B. Provide written certification from the manufacturers' representative that materials have been mixed and applied properly and surfaces to receive these products have been prepared properly, all in conformance with manufacturer's requirements.

C. Provide on-site time required for the manufacturer's representative to achieve a successful installation at no additional cost to the Owner.

Delivery, Storage and Handling

A. Provide shelter to store materials in area or areas designated by the Owner solely for this purpose. Confine mixing, thinning, clean-up and associated operations and storage of repair mortar materials debris before authorized disposal, to these areas.

B. Mix all specified materials in the sheltered mixing operation and materials from direct sunlight and inclement weather. Protect facilities from staining and damage.

C. Do not dispose of waste materials on-site.

D. Store waste temporarily in closed, nonflammable containers until final disposal. Keep no rubbish in Contractor's area longer than 24 hours.

E. Deliver all materials to the job site in new, unopened containers. Each container shall bear the manufacturer's name and label. Labels on all material containers shall contain the following information:
    1. Name of product.
    2. Federal Specification Number if applicable.
    3. Manufacturer's batch number.
    4. Manufacturer's name.
    5. Generic type of material.
    6. Hazardous material identification label.
    7. Shelf-life date.

F. Clearly mark all containers indicating any safety hazards associated with the use of or exposure to the materials.

G. Handle and store materials to prevent damage or loss of label. Protection of materials is the Contractor's responsibility.

Project/Site Conditions

A. Environmental Requirements:
    1. Comply with the repair material manufacturer's recommendations as to environmental conditions under which materials can be applied and cured.
    2. Do not apply materials when dust is being generated.

B. Protection:
    1. Cover or otherwise protect finish work or other surfaces not being repaired.

C. Ventilation:
    1. Provide ventilation to meet product requirements prior to, during, and after application.

Part 2: PRODUCTS

Water

A. The water used for mixing concrete repair products shall be clear, potable and free of deleterious substances.

Aggregate

A. All aggregates shall conform to ASTM C33 and Section 03 30 00.

Epoxy Bonding Agent

A. Epoxy bonding agent shall conform to ASTM C881 Type I, II, IV or V; Grade 2 for epoxy resin adhesives, depending on the application. The class of epoxy bonding agent shall be suitable for all ambient and substrate temperatures.

B. Products:
   1. Sika Corp.; Sikdur 32.
   2. Euclid Chemical Company; Duralcrete.
   3. Or acceptable equivalent product.

Anti-Corrosion Coating

A. Anti-corrosion coating shall be a three-component, epoxy-modified cementitious material.

B. Products:
   1. Sika Corp.; Sika Armatec 110.
   2. Sto Concrete Restoration Division; CR 246.
   3. Euclid Chemical Company; Duralprep.
   4. Or acceptable equivalent product.

Epoxy Crack Repair Binder

A. Epoxy crack repair binder shall be a two-component, 100 percent solids, high-modulus, low viscosity epoxy adhesive suitable for crack grouting by injection or gravity feed.

B. Products:
   1. Sika Corp.; Sikadur 52.
   2. Euclid Chemical Company; Duralcrete LV.
   3. BASF Chemical Company; SBC Concresive 1380.
   4. Or acceptable equivalent product.

Flexible Polyurethane Crack Repair Material

A. Flexible polyurethane crack repair material shall be a one-component, water-activated polyurethane hydrophilic injection grout capable of 700 percent expansion. Polyurethane grout shall form a tough flexible foam seal that is impenetrable to water.

B. Products:
   1. Prime Resins; Prime Flex 900 XLV.
   2. Avanti International; Scotch Seal 5600 Chemical Grout.
   3. Or acceptable equivalent product.

Epoxy Repair Mortar

A. Epoxy Repair Mortar shall be two-component, 100 percent solids, and 100 percent reactive epoxy resin system.

B. Spall repair mortar for use in horizontal applications.

1. Products:

a. BASF Building Systems; Concresive Paste LPL.

b. Sika Chemical Corp.; Sikadur 22 Lo-Mod.

c. Or acceptable equivalent product.

C. Spall repair mortar for use in vertical and overhead applications.

1. Products:

a. Sika Chemical Corp.; Sikadur 23 Lo-Mod Gel.

b. Or acceptable equivalent product.

Spall Repairs Using Non-Shrink Cementitous Mortar

A. Products:

1. BASF Building Systems; EMACO S88 CI.

2. BASF Building Systems; Thorite.

3. Sauereisen, Inc.; Underlayment F-120.

4. Or acceptable equivalent product.

Spall Repairs Using Polymer Modified Cementitous Mortar

A. Repair spalls repair not requiring formwork using a two-component, polymer-modified cementitious mortar having a minimum 28-day compressive strength of 7,000 psi.

B. Spall repair mortar for use in horizontal applications.

1. Products:

a. Sika Corp.; Sikatop 122 Plus.

b. Euclid Chemical Company; Duraltop Fast Set.

c. Or acceptable equivalent product.

C. Spall repair mortar for use in vertical applications.

1. Products:

a. Sika Corp; Sikatop 123 Plus.

b. Euclid Chemical Company; Duraltop Gel.

c. Or acceptable equivalent product.

Spall Repairs Requiring Formwork

A. Repair spalls requiring formwork using a two-component, polymer-modified cementitious mortar/pea gravel mixture and shall have a minimum 28-day compressive strength of 6,000 psi. Mix each unit of mortar with Saturated Surface Dry (SSD) pea gravel to form the repair material following the manufacturer's recommendations.

B. Products:

1. Sika Corp.; Sikatop 111 Plus.
2. Euclid Chemical Company; Duraltop Flowable Mortar.
3. Or acceptable equivalent product.

Sealant

A. Sealant shall be a two-component polyurethane sealant as specified in Section 03 15 00. Primers and bond breakers shall conform to the sealant manufacturer's recommendations

Expansion Joint Filler

A. Expansion joint filler shall be as specified in Specification 03 15 00.

Part 3: EXECUTION

General Requirements

A. Perform exterior work during dry weather and appropriate temperature conditions in accordance with the manufacturer's recommendations. Protect unfinished work during inclement weather with tarpaulins or heavy gage polyethylene sheeting.

B. Coordinate concrete rehabilitation work with other work being performed.

C. Remove scaling, broken, loose and disintegrating materials by use of hand tools or power driven saws, down to solid unyielding material.

D. Clean surfaces thoroughly of efflorescence, oils, grease and other objectionable material in area to be repaired in accordance with the manufacturer's recommendations.

Epoxy Bonding Agent

A. Use epoxy bonding agent to adhere fresh mortar to existing concrete. Roughen existing concrete surfaces prior to application of bonding agent. Concrete surface shall be clean and sound, free of all foreign particles and laitance. Place repair material while bonding agent is still tacky or per the written instructions of the manufacturer. Reapply bonding agent if bonding agent cures prior to placement of repair material.

B. Conform to all the requirements of ACI 503.4, and as specified herein.

Anti-Corrosion Coating

A. Sandblast, clean and coat reinforcing steel that is cut or exposed during alteration and/or repair operations with an anti-corrosive coating.

B. Cover all exposed parts of the steel with the coating and apply according to manufacturer's recommendations.

Epoxy Crack Repair

A. Cracks on horizontal surfaces: When permitted by the Engineer, repair existing structural cracks by gravity feeding an epoxy crack repair binder into the prepared crack.

    1. Rout concrete surface at the crack to form a minimum 1/4-inch wide by 1/4-inch deep V-notch and clean to remove all loose and foreign particles. Fill crack with clean, dry sand and pour epoxy crack repair binder into V-notch, completely filling crack.

    2. As binder penetrates into crack, apply additional binder to the V-notch.

B. Cracks on vertical or horizontal surfaces: Repair existing structural cracks by pressure injecting an epoxy crack repair binder into the prepared crack. Seal cracked surfaces and install injection ports per manufacturer's recommendations.

    1. Do not cut reinforcement steel when drilling holes for injection ports. If rebar is encountered during drilling, abandon the hole and relocate. Patch the abandoned hole immediately with epoxy mortar flush with the surface of the existing concrete.

    2. Once the surface sealing material has cured, inject crack with epoxy crack repair binder as directed by the manufacturer.

    3. Remove injection ports upon satisfactory completion of crack injection and patch with epoxy mortar.

Flexible Polyurethane Crack Repair

A. Repair leaking cracks by pressure injecting with a waterproof hydrophilic injection grout seal crack surfaces and install injection ports per manufacturer's recommendations.

B. Do not cut rebar when drilling holes for injection ports. If rebar is encountered during drilling, abandon the hole and patch immediately with epoxy mortar flush with the surface of the existing concrete.

C. Once the surface sealing material has cured, inject crack with waterproof hydrophilic injection grout as directed by the manufacturer.

Spall Repair

A. Saw cut the perimeter of the repair area to a minimum depth of 1/2-inch below the surface of the concrete. Chip all loose concrete in the repair area to remove loose and degraded concrete to a minimum of 1/2-inch or until a sound substrate is reached. Clean the area and repair to the original dimensions with spall repair patching material according to the manufacturer's recommendations

B. Make final finished surface of patches flat, level and even with the existing concrete surface. Do not feather repair mortar to meet existing concrete surface.

C. Finish final patches on horizontal surfaces consistent with the finish on the existing structure.

Joint Repair

A. Remove sealant, bond breaker and joint filler.

B. Remove unsound concrete on the joint faces.

C. Remove laitance and provide a clean dry surface.

D. Prepare an epoxy mortar by combining epoxy crack repair binder with aggregate following the manufacturer's instructions.

E. Restore surface to original dimensions by troweling epoxy mortar onto the existing substrate in a manner to ensure bonding following the manufacturer's instructions.

F. Cure repair in accordance with the manufacturer's instructions.

G. Install new joint filler, bond breaker and sealant.

Curing

A. Cure repair materials in accordance with manufacturer recommendations.

Cleaning

A. Mechanically remove excess material from walls, floors, etc. after material has cured.

B. Clean excess materials caused by work under this Section from existing surfaces by the use of power sanders. Sand cracks flush to adjacent surfaces.

C. Remove misplaced sealants using methods and materials recommended by the manufacturers. Leave finished work and work area in a neat and clean condition.

END OF SECTION

9.2.3 CONCRETE FORMWORK (03-10-00)

Part 1: GENERAL

Description

A. Provide design and furnish materials for fabricating, erecting and removing formwork, falsework and shoring for cast-in-place concrete and flowable fill as shown on the Contract Drawings and specified herein for a complete installation.

B. Use formwork to cast all cast-in-place concrete structures.

References

A. American Concrete Institute (ACI):

1. 117/117R: Standard Tolerances for Concrete Construction and Materials.
2. 309.2R: Identification and Control of Visible Effects of Consolidation on Formed Concrete Surfaces.
3. 318/318R: Building Code Requirements for Structural Concrete and Commentary.
4. 347: Guide to Formwork for Concrete.

B. American Society of Civil Engineers (ASCE):

1. ASCE 7, Minimum Design Loads for Buildings and other Structures

C. Engineered Wood Association (APA).

D. National Institute of Standards and Technology:

1. Voluntary Product Standard PS 1 Structural Plywood

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Design Requirements

A. Design formwork in conformance with the methodology of ACI 347R for anticipated loads, lateral pressures, depth of concrete placement and rate of concrete placement. Design shall consider any special requirements due to the use of self-consolidating, plasticized and/or retarded set concrete. All forms and shoring shall be designed at the Contractor's expense.

Qualifications

A. Formwork Designer: Formwork, falsework, and shoring design shall be by a licensed engineer.

Submittals

A. Submit product data for form ties, spreaders, chamfer strips, form coatings, and bond breakers.

B. Submit formwork drawings and calculations signed and sealed by a professional civil engineer or structural engineer.

Quality Assurance

A. Design of Formwork

1. The Contractor shall assume responsibility for the design, engineering and construction of formwork. Forms shall be designed to produce concrete members identical in shape, lines and dimensions to members shown on the Contract Documents.

2. When high range water reducer (superplasticizer) is used in concrete mix or when self-consolidated concrete is specified, forms shall be designed for full hydrostatic pressure per ACI 347.

3. The formwork shall be designed for the loads and lateral pressures in accordance with ACI 347 and wind loads of 30 pounds per square foot.

4. Construction and contraction joints, openings, offsets, recesses, chamfers, blocking, screeds, bulkheads, waterstops, anchorages, inserts, and other features shall be provided.

5. Formwork shall be designed to be readily removable without impact, shock, or damage to 'green' concrete surfaces and adjacent materials.

6. The maximum panel deflection shall be 1/360 of the span between structural members.

B. Unless otherwise specified herein, formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits as given in ACI 117.

C. Materials, fabrications and workmanship found defective shall be promptly removed and replaced and new acceptable work shall be provided in accordance with Contract requirements at no additional cost to the Owner

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Delivery, Storage, And Handling

A. Materials shall be delivered to the site in undamaged condition and at such intervals as will avoid delay in the work.

B. Material shall be stored and protected in a clean, properly drained location. Material shall be kept off the ground under a weather-tight covering permitting good air circulation. Formwork materials shall be stored on dry wood sleepers, pallets, platforms or other appropriate supports which have slope for positive drainage. Materials shall be protected

from distortion, excessive stress, corrosion and other damage. Materials shall not be stored on the structure in a manner that might cause distortion or damage to the supporting structure.

Part 2: PRODUCTS

Lumber

A. Lumber used in form construction shall be Douglas fir, No. 2 grade, S4S, Standard Grading and Dressing Rules No. 16, West Coast Lumber Inspection Bureau; or Southern Yellow Pine, No. 2, S4S, Standard Grade Rules Southern Pine Inspection Bureau. Boards shall be 6 inches or more in width.

Plywood

A. Only grade-marked plywood conforming to APA shall be provided.

B. Plywood used in form construction shall be Grade B-B, Class 1 plyform, mill-oiled, and sanded on both sides in conformance with U.S. Product Standard PS 1 Structural Plywood.

C. Thickness shall be sized to maintain alignment and surface smoothness, but not less than 5/8-inch thick.

Steel Forms

A. Commercial grade sheets not less than 16 gage shall be provided.

B. Stock material that is free from warps, bends, kinks, cracks, and rust or other matter that could stain the concrete shall be provided.

Form Material Locations

A. Wall Forms

1. Materials: Plywood, hard plastic finished plywood, overlaid waterproof particleboard, or steel in new and undamaged condition, of sufficient strength and surface smoothness to produce specified finish.

B. All Other Forms: Materials as specified for wall forms.

Form Ties

A. Locate form ties on exposed surfaces in a uniform pattern. Place form ties so they remain embedded in the concrete except for a removable portion at each end. Form ties shall have conical or spherical type inserts with a maximum diameter of 1 inch. Construct form

ties so that no metal is within 1-1/2 inch of the concrete surface when the forms, inserts, and tie ends are removed. Do not use wire ties. Ties shall withstand all pressures and maintain forms within acceptable deflection limits.

B. Flat bar ties for panel forms shall have plastic or rubber inserts having a minimum depth of 1-1/2 inch and sufficient dimensions to permit patching of the tie hole.

C. Tapered form ties shall be tapered through-bolts or through-bolts that utilize a removable tapered sleeve.

D. Wire ties are not permitted.

E. Waterstop for Ties: For water-holding structures, furnish one of the following:

1. Integral steel waterstop 0.103 inch thick and 0.625 inch in diameter tightly and continuously welded to tie.

2. Neoprene waterstop 3/16-inch thick and 15/16 inch diameter whose center hole is one-half diameter of tie, or molded plastic waterstop of comparable size.

F. Elastic Vinyl Plug

1. Design and size of plug shall allow insertion with tool to enable plug to elongate and return to original length and diameter upon removal forming watertight seal.

2. Manufacturer:
   a. Dayton Superior, Miamisburg, OH; A58 Sure Plug.
   b. Or acceptable equivalent product.

G. Mechanical EPDM Rubber Plug:

1. Mechanical plug for taper tie.

2. Manufacturers:
   a. Greenstreak Group Inc.
   b. Or acceptable equivalent product.

3. Friction fit plugs will not be allowed.

Bond Breaker

A. Bond breaker shall be a V.O.C.-compliant nonstaining type that will provide a positive bond prevention.

B. Manufacturers:

1. Edoco Burke; Clean Lift 90 W.B.
2. Nox-Crete, Inc.; Silcoseal 97EC.
3. Or acceptable equivalent product.

Form Caulking

A. Form caulking shall be a one-component, gun-grade silicone sealant that is capable of producing flush, watertight and non-absorbent surfaces and joints. Sealant shall be compatible with the type of forming material and concrete ingredients used.

B. Products:

1. Series 1200 Construction Caulking; GE Silicones, Waterford, NY.
2. Dow Corning 999-A; Dow Corning Co., Midland, MI.
3. Or acceptable equivalent product

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Chamfer Strips

A. Provide chamfer strips, of the size required to form the chamfered edge detail shown on the Drawings. Chamfer strips shall be milled from clear, straight-grain pine, surfaced each side, or having extruded vinyl type with or without nailing flange unless otherwise shown on the Contract Documents.

Inserts

A. Provide galvanized cast steel or galvanized welded steel inserts, complete with anchors to concrete and fittings such as bolts, wedges and straps.

Form Release Agent

A. Form release agent shall not bond with, stain, or adversely affect concrete surfaces and shall not impair subsequent treatments of concrete surfaces when applied to forms. A ready-to-use water-based material formulated to reduce or eliminate surface imperfections and containing no mineral oil or organic solvents.

B. Manufacturers and Products:

1. BASF, Shakopee, MN; MBT, Rheofinish 211.
2. Cresset Chemical Company; Crete-Lease 20-VOC.
3. Magic Kote: Symons Corporation, Des Plaines, IL.
4. Or acceptable equivalent product.

Part 3: EXECUTION

Form Tolerances

A. Comply with the requirements of ACI 117 for tolerances for formed surfaces except as specified in Table 03 10 00-1.

Table 03 10 00-1	
Vertical alignment (plumbness)	1/4-inch in any 10 feet and 1-inch maximum for entire length
Variation in the lines and surfaces of foundation mats, base slabs and walls	1/4-inch in any 10 feet and 1-inch max. for entire length
Variation from the level or from the grades indicated on the Drawings	1/4-inch in any 10 feet
Variation of the linear structure lines from established position in plan	1/2-inch in any 20 feet and 1-inch maximum for entire length
Variation of distance between walls	1/4-inch in any 10 feet and 1-inch maximum for entire length and height
Variation in the sizes and locations of sleeves, floor openings, and wall openings	Minus 1/4-inch. Plus 1/2-inch.
Variation in thickness of slabs and walls	Minus 1/4-inch. Plus 1/2-inch.
Offset between adjacent panels of formwork facing material	1/2-inch (ACI 117 Class C finish).
Offset between adjacent panels of formwork facing material for exposed surfaces where appearance is of importance	1/8-inch (ACI 117 Class A finish).

B. Tolerances are not cumulative.

C. Where equipment is to be installed, comply with manufacturer's tolerances if more restrictive than above.

D. Failure of the forms to produce the specified concrete surface and surface tolerance shall be grounds for rejection of the concrete work. Rejected work shall be repaired or replaced at no additional cost to the Owner.

Preparation

A. Clean form surfaces to be in contact with concrete or foreign material prior to installation. Tape, gasket, plug, and/or caulk joints, gaps, and apertures in forms so that the joint will remain watertight and withstand placing pressures without bulging outward or creating surface irregularities.

B. Coat form surfaces in contact with concrete with a form release agent prior to form installation.

C. Keep form coatings off steel reinforcement, items to be embedded, and previously placed concrete.

D. Steel Forms: Apply form release agent to steel forms as soon as they are cleaned to prevent discoloration of concrete from rust.

Erection and Installation

A. Forms shall be constructed in accordance with ACI 347 to required dimensions, plumb, straight and mortar tight, and all joints and seams shall be made mortar-tight. Forms shall be substantial, properly braced, and tied together to maintain position and shape and to resist all pressures to which they may be subject. Unless otherwise indicated on the Contract Documents, formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits in ACI 117 and herein specified.

B. Provide means for holding adjacent edges and ends of form panels tight and in accurate alignment to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. Forms shall be tight and shall prevent the loss of mortar and fines during placing and vibration of concrete.

C. Provide exterior corners in concrete members with chamfers as specified.

D. Provide means for removing forms without injury to the surface of finished concrete.

E. Do not embed any form-tying device or part thereof other than metal in the concrete.

F. Locate large end of taper tie on the "wet" side of the wall.

G. Use only form or form-tying methods that do not cause spalling of the concrete upon form stripping or tie removal.

H. Form surfaces of concrete members except where placement of the concrete against the ground or rock is shown in the Drawings. The dimensions of concrete members shown in the Drawings apply to formed surfaces, except where otherwise indicated. Placement of concrete against the ground shall be limited to footings.

I. Set anchor bolts and other embedded items accurately before placing concrete and hold securely in position until the concrete is placed and set. Check special castings, channels, or other metal parts that are to be embedded in the concrete prior to and again after placing concrete. Check nailing blocks, plugs, and strips necessary for the attachment of trim, finish, and similar work prior to placing concrete.

Protection

A. During installation, the forms shall not be used as a storage platform nor as a working platform until the forms have been permanently fastened in position.

Removal of Forms

A. Forms shall be removed in accordance with ACI 347 recommendations without damage to concrete and in a manner to ensure complete safety to the structure. Forms, form ties and bracing shall not be removed without specific permission of the Engineer.

B. The following table indicates the minimum allowable time after the last cast concrete is placed before forms, shoring, or wall bracing may be removed; during which the air surrounding the concrete is above 50°F.

Table 03 10 00-2	
Sides of footings	24 hours
Walls and similar members not supporting loads	48 hours
Wall bracing	Until top or roof slab concrete reaches 70 percent specified 28-day strength and 7 days minimum

C. Removal times will be increased if the concrete temperature following placement is permitted to drop below 50 degrees F.

D. Do not remove supports and re-shore.

Patching of Tapered Tie Holes

A. Elastic Vinyl Plugs
   1. Clear tie hole of all loose debris with a taper tie void brush and flush debris from tie hole with air or water.

   2. Install elastic vinyl plug from larger tie hole end in accordance with manufacturer's instructions using an insertion tool as recommended by the manufacturer.

   3. Coat entire annular surface of the hole with epoxy bonding compound prior to filling with non-shrink, non-metallic patching mortar. Apply epoxy in accordance with manufacturer's instructions.

   4. Fill each side of hole with mortar. Apply mortar to the "wet" side of the wall first. Consolidate mortar solidly into the hole.

B. Mechanical Plugs
   1. Clear tie hole of all loose debris with a taper tie void brush and flush debris from tie hole with air or water.

   2. Install mechanical plug in accordance with manufactures instructions.

   3. Coat entire annular surface of the hole with epoxy bonding compound prior to filling with non-shrink, non-metallic patching mortar. Apply epoxy in accordance with manufacturer's instructions.

   4. Fill each side of hole with mortar. Apply mortar to the "wet" side of the wall first. Consolidate mortar solidly into the hole.

Field Quality Control

A. Contractor Shall Notify the Engineer of readiness for items under this Section to be inspected a minimum of five working days prior to the items being covered by further work. Failure to provide this notification will be cause for delay in placing until observations can be completed.

END OF SECTION

9.2.4 CONCRETE JOINTS AND ACCESSORIES (03.15.00)

Part 1: GENERAL

Description

A. This Section describes materials, testing, and installation of concrete joints and accessories as specified and as shown on the Contract Drawings.

References

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

1. A276: Standard Specification for Stainless Steel Bars and Shapes.
2. C920: Specification for Elastomeric Joint Sealants.
3. C1193: Guide for Use of Joint Sealants.
4. D412: Standard Test Methods or Vulcanized Rubber and Thermoplastic Elastomers – Tension.
5. D570: Standard Test Method for Water Absorption of Plastics.
6. D624: Standard Test method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
7. D638: Standard Test Method for Tensile Properties of Plastics.
8. D746: Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
9. D747: Standard Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam.
10. D792: Standard Test Methods for Density and Specific Gravity of Plastics by Displacement.
11. D994: Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
12. D1752: Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
13. D2240: Standard Test Method for Rubber Property – Durometer Hardness.

B. U.S. Army Corps of Engineers:

1. CRD-C 572: Specifications for Polyvinylchloride Waterstop.

Submittals

A. Submit following shop drawings.

1. Manufacturer's printed data and application instructions for specified materials and locations where materials are to be used.

2. Submit one sample of each type of waterstop.

3. Submit layouts for joints.

4. Certification that materials used within the joint system are compatible with each other.

Quality Assurance

A. Do not add, relocate or omit joints without written permission from the Engineer.

B. Reject material exceeding expiration date for use.

C. Clean concrete surfaces to receive expansion joint compound in accordance with the printed instructions of the joint compound manufacturer.

Delivery, Storage and Handling

A. Transport, handle, and deliver materials to the job site in the manufacturer's sealed bags, unopened containers or banded pallets.

B. Store materials off the ground on a platform or skids and protect with covers from snow, rain and ground splatter.

C. Store expansion joint compounds in a dry location where they cannot freeze.

D. Store plastic products and waterstops under cover in a dry location, out of direct sunlight.

Manufacturer's Services

A. Prior to joint preparation for joints receiving sealant materials, require joint manufacturer's technical representative to demonstrate, on site, joint preparation, priming, and sealant materials application for the Contractor's personnel performing joint work.

Part 2: PRODUCTS

PVC Waterstop

A. Waterstops shall be extruded from a PVC compound and shall be flat ribbed or ribbed with centerbulb type. Waterstop shall comply with U.S. Army Corps of Engineers Specification CRD-C-572

B. PVC waterstops for construction joints:

C.

1. Flat ribbed type, 6 inches wide unless otherwise noted on the Contract Drawings, with a minimum thickness of 3/8-inches. Products:

    a. Sika Greenstreak; Model 679.
    b. Or accepted equivalent product.

2. Flat ribbed type, 4 inches wide unless otherwise noted on the Contract Drawings, with a minimum thickness of 3/16-inches. Products:

    a. Sika Greenstreak; Model 781.
    b. Or accepted equivalent product.

3. PVC waterstop for expansion joints shall be ribbed with a center bulb, 9 inches wide with a minimum thickness of 1/4-inches. The center bulb shall have an O.D. not less than 1-3/8 inches. Products:

    a. Sika Greenstreak; Model 696.
    b. Or accepted equivalent product.

4. PVC waterstops for sealing existing concrete structures and new concrete placement shall be retrofit type, 6 inches wide and 3-3/16 inches height with a minimum thickness of 3/8-inches. Attach waterstop to existing concrete using 1/4-inch by 2-1/4 inch stainless steel sleeve expansion bolt with stainless steel batten bars. Products:

    a. Sika Greenstreak; Model 609.
    b. Or accepted equivalent product.

TABLE 03 15 10-1

Requirement	**ASTM Spec.**
Tensile strength, 1,600 psi	D638
Hardness, Shore durometer, 70-80	D2240
Elongation, ultimate, 300 percent to 450 percent	D638
Water absorption, dry weight, maximum (48 hours) 0.15 percent	D570
Specific gravity, 1.3 to 1.4	D792
Stiffness in flexure, 600 psi	D747
Cold brittleness, -35 degrees F	D746
Tear resistance, 300 lbs/inch	D624

D. Provide waterstops resistant to chemical action with Portland cement, alkalis, acids, and not affected by mildew or fungi. It shall show no effect when immersed for 10 days in a 10 percent solution of sulfuric or hydrochloric acid, saturated lime solution or salt water. Waterstops shall be such that any cross section will be dense, homogeneous, and free from porosity and other imperfections. They shall be symmetrical in shape. When tested in accordance with Federal Standard No. 601, the material shall meet the requirements in Table 03 15 10-1.

Hydrophilic Rubber Waterstop

A. Provide a bentonite free rubber waterstop with adhesive back. Waterstop shall expand by a minimum of 80 percent of dry volume in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast. Provide minimum concrete cover as recommended by the waterstop manufacturer. Center the waterstop between vertical reinforcement.

1. Products:

a. Adeka; Ultraseal MC-2005T.

b. Or accepted equivalent product.

Hydrophilic caulk Waterstop

A. Provide a water-swelling, single component, elastic sealant. Caulk waterstop shall expand by a minimum of 80 percent of dry volume in the presence of water.

1. Products:

a. Adeka; Ultraseal P-201.

b. Or accepted equivalent product.

Joint Sealant for Concrete Structures

A. Joint sealant shall be a multipart, gray, nonstaining, nonsagging, gun grade polyurethane sealant, which cures at ambient temperature to a firm, flexible, resilient, tear-resistant rubber. Sealant shall comply with ASTM C920, Type M, Grade P, Class 25 for horizontal joints and Grade NS, Class 25 for vertical joints and be recommended by the manufacturer for continuous immersion in water. Troweling of sealants into joints will not be permitted. Sealant shall meet requirements in Table 03 15 10-2.

TABLE 03 15 10-2	
Characteristic or Parameter	**Technical Requirements**
Pot life	1 to 3 hours
Hardness	25 Shore A, +/- 5
Elongation	500 percent, ASTM D412
Tensile strength	95 psi, ASTM D412
Peel strength on concrete	No adhesion loss at 25 pounds
Temperature service range	-40 to 170 degrees F
Immersion in water	Continuous

B. Products:
   1. Sika Corporation; Sikaflex-2c SL (for horizontal joints; Type M, Grade P, Class 25)
   2. Sika Corporation; Sikaflex-2c NS (for vertical joints; Grade NS, Class 25).
   3. Or accepted equivalent product.

Backing Rod for Expansion Joints

A. Provide an extruded closed-cell polyethylene foam rod. The rod shall be 1/4-inch larger in diameter than the joint width. Where possible, provide full-length sections for the joint; minimize splices:

   1. Industrial Systems Department; Minicel backer rod.
   2. Hercules, Inc.; Plastic Products Group.

Bond Breaker Tape

A. Provide an adhesive-backed glazed butyl or polyethylene tape that will adhere to the premolded joint material or concrete surface. The tape shall be the same width as the joint. The tape shall be compatible with the sealant.

Premolded Joint Filler for Below Grade

A. Joint filler shall be preformed, nonextruded type constructed of closed-cell neoprene conforming to ASTM D1752, Type I.

B. Bituminous-type preformed expansion joint filler conforming to ASTM D994.

Premolded Joint Filler for Exposed Above Grade

A. Self-expanding cork per ASTM D1752, Type III.

B. Sponge rubber per ASTM 1752, Type I. Preformed, non-extruded type constructed of closed-cell neoprene.

Expansion Joint Dowels

A. Stainless steel smooth bar dowels conforming to ASTM A276, Type 316.

B. Thoroughly grease expansion joint dowels prior to placing adjoining wall or slab concrete.

PVC Expansion Sleeves

A. Single component dowel sleeve for use in expansion joints. 100% PVC material. Products:

1. Sika Speed Load.

2. Or accepted equivalent product.

Part 3: EXECUTION

PVC Waterstops

A. Heat splice at ends and intersections. Provide waterstops that provide a continuous, uninterrupted watertight diaphragm throughout the entire joint system below the high water level and below grade, unless noted otherwise on the Drawings.

B. Construct forms for construction joints to prevent injury to waterstops. Hold waterstops securely in position in the construction joints by wire ties, continuous bars, and rings as shown on the Contract Drawings. Install waterstops in construction joints in hydraulic structures and as shown on the Contract Drawings.

C. Use factory-made crosses, tees and ells. Make field splices with a thermostatically controlled heating iron in conformance with the manufacturer's current recommendations. Allow at least 10 minutes before pulling or straining the new splice in any way. The finished splices shall provide a cross section that is dense and free of porosity with tensile strength of not less than 80 percent of the unspliced materials.

D. Provide waterstops with an integral fastening system consisting of grommets or pre-punched holes.

Joints

A. Make joints only at locations shown on the Contract Drawings or as permitted by the Engineer. Any addition or relocation of construction joints proposed by the Contractor must be submitted to the Engineer for written approval.

B. Cast slabs and beams monolithically without horizontal joints unless specifically indicated on the Drawings.

C. Do not use horizontal joints within foundation mats, base slabs, footings, or slabs on grade.

D. Provide waterstops in all wall and slab joints in liquid containment structures and at locations shown on the Contract Drawings. Do not provide metal waterstops unless permitted by the Engineer.

E. Construction Joints:

1. Provide waterstops at construction joints where shown on the Contract Drawings and specified herein.

2. Allow 7 days minimum between adjacent pours.

3. After the pour has been completed to the construction joint and the concrete has hardened, thoroughly clean the entire surface of the joint of surface laitance, loose concrete, foreign material, and expose clean aggregate by waterblasting the surface of construction joints before placing the new concrete.

4. In case of emergency, place additional construction joints. (An interval of 45 minutes between two consecutive batches of concrete shall constitute cause for an emergency construction joint.)

Expansion Joints

A. Size and location of expansion joints shall be as shown on the Contract Drawings.

B. Provide center bulb waterstop at expansion joints where shown on Contract Drawings and specified herein.

C. Do not extend reinforcement or other embedded items bonded to the concrete except dowels bonded on only one side of joint continuously through any expansion joint.

D. Install PVC sleeves and stainless-steel expansion joint dowels parallel to wall or slab face, perpendicular to the joint face, and in true horizontal position. Align PVC sleeves and stainless-steel expansion joint dowels as indicated in the Drawings. Secure tightly PVC sleeves and stainless-steel expansion joint dowels in forms with rigid ties. Orient PVC sleeves and dowels to permit joint movement.

Installation of Joint Sealants

A. Immediately before installing the joint sealant, clean the joint cavity by sandblasting or power wire brushing. Install bond breaker tape per manufacturer's instructions.

B. Apply masking tape along the edges of the exposed surface of the exposed joints.

C. Application criteria for the sealant materials, such as temperature and moisture requirements and primer cure time, shall be in accordance with the recommendations of the sealant manufacturer.

D. After the joints have been prepared as described above, apply the joint sealant. Apply the primer, if required, and joint sealant only with the equipment and methods recommended by the joint sealant manufacturer.

E. Trowel the joints smooth with a tuck-pointing tool wiped with a solvent recommended by the sealant manufacturer.

F. After the sealant has been applied, remove the masking tape and any sealant spillage.

G. Sealants used in water retaining structures shall achieve final cure at least seven days before the structure is filled with water.

Field Quality Control

A. Contractor shall notify the Engineer of readiness for items under this Section to be inspected a minimum of 5 working days prior to the items being covered by further work. Failure to provide this notification will be cause for delay in placing until observations can be completed.

END OF SECTION

9.2.5 REINFORCEMENT BARS (03.21.00)

Part 1: GENERAL

Description

A. Provide concrete reinforcement as indicated and specified.

B. Section Includes:

1. Standard reinforcement bars.
2. Reinforcement accessories.
3. Dowel adhesive material for anchoring reinforcing bars into hardened concrete.

References

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

1. A82: Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. A615: Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
3. A706: Standard Specification for Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

B. American Concrete Institute (ACI):

1. 301: Standard Specification for Structural Concrete.
2. 315: Details and Detailing of Concrete Reinforcement.
3. 318: Building Code Requirements for Structural Concrete.
4. SP-66: ACI Detailing Manual.

C. Concrete Reinforcing Steel Institute (CRSI):

D. Manual of Standard Practice.

1. Placing Reinforcing Bars.

E. International Code Council - Evaluation Services (ICC-ES):

1. ICC-ES Acceptance Criteria 308: Post-installed Adhesive Anchors in Concrete and Masonry Elements.

F. Where reference is made to one of the above standards, the version in effect at the time of bid opening shall apply.

Submittals

A. Unless otherwise acceptable to the Engineer, each submittal shall include reinforcement only for the individual structure to which it pertains.

B. Shop Drawings:
   1. Submit bar lists and placing drawings for all reinforced concrete structures.
   2. Detail reinforcement in conformance with ACI SP-66.
   3. Clearly indicate bar sizes, spacings, locations and quantities of reinforcement steel, bending schedules, and supporting and spacing devices. Show joints, with applicable joint reinforcement.
   4. Coordinate bar splicing and placement with Contractor's concrete placing schedule and joint locations. Do not add or delete joints without permission from the Engineer.
   5. Show wall reinforcement in elevation.
   6. Show slab reinforcement in plan view.
   7. Show location and size of all penetrations greater than 12-inches in diameter or least dimension of the opening with the corresponding added reinforcement around the penetrations.
   8. Clearly show marking for each reinforcement item.
   9. Indicate locations of reinforcement bar cut-offs, splices and development lengths.

C. Submit certified copies of mill test reports of reinforcement analysis for each shipment of reinforcement with specific lots in shipments identified.

D. Chemical composition of reinforcement steel: Ladle analysis indicating percentage of carbon, phosphorous, manganese and sulfur present in steel.

E. Where mechanical couplers are required or permitted to be used to splice reinforcement steel, submit Manufacturer's literature that contains instructions and recommendations for installation for each type of coupler used; certified test reports that verify the load capacity of each type and size of coupler used; and Shop Drawings that show the location of each coupler with details of how they are to be installed in the formwork.

Quality Assurance

A. Provide ICC-ES evaluation report for the dowel adhesive.

B. Do not fabricate reinforcement until shop and placement drawings have been reviewed and accepted by the Engineer.

C. Perform concrete reinforcement work in accordance with CRSI Manual of Standard Practice.

D. In no case shall any reinforcement steel be covered with concrete until the installation of the reinforcement has been observed by the Engineer and the Engineer's authorization to proceed with the concreting has been obtained. The Engineer shall be given 5 working days minimum prior notice of the readiness of placed reinforcement for observation. The forms shall be kept open until the Engineer has finished observations of the reinforcement steel.

Delivery Storage and Handling

A. Keep reinforcement steel free from mill scale, rust, dirt, grease or other foreign matter.

B. Ship and store reinforcement steel with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings showing the same "mark" designations as those shown on the submitted placing drawings. Clearly label weldable reinforcement.

C. Store reinforcement steel off the ground, protected from moisture and kept free from dirt, oil or other injurious contaminants.

Part 2: PRODUCTS

Reinforcement Steel

A. Reinforcement Steel: Astm A615/A615M, 60 ksi yield grade; deformed billet steel bars, unfinished or ASTM A706/A706M, 60 ksi yield strength; deformed low-alloy steel bars, unfinished.

B. Provide support bars and reinforcement bar supports as specified herein to obtain the concrete cover indicated.

Accessory Materials

A. Tie Wire: Minimum 16 gage annealed type.

B. Chairs, Bolsters, Bar Supports, and Spacers: sized and shaped for strength and support of reinforcement during concrete placement.

C. Special Chairs, Bolsters, Bar Supports, and Spacers Adjacent to Weather Exposed Concrete Surfaces: plastic coated steel, stainless steel or plastic type; size and shape.

D. Provide 3-inch by 3-inch plain precast concrete blocks, precast concrete doweled blocks or concrete brick for support of bottom reinforcement in foundation mats, base

slabs, footings, pile caps, grade beams and slabs on grade. Provide block thickness to produce concrete cover of reinforcement as indicated.

E. Mechanical Couplers:

1. Reinforcement Tension Bar Splicers:

a. Manufacturers: Cadweld or Lenton rebar splicers by Erico Products, Inc. and Dayton Barsplice, Inc.

b. Manufacturers: DB-SAE splicer system by Richmond Screw Anchor Company, Inc., C2D rebar flange coupler by Williams Form Engineering Corporation and Lenton Form Saver by Erico Products, Inc.

c. Develop minimum 125 percent of yield capacity of bars spliced in tension when tested as an assembly in accordance with ASTM A370 and A615.

2. Reinforcement Compression Bar Splicers:

a. Manufacturers: G-Loc splicers by Gateway Building Products Division and Speed-Sleeve by Erico Products, Inc.

F. Dowel Adhesive (Epoxy):

1. Install dowel adhesive in full compliance with the adhesive manufacturer's recommendations.

2. Product:

a. Hilti Corporation, HIT-RE 500 V3.

b. Or acceptable equivalent product.

Fabrication

A. Fabricate concrete reinforcement in accordance with CRSI Manual of Standard Practice.

B. Weld reinforcement in accordance with AWS D1.4 only when permitted by the Engineer.

C. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Review location of splices with Engineer.

D. Cold bend bars. Do not straighten or rebend bars.

E. Do not heat reinforcement steel to bend or straighten.

F. Bend bars around a revolving collar having a diameter of not less than that recommended by ACI 318.

Part 3: EXECUTION

Installation

A. Place, support and secure reinforcement against displacement. Do not deviate from the required position. Place reinforcement a minimum of 2-inches clear of any metal pipe or fittings.

B. Position dowels accurately. Rigidly support, align and securely tie dowels normal to the concrete surface before concrete placement. Setting dowels into wet concrete is prohibited.

C. Bars additional to those indicated that may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position shall be provided by the Contractor at no additional cost to the Owner.

D. Provide additional reinforcement bars to support top reinforcement in slabs. Do not shift reinforcement bars from positions in upper layers to positions in lower layers as a substitute for additional support bars.

E. Support reinforcement steel in accordance with CRSI “Placing Reinforcement Bars” with maximum spacing of 4 feet-0 inches.

F. Tie reinforcement steel at intersections in accordance with CRSI “Placing Reinforcement Bars”:

1. Maximum tie spacing for footings and walls: every third intersection or 3 feet-0 inches.

2. Maximum spacing for slabs and other work: every fourth intersection or 3 feet-0 inches.

3. Tie a minimum of 25 percent of all intersecting bars in foundation mats, base slabs, footings, and slabs on grade.

4. Secure all dowels in place before placing concrete.

5. Tie wires shall be bent away from the forms and from finished concrete surfaces in order to provide the required concrete coverage.

G. Locate reinforcement to avoid interference with items drilled in later, such as concrete anchors.

H. Mechanical coupler systems may be substituted for dowels at Contractor’s option when permitted by Engineer.

I. Securely support and tie reinforcement steel to prevent movement during concrete placement.

J. Unless otherwise shown on the Drawings or permitted by the Engineer, do not bend reinforcement bars that project from in-place concrete.

K. Do not weld reinforcement steel bars (including tack welded) either during fabrication or erection unless specifically shown on the Drawings or specified herein, or unless prior written permission has been obtained from the Engineer. Immediately remove bars that have been welded, including tack welds, without such permission from the work.

L. Reinforcement steel interfering with the location of other reinforcement steel, drainpipes, or embedded items may be moved within the specified tolerances or one bar diameter, whichever is greater. Make greater displacement of bars to avoid interference only with the permission of the Engineer. Do not cut reinforcement to install inserts, drainpipes, mechanical openings or other items without prior permission from the Engineer.

M. Reinforcement shall be clean and free from loose mill scale, dirt, grease, oil, form release agent, dried concrete or any material reducing bond with concrete.

N. Setting bars on layers of fresh concrete as the work progresses or adjusting reinforcement during the placement of concrete is prohibited.

O. Provide and place safety caps on all exposed ends of vertical reinforcement that pose a danger to injury or life safety.

Concrete Cover Over Reinforcement Bars

A. Refer to the Drawings for concrete cover over reinforcement.

Reinforcement Around Openings and Penetrations

A. Accommodate placement of formed openings and penetrations.

B. Unless specific additional reinforcement around openings and penetrations is shown on the Drawings, provide additional reinforcement steel on each side of opening or penetration equivalent to one half of the cross-sectional area of the reinforcement steel interrupted by an opening or penetration. The bars shall have sufficient length to be fully developed at each end beyond the opening or penetration.

C. Refer to details on Drawings for additional diagonal bars around openings or penetrations and bar extension length on each side of openings or penetrations.

Splicing Of Reinforcement

A. Splices may be used to provide continuity due to bar length limitations. The minimum length of bars spliced for this reason is 30 feet. Do not splice reinforcement that is detailed to be continuous in the Drawings.

B. ACI 318 Class B Splices shall be used unless noted otherwise.

C. Make reinforcement continuous through construction joints.

D. Reinforcement may be spliced at construction joints provided that entire lap is placed within only one concrete placement.

Accessories

A. Provide accessories such as chairs, chair bars and the like in sufficient quantities and strength to adequately support the reinforcement and prevent its displacement during the erection of the reinforcement and the placement of concrete.

B. Use precast concrete blocks for the bottom mat of reinforcement where the reinforcement steel is to be supported over soil.

C. Provide stainless steel bar supports or steel chairs with plastic tips where the chairs are set on forms for a concrete surface that will be exposed to weather, high humidity or liquid (including bottom of slabs over liquid containing areas) unless otherwise noted on contract documents.

D. Do not use metal chairs, ferrous clips, nails, etc. that extend to the surfaces of the concrete. Do not use stones, brick or wood block supports.

E. Do not use alternate methods of supporting top steel in slabs, such as steel channels supported on the bottom steel or vertical reinforcement steel fastened to the bottom and top mats unless permitted by the Engineer.

F. Mechanical Couplers:
   1. Couplers that are located at a joint face can be a type that can be set either flush or recessed from the face as indicated.

   2. Seal couplers during concrete placement to completely eliminate concrete or cement paste from entering.

   3. Unless indicated otherwise, provide mechanical coupler spacing and size to match the spacing and size of the reinforcement indicated for the adjacent section.

   4. Dowel Adhesive:

      Install dowels in accordance with adhesive manufacturer recommendations. Embedment depth of dowels shall be as recommended by the adhesive manufacturer, but not less than as shown on the Drawings.

Field Quality Control

A. Contractor shall notify the Engineer of teadiness for items under this Section to be inspected a minimum of five working days prior to the items being covered by further work. Failure to provide this notification will be cause for delay in placing until observations can be completed.

B. Remove reinforcement with kinks or bends not shown on shop or placement drawings. Remove such reinforcement from job site and replace with new fabricated steel. Do

not field bend reinforcement unless reinforcement is indicated or specified to be field bent.

C. Protect reinforcement from rusting, deforming, bending, kinking and other injuries. Clean in-place reinforcement that has rusted or been splattered with concrete using sand or water blasting prior to incorporation into the Work.

D.

9.2.6 CAST IN PLACE CONCRETE (03-30-00)

Part 1: GENERAL

Description

A. Provide Labor, materials, equipment and incidentals necessary to furnish and install cast-in-place concrete as specified and as shown on the Contract Drawings.

References

A. American Concrete Institute (ACI):

1. 214R: Guide to Evaluation of Strength Test Results of Concrete.
2. 301: Standard Specifications for Structural Concrete.
3. 304R: Guide for Measuring, Mixing, Transporting and Placing Concrete.
4. 304.2R: Placing Concrete by Pumping Methods.
5. 305R: Hot Weather Concreting.
6. 306R: Cold Weather Concreting.
7. 308: Standard Practice for Curing Concrete.
8. 309R: Guide for Consolidation of Concrete.
9. 311.4R: Guide for Concrete Inspection.
10. 318: Building Code Requirements for Structural Concrete.

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

1. C31: Standard Practice for Making and Curing Concrete Test Specimens in the Field.
2. C33: Standard Specification for Concrete Aggregates.
3. C39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. C40: Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

5. C42: Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

6. C88: Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.

7. C94: Standard Specification for Ready-Mixed Concrete.

8. C109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or [50-mm] Cube Specimens).

9. C138: Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

10. C143: Standard Test Method for Slump of Hydraulic Cement Concrete.

11. C150: Standard Specification for Portland Cement.

12. C171: Standard Specification for Sheet Materials for Curing Concrete

13. C172: Standard Practice for Sampling Freshly Mixed Concrete.

14. C231: Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

15. C260: Standard Specification for Air-Entraining Admixtures for Concrete.

16. C309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

17. C494: Standard Specification for Chemical Admixtures for Concrete.

18. C595: Standard Specification for Blended Hydraulic Cements.

19. C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

20. C881: Standard Test Method for Epoxy Resin Base Bonding Systems for Concrete.

21. C989: Standard Specification for Slag Cement for Use in Concrete and Mortars.

22. C1017: Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

23. C1064: Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

24. C1260: Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).

25. C1567: Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).

26. D4832: Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.

27. D6103: Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM).

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

1. M182: Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.

2. M302: Standard Specification for Slag Cement for Use in Concrete and Mortars.

Submittals

A. Testing required under Article 1.03 is the responsibility of the Contractor and shall be provided at no additional cost to the Owner.

B. If during the progress of the work the materials from the sources originally accepted change in characteristics, the Contractor shall at their own expense make new acceptance tests of aggregate and establish new design mixes.

C. If during the progress of the work it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order changes in proportions, materials or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor’s expense.

D. Plant Qualification: Submit certification from the National Ready Mixed Concrete Association indicating compliance with the specified qualification requirements.

E. Product Data:

1. Manufacturer's specifications and instructions including ASTM Standards conformance and Material safety Data Sheets (MSDS) for admixtures and curing materials. Manufacturer’s certification of compatibility of all admixtures.

F. Shop Drawings:

1. Provide certificate that cement used complies with ASTM C595 and these specifications.

2. Provide certificates that aggregates comply with required ASTM standards. Submit gradation analysis with concrete mix designs. Include source/location of aggregates. Potential alkali reactivity (ASTM C1567) test results for each aggregate type and source.

3. Provide certificate of compliance with these specifications from the manufacturer of the concrete admixtures.

4. For each formulation of concrete proposed, provide concrete mix designs and laboratory 7-day and 28-day compressive tests, or submit test results of 7- and 28-day compressive tests of the mix where the same mix has been used on two previous projects in the past twelve months. Follow standards of concrete control per the statistical principles of ACI 214R.

5. As a minimum each concrete mix design submittal shall include but is not limited to containing the following information.

    a. 7-day and 28-day compression test results. Include mean and standard deviation for test results on each 7 or 28-day group.

    b. Constituent quantities per cubic yard.

    c. Water cementitious materials ratio.

    d. Concrete slump.

    e. Air content.

    f. Water soluble chloride ion content of any individual components of the proposed mix.

    g. Type of concrete mix.

    h. Manufacturer of cementitious products.

    i. Sources of cement, pozzolan, and aggregates.

    j. Letter certifying that the admixtures used in the same concrete mix are compatible with each other, as well as the aggregates.

6. Submit Placement Plan including layout for joints and plan for joint surface preparation.

7. Proposed special procedures for protection of concrete under wet weather placement conditions.

8. Proposed special procedures for protection and curing of concrete under hot and cold weather conditions.

G. Manufacturers' Instructions:

1. Provide epoxy bonding compound and non-epoxy compound manufacturer's specific instructions for use. Provide manufacturer's data sheets as to suitability of product to meet job requirements regarding surface, pot life, set time, vertical or horizontal application, and forming restrictions.

H. Field Quality Control Submittals:

1. Provide delivery tickets for ready-mix concrete or weighmasters certificate per ASTM C94, including weights of cement and each size aggregate and amount of water added at the plant and record of pours. Record the amount of water added on the job on the delivery ticket. Water added at the plant shall account for moisture in both coarse and fine aggregate. If it is necessary to add water to obtain the specified slump, add water per ASTM C94, but do not exceed the water content of the approved design mix.

Quality Assurance

A. Unless otherwise indicated, materials, workmanship, and practices shall conform to the following standards:

1. ACI 301, "Structural Concrete for Buildings."

2. ACI 318, "Building Code Requirements for Reinforced Concrete."

B. Where provisions of pertinent codes and standards conflict with this specification, the more stringent provisions govern.

C. Concrete not meeting the minimum specified 28-day design strength shall be cause for rejection and removal from the Work.

D. Perform concrete work in conformance with ACI 301 unless otherwise specified.

E. Do not use admixtures, including calcium chloride, which will cause accelerated setting of cement in concrete.

F. Provide and complete a pre-placement checklist.

G. Do not place concrete until design mix, material tests and trial concrete batch mix compression test results are accepted by the Engineer.

H. Employ an independent testing laboratory, acceptable to the Engineer, to develop concrete mix designs and testing. Concrete testing shall be performed by an ACI Concrete Field Technician, Grade I or equivalent. Refer to Article 1.03 above.

I. The Owner shall employ an independent testing laboratory to perform field testing in order to verify conformity of materials to specifications. Field concrete testing shall be performed by an ACI Concrete Field Technician, Grade I or equivalent. Contractor shall allow free access to obtain test samples.

J. Concrete samples to be taken as part of the required Field Testing, shall be taken at the point of placement.

K. Methods of Sampling and Testing:

1. Fresh Concrete Sampling: ASTM C172.

2. Specimen Preparation: ASTM C31.

3. Compressive Strength: ASTM C39.
4. Air Content: ASTM C231.
5. Slump: ASTM C143.
6. Temperature: ASTM C1064.
7. Unit Weight: ASTM C138.
8. Obtaining Drilled Cores: ASTM C42.

L. Acceptance of Structure: Acceptance of completed concrete work requires conformance with dimensional tolerances, appearance and strength as indicated or specified.

M. Do not cover up or enclose work until it has been properly and completely inspected, tested, and approved.

N. Should any of the work be covered up or enclosed prior to all required inspections, tests, and approvals, uncover the work as required for test and inspection. After inspection, tests, and approval, make all repairs and replacements with such materials as are necessary to the approval of the Owner at no additional cost to the Owner. Retest as required to verify that all work is in accordance with the specifications.

O. Hot weather concrete to conform to ACI 305R and as specified herein.

P. Cold weather concrete to conform to ACI 306R and as specified herein.

Q. Reject concrete delivered to job site that exceeds the time limit or temperature limitations specified.

R. Do not place structural concrete in water or on frozen or uncompacted ground.

S. Workability:

1. Concrete shall be of such consistency and composition that it can be worked readily into the forms and around the reinforcement without excessive vibrating and without permitting the materials to segregate or free water to collect on the surface.
2. Adjust the proportions to secure a plastic, cohesive mixture, and one that is within the specified slump range and water cementitious ratio.
3. To avoid unnecessary changes in consistency, obtain the aggregate from a source with uniform quality, moisture content, and grading. Handle materials to minimize variations in moisture content that would interfere with production of concrete of the established degree of uniformity and slump.

Delivery, Storage, and Handling

A. Deliver Concrete To Discharge Locations in watertight agitator or mixer trucks without altering the specified properties of water-cement ratio, slump, air entrainment, temperature and homogeneity.

B. Reject concrete not conforming to specification, unsuitable for placement, exceeding the time or temperature limitations or not having a complete delivery batch ticket.

Site Conditions

A. Do Not Place concrete until conditions and facilities for making and curing control test specimens are in compliance with ASTM C31 and as specified herein.

Part 2: PRODUCTS

Materials

A. Cement:

1. Portland Cement, ASTM C595, Type IL.

2. Use only one brand of cement in any individual structure. Use no cement that has become damaged, partially set, lumpy, or caked. Reject the entire contents of the sack or container that contains such cement. Use no salvaged or reclaimed cement.

3. Maximum tricalcium aluminate shall not exceed 8 percent. The maximum percent alkalies shall not exceed 0.6 percent.

B. Fly Ash:

1. Provide fly ash conforming to the following requirements:

a. Class F fly ash conforming to ASTM C618 for chemical and physical properties.

Supplemental requirements in percent:

a. Maximum carbon content: 3 percent.

i. Maximum sulfur trioxide (SO3) content: 4 percent.

ii. Maximum loss on ignition: 3 percent.

iii. Maximum water requirement (as a percent of control): 100 percent.

C. Slag Cement:

1. Slag cement shall conform to the chemical and physical requirements of ASTM C989, Grade 100 or better.

D. Fine Aggregates:

1. Clean, sharp, natural sand conforming to requirements of ASTM C33 with a fineness modulus between 2.50 and 3.0.

2. All aggregate shall be innocuous per ASTM C1260 or C1567; less than 0.10 percent expansion.

E. Coarse Aggregate:

1. Well graded crushed stone, natural rock conforming to requirements of ASTM C33.

2. Limit deleterious substances in accordance with ASTM C33, Table 3, Severe Weathering Regions, limit clay lumps not to exceed 1.0 percent by weight, and limit loss when tested for soundness using magnesium sulfate to 12 percent.

3. All aggregate shall be innocuous per ASTM C1260 or C1567; less than 0.10 percent expansion.

F. Water and Ice:

1. Use water and ice free from injurious amounts of oil, acid, alkali, salt, organic matter or other deleterious substances and conforms to requirements of ASTM C94.

2. Water shall not contain more than 500 mg/L of chlorides nor more than 500 mg/L of sulfate.

3. Heat or cool water to obtain concrete temperatures specified, and in conformance with ACI 305R and ACI 306R.

G. Concrete Admixtures:

1. Maintain compressive strength and maximum water-cement ratios specified in Table 03 30 00-1 when using admixtures. Include admixtures in solution form in the water-cement ratio calculations.

2. Do not use any admixture that contains chlorides or other corrosive elements in any concrete. Admixtures shall be nontoxic after 30 days.

3. Hydration controlling admixtures may be used but shall be submitted for approval and identified clearly on all batch tickets.

4. Use admixtures in compliance with the manufacturer’s printed instructions. The manufacturer shall certify the compatibility of multiple admixtures used in the same mix.

5. Do not use admixtures in greater dosages than recommended by manufacturer.

6. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

7. Air Entrainment:

   a. Class A concrete; an air-entraining admixture conforming to ASTM C260.

   b. Products:

      (1) BASF Corporation; MB-AE 90.

      (2) Sika Corporation, AER.

      (3) Or accepted equivalent product.

   c. Adjust the admixture content to accommodate fly ash or pozzolan requirements, and other admixtures when used, in order to obtain the specified air content.

8. Water Reducing:

   a. For Class A concrete a water-reducing admixture conforming to ASTM C494, Type A and compatible with the air-entraining admixtures. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations.

   b. Products:

   i. BASF Corporation; Polyheed Series.

      (1)Sika Corporation, Plastocrete 161.

      (2)WR Grace & Co.; Darex II-AEA.

      (3)Euclid Chemical Company; Eucon NW.

      (4)Or accepted equivalent product.

9. Water Reducing and Retarding:

   a. For Class A concrete a water-reducing and retarding admixture conforming to ASTM C494, Type D and compatible with the air-entraining admixtures. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations.

   b. Products:

      (1)BASF Corporation; Pozzolith Series.

      (2)Sika Corporation; Plastiment.

      (3)Euclid Chemical Company; Eucon WR-91.

(4)Or accepted equivalent product.

10. High-Range Water-Reducing Admixture (Superplasticizer):

    a. For Class A concrete a High-Range water-reducing admixture conforming to ASTM C494, Type F or ASTM C1017, Type I.

    b. Products:

        (1) BASF Corporation; Glenium Series.

        (1) WR Grace & Co.; Daracem 100.

        (2) Euclid Chemical Company; Eucon SPC.

        (3) Or accepted equivalent product.

11. Hydration Controlling Admixture:

    a. Hydration controlling admixture conforming to ASTM C494 and compatible with the air-entraining admixtures. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations.

    b. Products:

        (1) BASF Corporation; DELVO Stabilizer.

        (2) Sika Corporation; SikaTard 440.

        (3) Or accepted equivalent product.

H. Bonding Compound:

1. Epoxy bonding compound shall conform to ASTM C881 Type I, II, IV or V; Grade 2 for epoxy resin adhesives. The class of epoxy bonding compound shall be suitable for ambient and substrate temperatures.

    a. Products:

        (1) Sika Corp.; Sikadur 32.

        (2) Euclid Chemical Company; Duralcrete.

        (3) BASF Corporation, Concresive Liquid LPL.

        (4) Or accepted equivalent product.

2. Non-epoxy bonding compound shall be Weldcrete by Larsen Products Corp., Link by Sta-Dry Manufacturing Corp., Euco Weld by Euclid Chemical Co., or equivalent.

I. Curing Compound:

1. Liquid form, which will form impervious membrane over, exposed surface of concrete when applied to fresh concrete by means of spray gun. Use Type I, Class A or B, having 18 percent minimum solids conforming to ASTM C309.

2. Products:

a. BASF Building Systems; Kure 1315.

b. Euclid Chemical Company; Super Diamond Clear VOX.

c. W. R. Meadows, Inc.; VOCOMP-30.

d. Dayton Superior Corp; Safe Cure and Seal 30 percent.

e. Or accepted equivalent product.

J. Burlap Mats:

1. Conform to AASHTO M182.

K. Sisal-Kraft Paper and Polyethylene Sheets for Curing:

1. Conform to ASTM C171.

Mixes

A. Conform to ASTM C94, except as modified by these specifications.

B. Air content as determined by ASTM C231:

1. 5 ½ ± 1½ percent for concrete using 1 ½-inch maximum aggregate size.

2. 5 ½ ± 1½ percent for concrete using 1-inch maximum aggregate size.

3. 6 ± 1½ percent for concrete using ¾-inch maximum aggregate size.

C. Provide concrete with the following compressive strengths at 28 days and proportion it for strength and quality requirements in accordance with ACI 318. The resulting mix shall not conflict with limiting values specified in Table 03 30 00-1.

Table 03 30 00-1				
Class	**Type of Work**	**28-Day Minimum Compressive Strength (psi)**	**Minimum Cementitious Content (lbs per C.Y.)**	**Maximum Water/ Cement Ratio**
A	Concrete for all structures and concrete not otherwise specified	4,500	560	0.42
B	Lean concrete fill below structure foundations	3,000	500	0.54
FF	Flowable Fill	Refer to “FLOWABLE FILL,” specified below		

D. Measure slump in accordance with ASTM C143:

1. Proportion and produce the concrete to have a maximum slump of 4 inches. A tolerance of up to 1 inch above the indicated maximum is allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit. Concrete of lower than usual slump may be used provided it is properly placed and consolidated.

2. Mixes containing water reducers shall have a maximum slump of 6 inches after the addition of a mid-range water reducer and maximum slump of 8 inches after the addition of a high range water reducer.

E. Pozzolan Content:

1. Where fly ash is included in the mix, the fly ash content shall be no less than 15 percent, nor more than 20 percent of the total cementitious content by weight.

2. Slag cement will be permitted as a substitute for fly ash at no additional cost to the Owner, in the event that Class F fly ash is not available. The slag substitution shall be in the same proportions and percentages of the total cementitious material as shown for fly ash.

F. Aggregate Size shall be:

1. ¾-inch maximum for slabs and sections 8-inches thick and less;

2. 1-inch maximum for sections greater than 8-inches and less than 17-inches; and

3. ½-inches maximum for all slabs and sections greater than 17-inches.

4. Combined aggregate grading shall be as shown in the following table:

Table 03 30 00-2				
Maximum Aggregate Size	**1-1/2 inch**	**1 inch**	**3/4-inch**	**3/8-inch**
Aggregate Grade per ASTM C33	467	57	67	8

Flowable Fill

A. Flowable fill (flowfill) shall consist of a fluid, workable mixture of aggregate, fly ash, cement, and water.

B. Aggregate shall be composed of 75% to 80% fine aggregate, measured by weight, and 20% to 25% coarse aggregate.

C. Fine aggregate: composed of commercial quality concrete sand.

D. Coarse aggregate: conform to the grading and quality requirements of ASTM C33 for size No. 7.

E. Proportion the aggregate, fly ash, cement, and water by either weight or volume. Include at least 50 pounds of cement per cubic yard produced. The water content shall be sufficient to produce a fluid, workable mix that will flow and can be pumped without segregation of the aggregate while being placed.

F. Thoroughly machine-mix the materials for the flowable fill in pugmill, rotary drum, or other mixer. Continue the mixing until the cement and water are thoroughly dispersed throughout the material. Place flowable fill within 1-hour after mixing.

G. Flowable fill shall have a minimum 28-day compressive strength of 100 psi, measured in accordance with ASTM D4832.

H. Flowable fill shall have minimum flow consistency of 7 inches and a maximum flow consistency of 9 inches, measured in accordance with ASTM D6103.

Part 3: EXECUTION

Inspection

A. Examine The subgrade and the conditions under which work is to be performed and notify the Engineer in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions are corrected to comply with specified subgrade conditions in a manner acceptable to the Engineer.

Mixing and Transporting Concrete

A. General: Conform to concreting procedures set forth in ASTM C94, ACI 304R and as specified herein. Concrete shall be rejected if it does not meet these Specifications.

1. Transport concrete to discharge locations without altering the specified properties of water-cement ratio, slump, air entrainment, temperature and homogeneity.

2. Discharge concrete into forms within 1-1/2 hours after cement has entered mixing drum or before the drum has revolved 300 revolutions after the addition of water, whichever occurs first.

3. Do not add water at the jobsite unless permitted by the Engineer. If it is necessary to add water to obtain the specified slump, add water per ASTM C94, but do not exceed the maximum water content in the reviewed concrete design mix. Added water shall be incorporated by additional mixing of at least 35 revolutions.

4. Do not add water to concrete containing high range water reducing admixture. Do not add water to concrete in delivery equipment not acceptable for mixing.

5. Keep a record showing time and place of each pour of concrete, together with transit-mix delivery slips certifying the contents of the pour.

6. Discharge of concrete shall be completed within the limits set out in Table 03 30 00-3.

Table 03 30 00-3

Time Limit for Concrete Placement

Air Temperature	Required Concrete Temperature Limits	Hydration Controlling Admixture Required	Time Limit for Completion of Placing After Initial Mixing
< 32 degrees F	60 to 75 degrees	No	150 minutes
32 - 60 degrees F	50 to 80 degrees	No	120 minutes
60 - 85 degrees F	85 degrees max	No	90 minutes
60 - 85 degrees F	85 degrees max	Yes	120 minutes

B. Conveying: Convey concrete from agitator or mixer truck to place of final deposit in forms by one of the following methods:

1. Buckets or hoppers with discharge gates having a clear opening equal to not less than one-third the maximum interior horizontal area or five times the maximum aggregate size being used, whichever is greater, and side slopes of not less than 60 degrees to horizontal.

2. Buggies or wheelbarrows equipped with pneumatic tires.

3. Round bottom, metal or metal-lined chutes with inclined slope of between 2- to 3-feet horizontally to 1-foot vertically and of sufficient capacity to avoid overflow.

4. Circular drop pipes with a top diameter of at least eight times the maximum aggregate size, but not less than 6-inches, or tapered to not less than six times maximum aggregate size.

Concrete Acceptance

A. Accept or reject each batch of concrete delivered to the point of agitator or mixer truck discharge. Sign delivery batch tickets to indicate concrete acceptance.

B. Reject concrete delivered without a complete concrete delivery batch ticket as specified herein. The concrete supplier will furnish copies of the signed batch ticket to the Contractor and Engineer.

C. The Testing Agency shall perform field tests at the point of placement. Accept or reject concrete on the basis of conformity with slump, air content and temperature specified.

D. The Testing Agency shall inspect concrete transit truck's barrel revolution counter and gauge for measuring water added to the concrete. Reject concrete that exceeds the maximum barrel revolution of 300, the limits in Table 03 30 00-3 or concrete that has water content exceeding the specified water-cement ratio.

E. Reject concrete not conforming to specification before discharging into the forms.

Preparation and Coordination

A. Contractor shall notify the Engineer of readiness to place concrete in any portion of the work a minimum of 5 working days prior to concrete placement. Failure to provide this notification will be cause for delay in placing until observations can be completed. Contractor shall develop emergency/backup procedures that are approved prior to concrete delivery.

B. Coordinate the sequence of placement such that construction joints will occur only as designed.

C. Schedule sufficient equipment for continuous concrete placing. Provide backup equipment (cranes/excavators/loaders with concrete buckets, etc.) and procedures to be taken in case of an interruption in concrete placement. Provide backup concrete vibrators at the project site. Test concrete vibrators the day before placing concrete.

D. Compact the subgrade and/or bedding. Saturate the subgrade approximately eight hours before placement and sprinkle ahead of the placement of concrete. Remove standing water, mud, and foreign matter before concrete is deposited.

E. Where shown on the Contract Drawings, intentionally roughen surfaces of set concrete in a manner to expose bonded aggregate uniformly at joints.

A. Placement shall conform to ACI 304R as modified by these specifications.

B. Concrete shall be placed only in the presence of the Engineer or a duly authorized representative.

C. Alternating sections of concrete walls and slabs may be cast simultaneously. Do not place adjacent sections of walls and slabs until seven days after placement of first placed concrete.

D. Refer to the Drawings for additional requirements for concrete placements related to the individual structures associated with the Project.

E. Do not place concrete until free water has been removed or has been diverted by pipes or other means and carried out of the forms, clear of the work. Do not deposit concrete underwater, and do not allow free water to rise on any concrete until the concrete has attained its initial set. Do not permit free or storm water to flow over surfaces of concrete so as to injure the quality or surface finish.

F. Do not place concrete during inclement weather. Protect concrete placed from inclement weather. Always keep sufficient protective covering ready for this purpose.

G. Deposit concrete at or near its final position to avoid segregation caused by rehandling or flowing. Do not deposit concrete in large quantities in one place to be worked along the forms with a vibrator.

H. Deposit concrete continuously and in level layers 1 to 2 feet thick. Avoid inclined layers and cold joints. Place concrete at lower portion of slope first on sloping surfaces.

I. Do not deposit partially hardened concrete in forms. Retempering of partially hardened concrete is not permitted. Remove partially hardened concrete from site at no additional compensation.

J. Do not allow concrete to fall freely in forms to cause segregation (separation of coarse aggregate from mortar). Limit maximum free fall of concrete to 4 feet. Do not move concrete horizontally more than four feet from point of discharge. Space points of deposit not more than eight feet apart.

K. At least two hours shall elapse after depositing concrete in the columns or walls before depositing in beams, girders, or slabs supported thereon. Place beams, girders, brackets, column capitals, and haunches monolithically as part of the floor or roof system, unless otherwise shown on the Contract Drawings.

L. Consolidate concrete using mechanical vibrators operated within the mass of concrete and/or on the forms conforming to procedures set forth in ACI 309R and as specified herein.

M. Conduct vibration to produce concrete of uniform texture and appearance, free of honeycombing, streaking, cold joints or visible lift lines.

N. Conduct vibration in a systematic manner with regularly maintained vibrators. Furnish sufficient backup units at job site. Use vibrators having minimum frequency of 8,000

vibrations per minute and of sufficient amplitude to consolidate concrete. Use not less than one vibrator with crew for each 35 to 40 cubic yards of concrete placed per hour.

O. Insert and withdraw vibrator vertically at a uniform spacing over the entire area of placement. Space distances between insertions such that spheres of influence of each insertion overlap.

P. Use additional vibration with pencil vibrators on vertical surfaces and on exposed concrete to bring full surface of mortar against the forms so as to eliminate air voids, bug holes and other surface defects. Employ the following additional procedures for vibrating concrete as necessary to maintain proper consolidation of concrete:

1. Reduce distance between internal vibration insertions and increase time for each insertion.

2. Insert vibrator as close to face of form as possible without contacting form or reinforcement.

3. Use spading as a supplement to vibration where particularly difficult conditions exist.

Q. Pumping Concrete:

1. Conform to the recommendations of ACI 304.2R except as modified herein.

2. Base pump size on rate of concrete placement, length of delivery pipe or hose, aggregate size, mix proportions, vertical lift, and slump of concrete.

3. Use pipe with inside diameter of at least three times the maximum coarse aggregate size, but not less than 2 inches.

4. Do not use aluminum pipes for delivery of concrete to the forms.

R. Waterstops:

1. Prevent displacement of waterstops during concrete placement.

Curing and Protection

A. General:

1. Protect concrete from premature drying, hot or cold temperatures, and mechanical injury, beginning immediately after placement and maintain concrete with minimal moisture loss at relatively constant temperature.

2. Comply with curing procedures set forth in ACI 301, ACI 308 and as specified herein.

3. Perform hot weather concreting in conformance with ACI 305R and as specified herein when the ambient atmospheric temperature is 80 degrees F or above.

4. Perform cold weather concreting in conformance with ACI 306R and when the ambient atmospheric temperature is below 40 degrees F.

5. Concrete required to be moist cured shall remain moist for the entire duration of the cure. Repeated wetting and drying cycles of the curing process will not be allowed.

B. Curing Duration:

1. Start initial curing after placing and finishing concrete as soon as free moisture has disappeared from unformed concrete surfaces. Initial curing starts as soon as concrete achieves final set. Forms left tightly in place are considered as part of the curing system; keep forms in place a minimum of 72 hours (3 days).

2. Begin final curing procedures immediately following initial curing and before the concrete has dried. Continue final curing for at least 7 days and in accordance with ACI 301 procedures for a total curing period, initial plus final, of at least 10 days.

3. Avoid rapid drying at the end of the final curing period.

4. If protection is temporarily removed during the curing/protection period, the curing/protection period shall be extended by the amount of time lost (including time to bring concrete temperature back above 50 degrees F).

C. Curing Requirements:

1. Unformed Surfaces: Cover and cure entire surface of newly placed concrete immediately after completing finishing operations and water film has evaporated from surface or as soon as marring of concrete will not occur. Protect finished slabs from direct rays of the sun to prevent checking, crazing and plastic shrinkage.

2. Formed Surfaces: Minimize moisture loss for formed surfaces exposed to heating by the sun by keeping forms wet until safely removed. Keep surface continuously wet by warm water spray or warm water saturated fabric immediately following form removal unless otherwise permitted by the Engineer.

3. Other concrete: Moist cure by moisture-retaining cover curing, or by the use of curing compound.

D. Curing Methods: Contractor shall select from the following curing methods:

1. Water Curing: Use water curing for unformed surfaces. Continuously water cure all exposed concrete for the entire curing period. Continuous water curing shall not be used during winter construction; use sealing materials or membrane curing compound. Provide moisture curing by any of the following methods:

a. Keeping the surface of the concrete continuously wet by ponding or immersion.

b. Continuous water-fog spray or sprinkling.

c. Covering the concrete surface with curing mats, thoroughly saturating the mats with water, and keeping the mats continuously wet with sprinklers or

porous hoses. Place curing mats so as to provide coverage of the concrete surfaces and edges, with a 4 inch lap over adjacent mats. Weight down the curing cover to maintain contact with the concrete surface.

2. Sealing Materials:

    a. Use common sealing materials such as plastic film or waterproofing (kraft) paper.

    b. Lap adjacent sheets a minimum of 12 inches. Seal edges with waterproof tape or adhesive. Use sheets of sufficient length to cover sides of concrete member.

    c. Place sheet materials only on moist concrete surfaces. Wet concrete surface with fine water spray if the surface appears dry before placing sheet material.

    d. The presence of moisture on concrete surfaces at all times during the prescribed curing period is proof of acceptable curing using sheet material.

3. Membrane Curing Compound:

    a. Apply membrane-curing compound uniformly over concrete surface by means of roller or spray at a rate recommended by the curing compound manufacturer, but not less than 1 gallon per 150 square feet of surface area. Agitate curing material in supply container immediately before transfer to distributor and thoroughly agitate it during application for uniform consistency and dispersion of pigment

    b. Do not use curing compounds on construction and expansion joints or on surfaces to receive concrete fills and toppings or other applications requiring positive bond.

    c. Reapply membrane-curing compound to concrete surfaces that have been subjected to wetting within 3 hours after curing compound has been applied by method for initial application.

E. Protection from environmental conditions: Maintain the concrete temperature above 50 degrees F continuously throughout the curing period (10 days). Make arrangements before concrete placing for heating, covering, insulation or housing to maintain the specified temperature and moisture conditions continuously for the curing period.

1. When the atmospheric temperature is 80 degrees F and above, or during other climatic conditions which will cause too rapid drying of the concrete, make arrangements before the start of concrete placing for the installation of wind breaks or shading, and for fog spraying, wet sprinkling, or moisture-retaining covering.

2. Protect the concrete continuously for the entire curing period (10 days).

3. Maintain concrete temperature as uniformly as possible and protect from rapid atmospheric temperature changes.

4. Avoid temperature changes in concrete that exceed 5 degrees F in any one hour and 50 degrees F in any 24-hour period.

F. Protection from physical injury: Protect concrete from physical disturbances such as shock and vibration during curing period. Protect finished concrete surfaces from damage by construction equipment, materials, curing procedures and rain or running water. Do not load concrete in such a manner as to overstress concrete.

G. Protection from Deicing Agents: Do not apply deicing chemicals to concrete.

Field Quality Control

A. Hot Weather Requirements:

1. During hot weather, give proper attention to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation in accordance with ACI 305R and the following.

2. When the weather is such that the temperature of the concrete as placed would exceed 90 degrees F, use ice or other means of cooling the concrete during mixing and transportation so that the temperature of the concrete as placed will not exceed 90 degrees F.

3. Take precautions when placing concrete during hot, dry weather to eliminate early setting of concrete. This includes protection of reinforcing from direct sunlight to prevent heating of reinforcing, placing concrete during cooler hours of the day, and the proper and timely application of specified curing methods.

4. There will be no additional reimbursement to the Contractor for costs incurred for placing concrete in hot weather.

5. Provide thermometers to indicate the ambient temperature and the temperature 2-inches inside the concrete surface. Thermometers, thermocouples or other means of measurement, acceptable to the Engineer, which provide readings for concrete 2-inches below the surface, may be used. Concrete temperatures shall be recorded at the beginning and end of each work day and shall continue for the entire curing duration.

B. Cold Weather Requirements:

1. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather in accordance with ACI 306R and the following.

2. When the temperature of the surrounding atmosphere is 40 degrees F or is likely to fall below this temperature, use heated mixing water not to exceed 140 degrees F. Do not allow the heated water to come in contact with the cement before the cement is added to the batch.

3. When placed in the forms during cold weather, maintain concrete temperature at not less than 55 degrees F. Materials shall be free from ice, snow, and frozen lumps before entering the mixer.

4. Maintain the air and the forms in contact with the concrete at temperatures above 40 degrees F for the first five days after placing, and above 35 degrees F for the remainder of the curing period. Provide thermometers to indicate the ambient temperature and the temperature 2 inches inside the concrete surface. Thermometers, thermocouples or other means of measurement, acceptable to the Engineer, which provide readings for concrete 2 inches below the surface, may be used. Concrete temperatures shall be recorded at the beginning and end of each work day and shall continue for the entire curing duration.

5. Prior to concrete placement, the Contractor shall submit an example concrete temperature record for review. Refer to ACI 306R-10, Section 4.4 for additional guidance regarding temperature records.

6. At the conclusion of each placement's curing period, a concrete temperature record shall be submitted to the Engineer for review. This complete record shall be provided to the Engineer by 10:00 AM the morning following the last recorded temperature.

7. There will be no additional reimbursement made to the Contractor for costs incurred for placing concrete during cold weather.

C. Backfill and Flowfill Against Walls:

1. Do not place backfill or flowfill against walls until the structural concrete has obtained a compressive strength equal to the specified 28-day compressive strength unless otherwise approved in writing by the Engineer. Where backfill is to be placed on both sides of the wall, place the backfill uniformly on both sides.

2. Do not backfill the walls of structures that will be laterally restrained or supported by suspended slabs or slabs on grade until the slab is poured and the concrete has reached the specified compressive strength.

3. The Contractor may provide additional concrete testing at his expense to determine concrete strength.

D. Concrete Testing:

1. Concrete quality testing will be performed on the concrete by a Testing Agency retained by the Owner. The Owner shall be responsible for all concrete testing costs.

2. Field cured cylinders are required for the Project. The Contractor may also take additional laboratory cured cylinders at no additional cost to the owner for concrete quality testing.

3. Testing Agency Responsibilities:

a. Perform sampling and curing of test specimen in accordance with ASTM C31.

b. Take concrete samples at the point of placement to perform slump (per ASTM C143), air content (per ASTM C231), and temperature tests (per ASTM C1064) and for field control test specimens.

c. Testing Agency personnel will record truck and load number from the delivery batch ticket, the concrete placement location of each specimen, the date, concrete strength, slump, air content, and temperature.

d. The Testing Agency will cast a minimum of one “set” of 6 test specimens, each 6 inch diameter by 12 inch long cylinders.

e. The required quantity of test specimen “sets” shall be that from the following criteria which yields the highest number of “sets”.

i. One set of specimens for each 50 cubic yards of each mix design of concrete.

ii. One set of specimens per placement.

iii. One set for each 1,000 square feet of surface area for slabs or walls.

f. Test cylinders in accordance with ASTM C39. Test one cylinder at 7 days for information; test three cylinders at 28 days for acceptance; and hold two reserve cylinders for verification. Strength acceptance will be based on the average of the strengths of the three cylinders tested at 28 days. If one cylinder of a 28-day test manifests evidence of improper sampling, molding, or testing, other than low strength, discard it and use one of the reserve cylinders for the test result.

g. The Testing Agency shall submit test reports of concrete testing specified above to the Contractor and to the Engineer.

4. Contractor Responsibilities:

a. Provide and maintain facilities for safe storage and proper curing of concrete test specimens on the project site, as required by ASTM C31.

b. Cure/protect field cylinders in the same manner as the corresponding portion of the structure.

5. The Contractor may take additional test cylinders and tests to establish early concrete strength at no additional expense to the Owner.

6. Concrete acceptance shall be based on the requirements of ACI 318.

7. Field cured cylinders conforming to ASTM C31 will be required to determine field compressive strength of concrete. Laboratory cured cylinders for concrete quality testing shall not be used for determining field compressive strength.

8. Concrete Coring:

    a. When the concrete quality test specimen compression tests fail to be in compliance with the Contract Documents or when the Engineer detects deficiencies in the concrete, the Contractor will take concrete cores from the structure in conformance with ASTM C42 at locations determined by the Engineer. The concrete cores shall be at least two inches in diameter, with a length between 1.9 to 2.1 times the diameter.

    b. Obtain at least three representative cores from each member or area of concrete that is considered potentially deficient.

    c. Obtain additional cores to replace cores that show evidence of having been damaged subsequent to or during removal from the structure.

    d. Concrete coring and core specimen labeling shall be performed in the presence of the Engineer. The Contractor shall submit cores to the Testing Agency for completion of cylinder compression tests in conformance with ASTM C39. The Testing Agency shall submit test strength test results of cores specified above to the Contractor and to the Engineer.

    e. All costs associated with coring and testing of cores will be borne by the Contractor at no additional cost the Owner.

    f. Concrete not meeting the requirements of the Contract Documents shall be removed and replaced. All additional costs for concrete removal and replacement shall be borne by the Contractor at no additional cost to the Owner.

9.2.7 CONCRETE FINISHES (03 35 00)

Part 1: GENERAL

Description

A. This Section describes materials and methods of concrete finishes for cast-in-place concrete.

References

A. American Concrete Institute (ACI):

1. 301: Specifications for Structural Concrete.
2. 302.1R: Construction of Concrete Floors.
3. 311.4R: Guide for Concrete Inspection.

Quality Assurance

A. Prior to concrete construction, develop an outlined quality control program for concrete finishing.

Part 2: PRODUCTS

Concrete Repair Material

A. Concrete repair material shall be in accordance with Section 03 01 30.

Part 3: EXECUTION

Concrete Finishes

A. Finish concrete surfaces in accordance with the following schedule:

Table 03 35 00-1

Finish Designation	Area Applied
F-1	Walls not exposed to water or view.
F-2	Walls exposed to water.
F-3	Walls of structures exposed to view and to 1 foot below water level or finished grade.
S-1	Slabs and concrete fill to be covered with concrete or grout.
S-2	Slabs and floors of structures exposed to view or which are water bearing.

S-3	Slabs and floors of structures which have foot traffic.
E-1	Exposed edges. EXCEPTION: edges normally covered with earth
E-2	Top of walls and similar unformed surfaces with no foot traffic
E-3	Top of walls and similar unformed surfaces with foot traffic (walkways, etc.)

1. Finish F-1: Repair defective concrete, fill depressions deeper than 1/2-inch, and fill tie holes.

2. Finish F-2: Repair defective concrete, remove fins, fill depressions 1/4-inch or deeper, and fill tie holes.

3. Finish F-3: In addition to Finish F-2, fill depressions and airholes with mortar. Dampen surfaces and then spread a slurry consisting of one part cement and one and one-half parts sand by damp loose volume, over the surface with clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap.

4. Finish S-1: Screed to grade without special finish unless otherwise shown on the Contract Documents. Roughen and/or apply bonding agent where shown on the Contract Drawings.

5. Finish S-2: Smooth steel trowel finish.

6. Finish S-3: Finish without local depressions or high points and apply a final stiff bristle broom finish.

7. Finish E-1: Provide chamfer or beveled edges per Section 03 10 00.

8. Finish E-2: Strike smooth and float to an F-3 finish.

9. Finish E-3: Finish without local depressions or high points and apply a final stiff bristle broom finish.

B. Protect finished concrete surfaces from damage by construction equipment, materials, curing procedures and rain or running water.

Finishing of Formed Surfaces

A. Cure surfaces until finishing and repairing are completed.

B. Perform finish work as soon as possible after forms are removed. Remove fins and irregularities by grinding or rubbing, fill depressions deeper than specified with mortar, and repair tie holes.

C. Conform to the requirements specified in Section 03 10 00 for tolerances for formed surfaces.

Finishing of Unformed Surfaces

A. Provide float finish then roughen the surface with stiff brushes or rakes before the final set for surfaces scheduled to receive concrete fills and toppings.

B. Provide steel-trowel finish to all top, horizontal and inclined surfaces not otherwise specified or indicated. This includes concrete fills and toppings and floors. Provide hand steel-trowel finish to all surfaces such as weirs or walls over which liquids will flow.

C. Provide broom finish to exterior walkways, exterior stairs, and concrete pads.

Concrete Repair

A. Surface Defects:

1. Do not repair defects until concrete has been reviewed by the Engineer. Coordinate repair of concrete surfaces with Section 03 01 30.

2. Repair defects including, air voids and bug holes with a nominal diameter or depth greater than 1/4-inch, honeycombed areas, visible construction joints, fins, burrs, color and texture variations and other defects as determined by the Engineer. Make concrete repairs with a polymer modified cementitious repair mortar in accordance with Section 03 01 30to produce a concrete surface uniform in color and texture and free of all irregularities.

B. Crack Repair:

a. Repair concrete cracks in accordance with Section 03 01 30.

C. Tie-hole Repair:

a. Repair tie holes in accordance with Section 03 10 00.

9.2.8 METAL RAILINGS (05 52 00)

Part 1: GENERAL

Description

A. Design, furnish and install railing systems, including connectors, fasteners, and system required accessories.

References

A. American Society of Civil Engineers (ASCE)

1. 7: Minimum Design Loads for Buildings and Other Structures.

B. American Society for Testing and Materials (ASTM)

1. A36/A36M: Standard Specification for Carbon Structural Steel.
2. A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. A123/A123M: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. A780: Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
5. E935: Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
6. E985: Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

C. American Welding Society (AWS)

1. C5.6: Recommended Practices for Gas Metal Arc Welding.
2. D1.1-1.17: Structural Welding Code.

D. International Code Council

1. IBC: International Building Code.

E. National Ornamental & Miscellaneous Metals Association (NOMMA)

1. Guideline 1: Joint Finishes
.
2. Metal Rail Manual.
3.

Performance/Design Criteria

A. Design and provide handrail and guardrail system to meet IBC, OSHA, and the criteria specified herein. Railing shall be capable of withstanding the following loads without exceeding design allowable stress of materials for handrails, railing anchors and connections.

1. Top rail

a. Uniform load of 50 pounds per foot applied in any direction.

b. Concentrated load of 200 pounds applied in any direction at any point.

c. Uniform and concentrated loads above need not be assumed to act concurrently.

2. Intermediate rails

a. Uniform load of 50 pounds per foot applied in any direction. Uniform load above need not be assumed to act concurrently with loads acting on top rail.

B. Thermal movements: Provide adequate expansion within the system to allow for thermal expansion and contraction caused by a temperature change of 100 degrees F to -20 degrees F without buckling or warping, opening of joints, overstressing of components, failure of connections and other detrimental effects.

C. Control of corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

Submittals

A. Show fabrication and installation of handrails and railings assembled from standard components. Include plans, elevations, component details, materials, finishes, connection and joining methods, and mounting details to adjoining work.

B. Identify location and type indicated.

C. Submit calculations or test data demonstrating that the railing system will resist the loads specified herein and OSHA. Calculations shall be stamped by a Professional Civil or Structural Engineer.

D. Product Data

1. Manufacture's literature for safety swing gate.

2. Assembly and installation instructions.

E. Certificates

1. Welders' Certificates: Certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

2. Submit certification that the railing system is in compliance with OSHA.

3. Operation and Maintenance Data

4. Manufacturer's instructions describing procedures for maintaining including cleaning materials, application methods, and precautions as to use of materials which may be detrimental to finish when improperly used.

Quality Assurance

A. Obtain field measurements prior to preparation of shop drawings and fabrication.

B. Handrails provided shall be end products of one manufacturer/fabricator to achieve standardization for appearance, maintenance and replacement.

C. Manufacturer/fabricator shall have a minimum of five years of experience specializing in manufacturing products specified in this Section.

D. Welding Qualification and Certification

1. Furnish written welding procedure for all welds in conformance with AWS Structural Welding Code.

2. Each welder, tacker and welding operator shall be certified by test to perform type of work required in conformance with AWS Structural Welding Code. Testing shall be conducted, and witnessed by an independent testing laboratory.

3. Maintain duplicate qualification and certification records at the job site readily available for examination.

Submittals

A. Provide shop drawing submittals for review.

Delivery Storage and Handling

A. Deliver, store and handle materials in manner preventing damage to finished surfaces.

B. Store materials in a dry, well ventilated, weather tight place away from uncured concrete.

Site conditions

A. Field verify measurements prior to fabrication and indicate measurements in shop drawings.

Part 2: PRODUCTS

Steel Railing System and Components

A. Material: 1-1/2 inch diameter minimum, steel welded or seamless pipe minimum Schedule 40 meeting requirements of ASTM A53.

B. Railings at open-side construction shall consist of three members with posts. Locate intermediate rails between top rail and finish floor as indicated on Drawings.

C. Provide 1/4-inch thick by 4-inch high or “S” type toe plate except on stairs and where concrete curb provided. Provide 1/4-inch clearance above floor level. Expansion joint in toe plate location to match railing joint location.

D. Fabrication
   1. Angles, offsets, other changes in alignment, and joining of posts and rails shall be made with welded or mechanically fastened connections. Miter and weld joints by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Run top rails continuously over post.

   2. Rail splices shall be butted and reinforced by tight fitting interior sleeve not less than 6 inch long.

   3. Fabricate wall railings with wall brackets for intermediate support and wall return fittings at ends. Brackets and end fittings shall be of cast or formed metal of same material and finish as supported rails and shall be of proper size to provide 3 inch clear space between wall and railing. Provide wall brackets not more than 5 feet on center.

   4. Provide expansion joint splices at 30 feet maximum spacing, with slip joint internal sleeve extending minimum of 4 inch beyond each side of joint. Weld to one side only. Locate within 12 inch of posts.

   5. Provide expansion joint splices at changes in support condition (transition from steel to concrete, concrete expansion joints, etc.).

   6. Space posts as shown on Drawings. Where spacing is not shown, space posts not more than 5 feet on center. Erect posts plumb in each direction.
   7. Fabricate joints which will be exposed to weather so as to exclude water. Provide weep holes at the lowest possible point on all railing system posts.

E. Railings at walls shall be single member

   1. Support wall rails on brackets spaced not more than 5 feet on center and at each end of rail. Cantilevered extensions are not allowed.

F. Anchorage

   1. Railings at Concrete: Provide concrete anchorage for posts by means of base flange welded to post and anchored to concrete with minimum of 4 concrete anchors.

G. Removable Railings: Install removable railing units free-standing in close fitting galvanized pipe sleeves, unattached to other railing units and adjoining work unless otherwise indicated.

H. Safety Swing Gate:
   1. Gate shall mount to the safety railing.
   2. Gate shall have self-closing stainless steel spring and anti-friction bearings.
   3. Adjustable gate for opening widths ranging from 24” to 40”:
      a. Safety Swing Gate Model No. H-5616 by ULINE (1-800-295-5510).

I. Finishes:
   1. Hot dip galvanized welded pipe railing in accordance with ASTM A123.

Part 3 EXECUTION

Installation

A. Install as shown on Drawings and accepted shop drawings.

B. Set posts plumb and aligned in each direction to within 1/4-inch in 12 feet.

C. Fit exposed connections together to form tight, hairline joints.

D. Provide anchorage devices and fasteners for securing handrails and railings and for transferring loads structures.

E. Provide mechanical joints for permanently connecting railing components at nonwelded connections.

Cleaning

A. Wash thoroughly using clean water and soap, rinse with clean water.

B. Do not use acid solution, steel wool or other harsh abrasive.

C. When stain remains after washing, remove finish and restore in accordance with manufacturer’s instructions.

Protection

A. Protect surfaces of completed installations to prevent damage during construction activities.

9.2.9 ACCESS HATCHES (05 53 00)

Part 1: GENERAL

Description

A. This section describes materials, fabrication, and installation of galvanized steel access hatches.

Design Criteria

A. Access Hatches: 300 psf loading.

Submittals

A. Submit drawings of access hatches. Show dimensions and reference materials of construction by ASTM designation and grade. Show design criteria.

B. Submit product data for all accessories (hardware, locking devices, safety grate, etc.).

Delivery Storage And Handling

A. Store to avoid damage. Store above ground on platforms, skids, or other supports. Keep material free from dirt, grease, and other foreign matter and protect from corrosion.

B. Remove material that has become damaged as to be unfit for use.

Part 2: MATERIALS

Galvanized Steel Access Hatches

A. Manufacturers of Prefabricated Floor Access Hatches:
   1. Bilco Company, Type J series.
   2. Halliday, W series.
   3. Thompson Fabrication Company, TE series.
   4. U.S.F. Fabrication, Inc.
   5. Or acceptable equivalent product.

B. Component Fabrication:

   1. Provide access hatches and frames of, type and size as shown on Drawings.

   2. Provide 1/4-inch thick minimum hatch frame with strap anchors or continuous anchors around frame. Hatches shall have no drainage channels.

3. Door leaves: 1/4-inch diamond plate with reinforcing on underside for live load.

4. Door Hardware:

    a. All hinges, pins, and hardware shall be stainless steel.

    b. Equip doors with fully enclosed compression springs and hold - open arm with positive locking device with conveniently positioned release handle for easy and controlled closing.

    c. Locking and Latching Devices: Manufacturer shall provide both a recessed padlock hasp covered by a flush hinged lid and a cylinder lock with keyway protected by a threaded cover plug.

C. Manufacturer shall warranty in writing against defects in materials or workmanship for five years.

D. Fall Protection Safety Grate:

1. Color shall be safety orange.

2. Provide torsion rod lift assistance for ease of operation.

3. Provide an aluminum or stainless steel hold open arm to automatically lock the panel in the fully open 90 degree position.

4. Provide a stainless steel release handle for closing the grating panel with a provision for locking the panel to prevent unauthorized access.

5. All other hardware shall be Type 316 stainless steel.

Part 3: EXECUTION

Examination

A. Upon receipt of material at job site, inspect all materials for shipping damage. Damaged items shall be replaced at no cost to the Owner.

B. Correct defects considered detrimental to proper installation.

Installation

A. Install and make connections in accordance with accepted submittals and manufacturer's written instructions.

B. Install materials accurately in location and elevation, level and plumb.

C. Coordinate and furnish anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete construction.

9.2.10 ROCK ANCHORS (31 68 00)

Part 1: GENERAL

Description:

A. This section includes materials, fabrication, installation, and testing of the rock anchors (hollow core anchors) as indicated on the Drawings and described herein.

References:

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

1. A36: Standard Specification for Carbon Structural Steel.
2. A123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. A513: Standard Specifications for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
5. C109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-In. or 50-mm Cube Specimens).
6. E448: Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.

Submittals:

A. Submit detailed installation drawings that indicate locations of fabricated items and details of installation procedures and equipment. Reproductions of contract documents will not be accepted for this purpose.

B. Submit fabricator and installer qualifications per Paragraph 0 below.

C. Submit the following data and test results:

1. Certified mill report for anchor rods with nuts and washers.
2. Certified mill report for bearing plate.
3. Grout mix design and grout mix test results.
4. Manufacturer's product data for admixtures and additives proposed to be added to the grout mixes. Certify the proposed admixtures and additives are compatible with the grout mixes.

5. Include catalogue cuts, technical data, and conformity to referenced ASTM standards.

D. Submit details showing the following information:

1. Hollow Injection bar.

2. Bearing assembly (bearing plate, washer, and nuts).

3. Total length of the anchor rod.

4. Anchor placement and installation instructions.

5. Grouting methods.

6. Contingency plan for unexpected grout loss and/or grout breakout.

E. Submit driller logs and anchor records.

Quality Assurance:

A. Submit anchor fabricator and installer qualifications as follows:

1. The submittals shall, where applicable, identify individuals who will be working on this contract and their relevant experience.

B. Fabricator Qualifications:

1. The anchors shall be fabricated by a manufacturer that has been in the practice of designing and fabricating hollow injection anchors similar in size and scope to this project for at least 5 years.

C. Installer Qualifications and Installation Plan:

1. Submit installation plan and installer qualifications and experience records. Experience records shall identify all the individuals responsible for the anchors and shall include a listing of projects of similar scope performed within the last 5 years along with points of contact.

Anchor Installation Preparatory Meeting:

A. Prior to commencing any work on the hollow bar anchors, the Contractor, including all field personnel to be involved in drilling and installation of the anchors, shall meet with the Engineer to review the Drawings and specifications, work plans, and submittals. Drilling may commence upon approval of the anchor installation plan and procedures and after conducting the Preparatory Meeting.

Delivery, Storage, and Handling:

A. Materials shall be suitably wrapped, packaged or covered at the factory or shop to prevent being affected by dirt, water, oil, grease, and rust. Protect materials against abrasion or damage during shipment and handling.

B. Place materials stored at the site above ground on a well-supported platform and covered with plastic or other approved material. Materials shall be protected from adjacent construction operations.

C. Reject and remove from the site an anchor which is damaged by abrasion, cuts, nicks, heavy corrosion, pitting, welds or weld spatter.

D. Store structural material, either plain or fabricated, above ground on platforms, skids, or other supports. Keep material free from dirt, grease, and other foreign matter and protect from corrosion.'

Part 2 – PRODUCTS

Anchor System:

A. Each anchor system shall consist of the following assembly of components. Refer to the Drawings for the configuration of these components.

B. Anchor:

1. The anchor rod shall be a galvanized hollow injection bar with diameter as shown in the Drawings, Grade 85, conforming to ASTM A513.

   a. Minimum yield stress = 85 ksi (minimum)

   b. Ultimate stress = 105 ksi (minimum)

   c. Elongation = 15% (minimum)

2. Submit certified test reports for each heat or lot of anchor steel with materials delivered to the site. Submit mill reports and a certificate from the manufacturer stating chemical properties, ultimate strengths, yield strengths, modulus of elasticity, and any other physical properties needed for the required computations, for the type of steel furnished.

3. Manufacturer shall be Williams-Form Engineering or approved equivalent.

Manufactured Units:

A. Bearing Plate Assembly:

1. The bearing plate assembly shall consist of steel bearing plate and nuts top and bottom. All components shall be galvanized steel.
2. The bearing plate shall be of the dimensions and thickness shown on the Drawings. The bearing plate shall conform to ASTM A36.

3. The nut shall be per the anchor manufacturer.

Equipment:

A. Drilling Equipment:

1. Provide drilling equipment suitable for advancing the drill tools to the depths and at the alignment required.

B. Grouting Equipment:

1. Grout Mixer:
   a. The grout mixer shall be a high-speed, high-shear, colloidal type grout mixer capable of continuous mechanical mixing that will produce uniform and thoroughly mixed grout which is free of lumps and undispersed cement.

   b. The mixer shall be equipped with a suitable water and admixture measuring device calibrated so that after each delivery the hands can be conveniently set back to zero.

2. Grout Pump:
   a. The grout pump shall be of the positive displacement type and shall be capable of pumping at all flow rates below 20 gpm, shall be capable of pumping at the pressure of at least 50 psi at zero flow rate.

   b. For neat cement grout, the pump shall have a screen with 0.125 inch maximum clearance to sieve the grout before being introduced into the pump. Screens are not required for shear type mixers. Make available a pump which is capable of pumping both neat cement grout mixes and sanded grout mixes.

   c. The pumping equipment shall have a pressure gauge capable of measuring pressures of at least 150 psi or twice the required grout pressure, whichever is greater.

Cement Grout:

A. Grout for grouting anchors shall consist of a homogenous, pumpable, stable mixture of Portland cement and water. Submit the proposed mix design to the Engineer for review. The water content shall be the minimum necessary for proper placement, but the water-cement ratio shall not exceed 0.45 by weight. Do not use accelerators.

B. Final proportions of materials shall be based on results of tests made on sample mixtures of grout. The minimum compressive strength of 2-inch cubes, molded, cured, and tested in accordance with ASTM C109, shall be 5,000 psi.

Anchor Fabrication:

A. General:

1. Fabrication of the anchors shall be as recommended by the manufacturer/supplier. Anchors shall be completely assembled.

2. Fabricated anchors shall be protected, transported and stored in a manner to prevent corrosion or damage to any components.

Part 3 – EXECUTION

Drilling Holes:

A. General:
   1. Holes shall be drilled at the locations shown and to the depths and diameters indicated. The locations of the holes may be changed only as approved by the Engineer.

   2. The Contractor shall determine the drilling method to be used.

   3. Wastewater from drilling operations shall be collected and disposed of off-site in accordance with Federal, State and local requirements.

B. Alignment:
   1. Tolerances:
      a. The anchor hole shall be located within 3-inches of the location shown in the Drawings. The entry angle shall be within 5 degrees of the specified inclination. If the hole alignment does not meet the specified tolerances, notify the Engineer immediately.

   2. Alignment Check:
      a. Check each drilled hole for alignment as specified herein upon completion of drilling and before commencement of any other work.

Installation of Anchors:

A. General:

1. The Contractor is responsible for each drilled hole until the anchor has been installed and grouted.

2. Install anchors per the manufacturer's instructions, as indicated on the Drawings, and as described herein.

3. Anchor installation shall be completed using only application specific tools approved by the anchor manufacturer for this specific application.

4. All the equipment used in handling and placing the anchors shall be such that it does not damage or deteriorate the anchor. Each anchor shall be inspected prior to insertion into the hole.

B. Grouting:

1. Grout the anchor only after it has been fully embedded.

2. Grout the anchor from the lowest gravitational point.

3. Estimated grout quantities shall be determined by the Contractor for each rock anchor.

4. Grouting will be checked at approximately 15 minutes from start of grouting, or when grouting has been in progress sufficiently long to indicate trends and to make sure grout mix is adequate.

5. If the rock anchor hole readily takes excess grout and the grout take does not decrease with time, the Contractor shall gradually thicken the grout mix until the grout take decreases. Grouting shall stop when the grout take exceeds 50 percent of the expected grout volume for the hole. Alternative measures shall subsequently be implemented that are mutually agreeable between the Contractor and the Engineer.

Field Quality Control:

A. General:

1. Three anchors will be pull tested. The Test Load shall not be exceeded.

2. Provide a qualified engineer to evaluate the anchor test results and determine the acceptability of the anchors in accordance with the criteria indicated hereunder. All tests shall be run in the presence of the Engineer or applicable representative.

B. Pull Test:

1. The Owner shall hire an Independent Testing Agency to test all the rock anchors in accordance with ASTM E488. Use incremental loading for tensile test up to the service design load per anchor as indicated on the Contract Drawings. Consider anchors to have failed if displacement exceeds 0.1 inch or if any failure modes occur.

2. Report the results of all tests and inspections conducted at the project site. Submit test results within 24 hours of physical completion of testing. Do not place or install materials without prior approval.

C. Driller Logs:

1. The Contractor shall submit drilling logs to the Engineer. Separate logs shall be made for each hole. The following information shall be included in the logs or in the records for each hole:

    a. Date(s) and time the hole was drilled.

    b. Hole number or designation and location at the structure for the start of the drilled hole.

    c. Diameter, depth, and inclination of hole.

    d. Note of any unusual events occurring during drilling.

    e. Depth drilled and elevation of both the top and bottom of the hole.

    f. Date and time grouting of the hole was started and ended.

    g. Grout take.

    h. Notation of any other observations relating to the grouting.

    i. Name of the person preparing the logs and the current date.

D. Anchor Records:

1. Upon completion of installation of each anchor, the anchor records shall be submitted to the Engineer. The following information shall be included in the records for each anchor:

    a. Report pull test results.

    b. The pull test results shall include measured lengths of drill holes and anchors, the loads and elongations recorded during testing, and graphs of test results.

    c. In addition, as-built drawings showing the completed installation of the anchors shall be furnished upon completion of installation of all anchors.

    d.

Acceptance:

A. Replacement of Rejected Anchors

1. Any anchor that fails the pull test or is rejected shall be replaced. A replacement anchor, including potentially a new anchor hole, shall be provided by the Contractor at no expense to the Owner. Provide all materials, supplies, equipment, and labor necessary to provide a new anchor assembly. No drilling shall be performed for a replacement anchor until the grouting of all adjacent anchors of the replacement anchor location has been allowed to set for at least 24 hours. Payment will not be made for rejected or failed anchors.

END OF SECTION

9.3 OTHER

9.3.1 AJ JOLLY BI-DIRECTIONAL STAINLESS STEEL KNIFE GATE VALVE

All valves shall be model KGC-BD Bi-Directional Cast Knife Gate Valves as manufactured by DeZURIK or an approved equal

Gate edges shall be machined, finished, and rounded. The gate faces shall be finish ground.

Exclusive Premium Packing System shall fit a rounded machined packing chamber. The Exclusive Premium Packing System shall consist of multiple layers of packing with anti-extrusion guides. The packing gland shall match the valve body or (specify). The fasteners shall be stainless steel.

Body shall be a one piece casting of type 316 stainless steel for corrosive applications. Valve inside port diameter shall be equal to ANSI B36.10 STD pipe inside diameter. Raised faces shall be full width per ASME B16.20 standards for spiral-wound gaskets.

Resilient Seat shall be capable of bubble-tight bi-directional shutoff to the full pressure rating of the valve, and provide shutoff on dead end service. Valves shall be of a perimeter seat design and the seat shall provide guiding for the gate. Resilient seat shall be a one-piece rubber molded seat with seat pucks at the top and an encapsulated full metal reinforcement insert in 316 stainless steel for rigidity. Seat pucks shall be locked into a machined pocket in the bottom of the packing chamber and not interfere with the integrity of the packing chamber. The perimeter seat shall be locked into the valve body in a dovetail groove. Resilient seat material shall be Buna-N.

Face-to-face dimension shall meet MSS SP-81 for knife gate valves.

Cold Working Pressure valve rating shall meet or exceed MSS SP-81. Valves shall be 150 psi (1030 kPa) for 2-28” (50-700mm) and 100 psi (690 kPa) available for 30” and 36” (750mm and 900mm).

Flange drilling shall be in accordance with ASME B16.5 class 150, 2-24”/50-600mm.

Actuation Manually actuated valves 14-36" (350-900mm) shall be supplied with 304 stainless steel extension, 304 stainless steel extension couplings, cast iron floor stand, bevel gear actuator with handwheel operator. The yoke shall be a two-piece 304 stainless steel. The yoke sleeve shall be aluminum bronze. The stem shall be type 304 stainless steel.

Warranty Valves and actuators shall be warranted by the manufacturer for defects in materials and workmanship for a period of two years (24 months) from date of shipment.

9.3.2 SSTEM GUIDE

CAST STAINLESS STEEL STEM GUIDES

1.0 GENERAL CONDITIONS

1.1 SCOPE OF WORK

A. The contractor shall furnish all labor, materials, equipment and incidentals required for installation of stem guides.

1.2 QUALITY ASSURANCE

A. The manufacturer shall have experience 10 years manufacturing stem guides and shall show evidence of satisfactory operation in at least 5 installations. The company must be ISO 9001 certified.

1.3. SUBMITTALS

A. The manufacturer shall submit drawings showing critical dimensions, general construction, and materials used in the stem guide.

2.0 PRODUCT

2.1 GENERAL DESIGN FOR MODEL STEM GUIDES

A. The Stem Guide shall be cast 316 stainless steel for corrosion resistance.

B. All castings for the stem guide shall be USA poured castings, and manufacturer shall be capable of supplying material certifications.

C. The stem guide shall consist of a guide and bracket assembly. The guide shall be attached to the bracket by a minimum of four bolts to ensure stability. D. Stem guide shall have the capability to adjust from 2” to 39”.

E. The bracket and guides shall be slotted to allow for adjustment in two directions for proper alignment at installation.

F. The stem guide shall be machined, assembled, and tested in the USA for quality assurance.

G. Manufacturer shall show proof of ISO 9001 certification.

H. Where required, the manufacturer shall provide valve operating stems, floor stands, and operators as specified in the valve schedule or plans.

I. Stem Guide and accessories shall be manufactured by Troy Valve, Model A25680 or approved equal.

9.3.3 QUALITY REQUIREMENTS (01 04 00)

PART 1: GENERAL

Description

A. This Section covers Quality Assurance and Quality Control requirements for this Contract .

B. The Contractor is responsible for controlling the quality of Work, including Work of its subcontractors and suppliers and for assuring the quality specified in these Contract Documents is achieved.

C. The Contractor shall bear the cost and responsibility for scheduling all materials testing for quality assurance purposes, as required by various Sections.

D. The Contractor shall be advised that the Owner will directly employ a materials testing consultant to perform independent materials testing and verification for quality assurance purposes.

1. The Contractor shall bear no costs for scheduling Owner-provided quality assurance testing.

2. Owner-provided quality assurance testing shall in no way relieve the Contractor of responsibility for providing the type, quantity, and frequency of testing as required by various Sections .

3. The Contractor shall provide all reasonable assistance with respect to access, scheduling and coordination for Owner-provided quality assurance testing.

Summary

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with these Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with these Contract Document requirements.

3. The Contractor is not limited by the quality assurance and quality control requirements identified in these Contract Documents to provide the product(s) meeting the project requirements.

Tolerances

A. Monitor tolerance control of installed products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding with installation.

C. Adjust products to appropriate dimensions; position before securing products in place.

References

A. For products or workmanship specified by association, trades, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified in these Specifications or are required by applicable codes or these Specifications.

B. Conform to reference standard by date of issue current on date of Contract Documents, or date specified in the individual Specification Sections, except where a specific date is established by code.

C. The contractual relationship, duties, and responsibilities of the parties performing work under this Contract and the Engineer shall not be altered from the Contract Documents by mention or inference in any reference document.

Definitions

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with Project Specification requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with Project Specification requirements. Services do not include contract enforcement activities performed by Owner or Engineer.

C. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

D. Qualified Testing Agency: An entity engaged to perform specific tests, inspections, or both and which is certified or licensed to perform the specific tests or inspections in the State of Kentucky. Testing laboratory shall mean the same as testing agency.

E. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

F. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of three previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

Conflicting Requirements

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.
B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

Contractor's Quality-Control Plan

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award and not less than seven days prior to preconstruction conference. Submit in format acceptable to Engineer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of the submittal process. Indicate qualifications of personnel responsible for submittal review.

C. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.

D. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and accepted mockups.

E. Monitoring and Documentation: Maintain testing and inspection reports including log of accepted and rejected results. Include work Engineer has indicated as

nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

SUBMITTALS, REPORTS, and DOCUMENTS

A. Submit in accordance with the plans and specifications.

B. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:\

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency
.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

C. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

Materials and Equipment

A. The Contractor shall comply with manufacturer’s printed instructions for furnished materials, regarding all facets of materials and/or equipment movement, storage, installation, testing, startup, and operation. Should circumstances occur where the Contract Documents are more stringent than the manufacturer’s printed instructions,

the Contractor shall comply with the Project Specifications. In cases where the manufacturer's printed instructions are more stringent than the Contract Documents, the Contractor shall advise the Engineer of the disparity and conform to the manufacturer's printed instructions. In either case, the Contractor is to apply the more stringent specification or recommendation, unless accepted otherwise by the Engineer.

Quality Control

A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility and the costs for such are to be included in the cost of Work. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

2. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

3. Comply with manufacturers' instructions, including each step in sequence.

4. When manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

5. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

6. Perform Work by persons qualified to produce required and specified quality.

7. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.

8. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

9. Where services are indicated as Contractor's responsibility, engage a Qualified Testing Agency to perform these quality-control services.

a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

10. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

11. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

12. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

13. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

14. Contractor’s failure to properly schedule and provide testing services and reports may be cause for rejection, removal and/or replacement of materials at Owner’s discretion and solely at Contractor’s expense.

B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00.

C. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Contractor activities, inspection of completed portions of the Work, and submittal of written reports.

D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents. Retesting of noncompliant Work shall be the Contractor's responsibility, shall follow the same procedures as the original testing, and be at the Contractor's cost.

E. Qualified Testing Agency Responsibilities: Cooperate with Owner, Engineer, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

6. Do not perform any duties of Contractor.

F. Contractor’s Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

4. Facilities for storage and field curing of test samples.

5. Preliminary design mix proposed for use for material mixes that require control by testing agency.

6. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Contractor Coordination: Coordinate sequence of activities to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Contractor Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

Quality Control

A. Quality control is the responsibility of the Contractor, and the Contractor shall maintain control over construction and installation processes to assure compliance with specified requirements.

B. Means and methods of construction and installation processes are the responsibility of the Contractor, and at no time is it the intent of the Engineer to supersede or void that responsibility.

Test and Inspection Log

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.

2. Description of the Work tested or inspected.

3. Date test or inspection results were transmitted to Engineer.

4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's reference during normal working hours.

Repair and Protection

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged Work and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification sections or matching existing substrates and finishes.

2. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

A. Protect Work exposed by or for quality-control service activities.

B. Repair and protection are the Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

TESTING SCHEDULE

A. Refer to the individual Sections for testing schedules and requirements.

9.3.4 OWNER'S CONTINGENCY (01 21 00)

PART 1 GENERAL

Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

Summary

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Owner's Contingency.

Definitions

A. An owner's contingency is a portion of the project budget (10%) set aside by the project owner to cover unanticipated costs that arise from scope changes, unforeseen conditions, design revisions, or other owner-directed decisions that are not included in the original contract price.
B. Owner's Contingency shall not be used for changes to material pricing, inflation, estimating uncertainty, etc.

Action Submittals

A. Draw from the Owner's Contingency amount shall follow the change order procedure with necessary paperwork and backup documentation to be provided by the Contractor.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work

Owner's Contingency

A. Use the contingency only as directed by Engineer for Owner's purposes and only by Change Orders that indicate amounts to be charged to the contingency.

B. Change Orders authorizing use of funds from the contingency will include Contractor's related costs and reasonable overhead and profit.

C. At Project closeout, credit unused amounts remaining in the contingency to Owner by Change Order.

Adjustment Of Contingency

A. Contingency Adjustment: To adjust contingency amounts, prepare a Change Order proposal based on the proposed changes to the Project.

1. Include installation costs in purchase amount only where indicated as part of the contingency.

2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.

3. Submit substantiation of a change in scope of Work.

4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

Schedule Of Allowances

A. Allowance No. 1: Owner's Contingency: Include a contingency amount of 10% of the Contractor's Base Bid.

END OF SECTION 01.21.00

9.3.5 DESIGNATED SPECIALTY SUBCONTRACTOR (01 31 00)

Purpose

A. The County requires that certain elements of the Work be performed by a designated specialty subcontractor due to the specialized nature of the services, continuity of technical knowledge, and integration with ongoing inspection/operational history associated with the facility.

Designated Specialty Subcontractor

A. Designated Specialty Subcontractor: EnviroScience, Inc. (the “Designated Firm”).

Contact: Patrick Evankovich
Commercial Diving Operation Manager
pevankovich@enviroscienceinc.com
330.472.9757

B. The Designated Firm shall perform, at minimum, the following specialty services (the “Designated Scope”):

1. Exercising/operational testing of the existing valve(s) and appurtenances;
2. Temporary upstream plugging, watertightness verification/testing, and associated field confirmation;
3. Specialized confined space / underwater / dewatering / instrumentation support as applicable;
4. Removal of existing gate valve, stem guide, pedestal
5. Installation of new gate valve, stem guide, pedestal
6. Any additional specialty tasks specifically identified in the Contract Documents as “Designated Scope.”

C. It is anticipated that the removal of the existing vale and installation of the new valve will be during the phase of construction that the portion of the concrete riser that is shown for removal has been demolished and removed. The Contract Holder shall provide a crane for the removal and installation of the valve.

Mandatory Utilization

A. The Prime Contractor/Offeror shall include EnviroScience, Inc in its proposal/bid and shall enter into a subcontract agreement with Enviroscience for the Designated Scope.
B. Substitution of Enviroscience is not permitted except as provided in Section 4.0 (County-approved substitution for cause).

C. The Prime remains fully responsible for all Work, including the performance of the Designated Firm, and no designation shall be interpreted as an assignment of the Prime's obligations to the County.

Substitution (For Cause Only)

A. The County may consider substitution only upon a written request showing that:

1. EnviroScience, Inc. is unable or unwilling to execute a subcontract on commercially reasonable terms; or

2. EnviroScience, Inc. is materially in default on a separate County contract and the County determines continued use is not in the County's best interest; or'

3. A conflict of interest, debarment, or legal prohibition prevents use.

B. Any substitution request must be submitted in writing with supporting documentation. Approval is at the sole discretion of the County.

Coordination Requirements

A. The Prime shall coordinate schedule, access, and sequencing with EnviroScience, Inc. and shall incorporate EnviroScience's deliverables into the overall project schedule.

B. All deliverables produced by EnviroScience under the Designated Scope shall be submitted through the Prime and become part of the project record.

9.3.6 CONSTRUCTION-CAMERA MONITORING (01.33.23)

PART 1 GENERAL

Summary

A. This Section includes the lease, installation, operation, and removal of a construction camera system for photographic recordings of the Work. The system shall be solar powered, cellular connected, 24 hours, and supported by a cloud-based platform providing live viewing, analytics, integrations, and time-lapse deliverables.

References

A. OxBlue Terms of Service, current edition, governing platform use and services, or approved equal.

B. Contract Documents including General Conditions and Supplementary Conditions.

Definitions

A. Construction Camera System refers to a fixed-position wide-angle camera, mounting hardware, solar power station, available for 24 hour recordings, cellular data transmission equipment, and associated cloud services providing automated photographic documentation and video monitoring.

B. Platform refers to the vendor's hosted system providing access to imagery, live video, analytics, weather data, integrations, and time-lapse creation tools.

Administrative Requirements

A. Provide a complete construction camera monitoring system and all associated services for a continuous nine-month prepaid lease period.

B. The system shall include:

1. Lease of an OxBlue 4MP Sapphire Series static wide-angle cellular camera or approved equal. Photos taken no less than every 10 minutes.
2. Solar power station providing one hundred percent autonomous operation.
3. Uncapped cellular data transmission.
4. Mobile applications
5. AI Activity & Safety Analysis – motion detection with artificial intelligence during off peak construction hours.
6. Access to real time and historical weather data
7. Proactive camera management by a dedicated client support manager.
8. Universal mounting system suitable for pole, wall, or parapet installation.
9. Full use of the Provider's platform for the duration of service.
10. One professionally produced high-definition time-lapse movie. Website integration for Marketing needs.
11. Procore and Project Management Integrations

PART 2 PRODUCTS

Manufacturer

A. Basis-of-design system shall be provided by OxBlue, part of Hexagon.

Construction Camera System

A. Camera shall be fixed-position, wide-angle, cellular-enabled, capable of live viewing and recorded imagery accessible via web and mobile applications.

B. Power system shall be solar powered with battery storage sized to maintain full autonomous operation under site conditions, 24 hours.

C. Cellular transmission shall provide uncapped data usage for continuous image and video transmission.

D. Mounting system shall be universal and suitable for pole, wall, or parapet applications using corrosion-resistant hardware.

PART 3 EXECUTION

Installation

A. Install the camera system within the timeframe directed by the Owner. Final location to be determined in the field. Allow for location changes during construction, as directed by the Owner. Securely mount all components and configure capture schedules, alerts, analytics, access permissions, weather data, and project management integrations.

Time-Lapse Deliverables

A. Provide automated and on-demand time-lapse functionality through the platform. Deliver one professionally produced high-definition time-lapse movie with basic titles and optional branding if requested.

Removal

A. At the end of the Construction period, remove all equipment, restore mounting locations, and return leased equipment in accordance with vendor requirements.

9.3.7 TEMPORARY FACILITIES, UTILITES, SERVICES, CONTROLS AND PROTECTIVE MEASURES (01.50.00)

PART 1 GENERAL

Summary

A. This Section includes requirements for **temporary facilities, utilities, services, controls, and protective measures** required to support construction operations and protect the Work, the public, and existing facilities.

B. Temporary facilities and controls include, but are not limited to:

1. Temporary utilities.
2. Temporary support facilities.
3. Temporary environmental, safety, and security controls.
4. Protection of existing facilities, adjacent property, and completed Work.
5. Removal and restoration upon completion.

Definitions

A. Temporary Facilities: All facilities, utilities, and services provided by the Contractor for construction operations and not intended to remain part of the permanent Work.
B. Temporary Controls: Measures implemented to protect the public, workers, environment, and existing improvements during construction.

Quality Assurance

A. Comply with all applicable federal, state, and local laws and regulations, including but not limited to:

1. Kentucky Revised Statutes (KRS).
2. Kentucky Administrative Regulations (KAR).
3. OSHA regulations.
4. Kentucky Division of Water requirements (where applicable).
5. Local ordinances and permits.

C. Provide temporary facilities and controls that meet or exceed applicable code and safety requirements.

Submittals

A. Temporary Facilities Plan:
Submit a site plan indicating locations of:

1. Temporary utilities.
2. Field offices and storage areas.
3. Staging and access routes.
4. Fencing, barricades, and safety controls.

B. Erosion and Sediment Control Plan, where applicable.

C. Traffic Control Plan, where work impacts public streets or rights-of-way.

Project Conditions

A. Maintain access to adjacent properties, public facilities, and emergency services at all times unless otherwise approved by the Owner.

B. Coordinate temporary facilities with ongoing municipal operations.

C. Do not use permanent facilities without written authorization from the Owner.

PART 2 PRODUCTS

Materials

A. Provide materials suitable for intended temporary use and capable of maintaining safe and orderly construction conditions.

B. Temporary materials shall not damage permanent Work or existing facilities.

Temporary Utilties

A. **Temporary Electric Power and Lighting**:
1. Provide temporary power and lighting sufficient for construction operations and safety.
2. Protect existing electrical systems from overload or damage.

B. **Temporary Water Service**:

1. Provide water required for construction, dust control, and sanitation.
2. Prevent contamination of public water systems.

C. **Temporary Sanitary Facilities**:

1. Provide and maintain sanitary facilities in accordance with OSHA and local health requirements.
2. Locate facilities to minimize impact on the public and existing operations.

Temporary Support Facilities

A. Field Offices:
Provide field offices as required for construction administration.

B. Storage and Staging Areas:

1. Provide secure areas for materials and equipment.
2. Prevent encroachment onto adjacent properties or rights-of-way.

C. Temporary Enclosures: Provide weather protection and enclosures necessary to protect Work and existing facilities.

Temporary Controls

A. Safety and Protection:

1. Provide barricades, fencing, warning signs, and lighting.
2. Protect the public from construction hazards at all times.

B. Traffic Control:

1. Provide traffic control devices in accordance with MUTCD and local requirements.
2. Maintain safe pedestrian and vehicular access.

C. Environmental Controls:

1. Control dust, noise, vibration, and runoff.
2. Implement erosion and sediment controls as required by permits.

D. Fire Protection: Provide temporary fire protection equipment and maintain clear access for emergency responders.

Protection of Existing Facilities and Completed Work

A. Protect existing utilities, pavements, structures, landscaping, and improvements.

B. Repair or replace damaged facilities at no cost to the Owner.

C. Protect completed portions of the Work from damage until final acceptance.

PART 3 – EXECUTION

Installation and Maintenance

A. Install temporary facilities and controls prior to beginning construction activities.

B. Maintain temporary facilities in a safe, operable condition for the duration of the Work
.

C. Modify temporary facilities as required by construction progress.

Removal and Restoration

A. Remove temporary facilities and controls upon completion of the Work unless otherwise directed.

B. Restore affected areas to equal or better condition than existed prior to construction.

Final Condition

A. Leave the Project site clean, safe, and suitable for public use.

9.3.8 TEMPORARY ENVIRONMENTAL MANAGEMENT (01.57.13)

PART 1 - GENERAL

Description

A. This Section includes the delivery, construction, installation, maintenance, and removal of temporary water quality, erosion and sediment control best management practices (BMPs), as necessary, to control the quality and quantity of surface water runoff, groundwater seepage, and dewatering system discharges at the construction site to protect the overall Project Site and adjacent streams, lakes and creeks and in compliance with all applicable permits.

B. Furnish all materials and labor to construct, install, maintain and remove water quality, erosion, and sediment control BMPs that are required to prevent waterborne sediments and any other potential contaminants from discharging into the adjacent streams, lakes and creeks.

C. Water quality, erosion, and sediment control BMPs shall be maintained during the Contract period and shall be removed at the end of construction.

Reference Standards

A. Kentucky Transportation Cabinet (KTC), Standard Specifications
.

B. Sanitation District No. 1 (SD1), Standard Specifications.

C. All applicable Project Technical Specifications.

D. Project Drawings.

Submittals

A. Provide the following submittals in accordance with drawings and specifications.

B. At least 14 calendar days prior to beginning of any ground disturbance, excavation, stockpiling, or other earthwork, submit a Water Quality, Sediment, and Erosion Control Plan to the Engineer showing the Contractor’s methods for control of surface water runoff and erosion.

C. The plan shall address water quality, sediment, and erosion control as required by Project permits and by applicable Federal, State, and local laws and regulations .

D. In the plan, address at a minimum the following issues:

1. Sequence of construction of BMPs relative to other construction activities.

2. Provisions for limiting sedimentation and/or other water quality effects on the river.

3. Inspection, adjustment, maintenance, repair, and replacement of BMP measures.

4. Sequence for final removal of temporary BMP facilities.

Quality Assurance

A. Comply with local, state and federal governing regulations regarding water quality and disposal of excavated material.

B. Comply with the requirements of the Commonwealth of Kentucky.

PART 2 - PRODUCTS

Silt Fence

A. Provide silt fence conforming to the following:
   1. Equivalent opening size of a U.S. Standard Sieve size of 40 (max.), 70 (min.).

      Mullen Burst Strength = 200 psi

      Grab Strength = 120 lbs (min.)

   2. Spun bonded nylon fabric reinforced with polyester netting, or polypropylene fabric with 2" x 4"- 12 Ga. woven wire backing fence

B. Manufacturers:

   1. Propex Silt Stop – Amoco Fabrics Company

   2. Mirafi 100k – Celanese

   3. Or approved equal.

Vehicle Tracking Control

A. Vehicle tracking control pad shall consist of a minimum nine (9) inch thick layer of rock.

B. Rock shall be 3-inch to 1-inch washed, semi-rounded aggregate conforming to the KTC Erosion and Sediment Control Practices Guide for a Stone Stabilized Pad Construction Entrance.

Miscellaneous

A. Hay Bale Dikes: May be utilized in combination with Silt Fence barriers. Hay Bales shall be secured in position by two 2"x2" wooden stakes (or metal stakes) per bale.

B. Geotextile Membrane: Mirafi 600x or approved equal.

C. Turbidity Curtain: Cormier Turbidity curtain - AH Harris

D. Lagoon Baffles - Slickbar Products Corp. - Seymour, CT

E. Oil booms: Use proven manufacturers providing products for the intended purpose.

PART 3 - EXECUTION

General

A. Install BMPs prior to work involving disturbance and/or excavation.

B. The first BMP to be installed on the site shall be construction fence, markers and other approved means of defining the Construction Limits.

C. Install BMPs in accordance with the Drawings and the Water Quality, Sediment, and Erosion Control Plan.

D. Accumulated sediment and debris shall be removed weekly from all BMPS or at any time that sediment or construction debris adversely impacts the function of the BMP. The Contractor is responsible for sediment clean up and disposal.

E. BMPs shall be maintained, adjusted, and replaced as needed to keep them in in good functional condition for the duration of the project. Inspect the BMPs weekly and after significant precipitation events and promptly make repairs as needed. Maintain records of inspections and maintenance repairs. BMPs shall be removed only after disturbed areas are permanently stabilized.

F. Any BMP which, on the opinion of the Engineer, is not effectively performing its intended functions shall be repaired or replaced as soon as possible.

Installation

A. Silt Fence: Install and maintain where required or directed in accordance with manufacturers' recommendations prior to beginning clearing or earthmoving operations.

B. Hay Bale Dikes: Install and maintain where required or directed prior to beginning clearing or earthmoving operations.

C. Sedimentation basins and pumping sumps/basins: Install and maintain prior to dewatering operations.

Vehicle Tracking Control

A. A vehicle tracking control pad shall be located at all access points where vehicles enter/exit the construction site from all paved rights-of-way.

B. Rock shall be reapplied and regraded as necessary to stabilize the entrance/exit and to maintain a consist depth.

C. Sediment tracked onto paved roads shall be removed throughout the day and at the end of the day by shoveling or sweeping. Sediment shall not be washed away.

D. The vehicle tracking control pad shall be maintained such that no mud or other debris are deposited from vehicles leaving the site beyond the tracking pad.

Concrete Washout Area

A. Do not locate an unlined concrete washout area within 400-feet of any natural drainage pathway or waterbody, or as otherwise restricted by permits. Do not locate within 1,000-feet of any wells or drinking water sources. If site constraints make this infeasible or if highly permeable soils exist on site, the concrete washout must be installed with an impermeable liner (16-mil minimum thickness) or surface storage alternatives using prefabricated concrete washout devices or lined above ground storage area should be used.

B. The concrete washout area shall be installed prior to concrete placement on site.

C. The concrete washout area shall include a flat subsurface pit that is at least eight-feet-square. The slope leading out of the subsurface pit shall be 3:1 or flatter. The pit shall be at least three feet deep.

D. Vehicle tracking pad shall be sloped 2% toward the concrete washout area.

E. Signs shall be placed at the construction entrance, at the concrete washout, and elsewhere as necessary to clearly indicate the location of the concrete washout area.

F. The concrete washout shall be repaired, cleaned, or enlarged as necessary to maintain capacity for concrete waste.

G. Concrete washout water, wasted pieces of concrete and all other debris in the washout structure shall be transported from the jobsite in a water tight container and disposed of properly.

H. The concrete washout shall remain in place until all concrete for the Project is placed.

I. The cleaning of concrete delivery trucks and chutes is restricted to approved concrete washout location on the site.

J. At the completion of the Project, the concrete washout structure shall be completely removed and the site restored to the satisfaction of the Engineer.

Stockpiles

A. Locate stockpiles away from all drainage system components.

B. Place sediment control BMPs around the perimeter of the stockpile.

Removal of Bmp Installations

A. Do not remove BMP facilities without written acceptance from the Engineer.

B. BMP materials shall remain the property of the Contractor and shall be removed from the site.

9.3.9 RECORD DOCUMENTS (01.78.39)

PART 1 - GENERAL

Description

A. This Section describes the requirements related to maintaining and submitting Record Documents.

Documents

A. Maintain at least one set of the following Record Documents, record revisions to the Work as the Work progresses:

1. Construction Drawings.
2. Specifications.
3. Documents and samples called for in the Contract Documents.
4. Reviewed submittals (shop drawings and product data).
5. Approved work plans and permits.
6. Addenda, RFIs, and Change Orders.
7. Field and laboratory test records.
8. Certificates of compliance.

Maintenance of Documents and Samples

A. Store Record Documents at Project Site and apart from documents used for construction.

B. File documents and samples in accordance with the Specification Section numbers.

C. Maintain documents and samples in a clean, dry, legible condition and in good order. Do not use Record Documents for construction purposes.

Recording

A. Label each document “PROJECT RECORD” in neat, large printed letters.

B. Record information concurrently with construction progress.

C. Do not cover Work until required information is recorded.

D. Marking (Redlining) of Project Record Documents:

1. Legible and with a red pen or pencil.

2. Ink shall not be water based or subject to easy smearing.

3. PDF redlines are an acceptable alternative to hard copy and must be posted in a shared location, such as SharePoint. Contractor shall maintain the bound print set required and replace redlined pages no less than monthly, if applicable, in advance of construction meetings.

E. Mark (Redline) Drawings to Record Actual Construction:

1. Field dimensions, elevations, and details.

2. Changes made by Addenda, RFI, or Modification.

3. Details not on original drawings.

4. Horizontal and vertical locations of underground utilities and appurtenances, referenced to a minimum of two permanent surface improvements.

5. Depths and elevations of various elements of foundation and inverts in relation to Project datum.

6. Location of internal utilities and appurtenances concealed in the construction, referenced from visible and accessible features of the structure.

7. Contractor shall make current as-built drawing redlines available to the Owner and Engineer for review as part of the pay application review process for the Project.

8. All as-built drawing redlines must be submitted to, and accepted by, the Owner and Engineer prior to issuing Final Acceptance.

Submission

A. Accompany each submittal with a transmittal letter in duplicate containing:

1. Date, Project Title, and Project Number.
2. Contractor's name, address, and telephone number.
3. Index containing title and number of each Record Document.
4. Signature of Contractor and Contractor's authorized representative.

B. Contractor shall make current as-built drawing redlines and Record Documents available as requested by the Owner or Engineer to show Record Documents are being maintained through the progress of the Work.

C. Provide input and documentation to support the Engineer in completing the submittal of the as-built drawings.

PART 2 - MATERIAL (Not Used)

PART 3 - EXECUTION (Not Used)

(NOT USED)

Terracon GeoReport

Geotechnical Evaluation Report

AJ Jolly Dam Spillway Investigation
Alexandria, Campbell County, Kentucky
July 29, 2020
Terracon Project No. N1195419

BORINGS 2-21-2-27-20

CORINGS 6-19-20

Prepared for:
Campbell County Fiscal Court
Newport, Kentucky

Prepared by:
Terracon Consultants, Inc.
Cincinnati, Ohio

July 29, 2020

Campbell County Fiscal Court
1098 Monmouth Street
Newport, Kentucky 41072

Attn: Mr. Luke Mantle – Road Supervisor
P: (859) 635-9100
E: lmantle@campbellcountyky.gov

Re: Geotechnical Evaluation Report
AJ Jolly Dam Spillway Investigation
Parklake Road
Alexandria, Campbell County, Kentucky
Terracon Project No. N1195419

Dear Mr. Mantle:

We have completed the Geotechnical Evaluation services for the above-referenced project. This study was performed in general accordance with Terracon Proposal No. PN1195419 dated December 18, 2019. This report presents the findings of the subsurface exploration and provides recommendations concerning the spillway leakage.

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.

STATE OF KENTUCKY
RUSSELL GATERMANN
33436
LICENSED PROFESSIONAL ENGINEER

Russ Gatermann, P.E.
Project Engineer

Ron S. Lech, P.E.
Senior Principal – Office Manager

REPORT TOPICS

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

Geotechnical Evaluation Report
AJ Jolly Dam Spillway Investigation
Parklake Road
Alexandria, Campbell County, Kentucky
Terracon Project No. N1195419
July 29, 2020

INTRODUCTION

This report presents the results of our geophysical survey, subsurface exploration, and geotechnical evaluation services performed for the spillway investigation at AJ Jolly Lake Dam located along Parklake Road in Alexandria, Campbell County, Kentucky. The purpose of these services is to provide a summary of our findings and provide recommendations concerning the spillway leakage.

The geotechnical engineering Scope of Services for this project included the advancement of four test borings to depths ranging from approximately 10.7 to 33.4 feet below existing site grades.

Our Scope of Services also included coring the spillway concrete slab-on-grade and sampling of the subgrade at six locations.

The geophysical survey included ground penetrating radar (GPR) survey lines performed with a push cart 400 MHz antenna and a handheld 1600 MHz antenna. The surveys with the push cart were performed both parallel and perpendicular to the spillway flow. In total, 11 surveys were conducted using the push cart antenna. Select scans of the slab and across joints were performed using the handheld antenna.

Maps showing the site and boring/coring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. A map showing the GPR survey line locations is included in the **GPR Exploration Plan** section. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section along with boring logs, coring logs, and graphical outputs from the GPR survey.

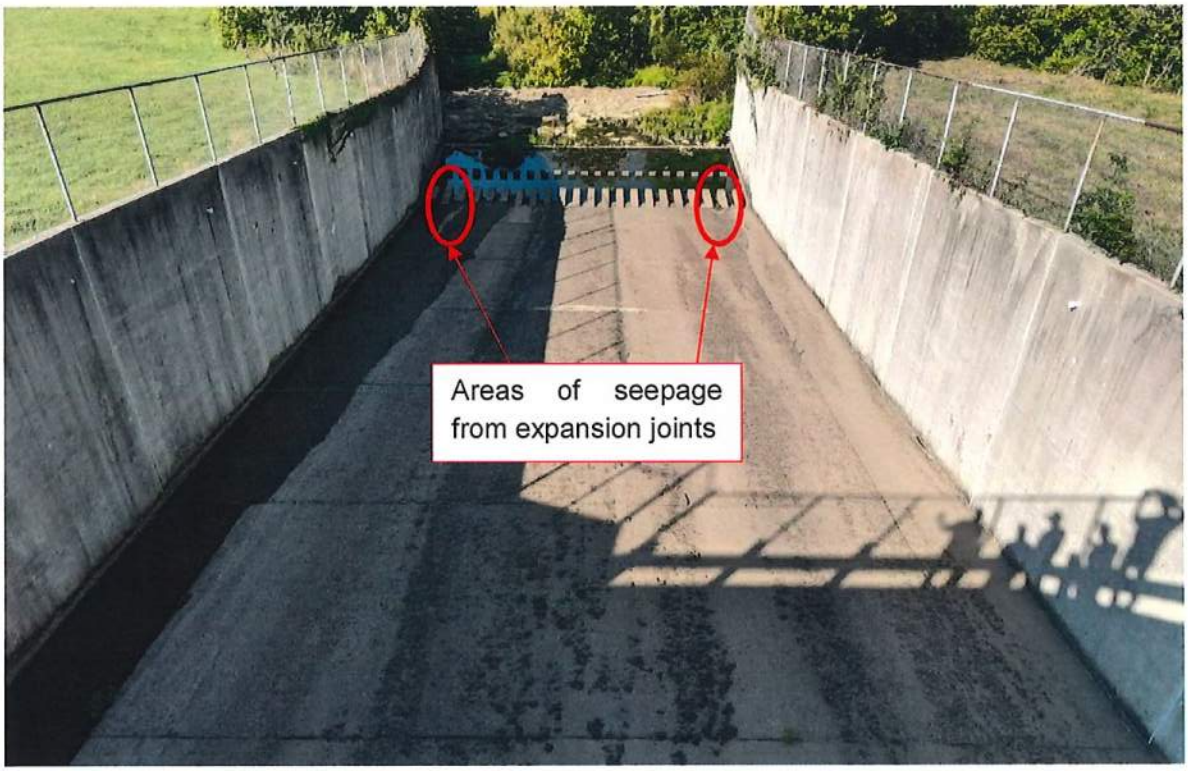
PROJECT DESCRIPTION

Our project understanding is based on the AECOM report dated January 16, 2020, our previous work completed at the site, and information relayed by Campbell County through various emails, phone conversations, in-person communications, and site visits.

The A.J. Jolly Lake Dam is located just east of U.S. Route 27 in A.J. Jolly Park about 5 miles south of Alexandria, Kentucky. The earth embankment dam was originally constructed in 1962

with a crest elevation of 695 feet and a maximum height of about 48 feet. The original spillway system consisted of a drop inlet type principal spillway with a riser and reinforced concrete box (RCB) barrel that discharged into a concrete stilling basin. On the basis of insufficient spillway capacity identified by the U.S. Army Corps of Engineers (USACE) in their 1978 Phase I Dam Inspection Report, the dam was modified in 1983. These modifications included raising the dam embankment height by 4 feet by buttressing the downstream slope, construction of a new principal spillway chute and stilling basin along the auxiliary spillway alignment, and converting the former principal spillway drop inlet structure into a low-level outlet (lake drain). The new principal spillway included a 50-foot wide reinforced concrete ogee crest control section at the top of the spillway with a crest elevation of 685 feet; a 50-foot wide reinforced concrete spillway chute; a reinforced concrete stilling basin; 12-foot high reinforced concrete abutment walls; a reinforced concrete bridge across the top of the spillway in line with the dam crest; inlet wingwalls; an upstream inlet slab (originally constructed in 1983 and extended in 1985), and an underdrain system.

The Kentucky Division of Water performed a safety inspection of the dam in July 2017. The inspection report noted seepage was observed in the spillway chute from the left and right expansion joints near the stilling basin (see photo below). Campbell County was advised to retain the services of a Professional Engineer to evaluate the observed seepage and recommend appropriate remedial actions.



Looking down spillway (east) from bridge (photo taken 9-3-2019)

AECOM was retaining by Campbell County to review existing documentation, perform a site visit to observe the seepage and damage, and perform CCTV inspection of the spillway underdrains. AECOM issued a report with their findings dated January 16, 2018.

Terracon was then retained by Campbell County to review the AECOM report, attend a site visit with Campbell County representatives, and issue a brief peer review of the AECOM report. Terracon issued a peer review letter dated October 9, 2019. In that letter, Terracon recommended Campbell County move forward with a subsurface investigation to further explore and evaluate the leakage issues. This report summarizes the findings of that investigation.

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting, and our understanding of the project. This characterization forms the basis of our geotechnical evaluation. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section. Four subsurface profiles showing the relationship of the spillway and the encountered subsurface conditions are also included in the **Figures** section. Photos of the spillway cores are included in **Exploration Results**.

Test Borings

Model Layer	Layer Name	General Description
1	Surface	Asphalt pavement (5 inches thick) and granular base (7 inches thick) were encountered at the surface in B-1 and B-2. Topsoil (6 inches thick) was encountered at the surface in B-3 and B-4.
2	Existing Fill (Dam Embankment)	Lean clay with variable amounts of shale and limestone fragments, encountered in all test borings, fill likely associated with dam embankment construction
3	Natural Cohesive Soils	Lean clay with limestone fragments (residuum), very stiff, only encountered in B-4 (possible natural soil also identified in B-2) (Note: Residuum is formed from in-place weathering of the parent bedrock material)
4	Brown Shale	Brown, highly weathered, with variable amounts of limestone fragments, encountered in all borings except B-3
5	Gray Shale	Gray, slightly weathered, with variable amounts of limestone fragments, all test borings terminated in this stratum

Spillway Cores

Model Layer	Layer Name	General Description
1	Concrete	Thickness ranged from about 12 to 20 inches, two layers of reinforcing steel encountered in all cores
2	Aggregate Base	Well-graded gravel with varying amounts of sand and fines, angular, gray in C-1 through C-4 and brown in C-5 and C-6
3	Existing Cohesive Fill	Lean clay, gray and brown, with varying amounts of shale and limestone fragments

Groundwater Conditions

The boreholes and corings were observed while drilling and immediately after their completion for the presence and level of groundwater. Observation wells were set in each of the test borings. Refer to **Exploration and Testing Procedures** and individual borings logs for details regarding observation well installation.

Water level readings of the observation wells were taken on March 5, March 20, and June 19, 2020. The observed readings are summarized in the table below.

Boring	Approximate depth (elevation) to groundwater while drilling, feet	Approximate depth (elevation) to groundwater after drilling, feet	March 5, 2020 [1] (feet below grade (elevation, ft))	March 20, 2020 [1] (feet below grade (elevation, ft))	June 19, 2020 [2] (feet below grade (elevation, ft))
B-1	Not observed	Not observed	28.2 (671.0)	28.0 (671.3)	28.4 (670.8)
B-2	Not observed	Not observed	30.8 (669.2)	30.6 (669.4)	31.1 (668.9)
B-3	Not observed	Not observed	6.6 (650.3)	5.8 (651.1)	7.8 (649.1)
B-4	Not observed	Not observed	14.6 (654.1)	14.0 (654.7)	14.6 (654.1)
C-5	-- [3]	16 inches (650.7)	--	--	--
C-6	-- [3]	19 inches (650.4)	--	--	--

1. Spillway was flowing during reading
2. Spillway was not flowing (dry) during reading
3. Accurate water observations during sampling were not able to be obtained due to disturbance from the hand auger

OBSERVATIONS

Test Borings

Four test borings were performed: two at the crest of the dam along Parklake Drive (B-1 and B-2) and two near the bottom of the spillway (B-3 and B-4). Beneath surficial materials (asphalt and

granular base in B-1 and B-2, topsoil in B-3 and B-4), all test borings encountered existing cohesive fill. The encountered existing fill is likely associated with fill placed for dam embankment construction. The existing fill consisted of lean clay with variable amounts of shale and limestone fragments. Moisture contents performed on select samples ranged from about 18 to 28 percent and averaged about 22 percent. Liquid limits performed on select samples ranged from 40 to 48 and plasticity indices ranged from about 20 to 27.

Natural cohesive soil was encountered in one test boring (B-4) beneath the existing fill. The natural soil visually classified as lean clay with limestone fragments (residuum).

Bedrock was encountered in all test borings, which generally consisted of highly weathered brown shale that transitioned to gray shale (brown shale was not encountered in B-3). All test borings terminated in gray shale bedrock.

Observation wells were set in each of the test borings with the tip of the well set near the top of gray shale bedrock. Readings of water levels in the observation wells were taken on March 5, March 20, and June 19, 2020. The spillway was flowing during the two March readings and it was not flowing (dry) during the June 19 reading. The maximum difference between the three readings in observation wells B-1, B-2, and B-4 ranged from about 0.4 to 0.6 feet. The maximum difference between the readings in B-3 was about 2 feet. Water levels taken during times when the lake was higher (spillway flowing) were similar to the water levels taken during times when the lake was lower (spillway not flowing). Based on these observations, the lake level and spillway flow does not appear to have a significant impact on the water level within the observation wells.

Terracon can continue to take water level readings at regular intervals as an addition to this scope. However, Campbell County has expressed interest in purchasing their own water level meter to take readings. We understand the AJ Jolly Golf Course recently installed a lake elevation meter as part of the intake system to water the golf course. The lake elevation should be noted during future readings of the observation wells so that trends between lake level and the observation wells can be identified.

Section 1 in **Figures** represents a subsurface profile taken across the spillway at the dam crest. It includes graphical logs of test borings B-1 and B-2 as well as the spillway geometry at the crest (under the bridge). Based on interpolation of top of bedrock between B-1 and B-2, it is likely that the spillway chute was at least partially excavated into brown shale bedrock. Maximum and minimum water levels readings from the observation wells are also depicted. The maximum water reading recorded in the observation wells (El. 671.3, B-1, March 20, 2020) is about 7 feet below the spillway at this location (El. 678 feet) and about 3.5 feet below the bottom of the cutoff wall (El. 674.75 feet) upstream of the crest.

Section 2 in **Figures** represents a subsurface profile taken across the spillway stilling basin. It includes graphical logs of test borings B-3 and B-4, graphical logs of corings C-5 and C-6, as well as the stilling basin geometry. Based on interpolation of top of bedrock between B-3 and B-4, it appears that the spillway stilling basin was at least partially excavated into bedrock. The maximum

water reading recorded in B-3 (El. 651.1, March 20, 2020) is about 2.6 feet above the stilling basin (El. 678 feet). The maximum water reading recorded in B-4 (El. 654.7, March 20, 2020) is about 6.2 feet above the stilling basin.

Sections 3 and 4 in **Figures** represent subsurface profiles taken along the north and south sides of the spillway. Interpolation of top of bedrock between borings at the top and bottom of the spillway also indicate that the spillway was at least partially excavated into bedrock. A straight-line interpolation between water levels in the observation wells and encountered short-term water levels in C-5 and C-6 indicate that the phreatic surface would intercept the spillway slab near or immediately upstream of the stilling basin where the observed leaks are located. However, it is important to note that the phreatic surface through an earthen dam and bedrock is often not linear and a straight-line interpolation between water levels at the top and bottom of the dam should be considered for approximation purposes only.

As part of their report, AECOM interviewed Ms. Marilyn Thomas of the Kentucky Division of Water. The report indicates that Ms. Thomas' recollection was that the spillway was mostly founded on bedrock, corroborating the top of bedrock elevations encountered in the test borings in relationship to the spillway chute.

Spillway Cores

Coring of the concrete spillway slab was performed within the sloped portion of the spillway. Two cores were performed near the top, two in the middle, and two at the bottom near the stilling basin and near the observed leakage. The concrete thickness at the coring locations ranged from about 12 to 20 inches thick. The excerpts of the Construction Drawings in the AECOM report specify a thickness of 12 inches for the sloped portion of the spillway slab. Two layers of reinforcing steel were encountered in each of the concrete cores and perpendicular reinforcing steel (two-way reinforcing steel) was encountered in some of the cores. The first layer of reinforcing steel was encountered between about 4 and 7 inches from the top of the core and the second layer was encountered between about 8 to 13 inches from the top of the core. The diameter of the reinforcing steel measured between about 5/8 and 3/4 inches, corresponding to #5 and #6 bars. The Construction Drawings specify two layers of reinforcing (top and bottom), each layer consisting of #6 bars at 6 inches on-center in the transverse direction (across the spillway) and #5 bars at 12 inches on-center in the longitudinal direction (up and down the spillway). The reinforcing steel in the spillway cores generally confirm the presence and size of the reinforcing steel as specified in the Construction Drawings.

After the spillway was cored, sampling of the subgrade material was performed with a hand auger. Aggregate base was encountered at all of the coring locations. The thickness of the base ranged from about 6 to 12 inches thick. The thickness was 10 inches or greater in all of the cores except in C-3, where it was 6 inches thick. The Construction Drawings specified 12 inches of crushed stone. The subgrade sampling generally confirms the presence of an aggregate base section

below the spillway slab; however, the thickness is variable across the cores and was less than the specified 12 inches at some locations.

Brown fines were encountered within the granular base layer at C-5 and C-6. Fines were not encountered in the remaining cores. The brown fines are similar in description to the brown "mud" that AECOM noted in many of the existing CCTV videos and below the leaks in the stilling basin.

Cohesive soils were encountered beneath the aggregate base at all coring locations. The soils visually classified as lean clay with shale and limestone fragments. The retrieved cohesive samples appear to be fill material (note: hand sampling results in heavily-disturbed samples which can make classification difficult, particularly distinguishing between existing fill and natural soils). The thickness of the cohesive soil ranged from about 3 inches to 1 foot at the coring locations. All subgrade sampling at the coring locations terminated at refusal condition. Due to the limitations of hand sampling equipment, it was not able to be determined if the refusal conditions were limestone floaters or competent bedrock.

The presence of cohesive soil beneath the aggregate base layer could be a result of one of the following: some amount of intentional bedrock undercutting was performed during spillway construction; bedrock excavation was not able to be performed "neat" and cohesive soil was used to fill in uneven excavations to create even support for spillway construction; or the spillway was founded on bedrock during construction, but the bedrock immediately beneath the spillway has weathered to a soil-like consistency.

Water was not encountered during or immediately after sampling in C-1 through C-4. Water was encountered after sampling in C-5 and C-6. Water was observed 16 inches (El. 650.7) below the spillway surface in C-5 and 19 inches (El. 650.4) below the spillway surface in C-6. These water level observations are higher than the stilling basin elevation (El. 648.5 feet).

Ground Penetrating Radar (GPR)

The geophysical survey included ground penetrating radar (GPR) survey lines performed with a push cart 400 MHz antenna and a handheld 1600 MHz antenna. The surveys with the push cart were performed both parallel and perpendicular to the spillway flow. In total, 11 surveys were conducted using the push cart antenna. Eight surveys were performed in the transverse direction and three were performed in the longitudinal direction. The 400 MHz antenna had an effective penetration depth of abut 4 feet below the top of the spillway slab. Layers of reinforcing steel and the transition from concrete to base material was able to be detected during the survey.

Select localized scans were performed across transverse joints using the 1600 MHz antenna. This antenna had an effective penetration depth of about 18 inches below the top of the concrete slab. The depth and orientation of the reinforcing steel as well as the transition from concrete to base material was detected in the surveys. The antenna could not provide enough penetration depth to produce information about the subgrade.

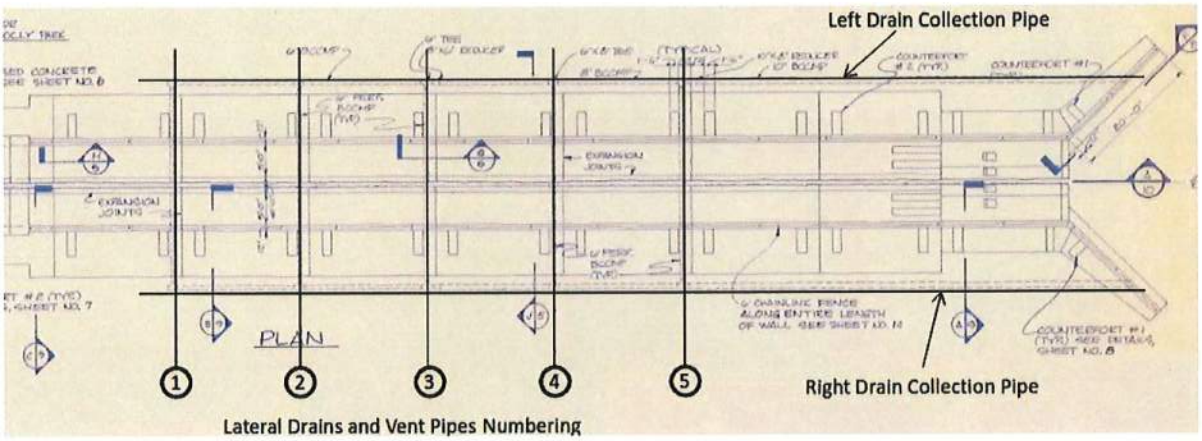
Key observations from the GPR survey:

- There was not enough relative change in the subgrade data to highlight anomalous areas. The data appeared consistent from the downstream end to the upstream end.
- The transverse scans across the spillway also did not produce a discernible change in the subgrade reflections to indicate changes from the downstream end to the upstream end or from one side to the other side.
- Indications of voids or free flowing water beneath the slab were not observed in the data. Due to the thickness of the slab and interference caused by the reinforcing steel, increased saturation in the subgrade may not have been detected.
- Indications of lateral drains were not observed in the data due to interference caused by the reinforcing steel. However, there were indications of thrust blocks at transverse joint locations.
- Indications of the 3-inch diameter lateral drains below transverse drain #5 (discussed below) were not observed in the data.

Graphical outputs from the GPR scans are provided in **Exploration Results**. The first sheet includes annotations of typical features encountered. The remaining two pages include graphical outputs from all the lines that were run.

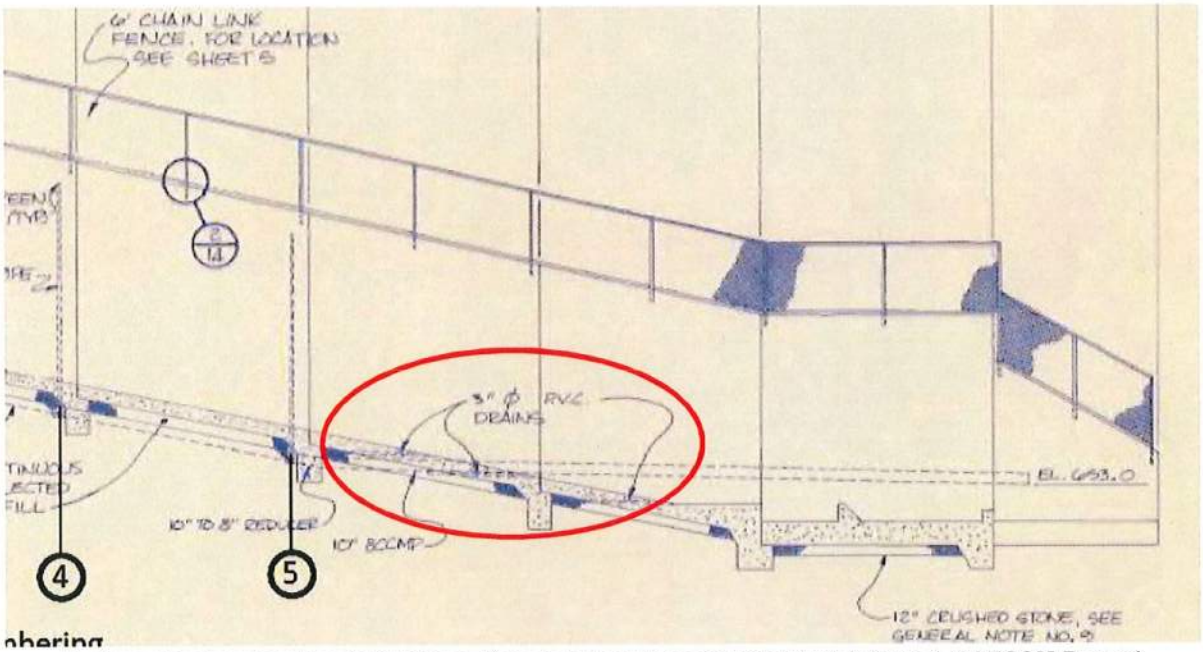
Review of Spillway Drainage System

The spillway has a drain system consisting of lateral (transverse) drains, collector pipes, and vents (see plan below). Starting at the first transverse construction joint below the level portion of the spillway under the bridge, there are a series of 5 transverse drains located at the transverse construction joints. The transverse drains consist of 6-inch diameter perforated bitumen-coated corrugated metal pipe (BCCMP). The transverse drains run the entire width of the spillway and about 15 feet beyond each spillway where they connect to collector pipes. The collector pipes collect from each of the five transverse drains. The collector pipes start as 6-inch diameter BCCMP at the first transverse drain and increase in diameter as they run down the spillway up to a maximum of 10 inches in diameter. After the connection at the #5 transverse drain, the collector pipes travel out to the downstream end of the spillway and daylight outside of the spillway walls at El. 653 feet.



Spillway Drainage System (Figure 1-5 AECOM Report)

In addition to the transverse drains and collector pipes, 3-inch diameter PVC drains are identified on the Construction Drawings at the bottom of the sloped spillway near the stilling basin (see below). The drains go from the slab base section and are indicated to daylight within the spillway slab. Outlets for these drains have not been observed site visits to the site. In addition, Mr. Luke Mantle (Campbell County Road Supervisor) is not aware of the presence of these drains. Based on the lack of observed drains, it seems likely that the drains were not constructed.



Drainage System Section (with 3-inch diameter PVC drains highlighted) (Figure 1-8 AECOM Report)

As part of their scope, AECOM subcontracted a CCTV inspection of the drain pipes. The camera was not able to be inserted up the right collector drain due to tree root blockage. The camera was able to be pushed approximately 38 feet upstream in the left drain, where it encountered a blockage. The camera was advanced to between about 13 feet and 18 feet into the vent pipes.

The camera encountered various obstructions in the vent pipes such as leaves, mud, and muddy water. The transverse drains were not able to be inspected. Water flows from the outlets of both collector pipes. This could indicate the drain system is functioning, or the water in the collector pipes is coming from another source.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on the observations and encountered subsurface conditions encountered in this study, it is our opinion that the primary source of the seepage observed in the joints near the bottom of the spillway is water from the reservoir flowing through the soil embankment and/or through the bedrock foundation, exiting at the bottom of the spillway.

As discussed previously, the water levels measured in the B-1 and B-2 observation wells were below the level portion of the spillway at the crest of the dam. The water levels measured in the B-3 and B-4 observation wells were near or above the stilling basin elevation. Readings of the observation wells were taken over a period of several months during times when the spillway was flowing (i.e., elevated lake level) and was not flowing (lower lake level). This indicates the water levels recorded in the observation wells are likely long-term water levels that are not affected much by precipitation or lake level. Based on the water levels recorded at the top and bottom of the spillway as well as the water levels observed in coring locations C-5 and C-6, it appears a long-term water flow is exiting in the lower portion of the spillway chute. Based on the observed water in C-5 and C-6 and the lack of observed water in the remaining cores, the flow appears to be exiting between cores C-4 and cores C-5/C-6.

We understand that the creek downstream of the spillway is never dry, even during long periods of no rain when the spillway has not flowed. Running water can also be heard under the grouted rip rap immediately downstream of the stilling basin. These observations further lead to the conclusion that there is a long-term seepage through the embankment and bedrock that is exiting near the bottom of the spillway and stilling basin.

Another source of the seepage could be the flow of water in the aggregate base layer between the bottom of spillway concrete and subgrade soil/rock. Water could be entering the aggregate base layer at the ogee crest. In addition, water could be entering the aggregate base layer through expansion joints in the spillway slabs during periods when the spillway is flowing. Caulk in the expansion joints was in poor condition or missing in some areas. It is also possible long-term seepage through the embankment/bedrock is entering the aggregate base layer upstream of the observed leaks near the stilling basin and is flowing down. We do not consider these primary sources of the observed seepage. Water was not observed in C-1 through C-4, which were performed during a dry condition when the spillway was not flowing. If the aggregate base layer was the primary source of the observed seepage at the bottom of the spillway, we would expect to have encountered water in cores C-1 through C-4 even in dry conditions. We understand the

flow of the leakage varies and is greater during wetter periods. It is possible that there is seepage through the aggregate base layer during wetter periods, increasing the observed leakage flow at the bottom of the spillway.

Recommendations

Polyurethane grouting was considered as a measure to stop the leaks. While polyurethane grout would likely be effective in stopping the observed leakage, we do not recommend this remediation. Blocking the current leaks would likely force the water to find another seepage path. The seepage could be pushed further upstream in the spillway chute, which could result in water flow surfacing upstream of the current leaks. In addition, the polyurethane grout could fill the voids in the aggregate base layer, blocking the only existing drainage mechanism in the lower portion of the spillway.

(1) At a minimum, we recommend a drainage system be designed and installed in the portion of the spillway slab downstream of transverse drain #5. We anticipate this system would include transverse drains and one or more collector drains, which could be located within the spillway by the spillway walls or down the middle of the spillway. The outlet drain could exit at/near the stilling basin. The new drain system would be completely independent of the existing drain system. We anticipate the system could be installed by saw-cutting and removing only relatively small widths of the slabs (on the order of 2 to 3 feet wide) along alignments of new transverse and collector drains. After drain installation, the removed sections of slab could then be re-poured by doweling into the existing slab. We do not believe complete removal and replacement of entire slab sections would be required. A full design of such a drain system should be performed by a qualified firm experienced with this type of project.

This scope of work would not address the existing slab drain system. Evaluating the remaining life span and effectiveness of the existing drain system is difficult, especially since the condition of the transverse drains is not known. (2) Consideration could be given to performing a CCTV inspection of the lateral drains. This effort would include coring through the spillway concrete to the lateral drains, drilling a hole through the top of the lateral drains, performing a CCTV inspection, patching the lateral drain, and patching the spillway concrete.

* If it is determined that the existing lateral drains are in poor condition, consideration could be given to not only constructing a drain system for the bottom portion of the spillway slab, but also re-constructing the entire slab drain system. As discussed above, we think it would be feasible to install a new drain system by making selective saw cuts removing only relatively small widths of the slabs (on the order of 2 to 3 feet wide) along alignments of new transverse and collector drains. The existing drain system would be abandoned in-place.

(3) The condition of the expansion joints are generally in marginal to poor condition. The material is deteriorated in many places and completely missing in others. We recommend that existing gaps in the joints be sealed to prevent the flow of water from the spillway into the base material when the spillway is flowing.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

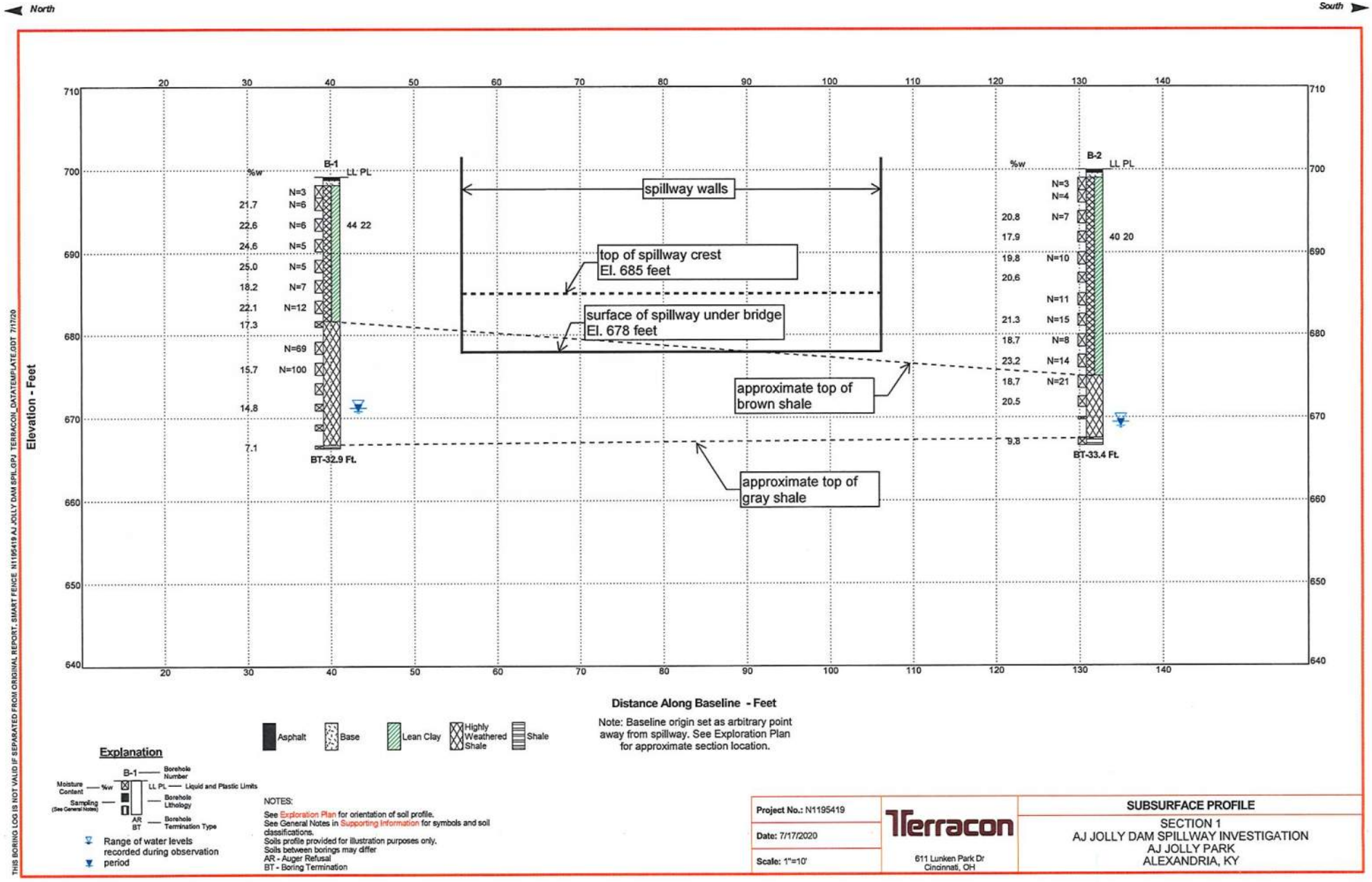
Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

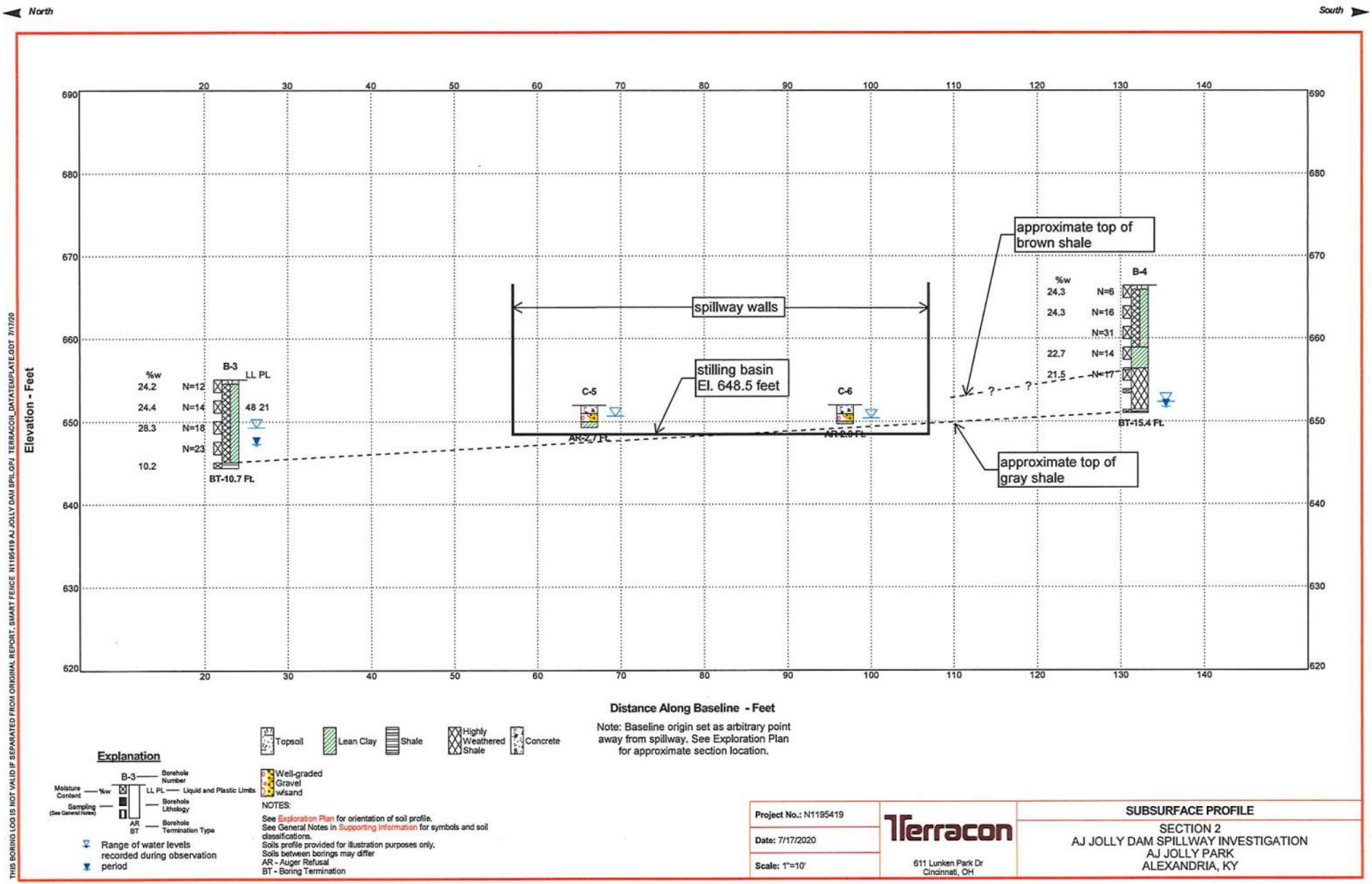
Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

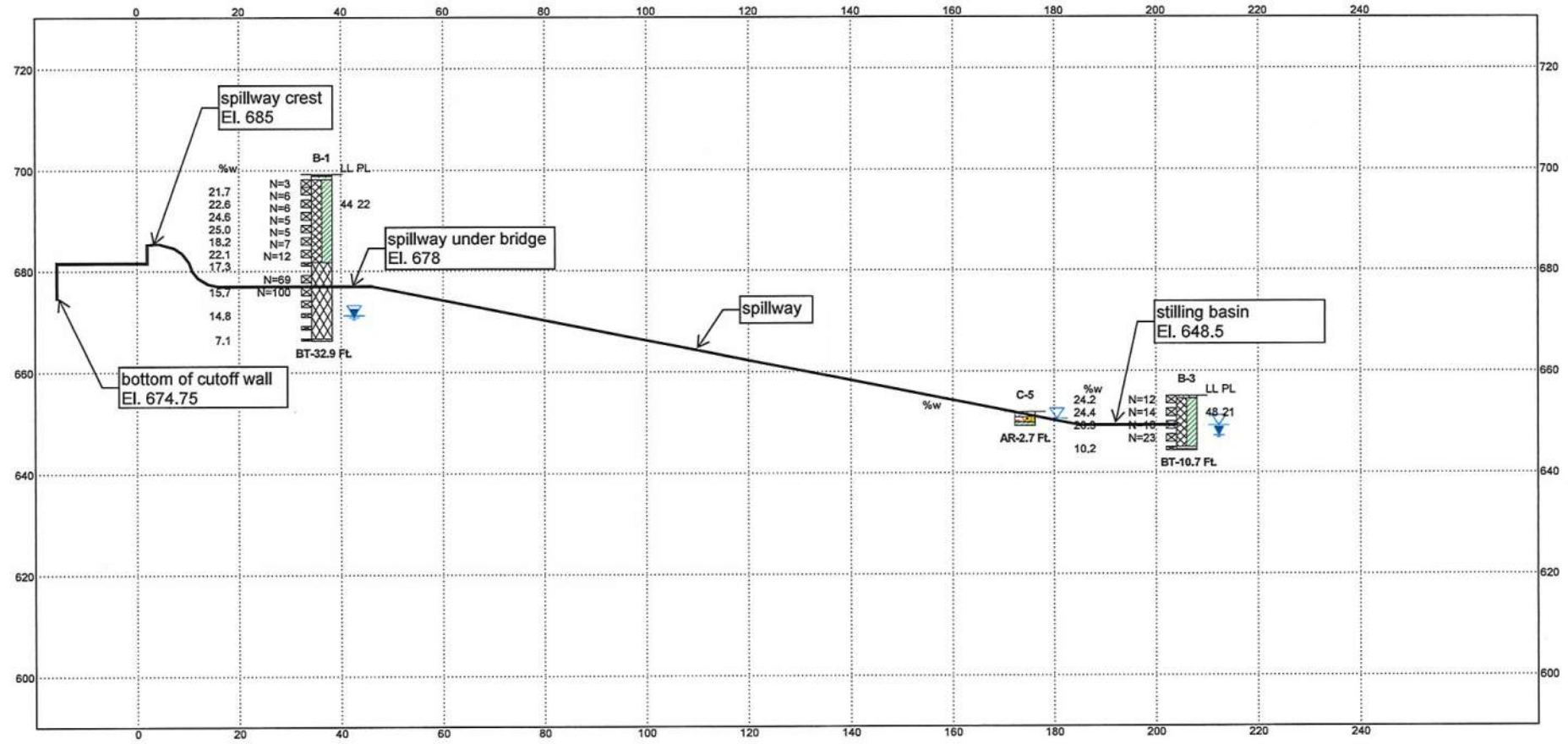
FIGURES

Contents:

Subsurface Profiles (Sections 1 through 4)


North
South
Elevation - Feet
Distance Along Baseline - Feet
B-1
LL PL
%w
N=3
N=6
N=6
N=5
N=5
N=7
N=12
N=69
N=100
21.7
22.6
24.6
25.0
18.2
22.1
17.3
15.7
14.8
7.1
44 22
BT-32.9 Ft.
B-2
N=3
N=4
N=7
N=10
N=11
N=15
N=8
N=14
N=21
20.8
17.9
19.8
20.6
21.3
18.7
23.2
18.7
20.5
9.8
40 20
BT-33.4 Ft.
spillway walls
top of spillway crest
El. 685 feet
surface of spillway under bridge
El. 678 feet
approximate top of
brown shale
approximate top of
gray shale
Asphalt
Base
Lean Clay
Highly Weathered Shale
Shale
Note: Baseline origin set as arbitrary point away from spillway. See Exploration Plan for approximate section location.
Explanation
B-1 Borehole Number
Moisture Content %w
LL PL Liquid and Plastic Limits
Sampling (See General Notes)
Borehole Lithology
AR
BT
Borehole Termination Type
Range of water levels recorded during observation period
NOTES:
See Exploration Plan for orientation of soil profile.
See General Notes in Supporting Information for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination
Project No.: N1195419
Date: 7/17/2020
Scale: 1"=10'
Terracon
611 Lunken Park Dr
Cincinnati, OH
SUBSURFACE PROFILE
SECTION 1
AJ JOLLY DAM SPILLWAY INVESTIGATION
AJ JOLLY PARK
ALEXANDRIA, KY
THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART FENCE N1195419 AJ JOLLY DAM SPILL.GPJ TERRACON_DATATEMPLATE.GDT 7/17/20


North
South
Elevation - Feet
Distance Along Baseline - Feet
spillway walls
stilling basin
El. 648.5 feet
approximate top of
brown shale
approximate top of
gray shale
B-3
LL PL
%w
24.2 N=12
24.4 N=14
28.3 N=18
N=23
10.2
48 21
BT-10.7 Ft.
C-5
AR-2.7 Ft.
C-6
AR 2.8 Ft.
B-4
%w
24.3 N=6
24.3 N=16
N=31
22.7 N=14
21.5 N=17
BT-15.4 Ft.
Note: Baseline origin set as arbitrary point
away from spillway. See Exploration Plan
for approximate section location.
Explanation
B-3 Borehole Number
Moisture Content %w
LL PL Liquid and Plastic Limits
Sampling (See General Notes)
Borehole Lithology
AR
BT Borehole Termination Type
Range of water levels recorded during observation period
Topsoil
Lean Clay
Shale
Highly Weathered Shale
Concrete
Well-graded Gravel w/sand
NOTES:
See Exploration Plan for orientation of soil profile.
See General Notes in Supporting Information for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination
Project No.: N1195419
Date: 7/17/2020
Scale: 1"=10'
Terracon
611 Lunken Park Dr
Cincinnati, OH
SUBSURFACE PROFILE
SECTION 2
AJ JOLLY DAM SPILLWAY INVESTIGATION
AJ JOLLY PARK
ALEXANDRIA, KY
THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART FENCE N1195419 AJ JOLLY DAM SPIL.GPJ TERRACON_DATATEMPLATE.GDT 7/17/20



Note: Baseline origin set as arbitrary point away from spillway. See Exploration Plan for approximate section location.

Explanation

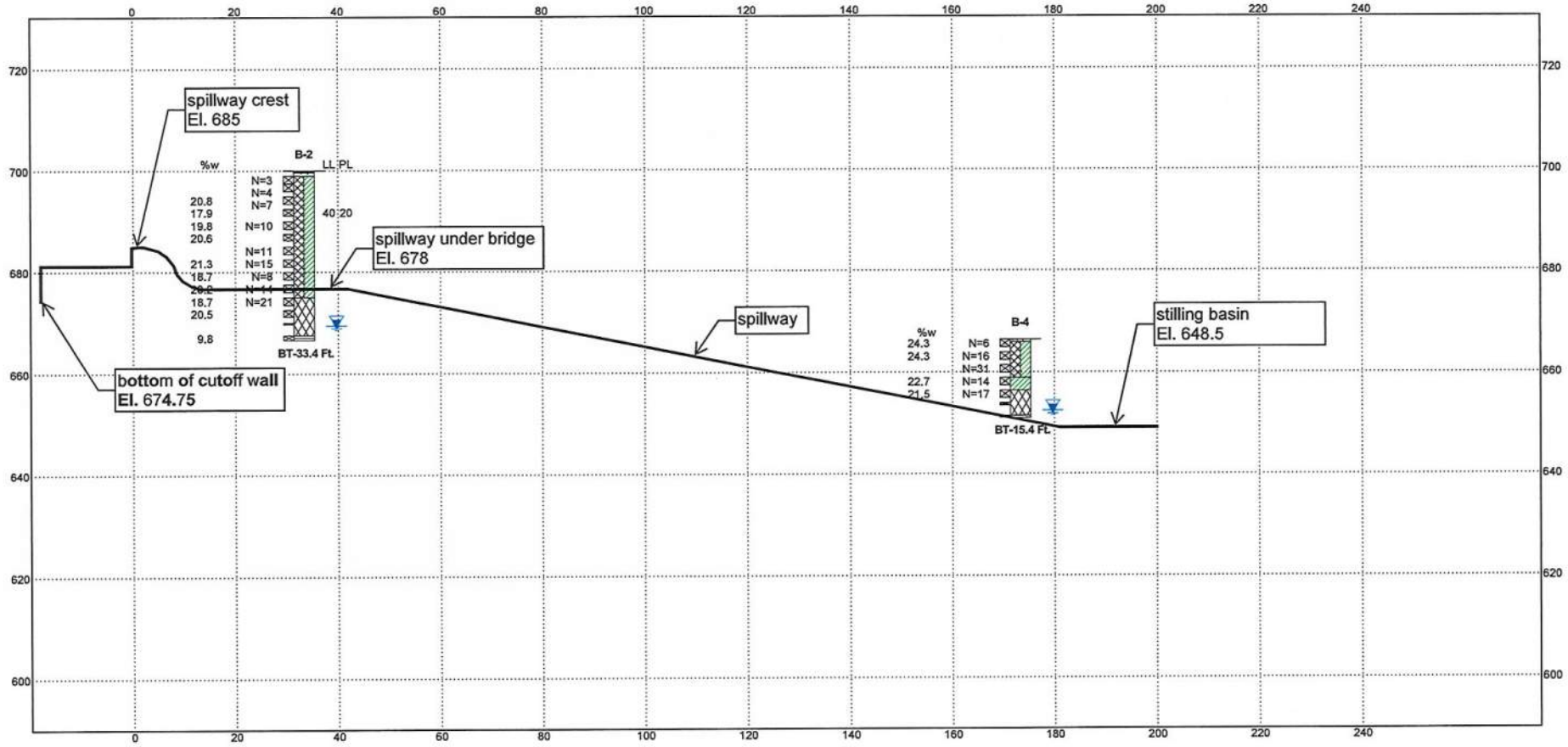
B-1 — Borehole Number
Moisture Content — %w
LL PL — Liquid and Plastic Limits
Sampling (See General Notes) — Borehole Lithology
AR / BT — Borehole Termination Type

Range of water levels recorded during observation period

Asphalt | Base | Lean Clay | Highly Weathered Shale | Shale
Topsoil | Concrete | Well-graded Gravel w/sand

NOTES:
See Exploration Plan for orientation of soil profile.
See General Notes in Supporting Information for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project No.: N1195419	Terracon 611 Lunken Park Dr Cincinnati, OH	SUBSURFACE PROFILE
Date: 7/17/2020		SECTION 3 AJ JOLLY DAM SPILLWAY INVESTIGATION AJ JOLLY PARK ALEXANDRIA, KY
Scale: 1"= 20'		



Note: Baseline origin set as arbitrary point away from spillway. See Exploration Plan for approximate section location.

Asphalt | Base | Lean Clay | Highly Weathered Shale | Shale | Topsoil

Explanation

B-2 — Borehole Number
Moisture Content — %w
LL PL — Liquid and Plastic Limits
Sampling (See General Notes) — Borehole Lithology
AR / BT — Borehole Termination Type

Range of water levels recorded during observation period

NOTES:
See Exploration Plan for orientation of soil profile.
See General Notes in Supporting Information for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project No.: N1195419	Terracon 611 Lunken Park Dr Cincinnati, OH	SUBSURFACE PROFILE
Date: 7/17/2020		SECTION 4 AJ JOLLY DAM SPILLWAY INVESTIGATION AJ JOLLY PARK ALEXANDRIA, KY
Scale: 1"= 20'		

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART FENCE N1195419 AJ JOLLY DAM SPILGPJ TERRACON_DATATEMPLATE.GDT 7/17/20

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings/Corings	Exploration Depth (feet)	Location
2 (B-1 and B-2)	32.9 to 33.4	Top of spillway
2 (B-3 and B-4)	10.7 to 15.4	Bottom of spillway
6 (C-1 through C-6)	2 to 3.6	Throughout spillway slab

Boring Layout and Elevations: Terracon personnel provided the boring and coring layout in coordination with Campbell County. Elevations and coordinates for the borings were obtained with a GPS unit (estimated vertical and horizontal accuracy of about ±1 feet). The locations of the coring locations were measured from physical features of the spillway (walls and joints). Using the field measurements, the coring locations were plotted on existing plans and aerial imagery, where coordinates and elevations were obtained.

Subsurface Exploration Procedures: We advanced the borings with a track-mounted rotary drill rig using continuous-flight, hollow-stem augers. Samples were generally obtained at 2.5-foot intervals. Samples were obtained using the split-barrel sampling procedure, where 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.

After the test borings were advanced to termination depth, a 5-foot-long PVC slotted screen was placed near the bottoms of the boreholes (B-1 to B-4). A solid section of PVC riser was then attached to the screen section and was extended to ground surface. A sand filter pack was placed in the annulus between the PVC and borehole from the bottom of the borehole up to about 2 feet above the top of the slotted screen. An approximately 2-foot-thick zone of bentonite chips was placed on top of the sand. The remainder of the boreholes were backfilled with cement-bentonite grout. A flush cover was installed at the ground surface at B-1 and B-2. A protective metal casing was placed to extend the ground surface at B-3 and B-4. Details for the observation wells and backfilling can be found on the individual boring logs.

The spillway slab was cored using an 8-inch diameter, thin-walled coring bit (performed by a subcontractor under supervision of Terracon). The coring bit was cooled and lubricated with water. After the full depth of the concrete was penetrated, the concrete core was removed. Sampling of the aggregate base and subgrade material was then performed using a hand auger. Hand auger sampling was advanced until termination at refusal conditions (obstructions or caving

soundings). After sampling, the subgrade was backfilled using excavated material up to the bottom of concrete. The entire thickness of the concrete section was then patched using quick-setting concrete.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Ground Penetrating Radar (GPR): Terracon utilized a GPR system consisting of a push cart 400 MHz antenna and a hand held 1600 MHz antenna, designed by Geophysical Survey Systems, Inc. (GSSI), to perform an upper profile geophysical survey. Scans were collected in single lines across the spillway. The primary goal was to locate potential voids beneath the slab or any other evidence as to the source of the flowing water. The data was processed with Radan 7 software for background noise, gain, and signal zeroing. After processing, the data was analyzed and interpreted.

All geophysical testing methods rely on instrument signals to indicate physical conditions in the field. Signal information can be affected by on-site conditions beyond the control of the operator, such as, but not limited to, cultural features, standing water, high subsurface moisture content, and other buried objects. Interpretation of those signals is based on a combination of known factors combined with the experience of the operator and geophysical scientist evaluating the results. The provided depth measurements are estimations based on an estimation of the electrical properties of the subsurface material. The GPR survey was performed in the accessible areas of the building, so some areas were not accessible for scanning.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil and rock strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

The laboratory testing program included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System. Rock classification was conducted using locally accepted practices for engineering purposes using the Description of Rock Properties.

SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location Plan
Exploration Plan
GPR Exploration Plan

Note: All attachments are one page unless noted above.

SITE LOCATION

AJ Jolly Dam Spillway Investigation ■ Alexandria, Campbell County, Kentucky
July 29, 2020 ■ Terracon Project No. N1195419

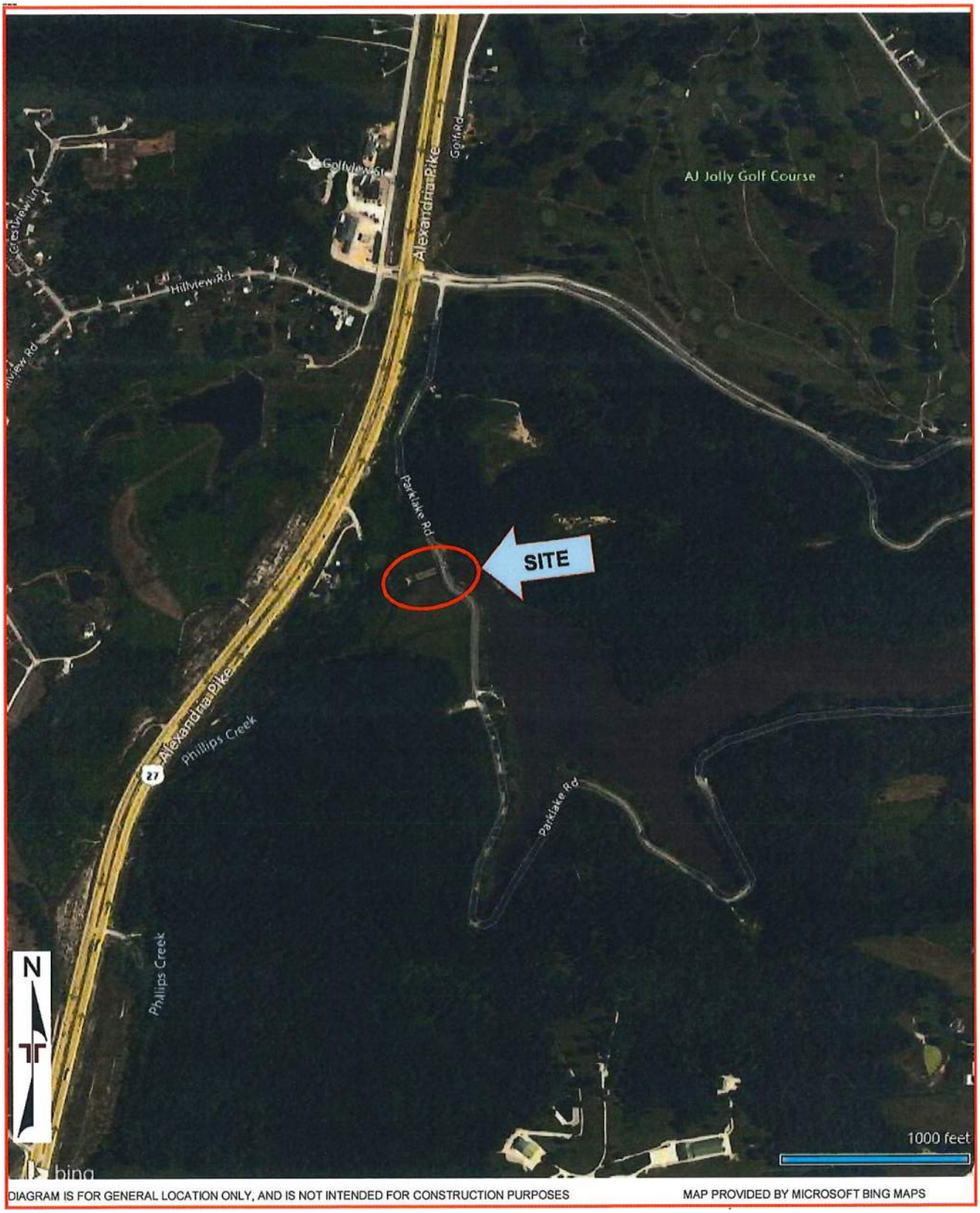


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN
AJ Jolly Dam Spillway Investigation ■ Alexandria, Campbell County, Kentucky
July 29, 2020 ■ Terracon Project No. N1195419

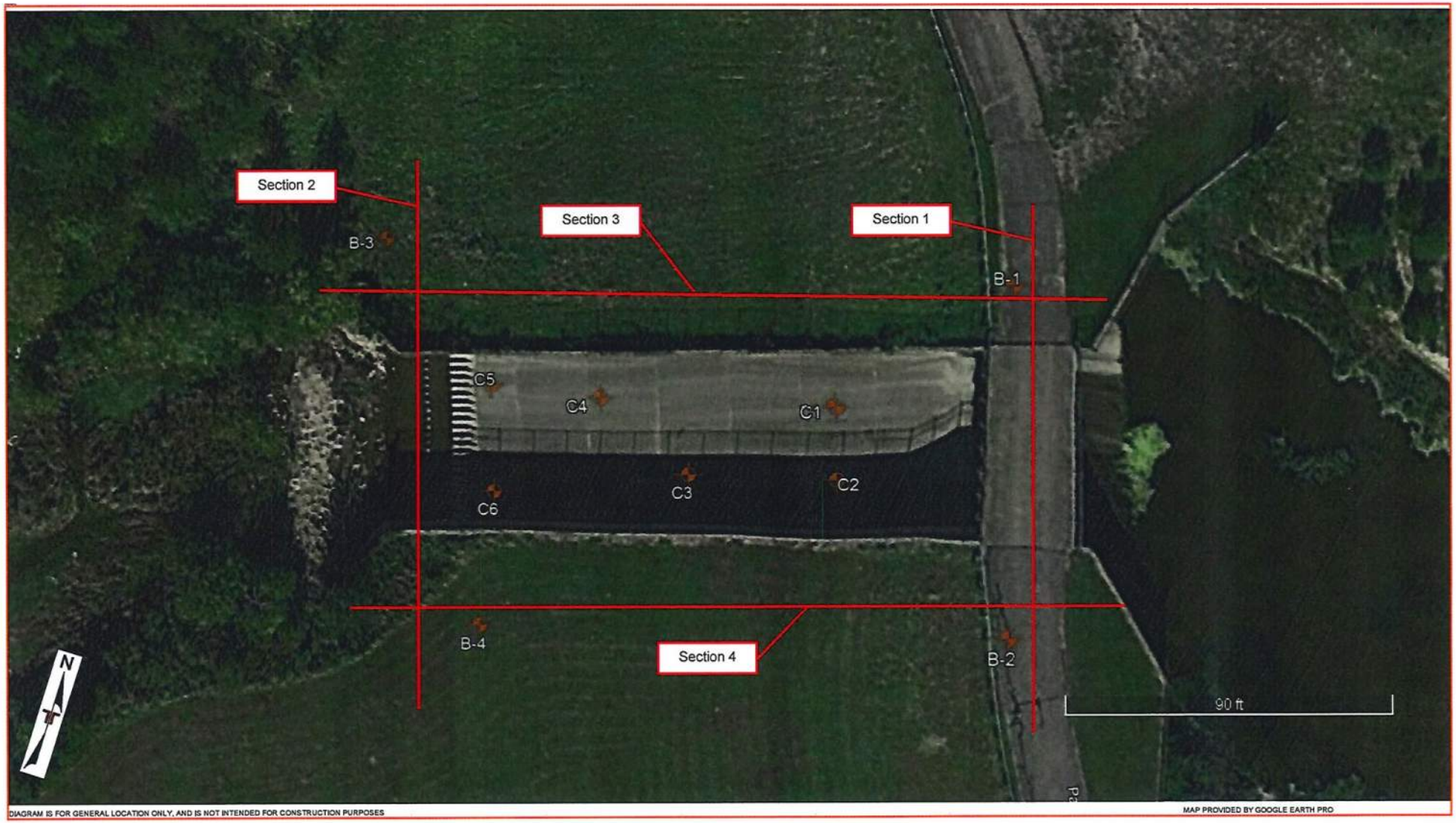


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DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project No. N1195419	Date: 7/29/2020
Project Manager: REG	Drawn by: JCT
File Name: exhibits.pdf	
Scale: N.T.S.	

Terracon
Consulting Engineers & Scientists
611 Lunken Park Dr. Cincinnati, OH
PH. (513) 612-9081 FAX. (513) 321-0294

GPR Exploration Plan

AJ Jolly Dam Spillway Investigation
Parklake Road
Alexandria, Campbell County, Kentucky

EXPLORATION RESULTS

Contents:

Boring Logs (B-1 through B-4)
Coring Logs (C-1 through C-6)
Concrete Core Photographs (C-1 through C-6)
GPR Graphical Outputs

Note: All attachments are one page unless noted above.

BORING LOG NO. B-1

PROJECT: AJ Jolly Dam Spillway Investigation

CLIENT: Campbell County Fiscal Court
Newport, KY

SITE: AJ Jolly Park
Alexandria, KY

LOCATION See Exploration Plan

Latitude: 38.878661° Longitude: -84.387022°
Northing: 502099 Easting: 1601406

Surface Elev.: 699.2 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	INSTALLATION DETAILS	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
0.4	699	**ASPHALT (5")**	Flush cover set at surface					
1.0	698	**GRANULAR BASE (7")**						
		FILL - LEAN CLAY (CL), trace gray shale and limestone fragments, olive brown and gray		33	0-1-2 N=3	0.5 (HP)		
				83	6-4-2 N=6	1.5 (HP)	21.7	
				67	2-3-3 N=6	1.5 (HP)	22.6	44-22-22
			PVC riser	83	2-2-3 N=5	1.5 (HP)	24.6	
				67	2-2-3 N=5	1.5 (HP)	25.0	
		-with limestone and gray shale fragments at 12.5'		100	2-3-4 N=7		18.2	
		-with gravel and asphalt fragments at 15'	Cement bentonite grout	100	3-6-6 N=12	1.0 (HP)	22.1	
17.5	681.5	**SHALE**, brown, highly weathered, weak		75	10-52/2"		17.3	
				100	13-50-19 N=69			
				100	12-50-50 N=100		15.7	
			Bentonite chips					
				0	32-49-50/4"			
		-with little gray at 27.5'	Sand filter pack	100	7-50/4"		14.8	
		-to brown and gray at 30'	5' PVC slotted screen	40	33-50/2"			
32.5	666.5							
32.9	666.5	**SHALE**, trace limestone fragments, gray, slightly weathered, weak		100	50/5"		7.1	
		Boring Terminated at 32.9 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

Abandonment Method:
See installation details above

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 and coordiantes recorded with Lieca Zeno 20 GPS

Notes:
The water levels shown on this boring log represent the minimum and maximum water levels recorded during the observation period.

WATER LEVEL OBSERVATIONS

- *No water observed during/immediately after drilling*
- *Water measured at 28.0' on 3/20/20 (min observed)*
- *Water measured at 28.4' on 6/19/20 (max observed)*

Terracon
611 Lunken Park Dr
Cincinnati, OH

Boring Started: 02-27-2020	Boring Completed: 02-27-2020
Drill Rig: Diedrich D50	Driller: J. Mathis
Project No.: N1195419	

BORING LOG NO. B-2

PROJECT: AJ Jolly Dam Spillway Investigation

CLIENT: Campbell County Fiscal Court
Newport, KY

SITE: AJ Jolly Park
Alexandria, KY

LOCATION See Exploration Plan
Latitude: 38.878423° Longitude: -84.386925°
Northing: 502012 Easting: 1601435
Surface Elev.: 700.0 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	INSTALLATION DETAILS	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
0.4	699.5	**ASPHALT (5")**	Flush cover set at surface					
1.0	699	**GRANULAR BASE (7")**						
		FILL - LEAN CLAY (CL), trace gray shale and limestone fragments, olive brown and gray		0	1-1-2 N=3			
				5	1-2-2 N=4			
		-with limestone fragments at 5'		67	2-3-4 N=7	1.0 (HP)	20.8	
			PVC riser	100	5-3-4/4"	2.0 (HP)	17.9	40-20-20
				67	4-4-6 N=10	2.0 (HP)	19.8	
		-with limestone fragments at 12.5'		80	5-6	2.0 (HP)	20.6	
		-with limestone and gray shale fragments at 15'	Cement bentonite grout	27	6-6-5 N=11			
				83	4-6-9 N=15	2.5 (HP)	21.3	
		-with gray shale fragments at 20'		67	2-2-6 N=8	2.5 (HP)	18.7	
		(possible natural soil at 22.5')		67	4-5-9 N=14	4.0 (HP)	23.2	
25.0	675		Bentonite chips					
		SHALE, brown, highly weathered, weak		100	5-8-13 N=21		18.7	
		-trace limestone at 27.5'	Sand filter pack	94	6-14-50/4"		20.5	
		-mostly limestone fragments recovered at 30'	5' PVC slotted screen	50	50/4"			
32.5	667.5							
33.4	666.5	**SHALE**, with limestone, gray, slightly weathered, weak		100	22-50/5"		9.8	
		Boring Terminated at 33.4 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

Abandonment Method:
See installation details above

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 and coordiantes recorded with Lieca Zeno 20 GPS

Notes:
The water levels shown on this boring log represent the minimum and maximum water levels recorded during the observation period.

WATER LEVEL OBSERVATIONS

- *No water observed during/immediately after drilling*
- *Water measured at 30.6' on 3/20/20 (min observed)*
- *Water measured at 31.1' on 6/19/20 (max observed)*

Terracon
611 Lunken Park Dr
Cincinnati, OH

Boring Started: 02-27-2020	Boring Completed: 02-27-2020
Drill Rig: Diedrich D50	Driller: J. Mathis
Project No.: N1195419	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-WELL N1195419 AJ JOLLY DAM SPIL.GPJ TERRACON_DATATEMPLATE.GDT 7/29/20

BORING LOG NO. B-3

PROJECT: AJ Jolly Dam Spillway Investigation

CLIENT: Campbell County Fiscal Court
Newport, KY

SITE: AJ Jolly Park
Alexandria, KY

LOCATION See Exploration Plan
Latitude: 38.878558° Longitude: -84.387619°
Northing: 502062 Easting: 1601240
Surface Elev.: 655.1 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
0.5	654.5	**TOPSOIL (6")**	Protective metal casing w/ lid extends about 21" above ground surface								
		FILL - LEAN CLAY (CL), dark brown and gray, iron oxide stains	Bentonite chips				100	4-5-7 N=12	2.5 (HP)	24.2	
			PVC riser				83	4-6-8 N=14	3.0 (HP)	24.4	48-21-27
		-trace gravel at 5'	Sand filter pack	5	▽		100	3-5-13 N=18	1.0 (HP)	28.3	
			5' PVC slotted screen		▼		11	13-12-11 N=23			
10.0	645			10							
10.7	644.5	**SHALE**, trace limestone fragments, gray, slightly weathered, weak					100	16-50/2"		10.2	
		Boring Terminated at 10.7 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

Abandonment Method:
See installation details above

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 and coordiantes recorded with Lieca Zeno 20 GPS

Notes:
The water levels shown on this boring log represent the minimum and maximum water levels recorded during the observation period.

WATER LEVEL OBSERVATIONS

▽ *No water observed during/immediately after drilling*
▽ *Water measured at 5.8' on 3/20/20 (min observed)*
▼ *Water measured at 7.8' on 6/19/20 (max observed)*

Terracon
611 Lunken Park Dr
Cincinnati, OH

Boring Started: 02-21-2020	Boring Completed: 02-22-2020
Drill Rig: Diedrich D50	Driller: J. Mathis
Project No.: N1195419	

BORING LOG NO. B-4

PROJECT: AJ Jolly Dam Spillway Investigation

CLIENT: Campbell County Fiscal Court
Newport, KY

SITE: AJ Jolly Park
Alexandria, KY

LOCATION See Exploration Plan

Latitude: 38.878296° Longitude: -84.387397°
Northing: 501968 Easting: 1601302

Surface Elev.: 666.4 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	INSTALLATION DETAILS	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)
0.5	666	**TOPSOIL (6")**	Protective metal casing w/ lid extends about 28" above ground surface				
		FILL - LEAN CLAY (CL), trace gravel, dark brown and gray		67	5-2-4 N=6	1.5 (HP)	24.3
			Cement bentonite grout	44	4-7-9 N=16	1.5 (HP)	24.3
		-with asphalt fragments at 5'	PVC riser	53	10-10-21 N=31	1.5 (HP)	
7.5	659		Bentonite chips				
		LEAN CLAY (CL), with limestone fragments, brown and gray, laminated bedding planes, (RESIDUUM)		27	5-7-7 N=14		22.7
10.0	656.5						
		SHALE, trace limestone fragments, brown and gray, highly weathered, weak	Sand filter pack	39	7-8-9 N=17		21.5
			5' PVC slotted screen	100	50		
15.0	651.5						
15.4	651	**SHALE**, trace limestone fragments, gray, slightly weathered, weak		100	50/5"		
		Boring Terminated at 15.4 Feet					

DEPTH (Ft.): 5, 10, 15

WATER LEVEL OBSERVATIONS

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

Abandonment Method:
See installation details above

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 and coordiantes recorded with Lieca Zeno 20 GPS

Notes:
The water levels shown on this boring log represent the minimum and maximum water levels recorded during the observation period.

WATER LEVEL OBSERVATIONS

- *No water observed during/immediately after drilling*
- *Water measured at 14.0' on 3/20/20 (min observed)*
- *Water measured at 14.6' on 6/19/20 (max observed)*

Terracon
611 Lunken Park Dr
Cincinnati, OH

Boring Started: 02-21-2020	Boring Completed: 02-22-2020
Drill Rig: Diedrich D50	Driller: J. Mathis
Project No.: N1195419	

CORING LOG NO. C-1

PROJECT: AJ Jolly Dam Spillway Investigation

CLIENT: Campbell County Fiscal Court
Newport, KY

SITE: AJ Jolly Park
Alexandria, KY

LOCATION See Exploration Plan

Latitude: 38.8785° Longitude: -84.3871°
Northing: 502055 Easting: 1601376

Approximate Surface Elev.: 672 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
		CONCRETE (14") -reinforcing steel observed about 5.5 and 10 inches below top of core								
	1.2	671+/-								
		FILL - WELL GRADED GRAVEL (GW), angular, gray								
	2.0	670+/-								
		FILL - LEAN CLAY (CL), with limestone fragments, olive brown and gray								
	3.0	669+/-								
		Hand Auger Refusal at 3 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: N/A

Advancement Method:
8-inch diameter thin-walled coring pit
3-inch-diameter Hand Auger

Abandonment Method:
Excavated materials used to backfill up to bottom of concrete. Quick-setting concrete used to patch full depth of concrete.

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.

Coordinates and elevations were interpolated from drawings (based on field measurements).

Notes:

WATER LEVEL OBSERVATIONS

No water observed during/after sampling

Terracon
611 Lunken Park Dr
Cincinnati, OH

Boring Started: 06-19-2020	Boring Completed: 06-19-2020
Drill Rig: Hand Equipment	Driller: Subcontractor/RMG
Project No.: N1195419	

CORING LOG NO. C-2

PROJECT: AJ Jolly Dam Spillway Investigation

CLIENT: Campbell County Fiscal Court
Newport, KY

SITE: AJ Jolly Park
Alexandria, KY

LOCATION See Exploration Plan

Latitude: 38.8785° Longitude: -84.3871°
Northing: 502036 Easting: 1601382

Approximate Surface Elev.: 672 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
		CONCRETE (13")								
		-reinforcing steel observed about 5.75 and 9 inches below top of core								
	1.1	671+/-								
		FILL - WELL GRADED GRAVEL (GW), trace sand, trace fines, angular, gray								
	2.0	670+/-								
		FILL - LEAN CLAY (CL), with limestone fragments, trace shale fragments, brown								
	3.0	669+/-								
		Hand Auger Refusal at 3 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: N/A

Advancement Method:
8-inch diameter thin-walled coring pit
3-inch-diameter Hand Auger

Abandonment Method:
Excavated materials used to backfill up to bottom of concrete. Quick-setting concrete used to patch full depth of concrete.

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.

Coordinates and elevations were interpolated from drawings (based on field measurements).

Notes:

WATER LEVEL OBSERVATIONS

No water observed during/after sampling

Terracon
611 Lunken Park Dr
Cincinnati, OH

Boring Started: 06-19-2020 | Boring Completed: 06-19-2020
Drill Rig: Hand Equipment | Driller: Subcontractor/RMG
Project No.: N1195419

CORING LOG NO. C-3

PROJECT: AJ Jolly Dam Spillway Investigation

CLIENT: Campbell County Fiscal Court
Newport, KY

SITE: AJ Jolly Park
Alexandria, KY

LOCATION See Exploration Plan

Latitude: 38.8785° Longitude: -84.3873°
Northing: 502024 Easting: 1601343

Approximate Surface Elev.: 663 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
		CONCRETE (18")								
		-reinforcing steel observed about 6.5 and 11.5 inches below top of core								
	1.5	661.5+/-								
		FILL - WELL GRADED GRAVEL (GW), trace sand, trace fines, angular, gray								
	2.0	661+/-								
	2.3	**FILL - LEAN CLAY (CL)**, with limestone fragments, trace shale fragments, brown 661+/-								
		Hand Auger Refusal at 2.25 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: N/A

Advancement Method:
8-inch diameter thin-walled coring pit
3-inch-diameter Hand Auger

Abandonment Method:
Excavated materials used to backfill up to bottom of concrete. Quick-setting concrete used to patch full depth of concrete.

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.

Coordinates and elevations were interpolated from drawings (based on field measurements).

Notes:

WATER LEVEL OBSERVATIONS

No water observed during/after sampling

Terracon
611 Lunken Park Dr
Cincinnati, OH

Boring Started: 06-19-2020	Boring Completed: 06-19-2020
Drill Rig: Hand Equipment	Driller: Subcontractor/RMG
Project No.: N1195419	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N1195419 AJ JOLLY DAM SPIL.GPJ TERRACON_DATATEMPLATE.GDT 7/29/20

CORING LOG NO. C-4

PROJECT: AJ Jolly Dam Spillway Investigation

CLIENT: Campbell County Fiscal Court
Newport, KY

SITE: AJ Jolly Park
Alexandria, KY

LOCATION See Exploration Plan

Latitude: 38.8785° Longitude: -84.3874°
Northing: 502037 Easting: 1601313

Approximate Surface Elev.: 659 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	
1.7	657.5+/-	**CONCRETE (20")** -reinforcing steel observed about 7 and 13 inches below top of core
2.6	656.5+/-	**FILL - WELL GRADED GRAVEL (GW)**, angular, gray
3.6	655.5+/-	**FILL - LEAN CLAY (CL)**, with limestone fragments, brown to brown and gray
		Hand Auger Refusal at 3.6 Feet

GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (%) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: N/A

Advancement Method:
8-inch diameter thin-walled coring pit
3-inch-diameter Hand Auger

Abandonment Method:
Excavated materials used to backfill up to bottom of concrete. Quick-setting concrete used to patch full depth of concrete.

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.

Coordinates and elevations were interpolated from drawings (based on field measurements).

Notes:

WATER LEVEL OBSERVATIONS

No water observed during/after sampling

Terracon
611 Lunken Park Dr
Cincinnati, OH

Boring Started: 06-19-2020 | Boring Completed: 06-19-2020
Drill Rig: Hand Equipment | Driller: Subcontractor/RMG
Project No.: N1195419

CORING LOG NO. C-5

PROJECT: AJ Jolly Dam Spillway Investigation

CLIENT: Campbell County Fiscal Court
Newport, KY

SITE: AJ Jolly Park
Alexandria, KY

LOCATION See Exploration Plan

Latitude: 38.8785° Longitude: -84.3875°
Northing: 502031 Easting: 1601282

Approximate Surface Elev.: 652 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description
1.0	651+/-	**CONCRETE (12")** -reinforcing steel observed about 4 and 8 inches below top of core
2.0	650+/-	**FILL - WELL GRADED GRAVEL (GW)**, with fines, angular, brown
2.7	649.5+/-	**FILL - LEAN CLAY (CL)**, with shale fragments, gray
		Hand Auger Refusal at 2.7 Feet

GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (%) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: N/A

Advancement Method:
8-inch diameter thin-walled coring pit
3-inch-diameter Hand Auger

Abandonment Method:
Excavated materials used to backfill up to bottom of concrete. Quick-setting concrete used to patch full depth of concrete.

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.

Coordinates and elevations were interpolated from drawings (based on field measurements).

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 16" after sampling*

Terracon
611 Lunken Park Dr
Cincinnati, OH

Boring Started: 06-19-2020 | Boring Completed: 06-19-2020
Drill Rig: Hand Equipment | Driller: Subcontractor/RMG
Project No.: N1195419

CORING LOG NO. C-6

PROJECT: AJ Jolly Dam Spillway Investigation

CLIENT: Campbell County Fiscal Court
Newport, KY

SITE: AJ Jolly Park
Alexandria, KY

LOCATION See Exploration Plan

Latitude: 38.8784° Longitude: -84.3874°
Northing: 502002 Easting: 1601292

Approximate Surface Elev.: 652 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description
		CONCRETE (13")
		-reinforcing steel observed about 5.5 and 9.5 inches below top of core
1.1	651+/-	**WELL GRADED GRAVEL (GW)**, with fines, angular, brown
2.0	650+/-	
2.3	649.5+/-	**LEAN CLAY (CL)**, with shale fragments, gray
		Hand Auger Refusal at 2.3 Feet

GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (%) | FIELD TEST RESULTS | LABORATORY HP (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: N/A

Advancement Method:
8-inch diameter thin-walled coring pit
3-inch-diameter Hand Auger

Abandonment Method:
Excavated materials used to backfill up to bottom of concrete. Quick-setting concrete used to patch full depth of concrete.

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.

Coordinates and elevations were interpolated from drawings (based on field measurements).

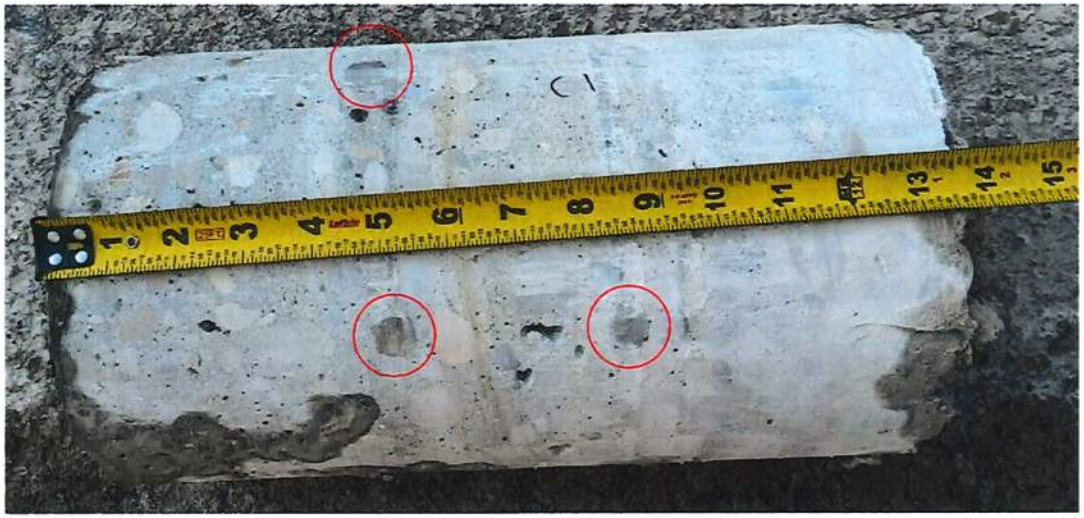
Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 19" after sampling*

Terracon
611 Lunken Park Dr
Cincinnati, OH

Boring Started: 06-19-2020 | Boring Completed: 06-19-2020
Drill Rig: Hand Equipment | Driller: Subcontractor/RMG
Project No.: N1195419



C-1

C-2

Red circle highlights reinforcing steel

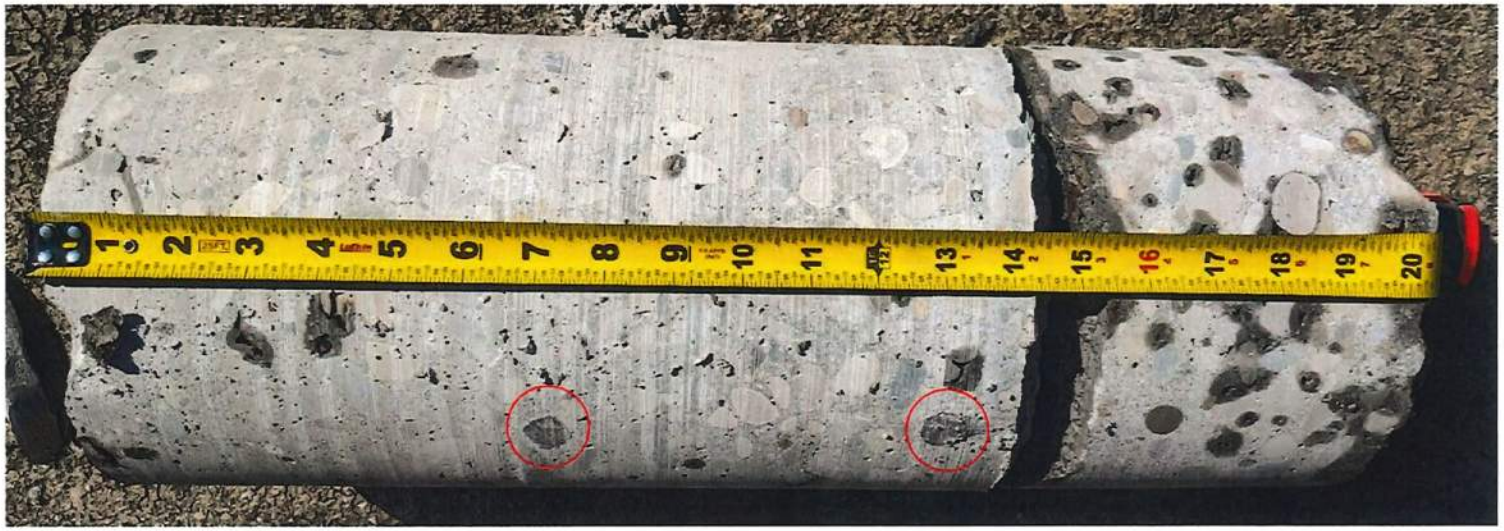
Project Manager: RMG	Project No. N1205123
Drawn by: RMG	Scale: AS SHOWN
Checked by: CMD	File Name: ROCK CORES
Approved by: RMG	Date: 5/19/2020

Terracon
611 Lunken Park Dr.
Cincinnati, OH 45226

CONCRETE CORE PHOTOGRAPHS

AJ Jolly Spillway Investigation
Campbell County Fiscal Court
Alexandria, Campbell County, Kentucky

C-3



C-4

Red circle highlights reinforcing steel

Project Manager: RMG	Project No. N1205123
Drawn by: RMG	Scale: AS SHOWN
Checked by: CMD	File Name: ROCK CORES
Approved by: RMG	Date: 5/19/2020

Terracon
611 Lunken Park Dr.
Cincinnati, OH 45226

CONCRETE CORE PHOTOGRAPHS

AJ Jolly Spillway Investigation
Campbell County Fiscal Court
Alexandria, Campbell County, Kentucky

C-5

C-6

Red circle highlights reinforcing steel

Project Manager: RMG	Project No. N1205123
Drawn by: RMG	Scale: AS SHOWN
Checked by: CMD	File Name: ROCK CORES
Approved by: RMG	Date: 5/19/2020

Terracon
611 Lunken Park Dr.
Cincinnati, OH 45226

CONCRETE CORE PHOTOGRAPHS

AJ Jolly Spillway Investigation
Campbell County Fiscal Court
Alexandria, Campbell County, Kentucky

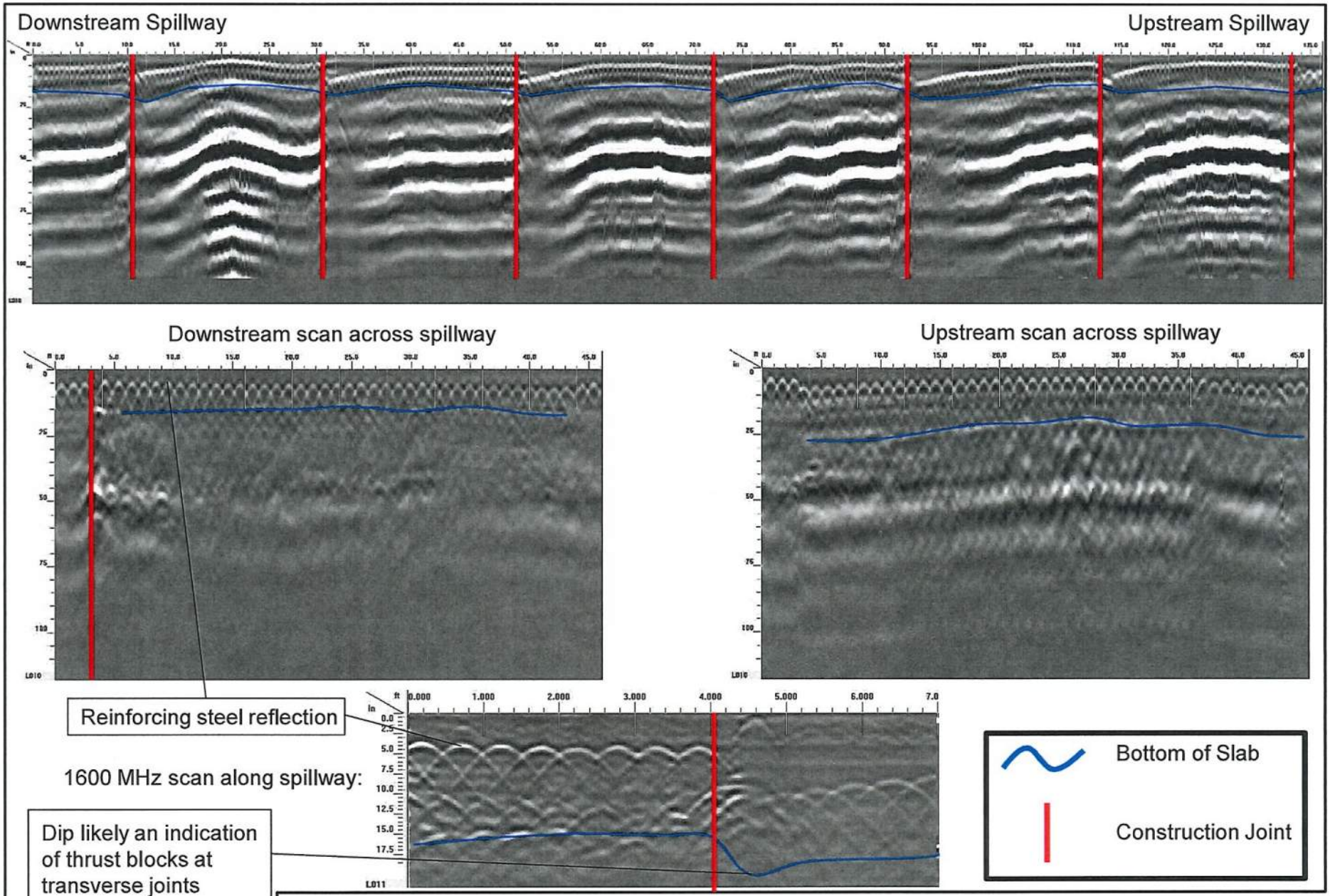


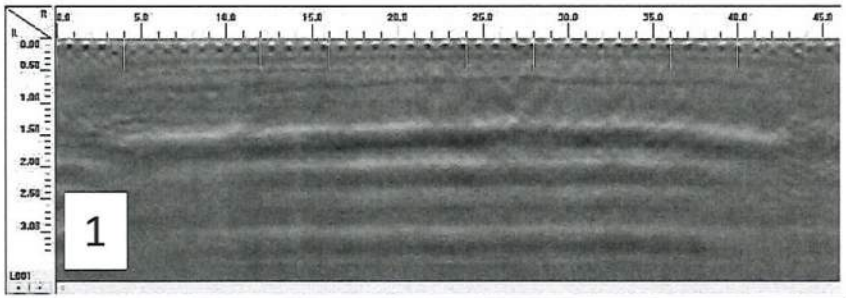
DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

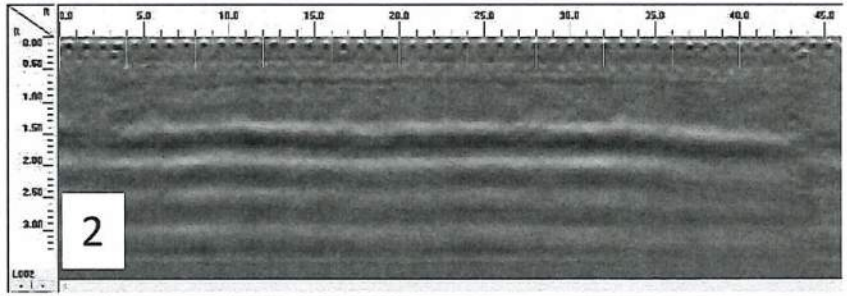
Project No. N1195419	Date: 7/29/2020
Project Manager: REG	Drawn by: JCT
File Name: exhibits.pdf	
Scale: N.T.S.	

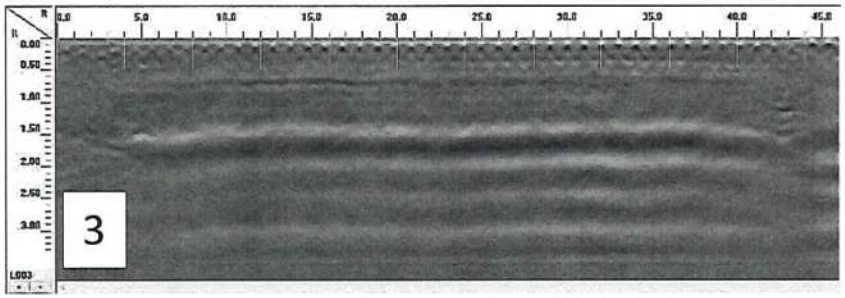
Terracon
Consulting Engineers & Scientists
611 Lunken Park Dr. Cincinnati, OH
PH. (513) 612-9081 FAX. (513) 321-0294

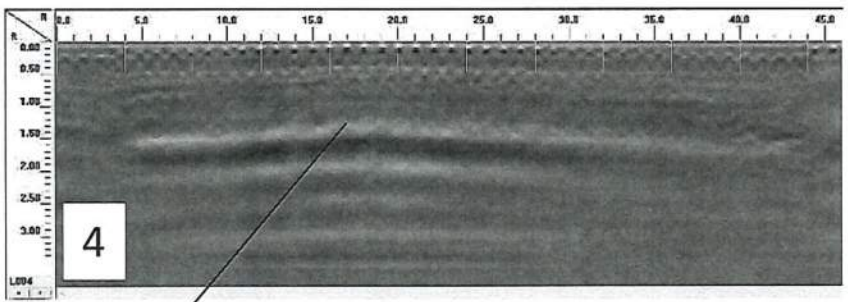
GPR Cross Sections – Select Sections Annotated

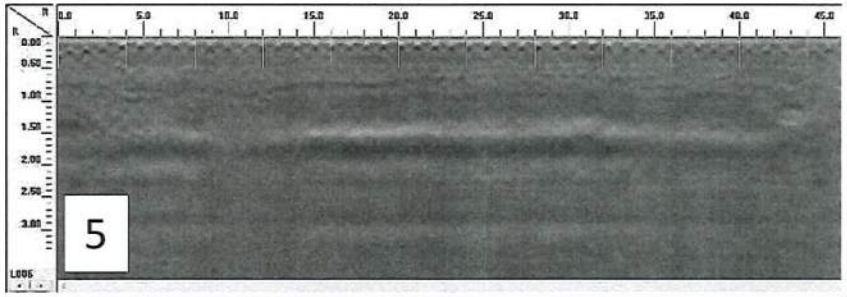
AJ Jolly Dam Spillway Investigation
Parkland Road
Alexandria, Campbell County, Kentucky

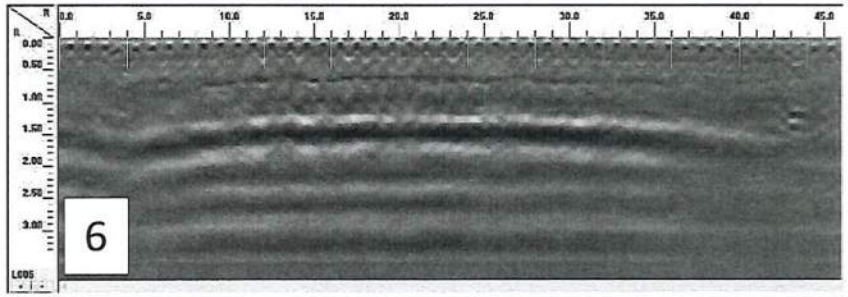


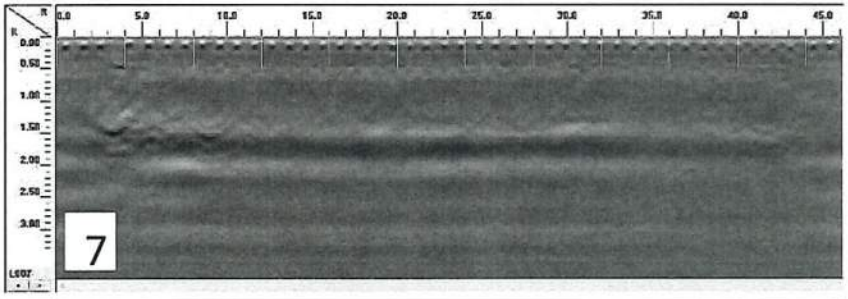


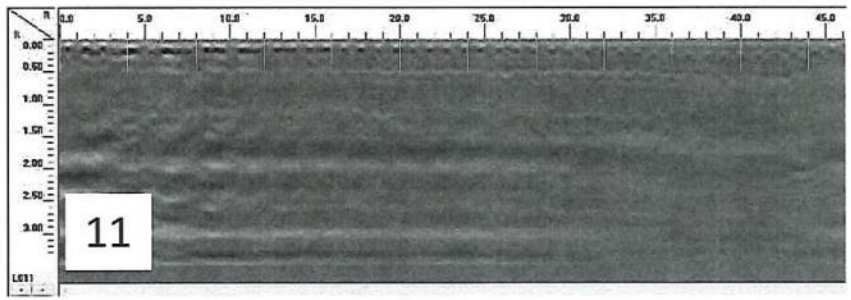












Reflection from transition from aggregate base to soil

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

Project No. N1195419	Date: 7/29/2020
Project Manager: REG	Drawn by: JCT
File Name: exhibits.pdf	
Scale: N.T.S.	

Terracon
Consulting Engineers & Scientists
611 Lunken Park Dr. Cincinnati, OH
PH. (513) 612-9081 FAX. (513) 321-0294

GPR Cross Sections

AJ Jolly Dam Spillway Investigation
Parklake Road
Alexandria, Campbell County, Kentucky

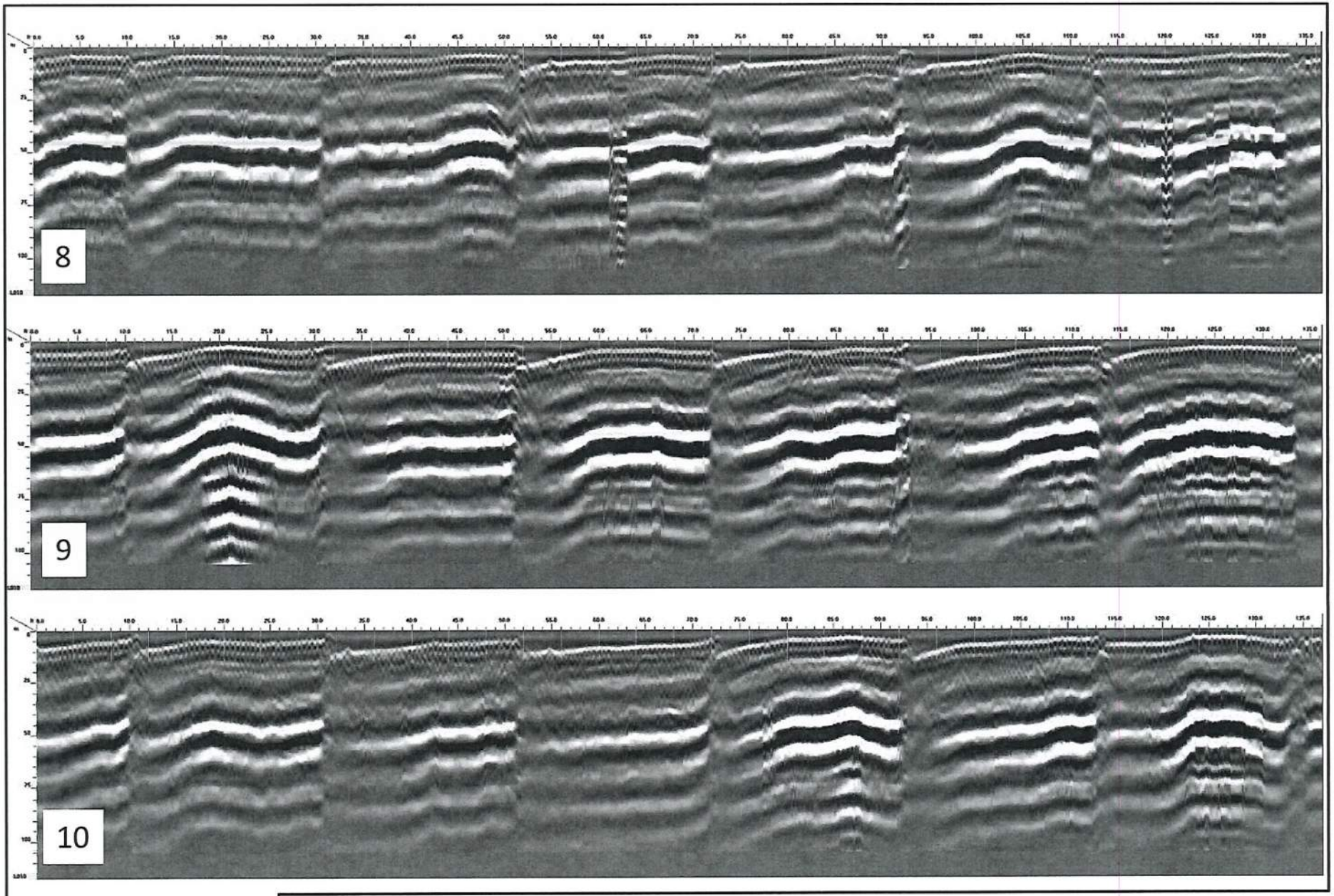


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project No. N1195419	Date: 7/29/2020
Project Manager: REG	Drawn by: JCT
File Name: exhibits.pdf	
Scale: N.T.S.	

Terracon
Consulting Engineers & Scientists
611 Lunken Park Dr. Cincinnati, OH
PH. (513) 612-9081 FAX. (513) 321-0294

GPR Cross Sections

AJ Jolly Dam Spillway Investigation
Parklake Road
Alexandria, Campbell County, Kentucky

SUPPORTING INFORMATION

Contents:

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS
AJ Jolly Dam Spillway Investigation ■ Alexandria, KY
Terracon Project No. N1195419

SAMPLING	WATER LEVEL	FIELD TESTS
Grab Sample Standard Penetration Test	Water Initially Encountered Water Level After a Specified Period of Time Water Level After a Specified Period of Time Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or [$Cc<1$ or $Cc>3.0$] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or [$Cc<1$ or $Cc>3.0$] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay [K, L, M, N] / Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay [K, L, M, P] / Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

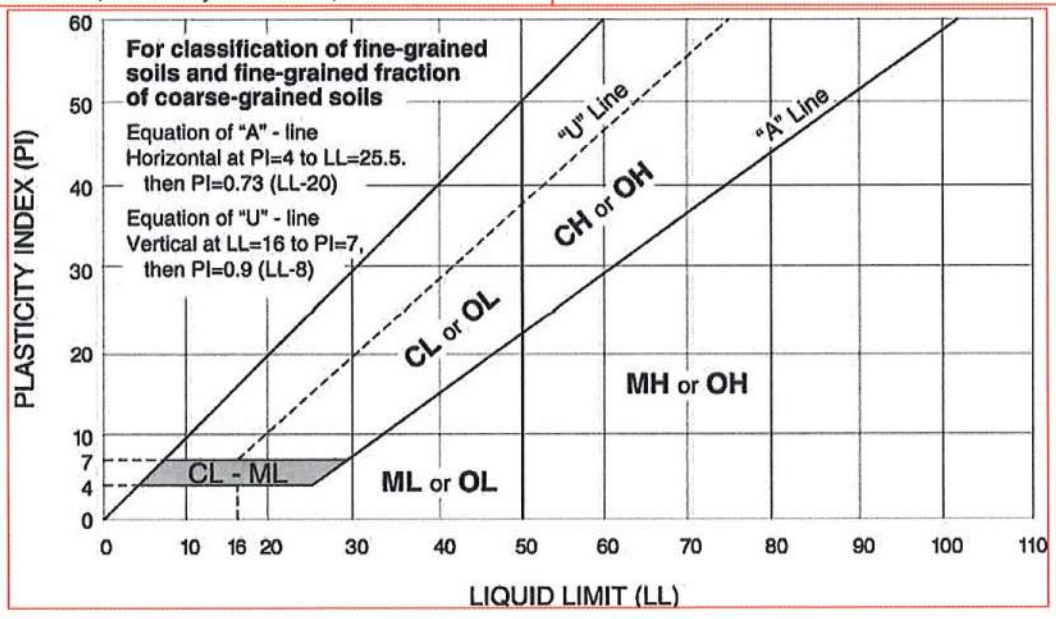
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



DESCRIPTION OF ROCK PROPERTIES

WEATHERING	
Term	**Description**
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	**Field Identification**	**Uniaxial Compressive Strength, psi (MPa)**
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		**Bedding Spacing (May Include Foliation or Banding)**	
Description	**Spacing**	**Description**	**Spacing**
Extremely close	< ¾ in (<19 mm)	**Laminated**	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	**Very thin**	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	**Thin**	2 in – 1 ft. (50 – 300 mm)
Moderate	8 in – 2 ft. (200 – 600 mm)	**Medium**	1 ft. – 3 ft. (300 – 900 mm)
Wide	2 ft. – 6 ft. (600 mm – 2.0 m)	**Thick**	3 ft. – 10 ft. (900 mm – 3 m)
Very Wide	6 ft. – 20 ft. (2.0 – 6 m)	**Massive**	> 10 ft. (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0-degree angle.

ROCK QUALITY DESIGNATION (RQD) [1]	
Description	**RQD Value (%)**
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009 Technical Manual for Design and Construction of Road Tunnels – Civil Elements

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.