



FLUVANNA COUNTY BOARD OF SUPERVISORS

REGULAR MEETING AGENDA

Circuit Courtroom, Fluvanna Courts Building

February 6, 2019

Regular Meeting - 4:00 pm

Budget Work Session - 7:00pm

TAB	AGENDA ITEMS
	1 - CALL TO ORDER
	2 - PLEDGE OF ALLEGIANCE AND MOMENT OF SILENCE
	3 – ADOPTION OF AGENDA
	4 – COUNTY ADMINISTRATOR’S REPORT
	5 – PUBLIC COMMENTS #1 (5 minutes each)
	6 – PUBLIC HEARING
	None.
	7 – ACTION MATTERS
A	Zion Crossroads Water & Sewer Project - AG Dillard Contract—Cyndi Toler, Purchasing Officer
B	Zion Crossroads Water & Sewer Capital Budget Project Carryover—Eric Dahl, Deputy County Administrator & Finance Director
	7A – APPOINTMENTS
	None
	8 – PRESENTATIONS (normally not to exceed 10 minutes each)
C	Shelter for Help in Emergency—Shaniece Bradford
	9 – CONSENT AGENDA
D	Minutes of January 23, 2019—Kelly Belanger Harris, Clerk to the Board
E	First Amendment to Water Tower Lease Agreement—Cyndi Toler, Purchasing Officer
F	Consent to Modify Equipment on Water Tower—Cyndi Toler, Purchasing Officer
G	2 nd Amendment to Project Agreement # 4 - Bowman—Cyndi Toler, Purchasing Officer
	10 – UNFINISHED BUSINESS
	TBD
	11 – NEW BUSINESS
	Resolution Recognizing Devon Shifflett--Steven M. Nichols, County Administrator
	12 – PUBLIC COMMENTS #2 (5 minutes each)
	13 – CLOSED MEETING AND DINNER RECESS
	TBD
RECESS – DINNER BREAK	
RECONVENE @ 7:00pm	

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A - CALL TO ORDER

B - BUDGET WORK SESSION

County Administrator's FY20 Budget Proposal and FY20-23 Projected Budgets (The Five-Year Financial Plan) – Steve Nichols, County Administrator

FY20 Revenues and Expenditures – Eric Dahl, DCA / Finance Director

C – CLOSED MEETING

TBD

D – ADJOURN



Digitally signed by Steven M. Nichols
Date: 2019.02.01 07:10:31 -05'00'

County Administrator Review

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*For the Hearing-Impaired – Listening device available in the Board of Supervisors Room upon request. TTY access number is 711 to make arrangements.
For Persons with Disabilities – If you have special needs, please contact the County Administrator's Office at 591-1910.*

PLEDGE OF ALLEGIANCE

I pledge allegiance, to the flag,
of the United States of America,
and to the Republic for which it stands,
one nation, under God, indivisible,
with liberty and justice for all.

GENERAL RULES OF ORDER

1. It shall be the duty of the Chairman to maintain order and decorum at meetings. The Chairman shall speak to points of order in preference to all other members.
2. In maintaining decorum and propriety of conduct, the Chairman shall not be challenged and no debate shall be allowed until after the Chairman declares that order has been restored. In the event the Board wishes to debate the matter of the disorder or the bringing of order; the regular business may be suspended by vote of the Board to discuss the matter.
3. No member or citizen shall be allowed to use defamatory or abusive language directed at any member of the Board or other person, to create excessive noise, or in any way incite persons to use such tactics. The Chair shall be the judge of such breaches, however, the Board may by majority vote of the Board members present and voting to overrule the judgment of the Chair.
4. When a person engages in such breaches, the Chairman shall order the person's removal from the building, or may order the person to stand silent, or may, if necessary, order the person removed from the County property.

RULES OF PROCEDURE FOR PUBLIC HEARINGS

1. PURPOSE
 - The purpose of a public hearing is to receive testimony from the public on certain resolutions, ordinances or amendments prior to taking action.
 - A hearing is not a dialogue or debate. Its express purpose is to receive additional facts, comments and opinion on subject items.
2. SPEAKERS
 - Speakers should approach the lectern so they may be visible and audible to the Board.
 - Each speaker should clearly state his/her name and address.
 - All comments should be directed to the Board.
 - All questions should be directed to the Chairman. Members of the Board are not expected to respond to questions, and response to questions shall be made at the Chairman's discretion.
 - Speakers are encouraged to contact staff regarding unresolved concerns or to receive additional information.
 - Speakers with questions are encouraged to call County staff prior to the public hearing.
 - Speakers should be brief and avoid repetition of previously presented comments.
3. ACTION
 - At the conclusion of the public hearing on each item, the Chairman will close the public hearing.
 - The Board will proceed with its deliberation and will act on or formally postpone action on such item prior to proceeding to other agenda items.
 - Further public comment after the public hearing has been closed generally will not be permitted.

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COUNTY OF FLUVANNA

"Responsive & Responsible Government"

P.O. Box 540
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www.fluvannacounty.org

2018-2019 STRATEGIC INITIATIVES AND ACTIONS

A SERVICE DELIVERY	
A1	Work with FRA to identify support options for Fire and Rescue volunteers.
A2	Continue to research and evaluate county-wide broadband expansion opportunities.
A3	Hold review meeting on ordinance enforcement (trash, buildings, vehicles) with Health Dept., Planning, Building Inspections, Public Works, and County Attorney.
A4	Perform strategic review of existing and needed partnerships with local area support and other non-profit groups. (Needed? Effective? Consolidate resource contributions?)
A5	Improve partnership with the school system for shared use of county and school owned facilities.
A6	Identify and assess resident concerns about roadway and public safety issues, and coordinate with VDOT for appropriate actions.
A7	Initiate comprehensive review of the Hwy 53 corridor from Lake Monticello Road to Ruritan Lake Road (e.g., Safety improvements at LM Monish Gate; 3-way stoplight at Food Lion; sight improvement at Ruritan Lake Road and Hwy 53; etc.)
B COMMUNICATION	
B1	Assess options to communicate more efficiently, effectively, and economically with Fluvanna residents.
B2	Marketing campaign to let residents know about accomplishments and where their tax dollars go.
B3	Meet with local Pastors to discuss effective communications and community support.
B4	Promote tax due dates, public hearings, etc., in FAN Mail.
B5	Expand County Website to receive, answer, and post questions from residents.
B6	Hold an Elected Official's Breakfast for our State Representatives in Fall of 2018
B7	Hold an Elected Official's Breakfast for our State Representatives in Fall of 2019
B8	Conduct 2019 Fluvanna County Residents Survey and analyze results.
C PROJECT MANAGEMENT	
C1	Continue Columbia area renewal efforts including improved enforcement of County/State codes and Health Department regulations.
C2	Complete a Master Water and Sewer (Plan Phase I) to identify sources for the county's long-term water needs; particularly for each of its community planning areas.
C3	Incorporate well-drilling logs provided by the Fluvanna Health Dept. into the county's geographic information system (GIS).
C4	Create master report and marketing plan regarding County tower assets and rental options.
C5	Investigate the use of Overlay Zones for the Zion Crossroads Community Planning Area to support economic development.

C6	Create a County-wide overlay map showing utilities and other key features that support business growth and development.
C7	Review and pursue opportunities and options for a Palmyra Village Streetscape project to improve safety, parking, walkability, and overall appearance.
C8	Successfully oversee and manage Fluvanna County aspects of the James River Water Project.
C9	Successfully oversee and manage the design and construction of the Zion Crossroads water and sewer system.
C10	Pursue Phase II of Fork Union streetscape project.
D	ECONOMIC DEVELOPMENT AND TOURISM
D1	Draft and adopt a formal County-wide economic development and tourism strategy inclusive of an implementation schedule.
D2	Develop a “This is Fluvanna County” video message to be shared with county citizens and businesses as well as use with county economic development initiatives.
D3	Coordinate development activity at Fluvanna’s northern border with Louisa County, including possible natural gas line along 250 and discussing “shared” parcels.
D4	Conduct 2018 local Business Climate Survey and analyze results.
D5	Hold an Economic Development Discussion Forum for local businesses with planning, zoning, building inspections, infrastructure components.
D6	Investigate and pursue with State offices the installation of select Boat Ramps along the Rivanna and James Rivers to support additional recreational and tourism opportunities.
D7	Investigate opportunities for park expansion or Rivanna River access points to support expanded recreational activities
D8	Investigate allowing large lot subdivisions in A-1 as alternative to current cluster subdivisions. (Amend the zoning and subdivision ordinances to allow for varying lot sizes, from small clustered lots to large parcels suitable for continued farming and rural living.)
D9	Review higher density options between PDA and R4.
D10	Review options, pros, cons, costs, etc., of creating a “teaching farm” at PG Park,
E	FINANCIAL STEWARDSHIP AND EFFICIENCY
E1	Review local business license/registration options and pros/cons.
E2	Reduce the County’s reliance on creating and mailing paper checks for payments and implement expanded ACH/EFT transaction options.
E3	Create monthly Treasurer’s Report for BOS Package and quarterly in-person briefing on the data.
E4	Implement credit card payment option for citizen at all County funds collection points through MUNIS Cashiering process.
E5	Expand Fluvanna County Website Data Dashboard with key metrics.
E6	Implement easy to access electronic format code of ordinances (MuniCode or similar).

FLUVANNA COUNTY BOARD OF SUPERVISORS AGENDA ITEM STAFF REPORT

TAB A

MEETING DATE:	February 6, 2019				
AGENDA TITLE:	Zion Crossroads Water and Sewer Fund Capital Budget Carryover				
MOTION(s):	I move the Board of Supervisors approve the carry-over of the unexpended FY18 Zion Crossroads Water and Sewer Fund Capital Budget in the amount of \$8,650,551.82 and reappropriate that amount to the FY19 Zion Crossroads Water and Sewer Fund Capital Budget.				
STRATEGIC INITIATIVE?	Yes	No	If yes, list initiative(s):		
		X			
AGENDA CATEGORY:	Public Hearing	Action Matter	Presentation	Consent Agenda	Other
		X			
STAFF CONTACT(S):	Eric Dahl, Deputy County Administrator/Finance Director				
PRESENTER(S):	Eric Dahl, Deputy County Administrator/Finance Director				
RECOMMENDATION:	Approval				
TIMING:	Effective July 1, 2018				
DISCUSSION:	<ul style="list-style-type: none"> At the end of FY18, the remaining Zion Crossroads Water and Sewer Capital Budget available was \$8,650,551.82. It is necessary to carry-over the budget, as the proceeds are restricted and taken out for the benefit of Zion Crossroads Water and Sewer project. 				
	Category	FY18 Beginning Budget	FY18 Expended	FY18 Available Budget	
	Design / Build Construction	\$ 6,132,000.00		6,132,000.00	
	Professional Services	288,733.19		288,733.19	
	Legal - Real Estate Acquisition Services	50,000.00		50,000.00	
	Land / Right of Way Acquisition	150,000.00		150,000.00	
	Wetland Mitigation Credits	4,000.00		4,000.00	
	Consulting	500,000.00		500,000.00	
	Legal - Costs of Issuance	107,526.20	107,526.20	-	
	Local Costs of Issuance	35,000.00	33,234.47	1,765.53	
	Contingency	1,524,053.10		1,524,053.10	
	TOTALS	\$ 8,791,312.49	\$ 140,760.67	\$ 8,650,551.82	

FISCAL IMPACT:	None, as the debt proceeds were issued for this project in FY18.				
POLICY IMPACT:	N/A				
LEGISLATIVE HISTORY:	N/A				
ENCLOSURES:	None				
REVIEWS COMPLETED:	Legal	Finance	Purchasing	HR	Other
		X			

FLUVANNA COUNTY BOARD OF SUPERVISORS AGENDA ITEM STAFF REPORT

TAB B

MEETING DATE:	February 6, 2019				
AGENDA TITLE:	Zion Crossroad Water and Sewer Line Contract - AG Dillard, Inc.				
MOTION(s):	I move the Board of Supervisors approve the Zion Crossroad Water and Sewer Line Contract with AG Dillard, Inc., in the amount of \$4,993,625.44, and authorize the County Administrator to execute the Agreement, subject to approval as to form by the County Attorney.				
STRATEGIC INITIATIVE?	Yes	No	If yes, list initiative(s):		C9
	x				
AGENDA CATEGORY:	Public Hearing	Action Matter	Presentation	Consent Agenda	Other
		x			
STAFF CONTACT(S):	Cyndi Toler, Purchasing Officer				
PRESENTER(S):	Cyndi Toler, Purchasing Officer				
RECOMMENDATION:	Approval				
TIMING:	Routine				
DISCUSSION:	<ul style="list-style-type: none"> • May 2018: IFB's issued for Construction <ul style="list-style-type: none"> - Bid Opening on October 9, 2018 at the Fluvanna Community Center - Bids Received <ul style="list-style-type: none"> • 2018-03 Water and Sewer System- 6 Bids • 2018-04 Elevated Water Tank- 4 Bids • 2018-05 Water Booster Station and Wastewater Pump Station- 6 Bids • Low bids have all been reviewed and approved by both Dewberry Engineers and the County Attorney's office. 				
	CONSTRUCTION CATEGORY	Estimated Construction Cost	Final Low Bid	Bidder	Bid to Estimate Difference
	Water Main (DOC east to 250/15)	\$2,567,000			
	Water Main (DOC west to Memory Lane)	\$549,000			
	Wastewater Force Main	\$2,965,000			
	Water & Wastewater Main Subtotal	\$6,081,000	\$4,993,625	AG Dillard	(\$1,087,375)
<ul style="list-style-type: none"> • AG Dillard is locally owned and operated since 1966; Headquartered in Fluvanna County 					

Zion Crossroad Water and Sewer Line Agreement Under IFB 2018-03

This document is based off of EJCDC C-520 Suggested Form of Agreement Between Owner and Contractor for Construction Contract (Stipulated Price), but has been substantially modified

THIS AGREEMENT (the “Agreement”) is by and between Fluvanna County, a political subdivision of the Commonwealth of Virginia ("Owner") and A. G. Dillard, Inc., a Virginia corporation (referred to as both “Bidder” and “Contractor”). All capitalized terms used herein shall have the meaning as defined in the General Conditions, attached hereto as Exhibit F, unless the context requires otherwise.

For mutual consideration, the sufficiency of which is acknowledged, the Owner and Contractor hereby agree as follows:

ARTICLE 1 - WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: Construction of the Zion Crossroads Water and Sewer System pursuant to that Invitation for Bids 2018-03 Zion Crossroads Water and Sewer System issued May 9, 2018 and all attachments, exhibits, and addendums thereto (the “IFB”).

ARTICLE 2 - THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows: Construction of the Zion Crossroads Water and Sewer System.

ARTICLE 3 - ENGINEER

3.01 The Project has been designed by Dewberry Engineers Inc. (Engineer), which is to assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents unless otherwise notified by the Owner from time to time.

ARTICLE 4 - CONTRACT TIMES

4.01 Time of the Essence

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

4.02 Days to Achieve Substantial Completion and Final Payment

- A. Phase 1: The Work will be substantially completed within 360 days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within 600 days after the date when the Contract Times commence to run.
- B. Phase 2: The Work will be substantially completed within 540 days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within 600 days after the date when the Contract Times commence to run.

4.03 Liquidated Damages

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner \$500.00 for each day that expires after the time specified in Paragraph 4.02 above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner \$500.00 for each day that expires after the time specified in Paragraph 4.02 above for completion and readiness for final payment until the Work is completed and ready for final payment.

4.04 Agreed Clarifications. The following Work is included in the Contract Price and shall be completed at no additional cost to the Owner unless otherwise specifically noted below:

A. Fencing. In completing all Work on the Project, the Contractor agrees that it will always provide temporary replacement fencing when the Work necessitates removing all or any portion of any fencing on any property affected by the Work and that such temporary fencing will be installed on the same day any fencing is removed. The Contractor further agrees that all fencing removed will be replaced with permanent replacement fencing of the same kind that was removed as soon as practicable after the Work on the affected property is completed to the reasonable satisfaction of the Owner.

B. Tree Removal. In completing all Work on the Project, the Contractor agrees that all branches, limbs, trunks and other parts of trees cut down for the Work on the Project will be removed from the affected property except if an affected parcel owner requests that all or a portion of such tree remain on the affected property (to be used as firewood, etc.). The Contractor will always ground up tree stumps for any trees that are cut down as soon as practicable after the Work on the affected property is completed to the reasonable satisfaction of the Owner.

C. Septic Service Lines. In completing all Work on the Project, the Contractor agrees that it will always replace any septic service lines when the Work damages or necessitates removing all or any portion of such lines on any property affected by the Work. The Contractor further agrees that such service lines will be replaced with permanent like-kind replacement service lines of the same or better quality than was damaged or removed as soon as practicable after the Work on the affected area of the property is completed to the reasonable satisfaction of the Owner. Contractor agrees to use all reasonable effort to have any septic service lines repaired as quickly as possible and agrees that no service lines shall be rendered unusable by the parcel owner of the affected property for more than a twenty-four (24) hour period and to coordinate such down-time with the affected parcel owner. Without limiting the foregoing, Owner and Contractor both anticipate that septic service lines on Project Parcel 54 (Fluvanna County Tax Map Parcel 5-1-B) will be affected and will need to be replaced.

D. Project Parcel 13 (Fluvanna County Tax Map Parcel 4-A-98F). On Project Parcel 13 (Fluvanna County Tax Map Parcel 4-A-98F), there is a tree stump with reflectors that will need to be removed as part of the Work on the Project. Contractor agrees to replace the stump by installing an approximately 3-foot-tall, 8 by 8-inch post buried approximately 2 to 3 feet deep in concrete with reflectors mounted on it in a similar manner to her existing stump. Contractor agrees to complete the work at the cost of materials (without markup) and for

no labor cost. Contractor further agrees that there is an existing drainage issue on Project Parcel 13 that causes water to wash over the driveway and parking area and pool and saturate the ground near the entrance to an out-building on the property. The Contractor believes that the Work on the Project will necessitate grading that is likely to fix this issue, but if not, the Contractor agrees to do any additional grading work upon execution of a Change Order for such Work at standard rates.

E. Issues. The Contractor agrees to immediately notify the Owner and Engineer if it identifies any issues which affect the Work on the Project or which may require a Change Order or modification to the Plans. Specifically, but without limitation, on Project Parcels 36, 37 and 38 (Fluvanna County Tax Map Parcels 4-A-118D, 4-A-119, and 4-A-126, respectively) the affected owner notified the Owner that there is a septic field somewhere near or possibly within the temporary easements on the affected property. An issue may require a change order and such change order may affect the Contract Price, but such notice to the Owner and Engineer will be provided at no additional cost.

ARTICLE 5 - CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraphs 5.01.A, 5.01.B, and 5.01.C below:

A. For all Work other than Unit Price Work, a lump sum of: \$N/A

All specific cash allowances are included in the above price in accordance with Paragraph 11.02 of the General Conditions.

B. For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the actual quantity of that item:

The Bid prices for Unit Price Work set forth as of the Effective Date of the Agreement are based on estimated quantities. As provided in Paragraph 11.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer as provided in Paragraph 9.07 of the General Conditions.

Notwithstanding the foregoing, the Owner and Contractor agree that the Bid Prices contain two minor errors described as follows: (i) the "Total of all Unit Price Bid Items" in the Bid contains an addition error, is incorrect and should be \$0.01 more; and (ii) Addendum No. 1 to the Invitation for Bids 2018-03 modified the estimated quantity of "12 Furnish and Install 8-inch Force main" to "11,784" units and the estimated "Bid Price" should have been "\$696,316.56", but the Bid was erroneously based off the original estimated quantity of units being "11,864" at an estimated "Bid Price" of "\$696,364.51". Therefore, the Owner and Contractor agree that the "Total of all Unit Price Bid Items" must be modified to reflect the correct estimated quantity of "12 Furnish and Install 8-inch Force main" is "11,784" units and the correct estimated "Bid Price" of "\$696,316.56". The Owner and Contractor agree that the corrected "Total of all Unit Price Bid Items" in the Bid is FOUR MILLION NINE HUNDRED NINETY-THREE THOUSAND SIX HUNDRED TWENTY-FIVE AND 44/100 DOLLARS (\$4,993,625.44).

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

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Final Payment, Submittal and Processing of Payments

A. The Contractor shall be paid a total of FOUR MILLION NINE HUNDRED NINETY-THREE THOUSAND SIX HUNDRED TWENTY-FIVE AND 44/100 DOLLARS (\$4,993,625.44) (the "Contract Price") for the Work on the Project in accordance with this Agreement (and specifically with 5.01 above) after the completion of all of the Work on the Project to the sole satisfaction of the Owner; however the Contract Price may change as set forth in 5.01B above since the Unit Price Work Bid price amount is based on estimated quantities which are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer. Such payment shall be made in accordance with Section 47 "Payment" of the County's General Terms, as defined below in Article 9, and in no event, shall Contractor be paid prior to the Completion Date of the Project (being final completion to the sole satisfaction of the Owner and not substantial completion). Contractor shall submit an invoice on the Application for Payment in accordance with Article 14 of the General Conditions to the Owner upon Final Completion and the Owner shall pay a proper invoice within forty-five (45) days of receipt. Payment in full under for the Work will be made after final completion of the work. Contractor shall only submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Owner as provided in the General Conditions and the County's General Terms.

6.02 Progress Payments; Retainage:

A. In lieu of payment in full at completion and if specifically requested by Contractor in its Bid, Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment **MADE NO MORE THAN MONTHLY ON THE CONTRACTORS APPLICATION FOR PAYMENT FORM, BEING EXHIBIT G1 HERETO** ("Payment Milestones"), but such progress payments shall only be up to those limits in Paragraph 6.02.A.1 below. All such payments will be measured by the schedule of milestones established as provided in Paragraph 2.07.A of the General Conditions. The payment milestones as used in this Agreement mean those units of Work ("installed quantity") as described in the Bid fully completed during the invoiced payment period. The application for payment amount is only the units fully completed during the invoiced payment period multiplied by the unit Bid Price (as the Bid Prices and quantity estimates from Exhibit B were corrected by Section 5.01B above) less the 5% retainage only to be paid only at Final Completion (see Paragraph 6.02.A.1 below). Such payments shall be made in accordance with Section 47 "Payment" of the County's General Terms, defined below in Article 9 below, and in no event, shall Contractor be paid prior to the completion date of each Milestone (being a specified Work unit identified on the Bid Form) on the Project. Contractor shall submit an invoice on the Application for Payment in accordance with Article 14 of the General Conditions to the Owner upon completion of each milestone and the Owner shall pay a proper invoice within forty-five days of receipt. Payment in full for all of the Work will be made after final completion of the work. Contractor shall only submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Owner as provided in the General Conditions and the County's General Terms.

1. In no event will progress payments made to the Contractor for Milestones exceed either:
 - a. 95 percent of Work completed (with the balance being retainage). If the character and progress of the Work have not been satisfactory to Owner and Engineer, then additional retainage will apply; and
 - b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

- c. The above retainage will only be paid to the Contractor upon final completion to the sole satisfaction of the Owner after proper invoice to the Owner consistent with Section 6.01 above.
- d. Milestones may be identified in a schedule by the Contractor that references dates each Milestone will be completed within x number of days of the date the Contract Times commence under the Article 2.03 of the General Conditions.

6.03 Final Payment

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price, if any, as provided in said Paragraph 14.07.

ARTICLE 7 - INTEREST

7.01 There shall be NO interest owed on any late payment made by the Owner.

ARTICLE 8 - CONTRACTOR'S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:
- A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
 - B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. Contractor has carefully studied all, if any: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities), if any, that have been identified in Paragraph SC-4.02 of the Supplementary Conditions as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in Paragraph SC-4.06 of the Supplementary Conditions as containing reliable "technical data."
 - E. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and (3) Contractor's safety precautions and programs.
 - F. Based on the information and observations referred to in Paragraph 8.01.E above, Contractor does not consider that further examinations, investigations, explorations, tests,

studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

- G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 - CONTRACT DOCUMENTS

9.01 Contents

- A. The Contract Documents (also referred to as the “Contract Package”) consist of the following:
 - 1. **This Agreement; and**
 - 2. **The Exhibits attached hereto and made a material part hereof being the following:**
 - A. **Exhibit A:** Portions of the Invitation for Bid 2018-03 Project Manual, being the following:
 - A1** - Bidding Requirements being the Owner's Advertisement for Bids entitled Invitation for Bid #2018-03 Zion Crossroads Water and Sewer System together with the County of Fluvanna General Terms, Conditions and Instructions to Bidders and Contractors (the “County’s General Terms”);
 - A2** - Instructions to Bidders; and
 - A3** - Any and all Addenda, amendments, exhibits, or attachments thereto, and specifically including Addendums No. 1 dated July 3, 2018, Addendum No. 2 dated August 24, 2018, and Addendum No. 3 dated September 26, 2018 (collectively the Addendums are sometimes referred to herein as the “IFB Addendums”);
 - B. **Exhibit B:** The Contractor's Bid dated October 8, 2018, being the offer or proposal of the Bidder/Contractor submitted including the prescribed forms (including without limitation the Contractor’s Qualification Statement, Bid Form, and Bid Bond) setting forth the prices for the Work to be performed including any and all exhibits, addenda or attachments thereto;
 - C. **Exhibit C:** Notice to Proceed (form of the same to be issued by the Owner within 30 days of the Effective Date of this Agreement, as defined below);

- D. **Exhibit D:** Performance bond (entitled “Standard performance Bond for Construction Contracts”);
- E. **Exhibit E:** Payment Bond (entitled “Standard Labor and Material Payment Bond”);
- F. **Exhibit F:** General Conditions;
- G. **Exhibit G:** Forms under the agreement, to be completed at appropriate times, from time to time, and used as described in the Contract Documents:
 - G1** – Contractors Application for Payment;
 - G2** – Certificate of Substantial Completion;
 - G3** – Work Change Directive;
 - G4** – Change Order;
 - G5** – Field Order; and
 - G6** – Request for Information;
- H. **Exhibit H:** Technical Specifications (**Owner and Contractor acknowledge and agree that the IFB Addendums modified the Technical Specifications.**)

TECHNICAL SPECIFICATIONS

Division 01 - General Requirements

- Section 01010 – Summary of Work
- Section 01013 – Mobilization
- Section 01200 – Price and Payment Procedure
- Section 01310 – Project Meetings
- Section 01320 – Scheduling of Construction
- Section 01330 – Submittal Procedures
- Section 01400 – Testing and Special Inspections
- Section 01500 – Temporary Facilities and Controls
- Section 01730 – Operating and Maintenance Data
- Section 01770 – Closeout Procedures

Division 02 – Site Construction

- Section 02100 – Site Preparation
- Section 02110 – Clearing and Grubbing
- Section 02120 – Erosion and Sediment Control
- Section 02230 – Dewatering
- Section 02300 – Earthwork for Utilities
- Section 02500 – Pavement
- Section 02665 – Potable Water Systems
- Section 02731 – Sanitary Sewer Systems
- Section 02798 – Utility Location and Identification
- Section 02800 – Horizontal Boring
- Section 02850 – Directional Drilling

Section 02920 – Turf and Grasses
Section 02990 – Utility Testing

Division 03 – Concrete

Section 03300 – Cast-In-Place Concrete
Section 03481 – Precast Concrete Manholes

Division 11 – Equipment

Section 11010 – Metering Equipment

Appendix

Appendix: Geotechnical Engineering Report

- I. **Exhibit I:** Drawings consisting of 75 sheets dated May 4, 2018 with each sheet bearing the following general title: Zion Crossroads Water and Sewer System. **Owner and Contractor acknowledge and agree that the IFB Addendums modified the Drawings, see specifically, but without limitation, Addendum No 1.**
- B. The documents listed in Paragraph 9.01A are attached to this Agreement and made a material part of this Agreement.
- C. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.
- D. **The parties agree that in the definition of “Resident Project Representative” in the “General Conditions” (being Exhibit F hereto), “Wayne Stephens Director of Public Works” is replaced with “Steven M. Nichols, Fluvanna County Administrator”.**
- E. In the event of a conflict between this Agreement and any of the exhibits the following shall be the order of preference in resolving any conflicts: (i) this **Agreement**, (ii) **Exhibit B**, being the Bid; (iii) the **IFB Addendums**; (iv) **Exhibit A**, except the IFB Addendums; (v) **Exhibit F**, being the General Conditions; (vi) **Exhibit H**, being the Technical Specifications, as modified by the IFB Addendums; (vii) **Exhibit I**, being the Project Drawings, as modified by the IFB Addendums; (viii) **Exhibit C**, being the Notice to proceed; (ix) **Exhibit D**; (x) **Exhibit E**; and (xi) **Exhibit G**, as blank forms. For clarification, (i) being this Agreement above shall control over (ii) through (xi) above; (ii) being Exhibit B shall control over (iii) through (xi), and so forth. Whenever possible the Agreement and all of the exhibits shall be read together.

ARTICLE 10 - MISCELLANEOUS

10.01 Terms

- A. Terms used in this Agreement will have the meanings stated in the Invitation for Bid, General Conditions and the Supplementary Conditions.

10.02 Assignment of Contract

- A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound in its sole discretion;

and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 Successors and Assigns

- A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 Severability

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

10.05 Contractor's Certifications

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

10.06 The Effective Date of the Agreement. This Agreement is signed and sealed on the dates indicated below. As used in the Contract Documents the "Effective Date" and the "Effective Date of the Agreement" is February 6, 2019; **and notwithstanding any other provision of this Agreement, the Owner shall have 30 days from the Effective Date, being on or before March 8, 2019 to issue the Notice to proceed.** Notwithstanding the foregoing should the Owner issue the Notice to Proceed prior to February 6, 2019, then the date that times will commence to run as set forth in such Notice to Proceed or February 6, 2019, whichever is sooner, shall be the Effective Date" and the "Effective Date of the Agreement".

10.07 Property Acquisition Accommodations. Owner and Contractor acknowledge and agree that significant property acquisitions (permanent easements, temporary easements, and land in fee) by the Owner are required for the Project and that issues may arise in which portions of the property interests needed for the Project or access thereto for the construction cannot be obtained prior to the time that the Contract Times commence to run. In the event that the County is reasonably and diligently pursuing such needed property interest(s), the Contractor agrees to make accommodations and accept change orders (whenever reasonable at no cost to the County) to avoid those portions of the Project, as will be set forth in the Notice to Proceed, during a portion of the Contract Times until such later time that the property can be acquired or accessed by the County for the Project whenever the Project schedule can reasonably be modified to account for the same.

[Signature page to follow.]

IN WITNESS WHEREOF, Owner and Contractor’s duly authorized representatives have signed and sealed this Agreement as of the dates set forth below. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

OWNER: Fluvanna County

CONTRACTOR: A. G. Dillard, Inc.

By: _____

By: _____

Steven M. Nichols, County Administrator

Printed Name: _____

Title: _____

DATE: _____

DATE: _____

Attest: _____

Attest: _____

Title: _____

Title: _____

Address for Notices:

Address for Notices:

Fluvanna County
Attn: County Administrator
132 Main Street
Palmyra, VA 22963

A. G. Dillard, Inc. (License No. 2701012090)

With a copy to:
Fluvanna County Attorney
414 East Jefferson Street
Charlottesville, VA 22902

Address for Service of Process:

Approved as to form:

Fluvanna County Attorney

SEEN AND ACKNOWLEDGED:

**ENGINEER:
Dewberry Engineers, Inc.**

By: _____

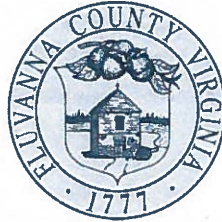
Printed Name: _____

Title: _____

Date: _____

Exhibit A

Exhibit A1



COUNTY OF FLUVANNA, VIRGINIA
Invitation for Bid (IFB) #2018-03
Zion Crossroads Water and Sewer System
Issue Date: May 9, 2018
Due Date: July 24, 2018

Procurement & Technical Contact:

County of Fluvanna
 Cyndi Toler, Purchasing Officer
 132 Main Street
 P.O. Box 540
 Palmyra, VA 22963
 Ph: (434) 591-1930 ext. 1124
 Email: ctoler@fluvannacounty.org

All sealed bids shall be turned in no later 2:00 p.m. EST, July 24, 2018. All bids that are delivered via mail or are hand delivered must be addressed to the "Procurement Contact" listed above. Any Bids that are turned in late will be rejected and returned unopened. Any Bids sent in via facsimile, telephone, or email shall not be considered.

Bid documents may be picked up at the Fluvanna County Department of Finance located at 132 Main Street, 2nd floor, Palmyra, VA 22963 or by clicking on the following link: <https://www.fluvannacounty.org/rfps>.

1. GENERAL INFORMATION

By this Invitation for Bids ("IFB"), the Fluvanna County Board of Supervisors (hereinafter the "County" or "Owner") is seeking competitive sealed bids from qualified licensed contractors (herein referred to interchangeably as "Contractor" or "Bidder") to establish a firm fixed price contract with Contractor to furnish, deliver, supply and install all necessary labor, and materials associated with the construction of the Zion Crossroads Water and Sewer System and other work related thereto (collectively the "Line Work") and complete any and all necessary or appropriate associated work at the site (the "Site Work") in accordance with the specifications, terms and conditions stated herein. Collectively the work on the Line Work and the Site Work are referred to herein as the "Project" or "project". The project consists of the installation of approximately 22,921 lf of 12" waterline, 9,825 lf of 10" force main, 12,412 lf of 8" force main, including multiple directional drills and horizontal bores installing casing pipe and carrier pipe, all necessary valves, appurtenances and connections to the existing 12" water line near the intersection of Route 250 and Route 15. This project also consists of connecting into new water lines and force mains being installed under simultaneous projects "Zion Crossroads Water Booster Pump Station and Wastewater Pump Station," and "Zion Crossroads Elevated Storage Tank" (collectively the "Other Projects"). These Other Projects are under separate contracts and Contractor will be responsible for coordination with the Other Projects and associated contractors.

- A. This project shall consist of two phases.
- B. Phase 1 shall consist of all work associated with the construction, inspection, testing, completion, and acceptance of the following:
 - i. Waterline A from STA WA9+87.47 to STA WA155+28.95
 - ii. Waterline C from STA WC10+00 to STA WC12+28.10
 - iii. Waterline D from STA WD10+00 to STA WD55+44.33

- C. Phase 2 shall consist of all work associated with the construction, inspection, testing, completion, and acceptance of the following:
- i. Waterline A from STA WA156+45.31 to STA WA188+74.44
 - ii. Waterline B from STA WB10+00 to STA WB13+71.20
 - iii. Force main from STA F10+00 to STA F233+61.96
2. **PLANS AND SPECIFICATIONS/EXHIBITS:** The following exhibits are attached hereto and incorporated herein as material parts of this IFB (collectively the “Plans and Specifications”):
- A. **APPENDIX I** – County of Fluvanna General Terms, Conditions and Instructions to Bidders and Contractors;
 - B. **INSTRUCTION TO BIDDERS** (based off of Engineers Joint Contract Documents Committee (“EJCDC”) C-200 Suggested Instructions to Bidders for Construction Contracts, but is substantially modified);
 - C. **Contractor’s Qualification Statement** (based off EJCDC form);
 - D. **Bid Form** (based off of EJCDC C-410 Suggested Bid Form for Construction Contracts, but is modified);
 - E. **Bid Bond** (EJCDC C-430 Bid Bond (Penal Sum Form);
 - F. **Notice of Award** (EJCDC C-510 Notice of Award);
 - G. **Agreement** (based off of EJCDC Suggested form of Agreement Between Owner and Contractor for Construction Contract (Stipulated Price), but is substantially modified);
 - H. **Notice to Proceed** (EJCDC C-550 Notice to Proceed);
 - I. **Standard Performance Bond for Construction Contracts;**
 - J. **Standard Payment Bond for Construction Contracts;**
 - K. **Contractor’s Application for Payment** (EJCDC C-620 Contractor’s Application for Payment);
 - L. **Certificate of Substantial Completion** (EJCDC C-625 Certificate of Substantial Completion);
 - M. **General Conditions** (Based off of EJCDC C-700 Standard General Conditions of the Construction Contract, but substantially modified);
 - N. **Supplementary Conditions** (Based off of EJCDC C-800 Supplementary Conditions of the Construction Contract, but substantially modified);
 - O. **Work Change Directive** (EJCDC C-940 Work Change Directive);
 - P. **Change Order** (based off of EJCDC C-941 Change Order, but substantially modified);
 - Q. **Field Order** (based off of EJCDC C-942 Field Order, but substantially modified);
 - R. **Request for Information form;**
 - S. **Pre-Bid Question Form** (suggested format); and
 - T. Any and all Project plans, documents, manuals, drawings, criteria, requirements, specifications or other materials attached to this IFB, incorporated by reference into any of the above documents or into this IFB by reference including without limitation all those Technical Specifications identified in the Table of Contents and those Sections entitled “Division 01 – General Requirements”, “Division 02 – Site Construction”, “Division 03 – Concrete”, “Division 11 – Equipment” and “Appendix” as well as the “Zion Crossroads Water and Sewer System” drawings.

To the extent any exhibit hereto directly conflicts with APPENDIX I – County of Fluvanna General Terms, Conditions and Instructions to Bidders and Contractors (the “County’s General Terms”), the County’s General Terms shall control. Whenever possible exhibits shall be read together and all provisions and requirements thereof shall be met even if they cover the same subject matter.

This IFB and the Plans and Specifications are a material part of the Contract Documents as such is defined in the General Requirements.

3. **PRE-BID CONFERENCE:**

- A. A mandatory Pre-Bid Conference will be held at the Fluvanna County Administration Building, Morris Room located at 132 Main Street, Palmyra, Virginia 22963 at 10:00 AM, local prevailing time on Wednesday June 27, 2018. All prospective bidders must attend.
- B. At the pre-bid conference Bidders will be allowed to inspect and analyze the current environment and collect further data in determination of their ability to perform the work on the Project. Any Procurement and technical questions shall be directed to Cyndi Toler, Purchasing Officer at ctoler@fluvannacounty.org during the course of this solicitation. The Bidder shall be presumed to have made a reasonable inspection of the Site(s) before the time of Bid submission and shall be held responsible for all information available through such inspections; and submission of a Bid will be a confirmation that the Bidder did make a site inspection and is aware of all conditions affecting performance and price(s) submitted. The County may determine in its sole discretion that a second pre-bid conference is necessary, the date and time of any such second pre-bid conference will be disclosed in an amendment to this IFB.

4. **SCOPE OF WORK:** Contractor shall provide, furnish deliver, supply and install, all necessary or appropriate labor, services, parts, tools, materials, equipment, items and resources as may be required to complete the work on the Project (the "Scope of Work"), in accordance with the specifications and terms and conditions stated herein, which Scope of Work, shall include at minimum, but is not limited to, all of the following:

- A. **Contractor Minimum Requirements:** At minimum the Contractor must meet these minimum performance standards:
 - i. The Contractor should have, at a minimum, a current Class "A" Contractor's license as issued by the Commonwealth of Virginia Board of Contractors, Department of Professional and Occupational Regulation.
 - ii. The Contractor shall possess the appropriate contractor's license with the specific specialty services as recognized by the Virginia Board for Contractors, Department of Professional and Occupational Regulation to perform any services required for the work on the Project.
 - iii. The Contractor's firm should have been in business providing similar services promulgated in this solicitation for a minimum of five (5) consecutive years.
 - iv. The Contractor's personnel assigned to the resulting contract should wear appropriate uniforms or attire that, at a minimum, bear the contractor's company name, the employees name, and shall be maintained in a professional condition at all times.
 - v. The Contractor shall be responsible for providing quality services on the Project in accordance with industry standards, plans, directions and instruction as provided hereunder and in any resulting Contract.
 - vi. All equipment, materials and installation work provided as a part of the Project shall conform to applicable Federal, State and local laws, regulations, rules and procedures including without limitation the Virginia Uniform Statewide Building Codes, OSHA and the specifications of this IFB.
 - vii. Contractor(s) shall report any safety concerns, near misses, accidents and injuries related to the work area to the County immediately.
 - viii. Contractor(s) shall warrant replace or repair any defective product, materials, installation or services on the Project for three (3) years from County's final acceptance of any services hereunder, work or services on the Project at no additional cost. County shall be deemed to have accepted services hereunder only after receipt of a proper and detailed

invoice from Contractor for all of the work on the Project and payment by the County to Contractor in full on such invoice.

- ix. Contractor(s) shall respond to emergency warranty repairs within one (1) day and shall respond to routine warranty repairs within three (3) business days.
- x. The Contractor shall transfer and assign to the County any and all warranties or similar guarantees for any materials or products provided by Contractor to the County hereunder.
- xi. The winning bidder will deliver a performance and payment bond in an amount equal to the contract price from an insurer licensed in Virginia.

B. Building Specifications: At minimum, the Line Work and all work on the Project must meet the following requirements:

- i. Be in all respects consistent with and meet any and all provisions, notes, requirements or specifications any and all attachments to this IFB (the "Plans and Specifications"). Site work is required to the extent necessary to produce a finished Project that meets or exceeds all the requirements and specifications provided in this IFB, including without limitation the Plans and Specifications.
- ii. All work, services, labor and materials shall be consistent with requirements of Applicable Law (as defined in 4(G) below).

C. ADDITIONAL REQUIREMENTS: The Contractor shall

- i. Assign a Supervisor to the project that shall be the main point of contact for the project.
- ii. Assure and guaranty that all equipment, materials, and installation work shall conform to the most current adopted Virginia Uniform Statewide Building Codes, OSHA, and this IFB.
- iii. Examine the work areas and site conditions under which work stated herein shall be performed. Contractor shall notify County of any condition(s) which may affect the Project.
- iv. Locate and clearly mark all underground utilities prior to construction.
- v. Perform all site preparation work inclusive of soil excavation and rough grade.
- vi. Provide grade stakes or locator flags to flag corners of building.
- vii. Obtain building permit.
- viii. Provide on-site supervision of construction activities.
- ix. Provide final approval/inspection and acceptance of Line Work, etc. for the Project.
- x. Provide finished grading work.
- xi. Verify site preparation work with a County designated Project Manager.
- xii. Deliver building materials to site location as designated by the Project Manager.
- xiii. Erect building(s).
- xiv. Furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
- xv. Provide County with any applicable manufacturer warranties.
- xvi. Agree to all of the provisions of the County of Fluvanna's General Terms, Conditions and Instructions to Bidders and Contractors attached to this IFB as Appendix I and further shall agree that any resulting contract awarded pursuant to this IFB shall incorporate by reference as material provisions of such Contract the County of Fluvanna's General Terms, Conditions and Instructions to Bidders and Contractors. Any resulting Contract shall be in form acceptable to the County in its sole discretion.

D. PROTECTION OF PERSON AND PROPERTY:

- i. All materials shall be protected from damage during delivery, storage and installation.
- ii. Work can be done on property from sun up to sun down 7 days a week.

- iii. The Contractor is responsible to keep a clean and safe construction area at the end of each work day.
- iv. Contractor shall be responsible for initiating, maintaining and supervision of all safety precautions in connection with the work being performed. Any damage to existing Property, site, buildings, land or personal property, resulting from the Work on the Project or the performance of a Contract awarded pursuant to this IFB shall be repaired or replaced at the sole cost and expense of the Contractor to the satisfaction of the County. The Contractor shall repair and/or replace any damage done to any County property by their employees or resulting from Contractor's services as soon as practicable, but in any event, no more than ten (10) calendar days after notification by the County. All such repairs or replacements shall be completed to the County's sole satisfaction. To protect the Contractor, the Contactor shall document any damages in the project area prior to commencing work. This written record shall be provided to the County prior to commencing work.

E. BUILDING PERMITS & INSPECTIONS:

- i. The Contractor shall locate all underground utilities and their depth and location prior to starting any work on the Project.
- ii. The Contractor shall apply for all required building permits before starting the Work on this Project.
- iii. Contractor shall notify the county to arrange for inspections at agreed milestones and shall notify for final inspection.
- iv. Plans and Specifications are attached hereto.

F. INSURANCE REQUIREMENTS:

- i. The Contractor shall agree to carry the required liability insurances that are listed under item number 39 of the "GENERAL TERMS, CONDITIONS AND INSTRUCTIONS TO BIDDERS AND CONTRACTORS" attached hereto as Appendix I and also as required by the Contract Documents.
- ii. By signing and submitting a proposal under this solicitation, the Contractor certifies that if awarded the contract, it will have the insurance coverage required at the time the work commences. The Contractor further certifies that the contractor will maintain the specified coverage during the entire term of the contract and that all insurance coverage will be provided by insurance companies authorized to sell insurance in Virginia by the Virginia State Corporation Commission.
- iii. During the period of the contract the County reserves the right to require the Contractor to furnish certificates of insurance for the coverage from time to time.
- iv. This is a construction contract under the Virginia Public Procurement Act and Performance and Payment Bonds shall be required pursuant to Virginia Code Section 2.2-4337.

G. APPLICABLE LAW: The Contractor shall comply with applicable federal, State and local laws, ordinances, rules and regulations in performance of the Contract ("Applicable Law"), including without limitation:

- i. The Americans with Disabilities Act, as this Project is a new construction Project for a unit of government; and
- ii. The Virginia Statewide Building Code.

5. SUBMITTAL INSTRUCTIONS

- A. The County will not be responsible for any expenses incurred by a Contractor in preparing and submitting a Bid. All Bids shall provide a straight-forward, concise delineation of the Contractor's capabilities to satisfy the requirements of this IFB. Emphasis should be on completeness and clarity of content. The contents of the Bid submitted by the successful Bidder and this IFB, and any amendments thereto, will become part of any contract awarded as a result of this IFB.
- B. The format of each bid must contain the following elements organized into separate chapters and sections, as the Bidder may deem appropriate. The following paragraphs provide guidelines to each Bidder for information to include in the bid document:
- C. **Cover Letter** - Provide a cover letter that confirms the Bidder's understanding of this IFB, a general understanding of the Project, an overview of the history and qualifications of the Contractor.
- D. **Overview** - The purpose of this section is to provide Fluvanna County with an overview of the history, qualifications and abilities of the Contractor's firm and for the Contractor to demonstrate the specific qualifications of the staff the Contractor will assign to this Project if selected. At a minimum, the proposal should: (i) Designate a Project Manager and indicate office location; and (ii) Include the organization chart, functional discipline, and responsibilities of Project team members.
- E. **Resumes/Qualifications** - Provide a concise resume or description of each team member's education, relevant professional experience, length of time employed by the Contractor and/or sub-consultant, and professional licenses. Each Contractor submitting a proposal shall provide an updated statement of qualifications highlighting the expertise and experience of the Contractor and its personnel related to the Project.
- F. **Demonstrated History of Successful Projects** - Discuss recent project information of similar type to the Project completed by the Contractor including the project name, location, brief description of the project, description of the scope of services provided, and principal contact person. List all work of a similar nature to the Project completed for any department or agency of the Commonwealth of Virginia and any Virginia public body or locality.
- G. **Proposed Sub-Consultants** - The Contractor shall clearly state whether it is proposing to subcontract any of the work herein. The names of all proposed sub-contractors shall be provided. By proposing such firm(s) or individuals, the Contractor assumes full liability for the sub-consultant's performance. The Contractor shall state the amount of previous work experience with the sub-consultant(s).
- H. **References:** Provide the current name, address, and telephone number of at least five (5) references the Contractor has served either currently or in the past three (3) years; preferably those where one or more of the Project team members provided the same or similar services as requested herein. Indicate the Scope of Services provided to each reference.
- I. **Pricing** – Notwithstanding any other provision contained herein or in any exhibit hereto, please provide flat lump sum pricing. The lump sum price shall include all labor, materials, services, equipment, tools, consumables, parts, supervision, permitting, overhead, administrative, overhead, delivery, shipping, handling, travel and other costs, fees or charges of any kind related to or required for the Work on the Project.
- J. **Project Full Specifications** – Must meet all Plans and Specifications contained herein.

- K. **Forms:** All forms required to be submitted under this IFB must be included in the Bid, including without limitation,
- i. Vendor Data Sheet (Attachment A)
 - ii. Proof of Authority to Transact Business in Virginia (Attachment B)
 - iii. Certificate of No Collusion (Attachment C)
 - iv. Bidder Statement (Attachment D); and
 - v. Any forms required by the Plans and Specifications
- L. The County is not responsible for failure to locate, consider and evaluate qualification factors presented outside this format.
- M. Any information thought to be relevant, but not applicable to the enumerated scope of work, should be provided as an appendix to the bid. If publications are supplied by the Officer to respond to a requirement, the response should include reference to the document number and page number. Bids not providing this reference may be considered to have no reference material included in the additional documents.
- N. Each Contractor submitting a bid shall provide an updated statement of qualifications. The following is the minimum to be considered a complete bid:
- i. Expertise and experience of the Contractor related to the scope of services contained in this IFB. This section shall include recent project information of similar type completed by the Contractor along with the name and telephone number of the point of contact for each project.
 - ii. Financial responsibility of the Contractor.
 - iii. The Contractor should include a street address of the office proposed to handle the work.
 - iv. Identification and statement of qualifications of the construction project team who will be assigned to the Project for actual “hands on” work, as well as the principal assigned the Project for oversight responsibilities.
 - v. Provide your proposed Project timeline/completion schedule.
- O. The County is not responsible for failure to locate, consider and evaluate qualification factors presented outside this format.

6. SUBMITTAL INSTRUCTIONS

- A. **Each Bidder must submit one (1) original and four (4) copies along with one (1) electronic copy of its bid documents on CD ROM, DVD, or USB flash drive/memory stick.**
- B. An authorized representative of the Bidder shall sign bid documents. All information requested should be submitted. Failure to submit all information requested may result in the bid being rejected by the County.
- C. All forms attached to this IFB must be fully completed, executed by the Bidder and returned as a part of Contactor’s Bid.
- D. **Each bid shall be in writing and received in hard copy by the deadline. Oral bids, bids received by telephone, fax, telegraph, or email shall be rejected.**

7. **CONTRACT AWARD:** The contract will be awarded to the lowest responsible and responsive bidder whose bid, conforming to this IFB, is most advantageous to the County, considering price and any other evaluation criteria set forth in the bid documents and consistent with the Virginia Procurement Act, the County's Code, the County's Procurement Policies and Procedures and other applicable law. Nothing herein requires that the County complete this Work and the County may determine not to award any Contract pursuant to this IFB in its sole discretion for any reason or no reason at all.

8. **TERMS**

- A. The County's General Terms, Conditions, and Instructions to Bidders and Contractors are attached hereto and incorporated herein by reference as Appendix I. These provisions bind all Bidders. Further, the conditions and requirements of this IFB, including, but not limited to, County's General Terms, Conditions, and Instructions to Bidders and Contractors, are a material part of any contract awarded between the County and the successful Bidder(s).
- B. Awards shall be made to as many Bidders as deemed necessary to fulfill the anticipated requirements of the County. The County may award contracts to multiple Bidders and use their services for some or all of the projects identified herein. The County may choose not to award a contract or Notice to Proceed for any or all projects described herein.
- C. The Contract awarded hereunder shall be in a form similar to that Agreement attached herein and referenced in Article 2(G) and acceptable to the County in its sole discretion.

VENDOR DATA SHEET

Note: The following information is required as part of your response to this solicitation. Failure to complete and provide this sheet may result in finding your bid nonresponsive.

1. Qualification: The vendor must have the capability and capacity in all respects to satisfy fully all of the contractual requirements.

2. Vendor's Primary Contact:

Name: _____ Phone: _____

3. Years in Business: Indicate the length of time you have been in business providing this type of good or service: _____ Years _____ Months

4. Vendor Information:

FIN or FEI Number: _____ If Company, Corporation, or Partnership
 SSN: _____ (If Vendor is a sole proprietor)

5. Indicate below a listing of at least four (4) current or recent accounts, either commercial or governmental, that your company is servicing, has serviced, or has provided similar goods. Include the length of service and the name, address, and telephone number of the point of contact.

Company:	Contact:
Phone:	Email:
Dates of Service:	\$\$ Value:

Company:	Contact:
Phone:	Email:
Dates of Service:	\$\$ Value:

Company:	Contact:
Phone:	Email:
Dates of Service:	\$\$ Value:

Company:	Contact:
Phone:	Email:
Dates of Service:	\$\$ Value:

By my signature below, I, as a duly authorized representative of the entity named below, certify the accuracy of the foregoing information:

_____ Date: _____
 Legal Name of Entity if Applicable

By: _____ (SEAL) Print Name: _____
 Signature of Authorized Representative

Print Title: _____

Vendor Certification (for a Sole Proprietor):

_____ (SEAL) Print Name: _____ Date: _____

Signature

PLEASE RETURN THIS PAGE WITH PROPOSAL SUBMISSION – [REQUIRED]

PROOF OF AUTHORITY TO TRANSACT BUSINESS IN VIRGINIA

THIS FORM MUST BE SUBMITTED WITH YOUR PROPOSAL/BID. FAILURE TO INCLUDE THIS FORM MAY RESULT IN REJECTION OF YOUR PROPOSAL/BID

Pursuant to Virginia Code §2.2-4311.2, an Offeror/Bidder organized or authorized to transact business in The Commonwealth pursuant to Title 13.1 or Title 50 of the Code of Virginia shall include in its proposal/bid the identification number issued to it by the State Corporation Commission (“SCC”). Any Offeror/Bidder that is not required to be authorized to transact business in the Commonwealth as a foreign business entity under Title 13.1 or Title 50 of the Code of Virginia or as otherwise required by law shall include in its proposal/bid a statement describing why the Offeror/Bidder is not required to be so authorized. Any Offeror/Bidder described herein that fails to provide the required information shall not receive an award unless a waiver of this requirement and the administrative policies and procedures established to implement this section is granted by the County Administrator, as applicable. If this quote for goods or services is accepted by the County of Fluvanna, Virginia, the undersigned agrees that the requirements of the Code of Virginia Section 2.2-4311.2 have been met.

Please complete the following by checking the appropriate line that applies and providing the requested information. **PLEASE NOTE: The SCC number is NOT your federal ID number or business license number.**

A. ____ Offeror/Bidder is a Virginia business entity organized and authorized to transact business in Virginia by the SCC and such vendor’s Identification Number issued to it by the SCC is _____.

B. ____ Offeror/Bidder is an out-of-state (foreign) business entity that is authorized to transact business in Virginia by the SCC and such vendor’s Identification Number issued to it by the SCC is _____.

C. ____ Offeror/Bidder does not have an Identification Number issued to it by the SCC and such vendor is not required to be authorized to transact business in Virginia by the SCC for the following reason(s): **Please attach additional sheets if you need to explain why such Offeror/Bidder is not required to be authorized to transact business in Virginia.**

Legal Name of Company (as listed on W-9): _____

Legal Name of Offeror/Bidder: _____

Date: _____

Authorized Signature: _____

Print or Type Name and Title: _____

PLEASE RETURN THIS PAGE WITH PROPOSAL SUBMISSION – [REQUIRED]

CERTIFICATE OF NO COLLUSION:

The undersigned, acting on behalf of _____, does hereby certify in connection with the procurement and proposal to which this Certificate of No Collusion is attached that:

This proposal is not the result of, or affected by, any act of collusion with another person engaged in the same line of business or commerce; nor is this proposal the result of, or affected by, any act of fraud punishable under Article 1.1 of Chapter 12 of Title 18.1 of the Code of Virginia, 1950, as amended (18.2-498.1 et seq.).

The undersigned declares that the person or persons signing this proposal is/are fully authorized to sign the proposal on behalf of the firm listed and to fully bind the firm listed to all conditions and provisions thereof.

Respectfully submitted this _____ day of _____, 2015.

Legal Name of Entity

By: _____ (SEAL)
Signature of Authorized Representative

Print Name: _____

Print Title: _____

Date: _____

ACKNOWLEDGEMENT

State of _____

In the County/City of _____, to-wit:

The foregoing Certification of No Collusion was subscribed and sworn to before me by _____ (Print Name), _____ (Print Title) on behalf of _____ (Print Name of Entity) on this _____ day of _____ (month), _____ (year).

Notary Public

My commission expires: _____

Registration Number: _____

PLEASE RETURN THIS PAGE WITH PROPOSAL SUBMISSION – [REQUIRED]

OFFEROR STATEMENT

The undersigned Offeror hereby certifies that the Offeror has carefully examined all instructions, plans, conditions, specifications and other documents or items of this Request for Proposal and hereby submits this Proposal pursuant to such instructions, plans, conditions, specifications and other documents or items.

Complete if Offeror is an Entity:

WITNESS the following duly authorized signature and seal:

Name of Entity: _____
By: _____ (SEAL)
Signature
Print Name: _____
Print Title: _____

STATE OF _____
COUNTY/CITY OF _____, to-wit:

The foregoing instrument was acknowledged before me this _____ day of _____ (month),
_____ (year) by _____ (Print Name),
_____ (Print Title) on behalf of _____ (Name of
Entity).

Notary Public [SEAL]

My commission expires: _____
Notary registration number: _____

Complete if Offeror is a Sole Proprietor:

Witness the following signature and seal:

_____ (SEAL)
Signature
Print Name: _____

STATE OF _____
COUNTY/CITY OF _____, to-wit:

The foregoing instrument was acknowledged before me this _____ day of _____ (month),
_____ (year) by _____ (Print Name), a sole proprietor.

Notary Public [SEAL]

My commission expires: _____
Notary registration number: _____

PLEASE RETURN THIS PAGE WITH PROPOSAL SUBMISSION – [REQUIRED]

Appendix I

COUNTY OF FLUVANNA

GENERAL TERMS, CONDITIONS AND INSTRUCTIONS TO BIDDERS AND CONTRACTORS

GENERAL TERMS, CONDITIONS AND INSTRUCTIONS TO BIDDERS AND CONTRACTORS

These General Terms, Conditions and Instructions to Bidders and Contractor (hereinafter referred to as the “General Conditions”) shall apply to all purchases and be incorporated into and be a part of each Solicitation (as defined below) and every Contract (as defined below) awarded by Fluvanna County, a political subdivision of the Commonwealth of Virginia (hereinafter referred to as the “County”) unless otherwise specified by the County in writing. Bidders, Offerors and Contractors or their authorized representatives are expected to inform themselves fully as to these General Conditions before submitting Bids or Proposals to and/or entering into any Contract with the County: failure to do so will be at the Bidder’s/Contractor’s own risk and except as provided by law, relief cannot be secured on the plea of error.

Subject to all Federal, State and local laws, policies, resolutions, regulations, rules, limitations and legislation, including the County’s Procurement Policies and Procedures, Bids or Proposals on all Solicitations issued by County will bind Bidders or Offerors, as applicable, and Contracts will bind Contractors, to all applicable terms, conditions, instructions, rules and requirements herein set forth unless otherwise SPECIFICALLY set forth by the County in writing in the Solicitation or Contract. All provisions of these General Conditions are material to any contract between the County and a Contractor.

INTRODUCTION

1. **VIRGINIA PUBLIC PROCUREMENT ACT AND ETHICS IN PUBLIC CONTRACTING:** The Virginia Public Procurement Act of Virginia Code §§ 2.2-4300 *et seq.* (hereinafter the “VPPA”) is incorporated herein by reference. Nothing in these General Conditions is intended to conflict with the VPPA and in case of any conflict, the VPPA controls. Specifically, the provisions of Article 6 of the VPPA (Virginia Code §§ 2.2-4367 through 2.2-4377) relating to ethics in contracting, shall be applicable to all Solicitations and Contracts solicited or entered into by the County. By submitting their Bids or signing any Contract, all Bidders and Contractors certify that they have not violated any of the provisions of Article 6 of the VPPA, including, but not limited to, that their Bids are made without collusion or fraud and that they have not offered or received any kickbacks or inducements.
2. **DEFINITIONS:** The definitions of Virginia Code §§ 2.2-4301, 2.2-4302.1 and 2.2-4302.2 are specifically incorporated herein by reference and as used in these General Conditions, whether capitalized or not, any of such defined terms have the same meaning as such terms have under the VPPA: such defined terms include: “Affiliate”, “Best Value”, “Business”, “Competitive Negotiation”, “Competitive Sealed Bidding”, “Construction”, “Construction Management Contract”, “Design-Build Contract”, “Employment Services Organization”, “Goods”, “Informality”, “Job Order Contracting”, “Multiphase Professional Services Contract”, “Nonprofessional Services”, “Potential Bidder or Offeror”, “Professional Services”, “Public Body”, “Public Contract”, “Responsible Bidder or Offeror”, “Responsive Bidder”, “Reverse Auctioning” and “Services”. Additionally, as used in these General Conditions, the following terms, whether capitalized or not, have the following meanings:

- a. Bid/Proposal: The offer of a Bidder or Offeror to provide specific Goods or Services at specified prices and/or other conditions specified in the Solicitation. The term “Bid” is used throughout these General Conditions and where appropriate includes the term “Proposal” or any modifications or amendments to any Bid or Proposal.
- b. Bidder/Offeror/Vendor: Any individual(s), company, firm, corporation, partnership or other organization bidding or offering on any Solicitation issued by the County and/or offering to enter into Contracts with the County. The term “Bidder” is used throughout these General Conditions and where appropriate includes the term “Offeror” and/or “Vendor”.
- c. Contract: Any contract to which the County will be a party.
- d. Contractor: Any individual(s), company, firm, corporation, partnership, or other organization to whom an award is made by the County or whom enters into any contract to which the County is a party.
- e. County: The County of Fluvanna, a political subdivision of the Commonwealth of Virginia, including where applicable all agencies and departments of the County.
- f. County Administrator: The Fluvanna County Administrator.
- g. County Attorney: The Fluvanna County Attorney.
- h. Purchasing Agent: The County Administrator is the County’s Purchasing Agent and is responsible for the purchasing activity of Fluvanna County; and has signatory authority to bind the County to all contracts and purchases made lawfully under the Fluvanna County Small Purchasing Procedures. The Purchasing Agent has signatory authority to bind the County to all other contracts and purchases only after the contracts or purchases have been approved by a vote of the Fluvanna County Board of Supervisors.
- i. General Terms, Conditions and Instructions to Bidders and Contractors (also referred to herein as the “General Conditions”): These General Terms, Conditions and Instructions to Bidders and Contractors shall be attached to and made a part of all Solicitations by the County and all Contracts to which the County is party.
- j. His: Any references to “his” shall include his, her, their, or its as appropriate.
- k. Invitation to Bid (also referred to herein as an “IFB”): A request which is made to prospective Bidders for their quotation on Goods or Services desired by the County. The issuance of an IFB will contain or incorporate by reference the General Conditions and the other specifications and contractual terms and conditions applicable to the procurement.
- l. Purchasing Officer: The Purchasing Officer employed by the County and to whom Bidders/Contractors can submit questions relating to any Bid or Contract.

- m. Request for Proposal (also referred to herein as a “RFP”): A request for an offer from prospective Offerors which shall indicate the general terms which are sought to be procured from Offerors. The RFP will specify the evaluation factors to be used and will contain or incorporate by reference the General Conditions and other applicable contractual terms and conditions, including any unique capabilities or qualifications that will be required of the Contractor.
 - n. Small Purchasing Procedures: The County’s Small Purchasing Procedures, being Chapter 4 of the County’s Procurement Policies and Procedures, a method of purchasing not requiring competitive sealed bids or competitive negotiation for single or term contracts for goods and services other than professional services if the aggregate or the sum of all phases is not expected to exceed \$50,000; and also allowing for single or term contracts for professional services without requiring competitive negotiation, provided the aggregate or the sum of all phases is not expected to exceed \$50,000.
 - o. Solicitation: The process of notifying prospective Bidders or Offerors that the County wishes to receive Bids or Proposals on a set of requirements to provide Goods or Services. “Solicitation” includes any notification of the County requirements may consist of public advertising (newspaper, County’s website, or other electronic notification), the mailing of notices of Solicitation, any Invitation for Quotes (“IFQ”), Initiations to Bid (“IFB”), or Requests for Proposal (“RFP”), the public posting of notices, issuance of an Open Market Procurement (“OMP”), or telephone calls to prospective Bidders or Offerors.
 - p. State: The Commonwealth of Virginia.
3. **AUTHORITY**: The Purchasing Agent shall serve as the principal public purchasing official for the County, and shall be responsible for the procurement of goods, services, insurance and construction in accordance with the County’s Procurement Policies and Procedures. The Purchasing Agent has responsibility and authority for negotiating, placing and when necessary modifying every Solicitation, Contract and purchase order issued by the County under the County’s Small Purchasing Procedures. The Purchasing Agent has signatory authority to bind the County to all contracts and purchases made lawfully under the County’s Small Purchasing Procedures. The Purchasing Agent has responsibility and authority for negotiating, placing and when necessary modifying every other Solicitation, Contract and purchase order issued by the County except that the Purchasing Agent has signatory authority to bind the County to all other contracts and purchases ONLY after the contracts or purchases have been adopted and approved by a vote of the Fluvanna County Board of Supervisors (the “Board”).

Unless specifically delegated by the Board or the Purchasing Agent, and consistent with the limited authority granted thereto, no other County officer or employee is authorized to order supplies or Services, enter into purchase negotiations or Contracts, or in any way obligate the County for any indebtedness. Any purchase or contract made which is contrary to such authority shall be of no effect and void and the County shall not be bound thereby.

For convenience, the County's Purchasing Officer shall serve as an intermediary between the Purchasing Agent and the Bidder or Contractor and any Bidder or Contractor may direct communications regarding any purchase, Solicitation or Contract to the Purchasing Officer; however as stated *supra* only the Board or County's Purchasing Agent can bind the County and only upon the conditions stated *supra*.

CONDITIONS OF BIDDING

4. **COMPETITION INTENDED:** It is the County's intent to encourage and permit open and competitive bidding in all Solicitations. It shall be the Bidder's responsibility to advise the County in writing if any language, requirement, specification, etc., or any combination thereof, stifles competition or inadvertently restricts or limits the requirements stated in a Solicitation to a single source. The County must receive such notification not later than seven (7) business days prior to the deadline set for acceptance of the Bids. In submitting a Bid, the Bidder guarantees that he or she has not been a party with other Bidders to an agreement to bid a fixed or uniform price. Violation of this implied guarantee shall render the Bid of any Bidder involved void.
5. **DISCRIMINATION PROHIBITED:** Pursuant to Virginia Code § 2.2-4310, the County does not discriminate against Bidders, Offerors or Contractors because of race, religion, color, sex, national origin, age, disability, status as a service disabled veteran, or any other basis prohibited by state law relating to discrimination in employment. Whenever solicitations are made, the County shall include businesses selected from a list made available by the Department of Small Business and Supplier Diversity. Pursuant to Virginia Code § 2.2-4343.1, the County does not discriminate against "faith-based organizations", being a religious organization that is or applies to be a contractor to provide goods or services for programs funded by the block grant provided pursuant to the Personal Responsibility and Work Reconciliation Act of 1996, P.L. 104-193.
6. **CLARIFICATION OF TERMS:** Pursuant to Virginia Code § 2.2-4316, if any Bidder has questions or comments about the specifications or other Solicitation documents, the prospective Bidder should contact the County no later than seven (7) business days prior to the date set for the opening of Bids or receipt of Proposals. Any revisions to the Solicitation will be made only by written addendum issued by the County. Notifications regarding specifications may not be considered if received in less than seven (7) business days of the date set for opening of Bids/receipt of Proposals.
7. **MANDATORY USE OF COUNTY FORM AND TERMS AND CONDITIONS:** Unless otherwise specified in the Solicitation, all Bids must be submitted on the forms provided by the County, including but not limited to, a Cover Sheet or Pricing Schedule, if applicable, properly signed in ink in the proper spaces and submitted in a sealed envelope or package. Unauthorized modification of or additions to any portion of the Solicitation may be cause for rejection of the Bid. However, the County reserves the right to decide, on a case by case basis, in its sole discretion, whether to reject any Bid or Proposal which has been modified.

These General Conditions are mandatory provisions of all Solicitations and all Contracts of the County.

- 8. LATE BIDS & MODIFICATION OF BIDS:** Any Bid or modification thereto received at the office designated in the Solicitation after the exact time specified for receipt of the Bid is considered a late Bid or modification thereof. The County is not responsible for delays in the delivery of the mail by the U.S. Postal Service, private carriers or the inter-office mail system. It is the sole responsibility of the Bidder to ensure their Bid reaches County by the designated date and hour. The following rules apply to all Bids submitted to the County:

- a. The official time used in the receipt of Bids/Proposals is that time on the automatic time stamp machine in the Finance Department;
- b. Late Bids or modifications thereof will be returned to the Bidder UNOPENED, if Solicitation number, due date and Bidder's return address is shown on the container;
- c. If a Bid is submitted on time, however a modification thereto is submitted after the due date and time, then the County in its sole discretion may choose to consider the original Bid except that the County may not consider such original Bid if the Bid is withdrawn by the Bidder pursuant to Section 9 below; and
- d. If an emergency or unanticipated event or closing interrupts or suspends the County's normal business operations so that Bids cannot be received by the exact time specified in the Solicitation, then the due date/time specified for receipt of Bids will be deemed to be extended to the same time of day specified in the Solicitation on the first work day on which normal County business operations resume.

9. WITHDRAWAL OF BIDS:

- a. Pursuant to Virginia Code § 2.2-4330, a Bidder for a public construction contract, other than a contract for construction or maintenance of public highways, may withdraw his Bid from consideration if the price bid was substantially lower than the other Bids due solely to a mistake in the Bid, provided the Bid was submitted in good faith, and the mistake was a clerical mistake as opposed to a judgment mistake, and was actually due to an unintentional arithmetic error or an unintentional omission of a quantity of work, labor or material made directly in the compilation of a Bid, which unintentional arithmetic error or unintentional omission can be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the Bid sought to be withdrawn.

If a Bid contains both clerical and judgment mistakes, a Bidder may withdraw his Bid from consideration if the price bid would have been substantially lower than the other Bids due solely to the clerical mistake, that was an unintentional arithmetic error or an unintentional omission of a quantity of work, labor or material made directly in the compilation of a Bid that shall be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the Bid sought to be withdrawn. The Bidder shall give notice in writing to the County of his or her claim of right to withdraw his or her Bid within two (2) business days after the conclusion of the Bid opening procedure and shall submit original work

papers with such notice.

- b. A Bidder for a Contract other than for public construction may request withdrawal of his or her Bid under the following circumstances:
 - i. Bids may be withdrawn on written request from the Bidder received at the address shown in the Solicitation prior to the time of opening.
 - ii. Requests for withdrawal of Bids after opening of such Bids but prior to award shall be transmitted to the County, in writing, accompanied by full documentation supporting the request. If the request is based on a claim of error, documentation must show the basis of the error. Such documentation may take the form of supplier quotations, Bidder work sheets, etc. If Bid bonds were tendered with the Bid, the County may exercise its right of collection.
- c. No Bid may be withdrawn under this Section 9 when the result would be the awarding of the Contract on another Bid of the same Bidder or of another Bidder in which the ownership of the withdrawing Bidder is more than five percent (5%).
- d. If a Bid is withdrawn under the authority of this Section 9 the lowest remaining Bid shall be deemed to be the low Bid.
- e. No Bidder who, is permitted to withdraw a Bid shall, for compensation, supply any material or labor to or perform any subcontract or other work agreement for the person or firm to whom the Contract is awarded or otherwise benefit, directly or indirectly, from the performance of the project for which the withdrawn Bid was submitted.
- f. The County shall notify the Bidder in writing within five (5) business days of its decision regarding the Bidder's request to withdraw its Bid. If the County denies the withdrawal of a Bid under the provisions of this Section 9, it shall State in such notice the reasons for its decision and award the Contract to such Bidder at the Bid price, provided such Bidder is a responsible and responsive Bidder. At the same time that the notice is provided, the County shall return all work papers and copies thereof that have been submitted by the Bidder.
- g. Under these procedures, a mistake shall be proved only from the original work papers, documents and materials delivered as required herein. The work papers, documents and materials submitted by the bidder shall, at the bidder's request, be considered trade secrets or proprietary information subject to the conditions of subsection F of Virginia Code § 2.2-4342.

10. ERRORS IN BIDS: When an error is made in extending total prices, the unit Bid price will govern. Erasures in Bids must be initialed by the Bidder. Carelessness in quoting prices, or otherwise in preparation of the Bid, will not relieve the Bidder. Bidders/Offerors are

cautioned to recheck their Bids for possible error. Errors discovered after public opening cannot be corrected and the Bidder will be required to perform if his or her Bid is accepted.

11. IDENTIFICATION ON BID ENVELOPE: All Bids, Proposals and requested copies thereof submitted to the County shall be in a separate envelope or package, sealed and identified with the following information clearly marked on the outside of the envelope or package:

- a. Addressed as indicated on page 1 of the solicitation;
- b. Solicitation number;
- c. Title;
- d. Bid due date and time;
- e. Bidder's name and complete mailing address (return address); and
- f. Pursuant to Virginia Code § 2.2-4311.2, the Bidder's identification number issued by the State Corporation Commission, or if the bidder is not required to be authorized to transact business in the Commonwealth as a foreign business entity under Title 13.1 or Title 50 or as otherwise required by law shall include in its bids or proposal a statement describing why the bidder or offeror is not required to be so authorized.

If a Bid is not addressed with the information as shown above, the Bidder takes the risk that the envelope may be inadvertently opened and the information compromised, which may cause the Bid to be disqualified. Bids may be hand delivered to the designated location in the County's offices. No other correspondence or other Proposals/Bids should be placed in the envelope. Any Bidder or Offeror that fails to provide the information required in (f) above shall not receive an award unless a waiver is specifically granted by the County Administrator.

12. ACCEPTANCE OF BIDS: Unless otherwise specified, all formal Bids or Proposals submitted shall be valid for a minimum period of one hundred twenty (120) calendar days following the date established for opening or receipt, respectively, unless extend by mutual agreement of the parties. At the end of the one hundred twenty (120) calendar days the Bid/Proposal may be withdrawn at the written request of the Bidder. Thereafter, unless and until the Proposal is withdrawn, it remains in effect until an award is made or the Solicitation is canceled by the County. The County may cancel any Solicitation at any time by notice of such cancelation to the Bidders.

13. COMPLETENESS: To be responsive, a Bid must include all information required by the Solicitation.

14. CONDITIONAL BIDS: Conditional Bids are subject to rejection in whole or in part.

15. RESPONSE TO SOLICITATIONS: In the event a Bidder cannot submit a Bid on a Solicitation, the Bidder is requested to return the Solicitation cover sheet with an explanation as to why the Bidder is unable to Bid on these requirements, or if there be no cover sheet for the Solicitation a letter to the County explaining the same.

- 16. BIDDER INTERESTED IN MORE THAN ONE BID AND COLLUSION:** More than one bid from an individual, firm, partnership, corporation or association under the same or different name will be rejected. Reasonable grounds for believing that a bidder is interested in more than one bid for the work contemplated will cause rejection of all bids in which the bidder is interested. Any or all bids may be rejected if there is any reason for believing that collusion exists among the bidders. Participants in such collusion may not be considered in future bids for the same work. Each bidder, as a condition of submitting a bid, shall certify that he is not a party to any collusive action as herein defined. However, a party who has quoted prices on work, materials, or supplies to a Bidder is not thereby disqualified from quoting prices to other Bidders or firms submitting a Bid directly for the work, materials or supplies.
- 17. BID OPENING:** Pursuant to Virginia Code § 2.2-4301, all Bids received in response to an IFB will be opened at the date, time and place specified, and announced publicly, and made available for inspection as provided in Section 21 of these General Conditions. Proposals received in response to an RFP will be made available for inspection as provided in Section 21 of these General Conditions.
- 18. TAX EXEMPTION:** The County is exempt from the payment of any federal excise or any Virginia sales tax. The price bid must be net, exclusive of taxes. Tax exemption certificates will be furnished if requested by the Bidder.
- 19. DEBARMENT STATUS:** By submitting their Bids, Bidders certify that they are not currently debarred from submitting Bids on Contracts by the County, nor are they an agent of any person or entity that is currently debarred from submitting Bids or Proposals on Contracts by the County or any agency, public entity/locality or authority of the State.
- 20. NO CONTACT POLICY:** No Bidder shall initiate or otherwise have contact related to the Solicitation with any County representative or employee, other than the Purchasing Officer or Purchasing Agent, after the date and time established for receipt of Bids. Any contact initiated by a Bidder with any County representative, other than the Purchasing Officer or Purchasing Agent, concerning this Solicitation is prohibited and may cause the disqualification of the Bidder.
- 21. VIRGINIA FREEDOM OF INFORMATION ACT:** As provided under Virginia Code § 2.2-4342, all proceedings, records, Contracts and other public records relating to procurement transactions shall be open to the inspection of any citizen, or any interested person, firm or corporation, in accordance with the Virginia Freedom of Information Act of Virginia Code §§ 2.2-3700 *et seq.*, except:

- a. Cost estimates relating to a proposed procurement transaction prepared by or for the County shall not be open to public inspection;
- b. Any competitive sealed bidding Bidder, upon request, shall be afforded the opportunity to inspect Bid records within a reasonable time after the opening of Bids but prior to award, except in the event that the County decides not to accept any of the Bids and to reopen the Contract. Otherwise, Bid records shall be open to public inspection only after award of the Contract;
- c. Any competitive negotiation Offeror, upon request, shall be afforded the opportunity to inspect Proposal records within a reasonable time after the evaluation and negotiations of Proposals are completed but prior to award except in the event that the County decides not to accept any of the Proposals and to reopen the Contract. Otherwise, Proposal records shall be open to the public inspection only after award of the Contract;
- d. Any inspection of procurement transaction records under this Section 21 shall be subject to reasonable restrictions to ensure the security and integrity of the records;
- e. Trade secrets or proprietary information submitted by a Bidder, Offeror or Contractor in connection with a procurement transaction shall not be subject to public disclosure under the Virginia Freedom of Information Act; however, the Bidder, Offeror or Contractor must invoke the protections of this Section 21 prior to or upon submission of the data or other materials, and must identify the data or other materials to be protected and State the reasons why protection is necessary; and
- f. Nothing contained in this Section 21 shall be construed to require the County, when procuring by “competitive negotiation” (RFP), to furnish a Statement of reasons why a particular Proposal was not deemed to be the most advantageous to the County.

22. CONFLICT OF INTEREST: Bidder/Contractor certifies by signing any Bid/Contract to/with the County that no conflict of interest exists between Bidder/Contractor and County that interferes with fair competition and no conflict of interest exists between Bidder/Contractor and any other person or organization that constitutes a conflict of interest with respect to the Bid/Contract with the County.

SPECIFICATIONS

23. OMISSIONS OR DISCREPANCIES: Any items or parts of any equipment listed in a Solicitation which are not fully described or are omitted from such specification, and which are clearly necessary for the completion of such equipment and its appurtenances, shall be considered a part of such equipment although not directly specified or called for in the specifications. Should a Bidder find a discrepancy or ambiguity in, or an omission from, the Solicitation, including the drawings and/or specifications, he or she shall so notify the County within twenty-four (24) hours of noting the discrepancy, ambiguity or omission and in any

event no less than five (5) days prior to the date set for the opening of Bids. If necessary, the County will send a written addendum for clarification to all Bidders no later than three (3) days before the date set for opening of Bids. Any notification regarding specifications received less than five (5) days prior to the date set for the opening of Bids may or may not be considered by the County in its sole discretion. The Bidder shall abide by and comply with the true intent of the specifications and not take advantage of any unintentional error or omission, but shall fully complete every part as the true intent and meaning of the specifications and drawings. Whenever the mention is made of any articles, material or workmanship to be in accordance with laws, ordinances, building codes, underwriter's codes, A.S.T.M. regulations or similar expressions, the requirements of these laws, ordinances, etc., shall be construed as to the minimum requirements of these specifications.

24. BRAND NAME OR EQUAL ITEMS: Pursuant to Virginia Code § 2.2-4315, unless otherwise provided in the Solicitation, the name of a certain brand, make or manufacturer does not restrict Bidders to the specific brand, make or manufacturer named; it conveys the general style, type, character, and quality of the article desired, and any article which the County in its sole discretion determines to be the equal of that specified, considering quality, workmanship, economy of operation, and suitability for the purpose intended, shall be accepted. The Bidder is responsible to clearly and specifically indicate the product being offered and to provide sufficient descriptive literature, catalog cuts and technical detail to enable the County to determine if the product offered meets the requirements of the Solicitation. This is required even if offering the exact brand, make or manufacturer specified. Normally in competitive sealed bidding, only the information furnished with the Bid will be considered in the evaluation. Failure to furnish adequate data for evaluation purposes may result in declaring a Bid non-responsive. Unless the Bidder clearly indicates in its Bid that the product offered is "equal" product, such Bid will be considered to offer the brand name product referenced in the Solicitation.

25. FORMAL SPECIFICATIONS: When a Solicitation contains a specification which states no substitutes, no deviation therefrom will be permitted and the Bidder will be required to furnish articles in conformity with that specification.

26. CONDITION OF ITEMS: Unless otherwise specified in the Solicitation, all items shall be new, in first class condition.

AWARD

27. RESPONSIBLE BIDDERS: In determining whether a Bidder is a responsible Bidder as defined herein, at minimum, the following criteria will be considered:

- a. The ability, capacity and skill of the Bidder to perform the Contract or provide the service required under the Solicitation;
- b. Whether the Bidder can perform the Contract or provide the service promptly, or within the time specified, without delay or interference;
- c. The character, integrity, reputation, judgment, experience and efficiency of the Bidder;
- d. The quality of performance of previous Contracts or Services;
- e. The previous and existing compliance by the Bidder with laws and ordinances relating to the Contract or Services;
- f. The sufficiency of the financial resources and ability of the Bidder to perform the Contract or provide the service;
- g. The quality, availability and adaptability of the Goods or Services to the particular use required;
- h. The ability of the Bidder to provide future maintenance and service for the use of the subject of the Contract;
- i. The number and scope of the conditions attached to the Bid;
- j. Whether the Bidder is in arrears to the County on debt or Contract or is a defaulter on surety to the County or whether the Bidder's County taxes or assessments are delinquent; and
- k. Such other information as may be secured by the County, the Purchasing Agent or the Purchasing Officer having a bearing on the decision to award the Contract. If an apparent low Bidder is not awarded a Contract for reasons of nonresponsibility, the County shall so notify that Bidder and shall have recorded the reasons in the Solicitation or Contract file.

28. AWARD OR REJECTION OF BIDS; WAIVER OF INFORMALITIES: The County shall award the Contract to the lowest responsive and responsible Bidder complying with all provisions of the IFB, provided the Bid price is reasonable and it is in the best interest of the County to accept it. Awards made in response to a RFP will be made to the highest qualified Offeror whose Proposal is determined, in writing, to be the most advantageous to the County taking into consideration the evaluation factors set forth in the RFP. The County reserves the right to award a Contract by individual items, in the aggregate, or in combination thereof, or to reject any or all Bids and to waive any informality in Bids received whenever such rejection or waiver is in the best interest of the County. Award may be made to as many Bidders/Offerors as deemed necessary to fulfill the anticipated requirements of the County. The County also reserves the right to reject the Bid if a Bidder is deemed to be a non-responsible Bidder. Pursuant to Virginia Code § 2.2-4319, an IFB, a RFP, any other solicitation, or any and all bids or proposals, may be canceled or rejected by the County at any time. The reasons for cancellation or rejection shall be made part of the contract file. The County shall not cancel or reject an IFB, a RFP, any other solicitation, bid or proposal solely to avoid awarding a contract to a particular responsive and responsible bidder or offeror.

- 29. EXCLUSION OF INSURANCE BIDS PROHIBITED:** Pursuant to Virginia Code § 2.2-4320, notwithstanding any other provision of law or these General Conditions, no insurer licensed to transact the business of insurance in the State or approved to issue surplus lines insurance in the State shall be excluded from presenting an insurance bid proposal to the County in response to a RFP or an IFB; excepting that the County may debar a prospective insurer pursuant to its Debarment Policy, see Chapter 2 of the County's Procurement Policies and Procedures.
- 30. ANNOUNCEMENT OF AWARD:** Upon the award or announcement of the decision to award a Contract as a result of this Solicitation, the County will publicly post such notice on the County's bulletin board located at 72 Main Street, 2nd Floor, Palmyra, Virginia 22963. Award results may also be viewed on the County's website.
- 31. QUALIFICATIONS OF BIDDERS OR OFFERORS:** The County may make such reasonable investigations as deemed proper and necessary to determine the ability of the Bidder to perform the work/furnish the item(s) and the Bidder shall furnish to the County all such information and data for this purpose as may be requested. The County reserves the right to inspect Bidder's physical facilities prior to award to satisfy questions regarding the Bidder's capabilities. The County further reserves the right to reject any Bid or Proposal if the evidence submitted by or investigations of, such Bidder fails to satisfy the County that such Bidder is properly qualified to carry out the obligations of the Contract and to complete the work/furnish the item(s) contemplated therein.
- 32. TIE BIDS AND PREFERENCE FOR VIRGINIA PRODUCTS WITH RECYCLED CONTENT AND FOR VIRGINIA FIRMS:**
- a. Pursuant to Virginia Code § 2.2-4328, in the case of a tie bid on an IFB only, the County may give preference to Goods, Services and construction produced in Fluvanna County or provided by persons, firms or corporations having principal places of business in Fluvanna County. If such choice is not available, preference shall then be given to Goods produced in Virginia, or for goods, services or construction provided by Virginia persons, firms, corporations, pursuant Virginia Code § 2.2-4324. If no County or State choice is available, the tie shall be decided publicly by lot. The decision by the County to make award to one or more such Bidders shall be final.
 - b. Whenever the lowest responsive and responsible bidder is a resident of any other state and such state under its laws allows a resident contractor of that state a percentage preference, a like preference shall be allowed to the lowest responsive and responsible bidder who is a resident of Virginia and is the next lowest bidder. If the lowest responsive and responsible bidder is a resident of any other state and such state under its laws allows a resident contractor of that state a price-matching preference, a like preference shall be allowed to responsive and responsible bidders who are residents of Virginia. If the lowest bidder is a resident contractor of a state with an absolute preference, the bid shall not be considered. The Department of General Services shall post and maintain an updated list on its website of all states with an absolute preference for their resident contractors and those states that allow their resident contractors a percentage preference, including the respective percentage amounts. For

purposes of compliance with this Section 32, the County may rely upon the accuracy of the information posted on this website.

- c. Notwithstanding the provisions of subsections a and b, in the case of a tie bid in instances where goods are being offered, and existing price preferences have already been taken into account, preference shall be given to the bidder whose goods contain the greatest amount of recycled content.
- d. For the purposes of this Section 32, a Virginia person, firm or corporation shall be deemed to be a resident of Virginia if such person, firm or corporation has been organized pursuant to Virginia law or maintains a principal place of business within Virginia.

33. NEGOTIATION WITH LOWEST RESPONSIBLE BIDDER: Pursuant to Virginia Code § 2.2-4318, unless cancelled or rejected, a responsive Bid from the lowest responsible Bidder shall be accepted as submitted, except that if the Bid from the lowest responsible Bidder exceeds available funds, the County may negotiate with the apparent low Bidder to obtain a Contract price within available funds. However, the negotiation may be undertaken only under conditions and procedures described in writing and approved by the County prior to issuance of the IFB and summarized therein.

CONTRACT PROVISIONS

34. APPLICABLE LAW AND COURTS: Any Bid or Contract resulting from a Solicitation and its terms, including, but not limited to, the parties' obligations under it, and the remedies available to each party for breach of it, shall be governed by, construed and interpreted in accordance with the laws of the Commonwealth of Virginia, and exclusive jurisdiction and venue of any dispute or matters involving litigation between the parties hereto shall be in the courts of Fluvanna County, Virginia. Any jurisdiction's choice of law, conflict of laws, rules, or provisions, including those of the Commonwealth of Virginia, that would cause the application of any laws other than those of the Commonwealth of Virginia, shall not apply. The Contractor shall comply with applicable federal, State and local laws, ordinances, rules and regulations in performance of the Contract.

35. PROVISION AND OWNERSHIP OF INFORMATION: The County shall make a good faith effort to identify and make available to the Contractor all non-confidential technical and administrative data in the County's possession which the County may lawfully release including, but not limited to Contract specifications, drawings, correspondence, and other information specified and required by the Contractor and relating to its work under any Contract. The County reserves its rights of ownership to all material given to the Contractor by the County and to all background information documents, and computer software and documentation developed by the Contractor in performing any Contract.

36. DOCUMENTS: All documents, including but not limited to data compilations, drawings, reports and other material, whether in hard copy or electronic format, prepared, developed or

furnished by the Contractor pursuant to any Contract shall be the sole property of the County. At the direction of the County, the Contractor shall have the right to make copies of the documents produced available to other parties. The County shall be entitled to delivery of possession of all documents, upon payment in accordance with the terms of any Contract for the service incurred to produce such documents.

37. CONFIDENTIALITY: Contractor shall not publish, copyright or otherwise disclose or permit to be disclosed or published, the results of any work performed pursuant to this contract, or any particulars thereof, including forms or other materials developed for the County in connection with the performance by Contractor of its services hereunder, without prior written approval of the County. Contractor, cognizant of the sensitive nature of much of the data supplied by the County, shall not disclose any information (other than information which is readily available from sources available to the general public) obtained by it in the course of providing services hereunder without the prior written approval of the County, unless disclosure of such information by it is required by law, rule or regulation or the valid order of a court or administrative agency.

38. INDEPENDENT CONTRACTOR: The Contractor and any agents, or employees of the Contractor, in the performance of any Contract shall act as an independent contractor and not as officers, employees or agents of the County.

39. INSURANCE: The Contractor agrees that, during the period of time it renders services to the County pursuant to any Contract, it shall carry (and provide the County with evidence of coverage) the following minimum amounts of insurance:

Automobile	\$500,000	Liability Medical Payment Comprehensive Collision
Public Liability	\$1,000,000	
Professional Liability	\$1,000,000	
Excess Liability	\$2,000,000	Aggregate Over Above Policy Limits (Excluding Professional Liability)
Worker's Compensation	Amount required by Virginia law	

The Contract may specifically require the Contractor to carry higher minimum amounts of insurance.

In addition, the Contractor shall require, and shall include in every subcontract, that any subcontractor providing any goods or services related to such Contract obtain, and continue to maintain for the duration of the work, workers' compensation coverage in the amount required by Virginia law.

40. KEY PERSONNEL: For the duration of any Contract, the Contractor shall make no substitutions of key personnel unless the substitution is necessitated by illness, death, or termination of employment, or as expressly approved by the County. The Contractor shall notify the County within five (5) calendar days after the occurrence of any of these events and provide the information required by the paragraph below.

The Contractor shall provide a detailed explanation of the circumstances necessitating any proposed substitution, complete resumes for the proposed substitute, and any additional information requested by the County. The proposed substitute should have comparable qualifications to those of the person being replaced. The County will notify the Contractor within fifteen (15) calendar days after receipt of all required information of its approval or disapproval of the proposed substitution.

41. SEVERABILITY: If any term, covenant or provision of these General Conditions or any Contract shall be held to be invalid, illegal or unenforceable in any respect, these General Conditions and any Contract shall remain in effect and be construed without regard to such provision.

42. TITLES: The titles and section headings herein and in any Contract are inserted solely for convenience and are not to be construed as a limitation on the scope of the provisions to which they refer.

43. ATTORNEYS' FEES: In the event of a dispute between the County and Contractor under any Contract which cannot be amicably resolved, in addition to all other remedies, the party substantially prevailing in any litigation shall be entitled to recover its reasonable expenses, including, but not limited to, reasonable attorneys' fees.

44. NO WAIVER: Neither any payment for, nor acceptance of, the whole or any part of the services by the County, nor any extension of time, shall operate as a waiver of any provision of any Contract, nor of any power herein reserved to the County, or any right to damages herein provided, nor shall any waiver of any breach of any Contract be held to be a waiver of any other or subsequent breach. Failure of the County to require compliance with any term or condition of any Contract shall not be deemed a waiver of such term or condition or a waiver of the subsequent enforcement thereof.

45. NO FINANCE CHARGES: No finance charges shall be paid by the County.

46. ANTITRUST: By entering into a Contract, the Contractor conveys, sells, assigns, and transfers to the County all rights, title and interest in and to all causes of the action it may now have or hereafter acquire under the antitrust law of the United States or the State, relating to the particular Goods or Services purchased or acquired by the County under said Contract.

Consistent and continued tie bidding could cause rejection of Bids by the County and/or investigation for antitrust violations.

47. PAYMENT: Pursuant to Virginia Code § 2.2-4352, unless more time is provided in the Solicitation or Contract, payment will be made forty-five (45) days after receipt by the County of a proper invoice, or forty-five (45) days after receipt of all Goods or acceptance of work, whichever is later. The County reserves the right to withhold any or all payments or portions thereof for Contractor's failure to perform in accordance with the provision of the Contract or any modifications thereto. Within twenty (20) days of receipt of proper invoice or of goods or services, the County shall notify the Contractor if any defect or impropriety that would prevent payment by the payment date. The following provisions apply to such payments:

- a. Invoices for items/Services ordered, delivered/performed and accepted shall be submitted by the Contractor in duplicate directly to the payment address shown on the purchase order, Solicitation or Contract, as applicable. All invoices shall show the Contract number, purchase order number, or Solicitation number, as applicable, and as required under Virginia Code § 2.2-4354, either the individual Contractor's social security number or the Contractor's federal employer identification number, whichever is applicable.
- b. Any payment terms requiring payment in less than forty-five (45) days will be regarded as requiring payment forty-five (45) days after receipt of proper invoice or receipt of all Goods or acceptance of work, whichever occurs later. Notwithstanding the foregoing, offers of discounts for payment in less than forty-five (45) days are valid and enforceable.
- c. Pursuant to Virginia Code § 2.2-4353, the date any payment shall be deemed the date of postmark in all cases where payment is made by mail.
- d. The County's fiscal year is July 1 to June 30. Contractors are advised to submit invoices, especially for Goods and/or Services provided in the month of June, for the entire month (i.e. June 1 - June 30), so that expenses are recognized in the appropriate fiscal year.
- e. Any payment made by the Contractor to the County shall only be made in U.S. Dollars. If payment is received in foreign currency the County may, in its sole discretion, reject such payment and require immediate compensation in U.S. Dollars.

48. SUBCONTRACTORS: Pursuant to Virginia Code § 2.2-4354, in the event that any subcontractors are used by Contractor in connection with the work, Contractor shall:

- a. Within seven (7) days after receipt of amounts paid to the Contractor for work performed by a subcontractor, either:
 - i. Pay the subcontractor for the proportionate share of the total payment received attributable to the work performed by the subcontractor under any Contract; or

- ii. Notify the County and subcontractor, in writing, of his intention to withhold all or a part of the subcontractor's payment with the reason for nonpayment.
- b. Contractor shall require each subcontractor to provide either (i) for an individual, their social security numbers, or (ii) for proprietorships, partnerships, and corporations to provide their federal employer identification numbers.
- c. The Contractor shall pay interest to any subcontractor on all amounts owed by the Contractor that remain unpaid after seven days following receipt by the Contractor of payment from the County for work performed by the subcontractor under any Contract, except for amounts withheld as allowed in subdivision (a)(II) above. Unless otherwise provided under the terms of any Contract, interest shall accrue at the rate of one percent (1%) per month.
- d. The Contractor shall include in each of its subcontracts under any Contract a provision requiring each subcontractor to include or otherwise be subject to the above payment and interest requirements (a), (b) and (c) with respect to each lower tier subcontractor.
- e. The Contractor's obligation to pay an interest charge to a subcontractor pursuant to the payment clause in this Section 48 shall not be construed to be an obligation of the County. No Contract modification may be made for the purpose of providing reimbursement for such interest charge. No cost reimbursement claim may include any amount for reimbursement for such interest charge.

49. RETAINAGE ON CONSTRUCTION CONTRACTS: Pursuant to Virginia Code 2§ 2.2-4333, if a Contract for construction provides for progress payments in installments based upon an estimated percentage of completion, then the contractor shall be paid at least ninety-five percent (95%) of the earned sum when payment is due, with no more than five percent (5%) being retained to ensure faithful performance of the contract. All amounts withheld may be included in the final payment. Any subcontract related to work on a Contract that provides for similar progress payments shall be subject to the provisions above and the Contractor agrees to include such provisions in every subcontract.

50. SUCCESSORS AND ASSIGNS: The County and the Contractor bind themselves and their respective successors and assigns to any Contract. The foregoing notwithstanding, the Contractor shall not assign, sublet or transfer its interest in any Contract without the prior written consent of the County, which may be granted or withheld in the County's sole discretion. Nothing hereinafter mentioned shall be construed as creating any personal liability on the part of any officer, agent or employee of the County, nor shall it be construed as giving any benefits hereunder to anyone other than the County and the Contractor.

51. DEFAULT: Failure of a Contractor to deliver Goods or Services in accordance with Contract terms and conditions and/or within the time specified, or within reasonable time as interpreted by the County in its sole discretion, or failure to make replacements/corrections of rejected articles/services when so requested, immediately or as directed by the County, or

failure of the Contractor to act in accordance with the Contract in any material respect, as reasonably determined by the County, shall constitute a "default" by the Contractor and shall further authority for the County to purchase in the open market articles/services of comparable grade/quality to replace the services, articles rejected, and/or not delivered. On all such purchases, the Contractor shall reimburse the County, within a reasonable time specified by the County, for any expense incurred in excess of Contract prices including, but not limited to, any purchase and administrative costs. Such purchases shall be deducted from the Contract quantities, if applicable. Should public necessity demand it, the County reserves the right to use or consume articles delivered or services performed which are substandard in quality, subject to an adjustment in price to be determined by the County. In case of any default, the County, after due oral or written notice if required in accordance with the Contract, may terminate the Contract at its option in its sole discretion effective immediately. These remedies shall be in addition to any other remedies which the County may have, including but not limited to, any remedies at law, under the Contract or in equity.

Notwithstanding the foregoing, the Contractor shall not be liable for damages for delay in shipment or failure to deliver when such delay or failure is the result of fire, flood, strike, act of God, act of Government, act of an alien enemy or by any other circumstances which, in the County's opinion, are beyond the control of the Contractor. Under such circumstances, however, the County may, at its sole discretion, terminate or cancel the Contract effective immediately.

52. NON-DISCRIMINATION ASSURANCES: The Contractor shall conform to the provisions of the Federal Civil Rights Act of 1964, as amended, as well as the Virginia Fair Employment Act of 1975, as amended, where applicable, and § 2.2-4311 of the Virginia Procurement Act:

- a. During the performance of any Contract, the Contractor agrees as follows: the Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability, or other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the Contractor. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause. The Contractor, in all Solicitations or advertisements for employees placed by or on behalf of the Contractor, will state that such Contractor is an equal opportunity employer. Notices, advertisements and Solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this Section 52.
- b. The Contractor shall include the provisions of paragraph (a) above in every subcontract or purchase over \$10,000.00 so that the provisions will be binding upon each subcontractor or Vendor.

53. MODIFICATION:

- a. Pursuant to Virginia Code § 2.2-4309, these General Conditions and any Contract entered into by the County and any Contractor shall not be subject to change, modification, or discharge except by written instrument signed by the County and Contractor, but no fixed-price contract may be increased by more than twenty-five percent (25%) of the amount of the contract or \$50,000, whichever is greater, without the advance written approval of the County's Board. In no event may the amount of any contract, without adequate consideration, be increased for any purpose, including, but not limited to, relief of an offeror from the consequences of an error in its bid or offer.
- b. The County may, but is not obligated to, extend the term of an existing contract for services to allow completion of any work undertaken but not completed during the original term of the contract.
- c. Nothing in this Section 53 shall prevent the County from placing greater restrictions on contract modifications.

54. INDEMNIFICATION: Contractor agrees to indemnify, keep and save harmless the County, its officers, agents, officials, employees and volunteers against any and all claims, claims of injuries, death, damage to property, patent claims, suits, liabilities, judgments, losses, costs and expenses, including but not limited to costs of investigation, all reasonable attorneys' fees (whether or not litigation results), and the cost of any appeal, occurring or arising in connection with the Contractor's, its agents', subcontractors', employees', or volunteers' negligence or wrongful acts or omissions in connection with its performance of any Contract. The Contractor shall, at his or her own expense, appear, defend and pay all charges of attorneys and all costs and other expenses arising therefrom or incurred in connection therewith; and if any judgment shall be rendered against the County in any such action, the Contractor shall, at his or her own expenses, satisfy and discharge the same. Contractor expressly understands and agrees that any performance bond or insurance protection required by any Contract, or otherwise provided by the Contractor, shall in no way limit the responsibility to indemnify, keep and save harmless and defend the County as herein provided. Nothing contained in this Solicitation or the Contract shall be deemed to be a waiver of the County's sovereign immunity.

55. DRUG-FREE WORKPLACE: Pursuant to Virginia Code § 2.2-4312, in every Contract over \$10,000.00 the following provisions apply: During the performance of any Contract, the Contractor agrees to (i) provide a drug-free workplace for the Contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a Statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the Contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all Solicitations or advertisements for employees placed by or on behalf of the Contractor that the Contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.

For the purposes of this Section, “*drug-free workplace*” means a site for the performance of work done in connection with a specific Contract awarded to a Contractor in accordance with this the VPPA and the County’s Procurement Procedures, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the Contract.

56. TERMINATION: Contracts will remain in force for full periods specified and/or until all articles ordered before date of termination shall have been satisfactorily delivered and accepted and thereafter until all requirements and conditions shall have been met, unless:

- a. Terminated prior to expiration date by satisfactory deliveries of entire Contract requirements;
- b. Terminated by the County upon thirty (30) days written notice to the Contractor at the County’s convenience in the County’s sole discretion (“termination for convenience”), unless a termination for convenience is specifically and expressly prohibited by the Contract. Any Contract cancellation notice shall not relieve the Contractor of the obligation to deliver and/or perform on all outstanding orders issued prior to the effective date of the termination;
- c. Terminated by the County for cause, default or negligence on the part of the Contractor. However, pursuant to Section 51 of these General Conditions, the County may hold the Contractor responsible for any resulting additional purchase and administrative costs. There is no advance notice requirement in the event of Termination for Cause and termination is effective immediately upon notice to Contractor of the termination for cause;
- d. Extended upon written authorization of County and accepted by Contractor, to permit ordering of unordered balances or additional quantities at Contract prices and in accordance with Contract terms.

57. APPROPRIATIONS: Notwithstanding any other provision of any Contract, the payment of the County's obligations under any Contract shall be subject to annual appropriations by the Board of Supervisors of the County in each fiscal year of monies sufficient to satisfy the same.

58. REFERENCES TO VIRGINIA LAW: Any reference in these General Conditions to the Code of Virginia or other relevant Federal, State or local law is incorporated in whole herein by reference as in effect at the time of the Solicitation or Contract as such statutory provisions may be amended or replaced by any statute dealing with the same or similar subject matter.

59. COOPERATIVE PROCUREMENT: Except as prohibited by the current Code of Virginia, all resultant Contracts will be extended to other Public Bodies of the Commonwealth of Virginia, to permit their ordering of Goods, supplies and/or Services at the prices and terms of the resulting Contract (“cooperative procurement”). By submitting any Bid or entering into

any Contract with the County a Bidder/Contractor expressly authorizes cooperative procurement under Virginia Code § 2.2-4304 to the full extent permitted by law. If any other public body decides to use any Contract, the Contractor must deal directly with that public body concerning all matters relating thereto, including but not limited to, the placement or orders, issuance of the purchase order, contractual disputes, invoicing and payment. The County acts only as the "Contracting Agent" for these public bodies. Any resulting contract with other public bodies shall be governed by the laws of that specific entity. It is the Contractor's responsibility to notify the public bodies of the availability of the Contract. Fluvanna County shall not be held liable for any direct or indirect costs, damages or other claim of any kind incurred by another public body or any Contractor as a result of any cooperative procurement.

60. AUDIT: The Contractor hereby agrees to retain all books, records and other documents relative to any Contract for five (5) years after final payment, or until audited by the County, whichever is sooner. The County, its authorized agents, and/or County auditors shall have full access to and right to examine any of said materials during said period.

61. GUARANTIES AND WARRANTIES: All guarantees, representations and warranties required shall be furnished by the Contractor and shall be delivered to the Purchasing Agent before final payment on any Contract is made. In addition to any guarantees, representations and warranties required under the Contract, the Contractor agrees to:

- a. Save the County, its agents and employees harmless from liability of any nature or kind for the use of any copyrighted or un-copyrighted composition; secret process, patented or unpatented; invention; article or appliance furnished or used in the performance of a Contract for which the Contractor is not the patentee, assignee, licensee or owner;
- b. Protect the County against latent defective material or workmanship and to repair or replace any damages or marring occasioned in transit or delivery;
- c. Furnish adequate protection against damage to all work and to repair damages of any kind to the building or equipment, to the Contractor's own work or to the work of other contractors, for which the Contractor's workers are responsible;
- d. Pay for all permits, licenses and fees and give all notices and comply with all laws, ordinances, rules and regulations of the County; and
- e. Protect the County from loss or damage to County owned property while it is in the custody of the Contractor;
- f. At minimum supply all Goods or Services with the manufacturer's standard warranty, if applicable; and
- g. For any Contract involving Services of any nature, the Contractor further agrees to:

- i. Enter upon the performance of Services with all due diligence and dispatch, assiduously press to its complete performance, and exercise therein the highest degree of skill and competence;
- ii. Allow Services to be inspected or reviewed by an employee of the County at any reasonable time and place selected by the County;
- iii. Acknowledges that the County shall be under no obligation to compensate Contractor for any Services not rendered in strict conformity with the Contract; and
- iv. Stipulates that the presence of a County Inspector shall not lessen the obligation of the Contractor for performance in accordance with the Contract requirements, or be deemed a defense on the part of the Contractor for infraction thereof. The Inspector is not authorized to revoke, alter, enlarge, relax, or release any of the requirements of any Contract. Any omission or failure on the part of the Inspector to disapprove or reject any work or material shall not be construed to be an acceptance of any such defective work or material.

62. PRICE REDUCTIONS: If at any time after the date of the Bid/Contract the Contractor makes a general price reduction in the comparable price of any material covered by the Contract to customers generally, an equivalent price reduction based on similar quantities and/or considerations shall apply to any Contract for the duration of the Contract period (or until the price is further reduced). Such price reduction shall be effective at the same time and in the same manner as the reduction in the price to customers generally. For purpose of this provision, a "general price reduction" shall mean any horizontal reduction in the price of an article or service offered (1) to Contractor's customers generally, or (2) in the Contractor's price schedule for the class of customers, i.e., wholesalers, jobbers, retailers, etc., which was used as the basis for bidding on this Solicitation. An occasional sale at a lower price, or sale of distressed merchandise at a lower price, would not be considered a "general price reduction" under this provision. The Contractor shall submit his or her invoice at such reduced prices indicating on the invoice that the reduction is pursuant to the "Price Reduction" provision of the Contract documents. The Contractor in addition will within ten (10) days of any general price reduction notify the County of such reduction by letter. FAILURE TO DO SO IS A DEFAULT UNDER THE CONTRACT AND MAY RESULT IN TERMINATION OF THE CONTRACT IN THE COUNTY'S DISCRETION. The Contractor, if requested, shall furnish, within ten (10) days after the end of the Contract period, a statement certifying either (1) that no general price reduction, as defined above, was made after the date of the Bid or Contract, or (2) if any such general price reductions were made, that as provided above, they were reported to the County within ten (10) days and the County was billed at the reduced prices. Where one or more such general price reductions were made, the statement furnished by the Contractor shall include with respect to each price reduction (1) the date when notice of any such reduction was issued, (2) the effective date of the reduction, and (3) the date when the County was notified of any such reduction.

63. COMPLIANCE WITH IMMIGRATION LAW: Pursuant to Virginia Code § 2.2-4311.1, in every Contract the following provision applies: the Contractor does not, and shall not

during the performance of the Contract, knowingly employ an unauthorized alien as defined in the federal Immigration Reform and Control Act of 1986.

64. VIRGINIA STATE CORPORATION COMMISSION: Pursuant to Virginia Code § 2.2-4311.2, Any Bidder or Contractor organized as a stock or non-stock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership shall be authorized to transact business in the Commonwealth as a domestic or foreign business entity if so required by Title 13.1 or Title 50 of the Code of Virginia, or as otherwise required by law, at the time of the Bid, Proposal or any response to Solicitation and during the term of the Contract and any Contract renewal. The Contractor shall not allow its existence to lapse or its certificate of authority or registration to transact business in the Commonwealth, if so required, to be revoked or cancelled at any time during the term or any renewal of the Contract. If the Contractor fails to remain in compliance with the provisions of this Section 64, the Contract may become void at the option of the County.

65. CLAIMS PROCEDURE:

- a. The procedure for consideration by the County of contractual claims for any Contract shall be that set forth in Virginia Code § 15.2-1243, *et seq.*
- b. In addition, pursuant to Virginia Code § 2.2-4364, contractual claims, whether for money or other relief, shall be submitted in writing to the County Administrator no later than sixty (60) days after final payment; however, written notice of the Contractor's intention to file such claim shall have been given at the time of the occurrence or beginning of the work upon which the claim is based. Nothing herein shall preclude a Contract from requiring submission of an invoice for final payment within a certain time after completion and acceptance of the work or acceptance of the Goods. Pendency of claims shall not delay payment of amount agreed due in the final payment.
- c. No written decision denying a claim or addressing issues related to the claim shall be considered a denial of the claim unless the written decision is signed by the Board or the County Administrator. The contractor may not institute legal action prior to receipt of the final written decision on the claim unless the County fails to render a decision within ninety (90) days of submission of the claim. Failure of the County to render a decision within ninety (90) days shall not result in the contractor being awarded the relief claimed or in any other relief or penalty. The sole remedy for the County's failure to render a decision within 90 days shall be the contractor's right to institute immediate legal action.
- d. A Contractor may not institute legal action, prior to receipt of the County's decision on the claim, unless the County fails to render such decision within the time specified by law. A failure by the County to render a decision within the time provided by law shall be deemed a final decision denying the claim by the County.

- e. The decision of the Board or the County Administrator shall be final and conclusive unless the Contractor appeals within six (6) months of the date of the final written decision by instituting legal action as provided in Virginia Code § 2.2-4364.
- f. No administrative appeals procedure pursuant to Virginia Code § 2.2-4365 has been adopted for contractual claims by the County.
- g. Nothing herein shall be construed to prevent the County from instituting legal action against any Contractor or Bidder.

66. NOTICES: All written notices required or permitted under any Solicitation, Bid or Contract shall be deemed sufficient if delivered in person to the County Purchasing Agent or Bidder/Contractor, as applicable, or sent by first class mail to the County or Bidder/Contractor at the addresses set forth in the Solicitation, Bid or Contract or at such other address as a party may designate from time to time by notice given in accordance with the terms of this Section 66; except that where a Solicitation, Bid or Contract expressly requires notice to a specific individual or at a specific location, such shall control. Such notices are deemed received when actually delivered to the party or its representative or agent if hand delivered, or one (1) business day after deposited into the United States mail, if mailed.

DELIVERY

67. SHIPPING INSTRUCTIONS-CONSIGNMENT: Unless otherwise specified in the Solicitation or Contract, as applicable, each case, crate, barrel, package, etc., delivered under the Contract must be plainly stenciled or securely tagged, stating the Contractor's name, purchase order number, and delivery address as indicated in the order. Where shipping containers are to be used, each container must be marked with the purchase order number, name of the Contractor, the name of the item, the item number, and the quantity contained therein. Deliveries must be made within the hours of 8:00 a.m. – 3:00 p.m. Deliveries at any other time will not be accepted unless specific arrangements have been previously made with the designated individual at the delivery point. No deliveries will be accepted on Saturdays, Sundays and holidays unless previous arrangements have been made. It shall be the responsibility of the Contractor to insure compliance with these instructions for items that are drop-shipped.

68. RESPONSIBILITY FOR SUPPLIES TENDERED: The Contractor shall be responsible for the materials or supplies covered by the Contract until they are delivered at the designated point. The Contractor shall additionally bear all risk on rejected materials or supplies after notice of rejection is tendered by the County. Rejected materials or supplies must be removed by and at the expense of the Contractor promptly after notification of rejection, unless public health and safety require immediate destruction or other disposal of rejected delivery. If rejected materials are not removed by the Contractor within ten (10) days after date of notification, the County may return the rejected materials or supplies to the Contractor at the Contractor's risk and expense or dispose of them as abandoned property.

- 69. INSPECTIONS:** The County reserves the right to conduct any test/inspection it may deem advisable to assure supplies and Services conform to the specification in the Solicitation, Bid or Contract, as applicable. Inspection and acceptance of materials or supplies will be made after delivery at destinations herein specified unless otherwise stated. Unless otherwise specified in the Contract, if inspection is made after delivery at the destination specified, the County will bear the expense of inspection except for the value of samples used in case of rejection. Final inspection shall be conclusive except in regard to latent defects, fraud or such gross mistakes as to amount to fraud. Final inspection and acceptance or rejection of the materials or supplies will be made as promptly as practicable, but failure to inspect and accept or reject materials or supplies shall not impose liability on the County for such materials or supplies as are not in accordance with the specifications.
- 70. COMPLIANCE:** Delivery must be made as ordered and in accordance with the Solicitation, Bid or Contract, as applicable, or as directed by the County when not in conflict with the Bid/Contract. The decision as to reasonable compliance with delivery terms shall be final. Burden of proof of delay in receipt of Goods by the purchaser shall rest with the Contractor. Any request for extension of time of delivery from that specified must be approved by the County, such extension applying only to the particular item or shipment affected. Unless otherwise specified in the Contract, should the Contractor be unreasonably delayed by the County, there shall be added to the time of completion a time equal to the period of such delay caused by the County. However, the Contractor shall not be entitled to claim damages or extra compensation for such delay or suspension. These conditions may vary for construction Contracts.
- 71. POINT OF DESTINATION:** All materials shipped to the County must be shipped F.O.B. DESTINATION unless otherwise stated specifically in the Solicitation, Bid or Contract, as applicable. The materials must be delivered to the "Ship To" address indicated on the purchase order or Solicitation, as applicable.
- 72. REPLACEMENT:** Materials or components that have been rejected by the County, in accordance with the terms of the Contract, shall be replaced by the Contractor at no cost to the County.
- 73. DAMAGES:** Any and all damages to property of the "County" that is the direct result of the Contractor, the employees of the Contractor and/or its subcontractors, agents, licensees, successors, or assigns, shall be the sole responsibility of the Contractor. The property shall be repaired to its last known condition prior to the damages and/or replaced at no cost to the County. The County shall approve any and all repairs/replacements prior to acceptance of the repairs/replacement.
- 74. PACKING SLIPS OR DELIVERY TICKETS:** All shipments shall be accompanied by Packing Slips or Delivery Tickets and shall contain the following information for each item delivered:
- a. Purchase Order Number;

- b. Name of Article and Stock Number;
- c. Quantity Ordered;
- d. Quantity Shipped;
- e. Quantity Back Ordered; and
- f. The Name of the Contractor.

Contractors are cautioned that failure to comply with these conditions shall be considered sufficient reason for refusal to accept the Goods.

75. ADDITIONAL CHARGES: No delivery charges of any kind shall be added to any invoice; except that (i) if Goods are expressly bought F.O.B. "shipping point" under the Contract and the Contractor prepays transportation, then delivery charges shall be added to invoices; and (ii) if express delivery is authorized and substituted by the County on orders for the method specified in the Contract, then the difference between freight or mail and express charges may be added to invoice.

76. METHOD AND CONTAINERS: Unless otherwise specified, Goods shall be delivered in commercial packages in standard commercial containers, so constructed as to ensure acceptance by common or other carrier for safe transportation to the point of delivery. Containers become the property of the County unless otherwise specified by bidder.

Exhibit A2

INSTRUCTION TO BIDDERS

This document is based off of EJCDC C-200 Suggested Instructions to Bidders for Construction Contracts, but is substantially modified.

ARTICLE 1 – DEFINED TERMS

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

A. *Issuing Office* – The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

B. *Engineer*:

Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060

C. Issuing Office shall be:

County of Fluvanna
Cyndi Toler, Purchasing Officer
132 Main Street
P.O. Box 540
Palmyra, VA 22963
Ph: (434) 591-1930 ext. 1124
Email: ctoler@fluvannacounty.org

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents are available on the eVA website and the County of Fluvanna’s website at: <https://www.fluvannacounty.org/rfps>.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder’s qualifications to perform the Work, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and any other data as indicated in Article 7 of the Bid Form.

3.02 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder’s

representations and certifications.

ARTICLE 4 – EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 *Subsurface and Physical Conditions*

A. The Supplementary Conditions identify:

1. Geotechnical Report by Schnabel Engineering, dated February 9, 2018, titled “Geotechnical Engineering Report – Revision No. 1 Zion Crossroads Water and Sewer Utility Alignment Route 250 and Route 15 Fluvanna County, Virginia” is included in the Appendix of this Project Manual.

4.02 *Underground Facilities*

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

4.03 *Hazardous Environmental Condition*

A. There are no known reports or drawings to Owner relating to a Hazardous Environmental Condition identified at the Site.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 4.06 of the General Conditions.

4.05 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all Applicable Laws and Regulations relative to excavation and utility locates.

4.06 A. Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of contract documents (other than portions thereof related to price) for such other work.

4.07 It is the responsibility of each Bidder before submitting a Bid to:

- A. examine and carefully study the Bidding Documents, and the other related data identified in the Bidding Documents;
 - B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
 - C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;
 - D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in Paragraph 4.02 of the Supplementary Conditions as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in the Paragraph 4.06 of the Supplementary Conditions as containing reliable "technical data";
 - E. consider the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site and the Bidding Documents; with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs;
 - F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;
 - G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
 - H. promptly give the County written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by the County is acceptable to Bidder; and
 - I. determine the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- 4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given the County written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by the County are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.
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ARTICLE 5 – PRE-BID CONFERENCE

- 5.01 A pre-Bid conference will be held at the time and location indicated on the advertisement for bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 – SITE AND OTHER AREAS

- 6.01 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to the County in writing on. Interpretations or clarifications considered necessary by the County in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by the County as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner.

ARTICLE 8 – BID SECURITY

- 8.01 Pursuant to Virginia Code Section 2.2-4336, a Bid must be accompanied by Bid security in an amount of 5 percent of Bidder's maximum Bid price and in the form of Bid bond insuring the Owner (on the form attached) issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions, the County's General Terms and Virginia law.
- 8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.
- 8.03 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 – CONTRACT TIMES

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

ARTICLE 10 – LIQUIDATED DAMAGES

- 10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND “OR-EQUAL” ITEMS

- 11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or “or-equal” items. Whenever it is specified or described in the Bidding Documents that a substitute or “or-equal” item of material or equipment may be furnished or used by Contractor if acceptable to the Owner, application for such acceptance will not be considered by the Owner until after the Effective Date of the Agreement.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS AND OTHERS

- 12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner, after due investigation, has reasonable objection consistent with the Virginia Public Procurement Act to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute without an increase in the Bid.
- 12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities so long as such is consistent with the Virginia Public Procurement Act. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.

ARTICLE 13 – PREPARATION OF BID

- 13.01 The Bid Form is included with the Bidding Documents. See the County’s General Terms for additional requirements.
- 13.02 All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each Bid item listed therein. In the case of optional alternatives the words “No Bid,” “No Change,” or “Not Applicable” may be entered.
- 13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president
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- or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown.
- 13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.
- 13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.
- 13.06 A Bid by an individual shall show the Bidder's name and official address.
- 13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.
- 13.08 All names shall be printed in ink below the signatures.
- 13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 13.10 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
- 13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state of Virginia, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 – BASIS OF BID; COMPARISON OF BIDS

14.01 *Lump Sum*

- A. Bidders shall submit a Bid on a lump sum basis as set forth in the Bid Form.

14.02 *Unit Price*

- A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule if any as listed in the Bid Form.
- B. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.
- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the method that results in a lower price to the Owner. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the method that results in a lower price to the Owner.

14.03 *Allowances – Not Applicable*

14.04 *Completion Time Comparisons – Not Applicable*

ARTICLE 15 – SUBMITTAL OF BID

- 15.01 With each copy of the Bidding Documents, a Bidder is furnished one copy of the Bid Form and the Bid Bond Form. The copy of the Bid Form is to be completed and submitted with the Bid security and the following documents as per Article 7 of the Bid Form.
- 15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation “BID ENCLOSED.” This shall be in addition to any requirements of the County’s General Terms.

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

- 16.01 See the County’s General Terms.

ARTICLE 17 – OPENING OF BIDS

- 17.01 See the County’s General Terms.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period. Also see the County’s General Terms.

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder so long as consistent with applicable law including without limitation the Virginia Public Procurement Act. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.
- 19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.
- 19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
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- 19.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.
- 19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work in accordance with the Contract Documents.
- 19.06 Also see the County's General Terms.

ARTICLE 20 – CONTRACT SECURITY AND INSURANCE

- 20.01 The County's General Terms and also Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds.

ARTICLE 21 – SIGNING OF AGREEMENT

- 21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement along with the other Contract Documents which are identified in the Agreement as attached thereto. Within 15 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within ten days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.
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Exhibit A3

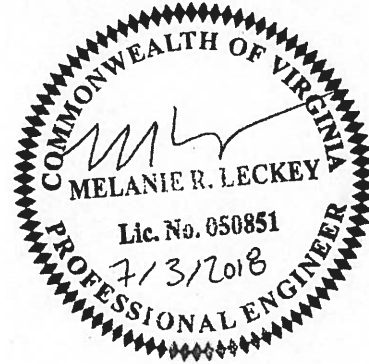
ADDENDUM NO. 1

TO: All Bid Document Holders

FROM: Melanie Leckey, P.E.

DATE: July 3, 2018

RE: ZION CROSSROADS WATER AND SEWER SYSTEM
FLUVANNA COUNTY DEPARTMENT OF PUBLIC WORKS
ITB NO. 2018-03



The following additions, corrections, clarifications and/or changes to the Contract Documents are to be made:

1. **Change:** Replace Specification Section Division 00, Invitation for Bid (IFB) #2018-03, First Paragraph in its entirety with the following:
 "All sealed bids shall be turned in no later than 2:00 p.m. EST, August 31, 2018. All bids that are delivered via mail or are hand delivered must be addressed to the "Procurement Contact" listed above. Any Bids that are turned in late will be rejected and returned unopened. Any Bids sent in via facsimile, telephone, or email shall not be considered.
Bids will be publically opened on August 31, 2018 at 3:00 p.m. EST at Fork Union Community Center, 5725 James Madison Highway, Fork Union VA 23055"
2. **Change:** Replace Specification Section Division 00, Agreement, Paragraph 6.02 in its entirety with the following:
 - A. In lieu of payment in full at completion and if specifically requested by Contractor in its Bid, Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment after competition of those milestones identified in an attachment to this Agreement and submitted by the Contractor in their Bid ("Schedule of Values"), but such progress payments shall only be up to those limits in Paragraph 6.02.A.1 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the General Conditions. Such payments shall be made in accordance with Section 47 "Payment" of the County's General Terms, defined below in Section IV, and in no event, shall Contractor be paid prior to the completion date of each Schedule of Value on the Project. Contractor shall submit an invoice on the Application for Payment in accordance with Article 14 to the Owner upon completion of each schedule of values item and the Owner shall pay a proper invoice within forty-five days of receipt. Payment in full under for all of the Work will be made after final completion of the work. Contractor shall only submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Owner as provided in the General Conditions and the County's General Terms.
 1. In no event will progress payments made to the Contractor for Schedule of Value Items exceed either:

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Fluvanna County Department of Public Works
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- a. 95 percent of Work completed (with the balance being retainage). If the character and progress of the Work have not been satisfactory to Owner and Engineer, then additional retainage will apply; and
 - b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
 - c. The above retainage will only be paid to the Contractor upon final completion to the sole satisfaction of the Owner after proper invoice to the Owner consistent with Section 6.01 above.
 - d. Schedule of Value Items may be identified in a schedule by the Contractor that references dates each Item will be completed within x number of days of the date the Contract Times commerce under the Article 2.03 of the General Conditions.
3. **Clarification:** Drawing C1.0, Erosion and Sediment Control Narrative:
 There shall not be more than one (1.0) acre of land disturbance occurring on a daily basis. This restriction applies to the entire project as a whole, regardless of the number of crews working at different locations along the project at the same time. Disturbed land that has received erosion and sediment control measures (i.e. seed and straw per VESCH Standards) does not apply to this acreage limit.
 4. **Change:** Drawing C2.5, Details "COMBINATION AIR RELEASE/VACUUM VALVE MANHOLE (10" FORCE MAIN" and "COMBINATION AIR RELEASE/VACUUM VALVE MANHOLE (8" FORCE MAIN)":
 Combination air release valves shall be 2" instead of 1". This applies to all combination air release valves for the entire force main.
 5. **Change:** Replace Drawing FM1.18 with attached revised drawing. Records of an existing drainfield and drainfield force main were provided to the County for the property PID 5-24-11. The proposed force main was rerouted to the south of this system based on the supplied records. The location of the drainfield shown on the revised drawing is approximate only and the Contractor will be responsible for horizontally and vertically locating the drainfield and drainfield force main prior to starting construction in this area. Contractor shall notify the County and Engineer immediately if actual conditions vary from those shown. This realignment resulted in approximately 80 LF less of 8" force main and the removal of five (5) horizontal bends.
 6. **Change:** Replace Specification Section Division 00, Bid Form in its entirety with the attached Bid Form.
 7. **Change:** Replace Specification Section Division 00, Invitation for Bid, Part 1 General Information, 1st Paragraph, 3rd Sentence in its entirety with the following:
 "The project consists of the installation of approximately 22,921 lf of 12" waterline, 9,825 lf of 10" force main, 12,332 lf of 8" force main, including multiple directional drills and horizontal bores installing casing pipe and carrier pipe, all necessary valves, appurtenances and connections to the existing 12" water line near the intersection of Route 250 and Route 15."

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Page 3 of 3

8. **Change:** Replace Specification Section 01010 Summary of Work, Section 1.1, A, 1, 2nd Sentence in its entirety with the following:
 "The Zion Crossroads Water and Sewer System Project consists of the installation of approximately 22,921 lf of 12" waterline, 9,825 lf of 10" force main, 12,332 lf of 8" force main, including multiple directional drills and horizontal bores installing casing pipe and carrier pipe, all necessary valves, appurtenances and connections to the existing 12" water line near the intersection of Route 250 and Route 15."
9. **Change:** Replace Drawing C1.0, Erosion and Sediment Control Narrative, Project Description , 1st Sentence in its entirety with the following:
 "The Zion Crossroads Water and Sewer System Project consists of the installation of approximately 22,921 lf of 12" waterline, 9,825 lf of 10" force main, 12,332 lf of 8" force main, including multiple directional drills and horizontal bores installing casing pipe and carrier pipe, all necessary valves, appurtenances and connections to the existing 12" water line near the intersection of Route 250 and Route 15."
10. **Change:** Specification Section Division 00, Invitation for Bid, Appendix I "General Terms, Conditions, and Instruction to Bidders and Contractors" Part 12 replace in its entirety with the following:
 "ACCEPTANCE OF BIDS: Unless otherwise specified, all formal Bids or Proposals submitted shall be valid for a minimum period of ninety (90) calendar days following the date established for opening or receipt, respectively, unless extend by mutual agreement of the parties. At the end of the ninety (90) calendar days the Bid/Proposal may be withdrawn at the written request of the Bidder. Thereafter, unless and until the Proposal is withdrawn, it remains in effect until an award is made or the Solicitation is canceled by the County. The County may cancel any Solicitation at any time by notice of such cancelation to the Bidders."
11. **Clarification:** Fusible C900 PVC will not be accepted as an alternative pipe material.
12. **Clarification:** Specification Section 02665, 2.4 Joint Restraint for PVC Pipe:
 Required restrained joint lengths are shown on the profile for the waterline and force main sheets. All joints must be restrained between the "START RES. JOINTS STA. XX+XX.XX" and "END RES. JOINTS STA. XX+XX.XX" text callouts where "XX+XX.XX" is the stationing as shown on the individual profile sheets.
13. Enclosed is the attendance list from the Pre-Bid Conference held on June 27, 2018.

Attachments:

- Specification Section Division 00 Bid Form
- Drawing FM1.18
- Pre-Bid Conference – Attendance List

All other parts of the Contract Documents remain unaltered by this Addendum. Bidders must acknowledge receipt of this Addendum on the Bid Form.

END OF ADDENDUM NO. 1

BID FORM

This document is based off of EJCDC C-410 Suggested Bid Form for Construction Contracts, but is modified.

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

Fluvanna County
P.O. Box 540
Fluvanna, VA 22963

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

ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER’S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

<u>Addendum No.</u>	<u>Addendum Date</u>
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions, if any, at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in SC-4.02 as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in SC-4.06 as containing reliable "technical data."

- E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.
- F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
 - B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
 - C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
 - D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
 - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
 - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
-

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):



Item No.	Description	Unit	Est. Qty.	Bid Unit Price	Bid Price
1	Furnish and Install 12-inch Water main	LF	21,491		
2	Directional Drill Complete with 14-inch HDPE Carrier (No Casing)	LF	621		
3	Horizontal Bore Complete with 24-inch Steel Casing and 12-inch DI Carrier	LF	809		
4	Furnish and Install 12-inch Gate Valve	Each	55		
5	Furnish and Install Fire Hydrant Assembly (includes 6-inch Gate Valve)	Each	35		
6	Furnish and Install Water Quality Monitoring Station	Each	4		
7	12"x12" Tapping Sleeve and Valve	Each	2		
8	Furnish and Install 10-inch Force main	LF	9,325		
9	Directional Drill Complete with 12-inch HDPE Carrier (No Casing)	LF	375		
10	Horizontal Bore Complete with 18-inch Steel Casing and 10-inch DI Carrier	LF	125		
11	Furnish and Install 10-inch Plug Valve	Each	4		
12	Furnish and Install 8-inch Force main	LF	11,784		
13	Directional Drill Complete with 10-inch HDPE Carrier (No Casing)	LF	323		
14	Horizontal Bore Complete with 18-inch Steel Casing and 8-inch DI Carrier	LF	225		
15	Furnish and Install 8-inch Plug Valve	Each	6		
16	Furnish and Install Sewage Combination Air Valve and Vault Complete	Each	17		
17	Furnish and Install 16-inch Gravity Sewer	LF	22		
18	Furnish and Install 15-inch Gravity Sewer	LF	71		
19	Furnish and Install 12-inch Gravity Sewer	LF	23		
20	Furnish and Install 48-inch Dia. Manhole	VF	19		
21	Furnish and Install Manhole Frame and Cover	Each	3		
22	Furnish and Install Metering Manhole Complete	Each	1		
23	Pavement Demo/Repair	SF	3,575		
24	Gravel Driveway Demo/Repair	SF	1,540		

Item No.	Description	Unit	Est. Qty.	Bid Unit Price	Bid Price
25	Excavation of Rock Material, where authorized or directed, proper disposal off-site of excess material, and furnishing, placing, and compacting select fill complete per specifications.	CY	110		
26	Excavation Unsatisfactory Soil Material, where authorized or directed, proper disposal off-site of excess material, and furnishing, placing, and compacting select fill complete per specifications.	CY	100		
27	Mobilization (Maximum 5% of Total Bid)	LS	1		
Total of All Unit Price Bid Items					\$

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

TOTAL OF ALL UNIT PRICE BID ITEMS

_____ (in words)
 Dollars (\$_____).

ARTICLE 6 – TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

- 7.01 The following documents are submitted with and made a condition of this Bid:
 - A. Required Bid security in the form of Bid Bond;
 - B. List of Proposed Subcontractors;
 - C. List of Proposed Suppliers;
 - D. List of Project References;
 - E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;

F. Contractor's License No.: _____

G. Required Bidder Qualification Statement, Section 00330, with supporting data.

ARTICLE 8 – DEFINED TERMS

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

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid is submitted by:

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____
(Individual's signature)

Doing business as: _____

A Partnership

Partnership Name: _____

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

A Corporation

Corporation Name: _____
(SEAL)

State of Incorporation: _____
Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____
(CORPORATE SEAL)



Attest _____

Date of Qualification to do business in [State where Project is located] is
____/____/____.

A Joint Venture

Name of Joint Venture: _____

First Joint Venturer Name: _____
(SEAL)

By: _____
(Signature of first joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____(SEAL)

By: _____
(Signature of second joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership,
and corporation that is a party to the joint venture should be in the manner indicated
above.)

Bidder's Business Address _____

Phone No. _____ Fax No. _____

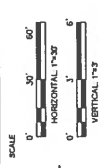
E-mail _____

SUBMITTED on _____, 20____.

State Contractor License No. _____ *[If applicable]*

**ZION CROSSROADS
 WATER AND SEWER SYSTEM**
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

NET PLAN



No.	DATE	BY	DESCRIPTION
1	7/2018	MRL	PM REALIGNMENT
REVISIONS			
DRAWN BY		JFH	
APPROVED BY		MRL	
CHECKED BY		DM	
DATE		MAY 2018	

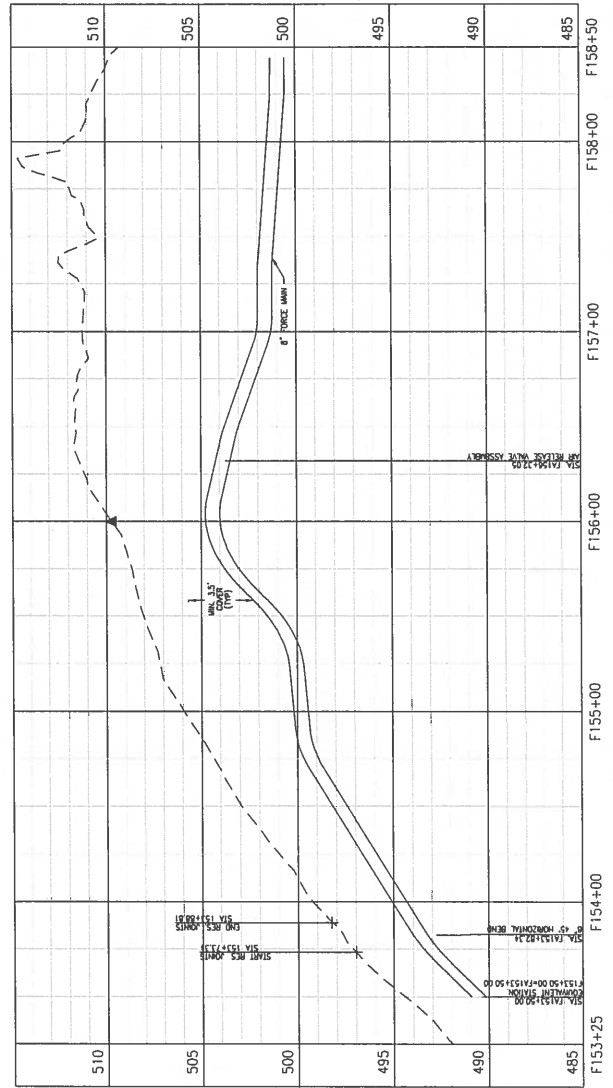
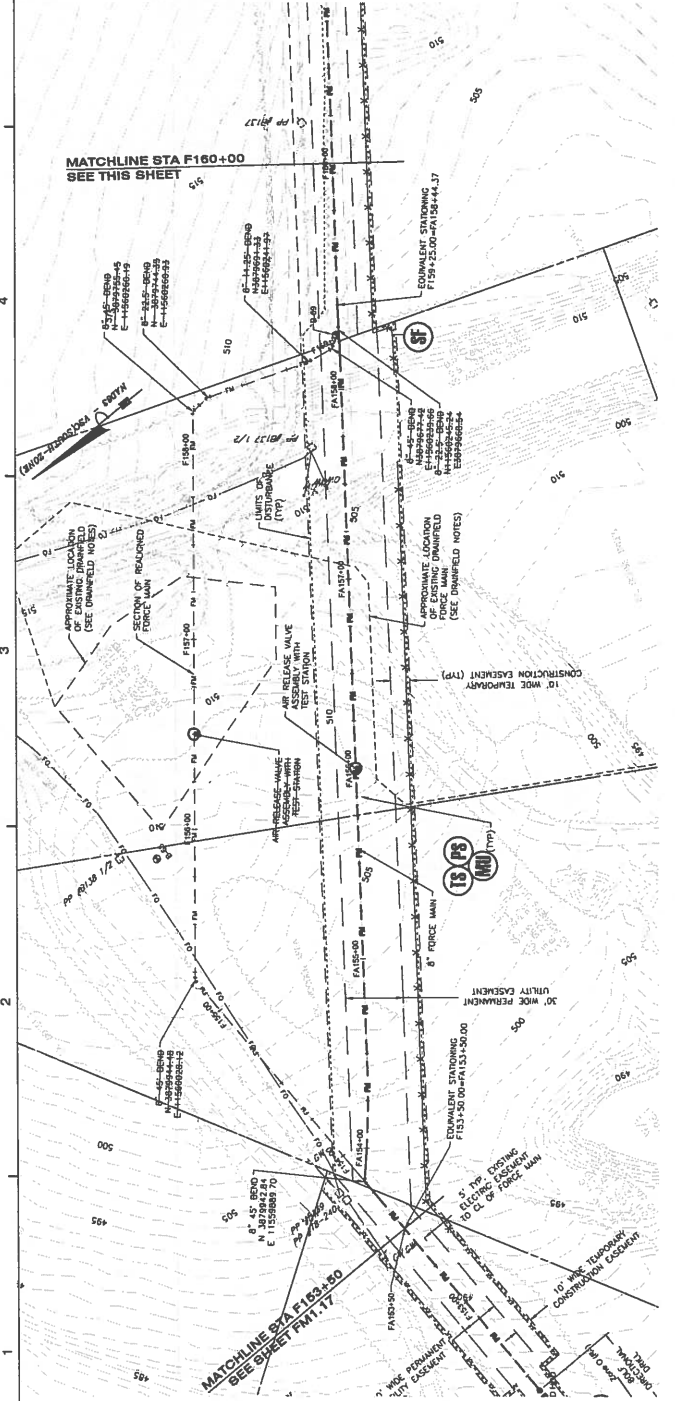
**FORCE MAIN
 PLAN AND
 PROFILES**

PROJECT NO. 5007096-1

FM1.18

NOTE:
 THE DESIGNER ASSUMES RESPONSIBILITY FOR DAMAGE TO THE ENVIRONMENT. A DDITIONAL TEMPORARY MEASURES SHALL BE TAKEN AS NECESSARY TO PROTECT THE ENVIRONMENT.

DRAINFIELD NOTES:
 THE APPROXIMATE LOCATION OF EXISTING DRAINAGE DITCHES AND DRAINAGE FORCES SHALL BE LOCATED AND DRAINAGE FORCES RECORDED TO HORIZONTAL AND VERTICAL ALIGNMENT. THE APPROXIMATE LOCATION OF EXISTING DRAINAGE DITCHES AND DRAINAGE FORCES SHALL BE LOCATED AND DRAINAGE FORCES RECORDED TO HORIZONTAL AND VERTICAL ALIGNMENT. THIS AREA, IF THE EXISTING CONDITIONS FOUND TO BE UNDESIRABLE, SHALL BE CONTACTED BY THE CONTRACT OWNER AND ENGINEER IMMEDIATELY.



Zion Crossroads Project

Company Name	Representative Name	Email Address	Phone No.	Signature
FL Johnson/ter	David Ingle	dave.ingle@fljohnson.com	434-845-3388	
Concrete Foundations	Tommy Kost	concretefoundations@ygha.com	434-656	
Crowder Construction Company	Brian Wade	bwade@crowderusa.com	804-314-0631	
WOOD EQPT. CO.	MIKE BAUMER	Mbaum@woodequip.com	540-597-7235	
Caldwell Tanks	Phil Bassett/Rick Smith	bassett@comcast.net rsmith@caldwelltanks.com	502-964-3361	
S.J. Louis Construction	Tom Schneider/Josh Bailey	tom5@slouis.com est.matt@slouis.com	326-253-9291	
Gannay Construction	Josh Klassen	Egymaking@macgannay.com	546-219-1864	
L.B. WINTER SERVICES, INC.	MIKE AUGUST	M.E. AUGUST@lbw.com	804-337-8440	
Fertile water-works	Thomas Glenn	thomas.glenn@fertile.com	540-797-5575	
Walker C. Nip	Steven Whitaker	Steven@wcvia.com	804-785-2288	
McDermott / CB&I	Paul Capanzano	paul.capanzano@medermott.com	346 305 1681	
FAVOURER CONSTRUCTION	ED SPALSTON	ESTEL@FAVOURERCONSTRUCTION.COM	474-295-0033	
Sherwood-Logan & Associates	Jon Lasarotti	lasarotti.j@sherwoodlogan.com	804 560 5410	
T.A. Sheets General Cont	TAMMY CHURCH	kent@tashetsinc.com	757-627-3000	
English Construction	Chase Maurhoff	jclifton@englishconst.com	434-845-0301	
EPICONST VINTY CONSTRUCTION	DANIEL O'CONNOR	docannor@ecubility.hrcmail.com	757-564-7098	
SMITH MICHARD	BOB TRUMBETTA	ATRUMBETTA@SMITHMICHARD.COM	703-927-3324	

Zion Crossroads Project

Company Name	Representative Name	Email Address	Phone No.	Signature
Ferguson Waterworks	Tommy Wigner	Tommy.Wigner@ferguson.com	804-381-2782	
SARGENT CORP.	JIM CIPOLLONE	J.CIPOLLONE@SARGENT-CORP.COM	804-968-7118	
Enviroscape Inc	Jim Aldous	JHA14@aol.com	804-737-0490	
Anderson Const. Inc.	Sporn Sullivan	W.A.Anderson@andersonconst.com	434-239-4917	
KBEF Keenwater Smart-Tex Keenwater Utility Const	KA Smart	Estimating@bf-nelson.com	804-801-1293	
LAURENCE WALLACE	Laurence Wallace	LWALLACE@TUSINCVA.COM	757-304-1577	
Hajoca	JOE SMITH	JOE.SMITH@HAJOCA.COM	804-901-0755	
Hajoca	Daniel Ice	Daniel.Ice@Hajoca.com	804-629-4102	
AG Dillard inc	Josh Recker	Josh@AGDillard.com	434-989-0094	
AG Dillard inc	Sheldon Shufflett	Sheldon@AGDillard.com	434-977-3750	
AG Dillard inc	John Alexander	John@AGDillard.com	434-977-3750	
Fortiline Waterworks	Rich Leeper	Rich.Leeper@Fortiline.com	919-920-2875	
TRENWATER UTILITY CONST. INC.	Robert Ackley	RACKLEY@TUSINCVA.COM	804-994-1489	
COMPANYS, FALCONER CONSTRUCTION INC	STEVE MAIONE	SMANO@FALCONERCONSTRUCTION.COM	434-295-0033	
FALCONER CONST. CO. INC.	BRIAN WOLFREY	bwolfrey@falconerconstruction.com	434-295-0033	
MEB General Contractors Inc,	DON WADE	DONW@MEBGC.COM	804-551-0598	
MEB General Contractor	Darley Williams			

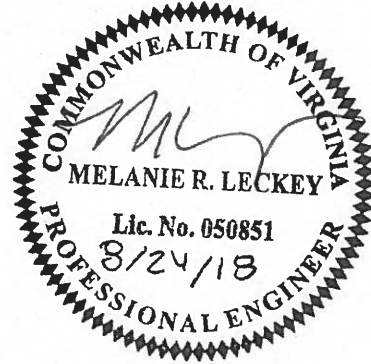
ADDENDUM NO. 2

TO: All Bid Document Holders

FROM: Melanie Leckey, P.E.

DATE: August 24, 2018

**RE: ZION CROSSROADS WATER AND SEWER SYSTEM
FLUVANNA COUNTY DEPARTMENT OF PUBLIC WORKS
ITB NO. 2018-03**



The following additions, corrections, clarifications and/or changes to the Contract Documents are to be made:

1. **Change:** Replace Specification Section Division 00, Invitation for Bid (IFB) #2018-03, First Paragraph in its entirety with the following:
"All sealed bids shall be turned in no later than 2:00 p.m. EST, October 2, 2018. All bids that are delivered via mail or are hand delivered must be addressed to the "Procurement Contact" listed above. Any Bids that are turned in late will be rejected and returned unopened. Any Bids sent in via facsimile, telephone, or email shall not be considered.
Bids will be publically opened on October 2, 2018 at 3:00 p.m. EST at Fork Union Community Center, 5725 James Madison Highway, Fork Union VA 23055"
2. **Clarification:** Specification Section Division 00, Invitation for Bid (IFB) #2018-03, Appendix I, Item 6: In accordance with this section, all questions or comments about the specifications or other Solicitation documents from the Bidder should be submitted to the County no later than seven (7) business days prior to the date set for the opening of the Bids. The bid due date stated in item number 1 of this Addendum would therefore require all questions to be submitted no later than September 21, 2018.
3. **Change:** Replace Specification Section Division 00, Invitation for Bid (IFB) #2018-03, Section 6 "Submittal Instructions", A in its entirety with the following:
 - A. Each Bidder must submit one (1) original and four (4) copies.
4. **Clarification:** All permit fees associated with permits required by Fluvanna County shall be waived. Contractor shall still be responsible for applying for, obtaining, and abiding by the requirements for each County permit. Contractor shall be responsible for applying for, paying any fees and bonds for, obtaining, and abiding by the requirements for the VDOT Land Use Permit and Performance Bond, as required.
5. **Clarification:** The anticipated VDOT Land Use Permit Fee is \$2,574.40. The anticipated VDOT Surety Bond is \$751,100.00.
6. **Clarification:** C900 PVC will not be accepted as an alternative pipe material.

Addendum # 2
Zion Crossroads Water and Sewer System
Fluvanna County Department of Public Works
Page 2 of 3

7. **Clarification:** Drawing C2.0, General Utility Notes, Note 16B. For the basis of bids, the restraint lengths and locations along the length of the utility shall be as shown on the profile view of Drawings WL1.0 – WL1.28 and FM1.0 – FM1.28, as indicated with a start and end stationing of the restraints. These restraints shall be in conformance with the specifications. Concrete thrust blocks will be required for all fire hydrants as shown on the fire hydrant detail. Tees, plugs, and caps shall be restrained in accordance with Detail BH-05 on Drawing C2.1.
8. **Change:** Specification Section 02731, 2.2, A, add the following section:
 3. The inside of all buried DI fittings shall be lined with ceramic epoxy Protecto 401 from STA FM10+00 to STA FM203+08.32.
9. **Change:** Specification Section 02731, Part 2, add the following section:
 - 2.13 DUCTILE IRON FORCE MAIN PIPE:
 - A. Ductile iron standard mechanical joint pipe shall conform to ANSI/AWWA C151/A21.51 or latest revision and have a protective asphaltic exterior coating. Thickness class shall be minimum Class 52.
 - B. Where restrained joint pipe is to be used, it shall conform to ANSI/AWWA C151/A21.51, have a protective asphaltic exterior coating and shall be as manufactured by U.S. Pipe, TR Flex Restrained Joint Pipe, or approved equal. Thickness class shall be minimum Class 52.
 - C. Maximum allowable joint deflection for DI pipe shall be 2.5°. Should additional deflection be needed, Contractor shall provide appropriate bends to maintain alignment at no additional cost.
 - D. Restrained joints shall be included for all ductile iron force main pipe within casing pipes.
 - E. Fittings for ductile iron pipe shall be ductile iron ANSI/AWWA C153/A21.53, compact fittings with minimum pressure class of 350 psi. Manufacturer's standard asphaltic coating (one-mil thickness) shall be provided on the exterior of all fittings.
 - F. The inside of buried pipe shall be lined with ceramic epoxy Protecto 401. The outside of buried pipe and fittings will be bituminous coated to meet the requirements of ANSI/AWWA C151/A21.51.
10. **Change:** Specification Section 02665, 2.2, C add the following section:
 4. Fittings for DI pipe shall be ductile iron ANSI/AWWA C153/A21.53, compact fittings with minimum pressure class of 350 psi. Manufacturer's standard asphaltic coating (one-mil thickness) shall be provided on the exterior of all fittings. Fittings shall have a double thickness cement-mortar lining in accordance with ANSI A21.4 (AWWA C104). Joint restraint shall be used where specified.

Addendum # 2
Zion Crossroads Water and Sewer System
Fluvanna County Department of Public Works
Page 3 of 3

Attachments:

- None

All other parts of the Contract Documents remain unaltered by this Addendum. Bidders must acknowledge receipt of this Addendum on the Bid Form.

END OF ADDENDUM NO. 2

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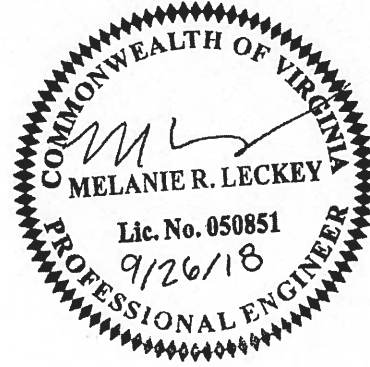
ADDENDUM NO. 3

TO: All Bid Document Holders

FROM: Melanie Leckey, P.E.

DATE: September 26, 2018

RE: ZION CROSSROADS WATER AND SEWER SYSTEM
FLUVANNA COUNTY DEPARTMENT OF PUBLIC WORKS
ITB NO. 2018-03



The following additions, corrections, clarifications and/or changes to the Contract Documents are to be made:

1. **Change:** Replace Specification Section Division 00, Invitation for Bid (IFB) #2018-03, First Paragraph in its entirety with the following:
 "All sealed bids shall be turned in no later than 2:00 p.m. EST, October 9, 2018. All bids that are delivered via mail or are hand delivered must be addressed to the "Procurement Contact" listed above. Any Bids that are turned in late will be rejected and returned unopened. Any Bids sent in via facsimile, telephone, or email shall not be considered.
Bids will be publically opened on October 9, 2018 at 3:00 p.m. EST at Fork Union Community Center, 5725 James Madison Highway, Fork Union VA 23055"
2. **Clarification:** Specification Section Division 00, Invitation for Bid (IFB) #2018-03, Appendix I, Item 18 "Tax Exemption" means the County is exempt from tax for its direct purchases under V.A.C. 10-210-690 A.
3. **Change:** Delete Specification Section Division 00, Invitation for Bid (IFB) #2018-03, Part 4, A, viii in its entirety and replace with the following:
 "Contractor(s) shall warrant replace or repair any defective product, materials, installation or services on the Project for one (1) year from County's final acceptance of any services hereunder, work or services on the Project at no additional cost. County shall be deemed to have accepted services hereunder only after receipt of a proper and detailed invoice from Contractor for all of the work on the Project and payment by the County to Contractor in full on such invoice."
4. **Change:** No additional questions will be answered following the issuance of this addendum.

Attachments:

- None

All other parts of the Contract Documents remain unaltered by this Addendum. Bidders must acknowledge receipt of this Addendum on the Bid Form.

END OF ADDENDUM NO. 3

Exhibit B

A.G. Dillard, Inc.
P.O. Box 7427
Charlottesville, VA 22906
Pho: (434) 977-3750
Cell: (434) 989-0044
Fax: (434) 979-8026
www.agdillard.com



Monday, October 08, 2018

Job: **Fluvanna County Zion's Crossroads Water and Sewer line Project**

I am pleased to on behalf of the AG Dillard team submit a bid for the installation of the water and sewer line to serve Fluvanna county residents and business's including our own corporate offices located along the service route.

Acknowledgement:

I would like to clearly state that the AG Dillard team has reviewed and fully understand the IFB, the team understands the scope and intent of the project, its location, and its timeline.

Bidder's Representations:

Furthermore, the AG Dillard team has been self-performing excavation and utility work in Albemarle and Fluvanna counties since 1966. Locally owned and operated, AG Dillard, has all the necessary resources and equipment located in the immediate proximity to the work. AG Dillard's headquarters which are located in Fluvanna county. AG Dillard has a single project bonding capacity of \$15 million and an aggregate capacity currently of \$30 million. AG Dillard is ready to self-perform all aspects of the utility line installations, with only the exception of subcontracting out the boring and horizontal drilling work. We look forward to working with Fluvanna county on this project.

Josh Rector


VP Business Development

Commonwealth OF Virginia



State Corporation Commission

CERTIFICATE OF GOOD STANDING

I Certify the Following from the Records of the Commission:

That A. G. DILLARD, INC. is duly incorporated under the law of the Commonwealth of Virginia;

That the date of its incorporation is November 21, 1972;

That the period of its duration is perpetual; and

That the corporation is in existence and in good standing in the Commonwealth of Virginia as of the date set forth below.

Nothing more is hereby certified.



*Signed and Sealed at Richmond on this Date:
October 8, 2018*

Joel H. Peck
Joel H. Peck, Clerk of the Commission

BB&T
CONSTRUCTION RISK SERVICES
BONDING · INSURANCE · EMPLOYEE BENEFITS

2108 W Laburnum Avenue, Suite 300 (23227)
P.O.Box 17370
Richmond, VA 23226
Office (804) 678-5000
Fax (888) 751-3010

Thursday, April 12, 2018

RE: Surety Prequalification
AG Dillard, Inc.

To Whom It May Concern:

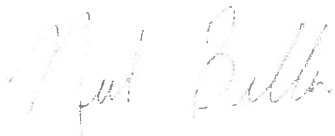
We are privileged to be the Surety Agent for AG Dillard, Inc. and consider this Company to be one of our most valued clients. Their bond needs are handled by The Cincinnati Insurance Company which has an A.M. Best Rating of "A" (Excellent), and is listed as an approved surety company in the Circular 570, and is licensed to do business in all 50 states.

The management team of AG Dillard, Inc. demonstrates excellence and added value to the projects they undertake. AG Dillard, Inc.'s construction and construction management performance is of a magnitude and quality that cast them in a significant and unique role in the construction market place. They have earned the respect of their Surety Company, owners, architects and engineers through the years. Without question, we can recommend this company to you and we think that you will quickly see the high degree of professionalism and expertise they offer.

AG Dillard, Inc. is financially sound and has the ability and financial capacity to bond single projects in the \$15,000,000 range with an aggregate range of \$30,000,000. These are parameters not absolutes.

Should AG Dillard, Inc. be awarded a contract for this project, then naturally, we would expect that the execution of any final bonds would be subject to a review of the final contract terms, conditions, and financing by our client and The Cincinnati Insurance Company. We assume no liability to third parties or to you if for any reason we do not executed said bonds.

Sincerely,



Neil B. Biller
Vice President
BB&T Insurance Services, Inc.

A.G. Dillard, Inc.
P.O. Box 7427
Charlottesville, VA 22906
Pho: (434) 977-3750
Cell: (434) 989-0044
Fax: (434) 979-8026
www.agdillard.com



Monday, October 08, 2018

Job: **Fluvanna County Water and Sewer line Project**

Resume/Qualifications

Founded in 1996, AG Dillard began as a residential contractor, focusing on paving driveways, installing driveways and completing other minor earth work projects. The company expanded over the years under the steady hand of Alan G. Dillard Jr. and earned the reputation of a well-respected earth work contractor. As AG Dillard grew, it developed the capacity for large commercial and residential subdivision earth work and utility work. Today AG Dillard is a total site work contractor with a \$30 million-dollar bonding capacity, and a GPS integrated fleet, capable of self-performing all aspects of site work.

- **Alan G. Dillard III (Trey) President**



- In 1988 Allen G. Dillard III (Aka Trey) began work for the company as a laborer, Trey worked up to becoming an operator and never slowed down from there, continuing up through the hierarchy of the company. Working at times as a truck driver, foreman, as well as superintendent, and eventually as vice president of operations. Alan G. Dillard III aka Trey officially took over the reins and then ownership of the business in late 2015 and began a program of modernization and expansion, transforming AG Dillard into a Total Site Contractor, capable of all aspects of site preparation from demolition to deep utility excavations, grading, curbing and pad preparation. From urban center sites, to rural land conversion, trey has brought AG Dillard the experience to complete any job. Today, AG Dillard Inc. uses a fleet of fully integrated GPS controlled machines and the best operators in the business to complete each job with precision, care and experience. The excellent local knowledge and relationships cultivated over decades of consistently high-quality work Trey brings to the leadership of the AG Dillard team, makes the difference for everyone.

- **John Alexander Vice President**



- John has extensive knowledge of, and ties to, the Fluvanna community, as well as the long history of municipal water in Fluvanna. After college (B.A. Hampden-Sydney 1993) he returned to join the family business interests in Fluvanna County. Part of his responsibilities involved managing timberland and commercial property, including land acquisition, ROWs, and forest management. The company participated in BMPs, riparian buffers, and other land management and conservation practices, both through forestry and agricultural avenues. He was the past Chairman of the FUSD Advisory Committee as well as a BOS appointed member of the Fluvanna County Economic Development Commission. In December 2016, he closed one of the businesses and decided to change direction. He joined A.G. Dillard team in March 2017 and is actively involved in the day to day operations of the company.

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- **Josh Rector Vice President Business Development**



- With a bachelor's Degree in Economics and Business Administration from Trinity University, Josh Rector began his career working in Northern California, developing master planned communities, then changed paths to commercial development in 2006 just before the housing bubble hit northern California. Spent the next 12 years, developing managing and redeveloping retail, office and light industrial buildings throughout the Midwest, Mid Atlantic and Texas. Most recently Josh completed the Eastgate Town Center Project in Richmond, VA the complete renovation and redevelopment of that \$38 million investment property. Josh joined the AG Dillard team in early 2018.

- **DJ Banton Head of Field Operations**



- As A.G. Dillard's Head of Field Operations, DJ is responsible for adding value to the organization by playing a critical role in ensuring effective execution of the core operational duties. DJ directs all field staff, subcontractors, materials and activities necessary to successfully complete a single project of varying complexity; and to work with the staff as a team to produce quality work on time, within the project budget, complying with safety standards and exceeding customers' expectations. DJ joined A.G. Dillard Inc. in 2000, as a laborer and through tenacity and experience has worked his way up to the Head of Field Operations. DJ has supervised the successful construction of various types of construction projects throughout the Commonwealth of Virginia including Old Trail Village, Glenmore, Whittington, Belvedere, and many more. His extensive experience ensures the project is constructed to meet customer expectations. DJ is one of the first point of contacts at A.G. Dillard, Inc. to take care and handle and problems, and he is passionate about completing every project in a timely manner. DJ provides the customer a superior level of care with an A.G. Dillard guarantee of the highest level of work and protection. Outside of work, DJ is a Captain in the Faber Fire Department and is an axillary Police Officer with The Town of Louisa.

- **Donald Madigan**



- Safety officer for AG Dillard, with 30+ years' experience in over the road trucking. Donnie joined the AG Dillard team in 2018, after taking countless classes and achieving OSHA certifications, Donnie has added a much greater level of Safety overview to the entire AG Dillard Team.

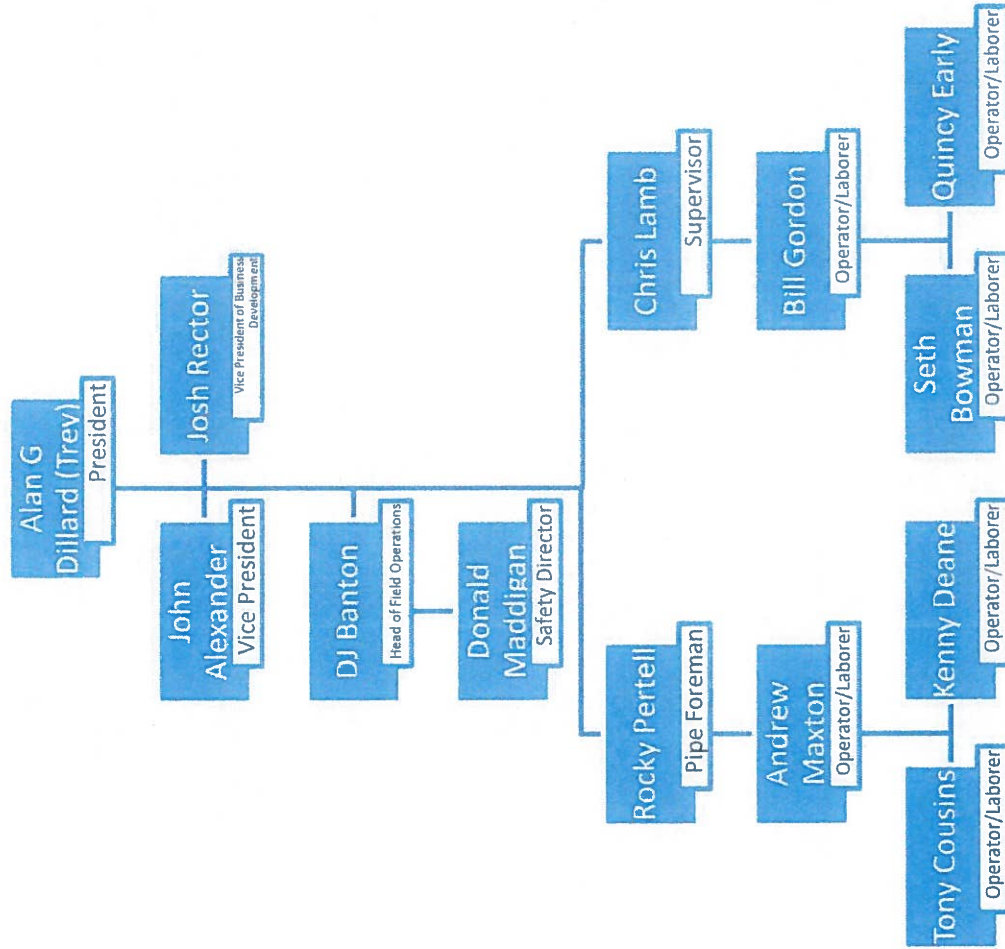
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- Andrew Maxton
 - Employee of AG Dillard's since July of 2014
- Tony Cousins
 - Employee of AG Dillard's since July of 2018
- Kenny Dean
 - Employee of AG Dillard's since February of 2018
- Chris Lamb
 - Employee of AG Dillard's since August of 2016
- Bill Gordon
 - Employee of AG Dillard's since May of 2018
- Seth Bowman
 - Employee of AG Dillard's since November of 2015
- Quincy Early
 - Employee of AG Dillard's since July of 2018



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Monday, October 08, 2018

Job: **Fluvanna County Zion's Water and Sewer line Project**

Demonstrated History of Similar projects

Since 2012, AG Dillard team has been working on Old Trail Village a master planned community in Crozet VA, installing infrastructure of all types, storm, water, sewer, and dry utilities, including all of the conditions that will be experienced during the Fluvanna water and sewer line projects of dealing with VDOT ROW's VEP Easements, as well as deep excavations, and borings under roadways and waterways. Our most current fully complete phase of this work is referred to as Block 10, it was a \$3,751,000 project which we performed 81% of the work in house. We are currently under contract for 3 additional phases of this project which 2 of the three will be wrapped up by fall. Crews whom have worked on these projects are assigned to begin the work on Zion Crossroad water and sewer system. For questions about successful completions of these projects please reach out to Dave Brockman of Old Trail Village, representative of the ownership of this project at 702-985-9088 or by email at Dave@oldtrailvillage.com

Currently AG Dillard is in the process of completing a complex utility installation project for the University of Virginia Foundation located at Old Ivy road in Charlottesville this project included jack and boring under Ivy road for a sewer main as well as for storm drainage lines. This project also included working with Charlottesville Gas to help excavate locations for their gas lines in difficult soils and rock surrounding the project. Please contact Nat Perkins P.E. of UVA Foundation for information on our performance, he can be reached at 434-531-7387 or by email at nperkins@uvafoundation.com

Additionally, AG Dillard over it's 50+ years in Albemarle and Fluvanna counties has completed numerous projects with the Albemarle county service authority. We regularly interact with them and for them on various projects. We recommend you discuss our progress with Jeremy Lynn P.E. by calling him at 434-977-4511 or by emailing him at jlynn@serviceauthority.org

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Monday, October 08, 2018

Job: **Fluvanna County Water and Sewer line Project**

Proposed Sub-Contractors

- SL Williamson - Asphalt paving
 - A 3rd generation Virginia business with plants convenient located nearby.
- Metcalf
 - <https://www.metcalfree.com/>
- Grindstaff Underground
 - Jack and Boring, direction drilling Sub-Contractor
 - In business in Virginia since 1965 experts in directional boring of all types, AG Dillard has a strong ongoing working relationship with Grindstaff Underground.
 - <https://www.grindstaffunderground.net/about>

Proposed Materials Suppliers

- Winchester Building Supply Inc.
 - 20001 Millwood Pike Winchester, VA 22602
- Allied Concrete
- Wilson Ready Mix
- Luck Stone
- Forti line Waterworks
 - 1766 Scottsville, rd. Suite a Charlottesville, va 22902 434-244-5048
- Fergusson Waterworks
 - 505 Garret Street Charlottesville, 22909 434-971-7000

CONTRACTOR'S QUALIFICATION STATEMENT

All questions must be answered in full. Additional sheets for clarification of answers or additional information may be attached. This statement must be notarized.

1. Name, address, phone number, IRS number of company.
 AG Dillard, Inc. 295 Memory Lane, Troy VA 22974, 54-0922048

2. Owner, principal officer, date and place organized.
 Allan G. Dillard III, 1966, Virginia

3. General character of work performed.
 Site civil contracting

4. Any work awarded failed to be completed or contracts defaulted on - where and why.
 None

5. List of three most important recent contracts over \$500,000. State the owner, work, approximate cost, place, date started and date completed.

1. Old Trail Village Upper Boulevard #971,091 \$
1/1/2016 From _____ To 3/1/2018

2. Coscocks (Charlottesville) \$ 2,690,439
12/1/2015 From _____ To 4/1/2018

3. Village Oaks (Charlottesville) \$ 1,922,085
1/1/2014 From _____ To 4/1/2017

6. List the contracts upon which you are currently working. Include owner, location, approximate cost, and estimated date of completion.

7. List your major equipment available for use on this project.

We have a \$15 million fleet of heavy construction equipment available to complete the job, including 326's to 379 excavators, skid steers, and off road dump trucks etc.

8. List of three material suppliers and amount of credit available.

- | | | | |
|----|------------------------|----|------------|
| 1. | <u>Alfred Concrete</u> | \$ | Unlimited |
| 2. | <u>Luck Stone</u> | \$ | 100,000.00 |
| 3. | <u>Ferguson</u> | \$ | 150,000.00 |

9. Bank references and credit available.

- | | | | | |
|----|------------------------|----|-----------|----------------------------|
| 1. | <u>Blue Ridge Bank</u> | \$ | 400,000 | Don Moskowitz 407-961-1246 |
| 2. | <u>1st Source Bank</u> | \$ | 1,000,000 | Ron Morrison 407-522-2603 |

10. Insurance coverage and amount.

Liability-Property: 2,340,000
 Liability-Personal Injury: 1,000,000
 Vehicle and Equipment: 1,000,000
 Other: General 2,000,000
 Identify umbrella 10,000,000

11. Bonding reference - List surety and highest coverage.

See Attached EB&T Bonding letter, \$30,000,000

12. Subcontractors utilized - List name, address specialty and years experience.

See Attached sub contractors letter.

1. SL Utilitension, 1230 River Rd Charlottesville VA 22902. Paving 60+ yrs.
2. Grunzstaff underground, 10644 Soubay Rd Martinsville, VA 24112, underground drilling since 1965
- 3.

- 13. Provide a general description of the experience of the company and its key personnel.
See Attached letter
- 14. Number of current full-time employees *102+*
Number employed at highest level in past twelve months *100+*
- 15. Are you on any list of debarred contractors maintained by the U.S. Department of Labor, U.S. Department of Housing and Urban Development, or Agencies of the Commonwealth of Virginia?
Yes _____ No *X*

The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by Fluvanna County in verification of the recitals comprising this statement of contractor's qualifications:

Contractor: *AG Dillard, Inc.*
 By: *[Signature]* *Joshua W. Rector*
 Title: *VP Business Development*
 Date: *10/8/18*

SEAL

STATE OF: *Virginia*

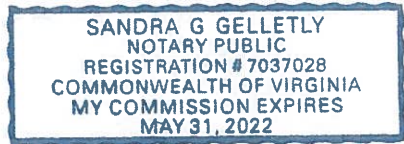
COUNTY OF: *Fluvanna*

Joshua Rector being duly sworn deposes and says that he/she is *VP* of *AG Dillard Inc* and that the answers to the foregoing questions and all statements therein contained are true and correct.

SUBSCRIBED AND SWORN TO BEFORE ME THIS *8th* DAY OF *Oct.*, 20*18*.

NOTARY PUBLIC *[Signature]*

MY COMMISSION EXPIRES



BID FORM

This document is based off of EJCDC C-410 Suggested Bid Form for Construction Contracts, but is modified.

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

Fluvanna County
 P.O. Box 540
 Fluvanna, VA 22963

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

ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 120 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER’S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

<u>Addendum No.</u>	<u>Addendum Date</u>
<u>1</u>	<u>July 3, 2018</u>
<u>2</u>	<u>Aug 24, 2018</u>
<u>3</u>	<u>Sept 26, 2018</u>

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions, if any, at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in SC-4.02 as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in SC-4.06 as containing reliable "technical data."

- E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.
- F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
 - B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
 - C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
 - D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
 - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
 - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
-

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

- 5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):
-

Item No.	Description	Unit	Est. Qty.	Bid Unit Price	Bid Price
1	Furnish and Install 12-inch Water main	LF	21,491	\$98.49	\$2,116,600.03
2	Directional Drill Complete with 14-inch HDPE Carrier (No Casing)	LF	621	\$285.31	\$177,174.68
3	Horizontal Bore Complete with 24-inch Steel Casing and 12-inch DI Carrier	LF	809	\$460.28	\$372,368.07
4	Furnish and Install 12-inch Gate Valve	Each	55	\$2,845.23	\$156,487.38
5	Furnish and Install Fire Hydrant Assembly (includes 6-inch Gate Valve)	Each	35	\$4,734.81	\$165,718.50
6	Furnish and Install Water Quality Monitoring Station	Each	4	\$2,093.38	\$8,373.53
7	12"x12" Tapping Sleeve and Valve	Each	2	\$7,416.55	\$14,833.10
8	Furnish and Install 10-inch Force main	LF	9,325	\$70.70	\$659,246.60
9	Directional Drill Complete with 12-inch HDPE Carrier (No Casing)	LF	375	\$238.92	\$89,593.61
10	Horizontal Bore Complete with 18-inch Steel Casing and 10-inch DI Carrier	LF	125	\$445.67	\$55,708.75
11	Furnish and Install 10-inch Plug Valve	Each	4	\$3,676.58	\$14,706.30
12	Furnish and Install 8-inch Force main	LF	11,864	\$59.09	\$696,364.51
13	Directional Drill Complete with 10-inch HDPE Carrier (No Casing)	LF	323	\$214.56	\$69,302.68
14	Horizontal Bore Complete with 18-inch Steel Casing and 8-inch DI Carrier	LF	225	\$367.97	\$82,343.56
15	Furnish and Install 8-inch Plug Valve	Each	6	\$2,524.45	\$15,146.70
16	Furnish and Install Sewage Combination Air Valve and Vault Complete	Each	17	\$8,553.14	\$145,403.38
17	Furnish and Install 16-inch Gravity Sewer	LF	22	\$130	\$2,860
18	Furnish and Install 15-inch Gravity Sewer	LF	71	\$75	\$5,325
19	Furnish and Install 12-inch Gravity Sewer	LF	23	\$120	\$2,760
20	Furnish and Install 48-inch Dia. Manhole	VF	19	\$800	\$12,800
21	Furnish and Install Manhole Frame and Cover	Each	3	\$500	\$1,500
22	Furnish and Install Metering Manhole Complete	Each	1	\$29,389.76	\$29,389.76
23	Pavement Demo/Repair	SF	3,575	\$5.30	\$18,951.71
24	Gravel Driveway Demo/Repair	SF	1,540	\$3.74	\$5,765.54

Item No.	Description	Unit	Est. Qty.	Bid Unit Price	Bid Price
25	Excavation of Rock Material, where authorized or directed, proper disposal off-site of excess material, and furnishing, placing, and compacting select fill complete per specifications.	CY	110	\$195	\$21,450
26	Excavation Unsatisfactory Soil Material, where authorized or directed, proper disposal off-site of excess material, and furnishing, placing, and compacting select fill complete per specifications.	CY	100	\$35	\$3,500
27	Mobilization (Maximum 5% of Total Bid)	LS	1	\$50,000	\$50,000
Total of All Unit Price Bid Items					\$ 4,993,673.38

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

TOTAL OF ALL UNIT PRICE BID ITEMS

Four Million Nine Hundred and Ninety Three Thousand Six Hundred and seventy Three Dollars and 38/100 (in words)

Dollars (\$ 4,993,673.38).

ARTICLE 6 – TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

- 7.01 The following documents are submitted with and made a condition of this Bid:
- A. Required Bid security in the form of Bid Bond;
 - B. List of Proposed Subcontractors;
 - C. List of Proposed Suppliers;
 - D. List of Project References;
 - E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;

F. Contractor's License No.: _____

G. Required Bidder Qualification Statement, Section 00330, with supporting data.

ARTICLE 8 – DEFINED TERMS

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

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid is submitted by:

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____

(Individual's signature)

Doing business as: _____

A Partnership

Partnership Name: _____

By: _____

(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

A Corporation

Corporation Name: AG. Dillard, Inc.
(SEAL)

State of Incorporation: Virginia
Type (General Business, Professional, Service, Limited Liability): _____

By:  _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): Joshua W. Reder

Title: Vice President Business Development



(CORPORATE SEAL)
Attest [Signature]
Date of Qualification to do business in [State where Project is located] is 11/21/1972

A Joint Venture

Name of Joint Venture: _____

(SEAL) First Joint Venturer Name: _____

By: _____
(Signature of first joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of second joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

Bidder's Business Address _____

Phone No. _____ Fax No. _____

E-mail _____

SUBMITTED on _____, 20____.

State Contractor License No. _____ [If applicable]



PENAL SUM FORM

BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER (Name and Address):

A.G. Dillard, Inc.
295 Memory Lane
Troy, VA 22974

SURETY (Name and Address of Principal Place of Business):

The Cincinnati Insurance Company
P.O. Box 145496
Cincinnati, OH 45250

OWNER

County of Fluvanna
P.O. Box 540
Palmyra, VA 22963

BID

Bid Due Date: October 9, 2018

Description:

Zion Crossroads Water and Sewer System
DEI Project No.: 50078861

BOND

Bond Number: Bid Bond

Date (Not earlier than Bid due date):

Penal sum	<u>Five Percent of the Bid Amount</u>	\$	<u>5%</u>
	(Words)		(Figures)

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

BIDDER

A.G. Dillard, Inc.
Bidder's Name and Corporate Seal

(Seal)

By:

[Signature]
Signature

John W. Rater
Print Name

Vice President Business Development
Title

Attest:

[Signature]
Signature

President
Title

SURETY

The Cincinnati Insurance Company
Surety's Name and Corporate Seal

(Seal)

By:

[Signature]
Signature (Attach Power of Attorney)

Joyce D. Barrett
Print Name

Attorney-in-Fact
Title

Attest:

[Signature]
Signature Leah D. Goare

Licensed Virginia Resident Agent
Title

Note: Above addresses are to be used for giving any required notice. Provide execution by any additional parties, such as joint venturers, if necessary.

PENAL SUM FORM

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

THE CINCINNATI INSURANCE COMPANY

Fairfield, Ohio

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That THE CINCINNATI INSURANCE COMPANY, a corporation organized under the laws of the State of Ohio, and having its principal office in the City of Fairfield, Ohio, does hereby constitute and appoint Walter P. Smith, III; Carolyn S. Mullenau; Christopher Brandon Pulliam; Neil Brian Biller; Veronica Hodkin Fox; Joyce D. Barrett; Richard W. Coon and/or Leah D. Goare each in their separate capacity.

of Richmond, Virginia its true and lawful Attorney(s)-in-Fact to sign, execute, seal and deliver on its behalf as Surety, and as its act and deed, any and all bonds, policies, undertakings, or other like instruments, as follows: Any such obligations in the United States, up to Fifty Million and No/100 Dollars (\$50,000,000.00).

This appointment is made under and by authority of the following resolution passed by the Board of Directors of said Company at a meeting held in the principal office of the Company, a quorum being present and voting, on the 6th day of December, 1958, which resolution is still in effect:

"RESOLVED, that the President or any Vice President be hereby authorized, and empowered to appoint Attorneys-in-Fact of the Company to execute any and all bonds, policies, undertakings, or other like instruments on behalf of the Corporation, and may authorize any officer or any such Attorney-in-Fact to affix the corporate seal; and may with or without cause modify or revoke any such appointment or authority. Any such writings so executed by such Attorneys-in-Fact shall be binding upon the Company as if they had been duly executed and acknowledged by the regularly elected officers of the Company."

This Power of Attorney is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Board of Directors of the Company at a meeting duly called and held on the 7th day of December, 1973.

"RESOLVED, that the signature of the President or a Vice President and the seal of the Company may be affixed by facsimile on any power of attorney granted, and the signature of the Secretary or Assistant Secretary and the seal of the Company may be affixed by facsimile to any certificate of any such power and any such power of certificate bearing such facsimile signature and seal shall be valid and binding on the Company. Any such power so executed and sealed and certified by certificate so executed and sealed shall, with respect to any bond or undertaking to which it is attached, continue to be valid and binding on the Company."

IN WITNESS WHEREOF, THE CINCINNATI INSURANCE COMPANY has caused these presents to be sealed with its corporate seal, duly attested by its Vice President this 10th day of May, 2012.



THE CINCINNATI INSURANCE COMPANY

Signature of Vice President

Vice President

STATE OF OHIO) ss:
COUNTY OF BUTLER)

On this 10th day of May, 2012, before me came the above-named Vice President of THE CINCINNATI INSURANCE COMPANY, to me personally known to be the officer described herein, and acknowledged that the seal affixed to the preceding instrument is the corporate seal of said Company and the corporate seal and the signature of the officer were duly affixed and subscribed to said instrument by the authority and direction of said corporation.



Signature of Mark J. Huller

MARK J. HULLER, Attorney at Law
NOTARY PUBLIC - STATE OF OHIO
My commission has no expiration date. Section 147.03 O.R.C.

I, the undersigned Secretary or Assistant Secretary of THE CINCINNATI INSURANCE COMPANY, hereby certify that the above is a true and correct copy of the Original Power of Attorney issued by said Company, and do hereby further certify that the said Power of Attorney is still in full force and effect.

GIVEN under my hand and seal of said Company at Fairfield, Ohio.
this 9th day of October, 2018



Signature of Scott R. Bolen

Assistant Secretary

VENDOR DATA SHEET

Note: The following information is required as part of your response to this solicitation. Failure to complete and provide this sheet may result in finding your bid nonresponsive.

1. Qualification: The vendor must have the capability and capacity in all respects to satisfy fully all of the contractual requirements.

2. Vendor's Primary Contact:

Name: Joshua W. Reiter Phone: 434-977-3750 or 434-989-0044

3. Years in Business: Indicate the length of time you have been in business providing this type of good or service: 52 Years 4 Months

4. Vendor Information:

FIN or FEI Number: 54-0922045 If Company, Corporation, or Partnership
 SSN: _____ (If Vendor is a sole proprietor)

5. Indicate below a listing of at least four (4) current or recent accounts, either commercial or governmental, that your company is servicing, has serviced, or has provided similar goods. Include the length of service and the name, address, and telephone number of the point of contact.

Company: <u>Albemarle County Service Authority</u>	Contact: <u>Jeremy Lynn</u>
Phone: <u>434-977-4511</u>	Email: <u>jlynn@serviceauthority.org</u>
Dates of Service:	\$\$ Value:

Company: <u>Much Mountain Properties</u>	Contact: <u>Dave Beckman</u>
Phone: <u>702-985-9089</u>	Email: <u>dave@oldtrailsillage.com</u>
Dates of Service:	\$\$ Value:

Company: <u>Roadbush, Cole & Associates</u>	Contact: <u>Bill Halbetter</u>
Phone: <u>434-977-0205</u>	Email: <u>B.halbetter@roadbush.com</u>
Dates of Service:	\$\$ Value:

Company: <u>The Resort Companies Inc.</u>	Contact: <u>Steve C. Krohn</u>
Phone: <u>434-220-7701</u>	Email: <u>Skrohn@ResortCompanies.com</u>
Dates of Service:	\$\$ Value:

By my signature below, I, as a duly authorized representative of the entity named below, certify the accuracy of the foregoing information:

AG Dillard Inc.
 Legal Name of Entity if Applicable

Date: 10/8/18

By: [Signature] (SEAL)
 Signature of Authorized Representative

Print Name: Joshua W. Reiter

Print Title: Vice President of Business Development

Vendor Certification (for a Sole Proprietor):

____ (SEAL)

Print Name: _____ Date: _____

Signature

PLEASE RETURN THIS PAGE WITH PROPOSAL SUBMISSION - [REQUIRED]

PROOF OF AUTHORITY TO TRANSACT BUSINESS IN VIRGINIA

THIS FORM MUST BE SUBMITTED WITH YOUR PROPOSAL/BID. FAILURE TO INCLUDE THIS FORM MAY RESULT IN REJECTION OF YOUR PROPOSAL/BID

Pursuant to Virginia Code §2.2-4311.2, an Offeror/Bidder organized or authorized to transact business in The Commonwealth pursuant to Title 13.1 or Title 50 of the Code of Virginia shall include in its proposal/bid the identification number issued to it by the State Corporation Commission ("SCC"). Any Offeror/Bidder that is not required to be authorized to transact business in the Commonwealth as a foreign business entity under Title 13.1 or Title 50 of the Code of Virginia or as otherwise required by law shall include in its proposal/bid a statement describing why the Offeror/Bidder is not required to be so authorized. Any Offeror/Bidder described herein that fails to provide the required information shall not receive an award unless a waiver of this requirement and the administrative policies and procedures established to implement this section is granted by the County Administrator, as applicable. If this quote for goods or services is accepted by the County of Fluvanna, Virginia, the undersigned agrees that the requirements of the Code of Virginia Section 2.2-4311.2 have been met.

Please complete the following by checking the appropriate line that applies and providing the requested information. **PLEASE NOTE: The SCC number is NOT your federal ID number or business license number.**

A. Offeror/Bidder is a Virginia business entity organized and authorized to transact business in Virginia by the SCC and such vendor's Identification Number issued to it by the SCC is 01419803.

B. Offeror/Bidder is an out-of-state (foreign) business entity that is authorized to transact business in Virginia by the SCC and such vendor's Identification Number issued to it by the SCC is _____.

C. Offeror/Bidder does not have an Identification Number issued to it by the SCC and such vendor is not required to be authorized to transact business in Virginia by the SCC for the following reason(s): **Please attach additional sheets if you need to explain why such Offeror/Bidder is not required to be authorized to transact business in Virginia.**

Legal Name of Company (as listed on W-9): AG Dillard Inc.

Legal Name of Offeror/Bidder: AG Dillard Inc.

Date: 10/05/2018

Authorized Signature: [Signature]

Print or Type Name and Title: Stephen W. Rader Vice President of Business Development

PLEASE RETURN THIS PAGE WITH PROPOSAL SUBMISSION - [REQUIRED]

CERTIFICATE OF NO COLLUSION:

The undersigned, acting on behalf of AG Dillard Inc., does hereby certify in connection with the procurement and proposal to which this Certificate of No Collusion is attached that:

This proposal is not the result of, or affected by, any act of collusion with another person engaged in the same line of business or commerce; nor is this proposal the result of, or affected by, any act of fraud punishable under Article 1.1 of Chapter 12 of Title 18.1 of the Code of Virginia, 1950, as amended (18.2-498.1 et seq.).

The undersigned declares that the person or persons signing this proposal is/are fully authorized to sign the proposal on behalf of the firm listed and to fully bind the firm listed to all conditions and provisions thereof.

Respectfully submitted this 8 day of October, 2018

A.G. Dillard Inc.
Legal Name of Entity

By: [Signature] (SEAL)
Signature of Authorized Representative

Print Name: Joshua W. Rector

Print Title: Vice President Business Development

Date: 10/8/18

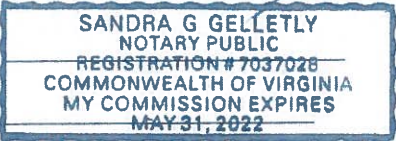
ACKNOWLEDGEMENT

State of Virginia
In the County/City of Gloucester, to-wit:

The foregoing Certification of No Collusion was subscribed and sworn to before me by Joshua Rector (Print Name), V.P. (Print Title) on behalf of AG Dillard Inc. (Print Name of Entity) on this 8th day of Oct. (month), 2018 (year).

[Signature]
Notary Public

My commission expires:
Registration Number:



PLEASE RETURN THIS PAGE WITH PROPOSAL SUBMISSION - [REQUIRED]

OFFEROR STATEMENT

The undersigned Offeror hereby certifies that the Offeror has carefully examined all instructions, plans, conditions, specifications and other documents or items of this Request for Proposal and hereby submits this Proposal pursuant to such instructions, plans, conditions, specifications and other documents or items.

Complete if Offeror is an Entity:

WITNESS the following duly authorized signature and seal:

Name of Entity: AG Dillard Inc.
By: (SEAL)
Signature

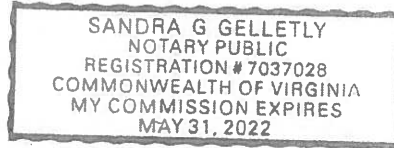
Print Name: Joshua W. Rector
Print Title: Vice President of Business Development

STATE OF Virginia
COUNTY/CITY OF Shuman, to-wit:

The foregoing instrument was acknowledged before me this 8th day of Oct (month), 2018 (year) by Joshua Rector (Print Name), VP (Print Title) on behalf of AG Dillard Inc (Name of Entity).

Sandra G Gelletly [SEAL]
Notary Public

My commission expires:
Notary registration number:



Complete if Offeror is a Sole Proprietor:
Witness the following signature and seal:

(SEAL)
Signature

Print Name:

STATE OF
COUNTY/CITY OF, to-wit:

The foregoing instrument was acknowledged before me this ___ day of ___ (month), ___ (year) by ___ (Print Name), a sole proprietor.

[SEAL]
Notary Public

My commission expires:
Notary registration number:

PLEASE RETURN THIS PAGE WITH PROPOSAL SUBMISSION - [REQUIRED]

EXPIRES ON
01-31-2020

NUMBER
2701012090

COMMERCIAL HEALTH OF VIRGINIA

Department of Professional and Occupational Regulation

9960 Mayland Drive, Suite 400, Richmond, VA 23233

Telephone: (804) 367-8500

BOARD FOR CONTRACTORS
CLASS A CONTRACTOR
CLASSIFICATIONS H/H

DILLARD A G INC
PO BOX 7427
CHARLOTTEVILLE, VA 22906



James W. DeBor
James W. DeBor, Director

Status can be verified at <http://www.dpor.virginia.gov>

(SEE REVERSE SIDE FOR PRIVILEGES AND INSTRUCTIONS)
(SEE REVERSE SIDE FOR BOARD INFORMATION)

DPOR-LIC (02/2017)

Exhibit C

Notice to Proceed

Date: _____

Project: Zion Crossroads Water and Sewer System	
Owner: Fluvanna County	Owner's Contract No.:
Contract:	Engineer's Project No.: 50078861
Contractor:	
Contractor's Address: <i>[send Certified Mail, Return Receipt Requested]</i>	

You are notified that the Contract Times under the above Contract will commence to run on _____. On or before that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the number of days to achieve Substantial Completion is 360 for Phase 1 and 540 for Phase 2, and the number of days to achieve readiness for final payment for Phase 1 and Phase 2 is 600.

Before you may start any Work at the Site, Paragraph 2.01.B of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds and loss payees) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

	Owner: Fluvanna County
	Given by: Steven M. Nichols
	Authorized Signature
	Title: County Administrator
	Date

Copy to Engineer

Exhibit D

STANDARD PERFORMANCE BOND FOR CONSTRUCTION CONTRACTS

KNOW ALL MEN BY THESE PRESENT:

That , _____ the Contractor ("Principal") whose principal place of business is located at _____ and _____ ("Surety") are held and firmly bound unto the County of Fluvanna, Virginia, the Owner ("Obligee") in the amount of Dollars (\$ _____), for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated the ___ day of _____, 20__ entered into a contract with Obligee for which contract (the "Contract") is by reference expressly made a part hereof;

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Principal shall promptly and faithfully perform said Contract in strict conformity with the plans, specifications and conditions of the Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Provided, that any alterations which may be made in the terms of the Contract, or in the Work to be done under it, or the giving by the Obligee of any extension of the time for the performance of the Contract, or any other alterations, extensions or forbearance on the part of either or both of the Obligee or the Principal to the other shall not in any way release the Principal and the Surety, or either of them, their heirs, executors, administrators, successors or assigns from their liability hereunder, notice to the Surety of any such alterations, extension, or forbearance being hereby waived.

No action shall be brought on this bond unless brought within one year after: (a) completion of the Contract and all Work thereunder, including expiration of all warranties and guarantees, or (b) discovery of the defect or breach of warranty or guarantee if the action be for such. The Surety represents to the Principal and to the Obligee that it is legally authorized to do business in the Commonwealth of Virginia. Exclusive venue and jurisdiction for any dispute arising hereunder shall be in the courts of the County of Fluvanna, Virginia.

Signed and sealed this ___ day of _____, 20__ .

Principal

Surety (must be signed by a Virginia Resident Agent of Surety)

By: _____

By: _____

Title: _____

Title: _____

Date: _____

Date: _____

Address: _____

Approved as to form:

Bond No.: _____

Fluvanna County Attorney

Exhibit E

STANDARD LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENT:

That, _____ the Contractor (“Principal”) whose principal place of business is located at _____ and _____ (“Surety”) are held and firmly bound unto the County of Fluvanna, Virginia, the Owner (“Obligee”) in the amount of Dollars (\$ _____), for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated the ___ day of _____, 20__ entered into a contract with Obligee for which contract (the “Contract”) is by reference expressly made a part hereof;

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Principal shall promptly make payment to all claimants as hereinafter defined, for labor performed and material furnished in the prosecution of the Work provided for in the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions.

The Principal and Surety, jointly and severally, hereby agree with Obligee as follows:

1. A claimant is defined as one having a direct contract with the Principal or with a subcontractor of the Principal for labor, material, or both for use in the performance of the Contract. A “subcontractor” of the Principal, for the purposes of this bond only, includes not only those subcontractors having a direct contractual relationship with the Principal, but also any other contractor who undertakes to participate in the Work which the Principal is to perform under the aforesaid Contract, whether there are one or more intervening subcontractors contractually positioned between it and the Principal (for example, a subcontractor). “Labor” and “material” shall include, but not be limited to, public utility services and reasonable rentals of equipment, but only for periods when the equipment rented is actually used at the work site.

2. Subject to the provisions of paragraph 3, any claimant who has performed labor or furnished material in accordance with the Contract documents in the prosecution of the Work provided in the Contract, who has not been paid in full therefor before the expiration of ninety (90) days after the day on which such claimant performed the last of such labor or furnished the last of such materials for which he claims payment, may bring an action on this bond to recover any amount due him for such labor or material, and may prosecute such action to final judgment and have execution on the judgment. The Obligee need not be a party to such action and shall not be liable for the payment of any costs, fees or expenses of any such suit.

3. Any claimant who has a direct contractual relationship with any subcontractor of the Principal from whom the Principal has not required a subcontractor payment bond, but who has no contractual relationship, express or implied, with the Principal, may bring an action on this bond only if he has given written notice to the Principal within one hundred eighty (180) days from the day on which the claimant performed the last of the labor or furnished the last of the materials

STANDARD LABOR AND MATERIAL PAYMENT BOND

for which he claims payment, stating with substantial accuracy the amount claimed and the name of the person for whom the Work was performed or to whom the material was furnished. Notice to the Principal shall be served by registered or certified mail, postage prepaid, in an envelope addressed to the Principal at any place where his office is regularly maintained for the transaction of business. Claims for sums withheld as retainages with respect to labor performed or materials furnished shall not be subject to the time limitations stated in this paragraph 3.

4. No suit or action shall be commenced hereunder by any claimant;

a. Unless brought within one year after the day on which the person bringing such action last performed labor or last furnished or supplied materials, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof, the limitation embodied within this bond shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

b. Other than in a Virginia court of competent jurisdiction and parties agree that exclusive venue and jurisdiction for any dispute arising hereunder shall be in the courts of the County of Fluvanna, Virginia.

5. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder.

Signed and sealed this ____ day of _____, 20__ .

Principal

Surety (must be signed by a Virginia Resident Agent of Surety)

By: _____

By: _____

Title: _____

Title: _____

Date: _____

Date: _____

Address: _____

Approved as to form:

Bond No.: _____

Fluvanna County Attorney

Exhibit F

SECTION C-700
GENERAL CONDITIONS

This is based off of EJCDC C-700 Standard General Conditions of the Construction Contract, but has been substantially modified.

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. All terms defined in the Invitation for Bids shall have the meaning set forth therein and wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 3. *Application for Payment*—The form acceptable to Owner which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed including any and all exhibits, addenda or attachments thereto.
 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements; and any and all Addenda, exhibits, or attachments thereto.
 9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
-

10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work including any and all Bidding Requirements and all Contract Documents. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
 12. *Contract Documents*—Those items so designated in the Agreement.. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents unless done so by a written amendment to the Agreement signed by Owner and Contractor.
 13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
 14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
 15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
 16. *Cost of the Work*—See Paragraph 11.01 for definition.
 17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
 18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
 19. *Engineer*—The individual or entity named as such in the Agreement.
 20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
 21. *General Requirements*—these *General Conditions*, the *Supplementary Conditions*, the *County's General Terms* and Sections of Division 1 of the Specifications.
 22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
-

23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
 24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
 25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
 26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work. Milestones that trigger a partial payment of the Contract Price must be identified by the Contractor in the Bid and defined with specificity.
 27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
 28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
 29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
 30. *PCBs*—Polychlorinated biphenyls.
 31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
 32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times and identifying all Milestones, if any.
 33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
 34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
 35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
-

36. *Resident Project Representative*—The authorized representative of the Owner, being Wayne Stephens, Director of Public works and an authorized representative Engineer who may be assigned to the Site or any part thereof.
 37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
 38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
 39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work identified as Milestones and used as the basis for reviewing Contractor's Applications for Payment, progress payments shall only be made if specifically requested in the Bid and if consistent with the Agreement.
 40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
 41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
 42. *Specifications*—Any and all parts of the Contract Documents (and any and all attachments, exhibits or addenda thereto) consisting of plans, specifications, written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
 43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
 44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer and Owner, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.
 45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
 46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
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47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.
52. *Final Completion*- The time at which all of the Work on the Project is fully and finally complete to the sole satisfaction of the Owner.

1.02 *Terminology*

- A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to
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undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. Day:

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. Defective:

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. Furnish, Install, Perform, Provide:

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.

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

ARTICLE 2 – PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
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B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

1. Evidence of Insurance shall be provided on industry standard forms (such as Accord Certificate of Insurance 25-S), and shall be signed by an authorized agent of the CONTRACTOR's insurer.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the thirtieth day after the Effective Date of the Agreement.

2.04 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run except with the specific written authorization of the Owner.

2.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
 2. a preliminary Schedule of Submittals; and
 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.
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2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. As soon as practicable, but at minimum 10 days before submission of the first Application for Payment if progress payments are requested in the Bid, a conference attended by Contractor, Owner, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment, if applicable, shall be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Owner if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Owner responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 - 2. Contractor's Schedule of Submittals will be acceptable to Owner and Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 - 3. Contractor's Schedule of Values will be acceptable to Owner and Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work, was specifically requested in the Bid and conforms to all requirements of the Contract Documents and the Agreement.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
 - B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the
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indicated result will be provided whether or not specifically called for, at no additional cost to Owner.

- C. Clarifications and interpretations of the Contract Documents shall be issued by Owner as provided in Article 9.

3.02 *Reference Standards*

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

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Owner and Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Owner before proceeding with any Work affected thereby.
 2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Owner and Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
 3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof or reasonably should have known.
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B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).
2. Where any Contract Documents deal with the same or similar subject matter, but do not directly conflict, then the requirements of both shall be met and such shall not be considered an ambiguity.

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive signed by both the Owner and Contractor.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 1. A Field Order signed by Owner;
 2. Owner's written approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or
 3. Owner's written interpretation or clarification.
 4. At the ENGINEER's or OWNER's discretion and prior to the execution of the Agreement, a confirmed set of drawings and specifications may be prepared and issued, incorporating all changes issued between the date of Notice of Invitation to Bid and the date of the Agreement. If specifically listed in the Agreement, the confirmed drawings and specifications will become the Drawings and Specifications, completely replacing those previously issued. However, if the confirmed drawings and specifications are not specifically listed in the Agreement, they will be considered to have been provided as a courtesy only, for the convenience of the parties involved, and will have no legal or contractual effect.

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
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1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
 2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and
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Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations, if such applies.

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

4.02 *Subsurface and Physical Conditions*

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

1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

C. If there are no reports of explorations and tests identified in the General Conditions, then any such items provided are provided only as a courtesy to CONTRACTOR, and such items are not represented to have been used in part or in whole in the ENGINEER's preparation of the Contract Documents, and CONTRACTOR shall have no grounds for claims related to the information provided therein, including the general accuracy of such information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
 2. is of such a nature as to require a change in the Contract Documents; or
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3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, may be adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A;
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03; and
 - c. acceptance in writing by the Owner in Owner's sole discretion.
 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
 3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or
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any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
 2. If Owner concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An adjustment may be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated; and if the Owner approves of such
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adjustment in its sole discretion. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer and Owner whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor
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shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. Intentionally omitted.
- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 Performance, Payment, and Other Bonds

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year
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after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
 - B. Intentionally omitted.
 - C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
 - D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
 - E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.
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5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is required under the County's General Terms and also as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
 5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
 2. include at least the specific coverages and be written for not less than the limits of liability provided in the County's General Terms, Supplementary Conditions or required by Laws or Regulations, whichever is greatest;
 3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
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4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
 5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
 6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.
- C. The limits of liability for the insurance required by Paragraph 5.04 of the General Conditions shall provide the following coverages for not less than the following amounts or greater where required by Laws and Regulations:
1. 5.04.A.1 and 5.04.A.2. Workers' Compensation, etc. under Paragraphs 5.04.A.1 and 5.04.A.2 of the General Conditions:
 - a. State: Statutory
 - b. Applicable Federal (e.g. Longshoreman's): Statutory
 - c. Employer's Liability: \$1,000,000
 2. 5.04.A.3, 5.04.A.4 & 5.04.A.5 CONTRACTOR's Liability Insurance under Paragraphs 5.04.A.3 through 5.04.A.5 of the General Conditions which shall also include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of CONTRACTOR:
 - a. General Aggregate (Except Products-Completed Operations): \$1,000,000
 - b. Products-Completed Operations Aggregate: \$1,000,000
 - c. Personal and Advertising Injury (Per Person/Organization): \$1,000,000
 - d. Each Occurrence (Bodily Injury and Property Damage): \$1,000,000
 - e. Property Damage liability insurance will provide Explosion, Collapse and Underground Coverages where applicable.
 - f. Excess Liability -
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- 1) General Aggregate: \$1,000,000
 - 2) Each Occurrence: \$1,000,000
3. 5.04.A.6 Automobile Liability:
- a. Bodily Injury: \$500,000 Each Person; \$1,000,000 Each Accident
 - b. Property Damage: \$1,000,000 Each Accident
4. 5.04.B.4 The Contractual Liability coverage required by Paragraph 5.04 shall provide coverage for not less than the following amounts:
- a. General Aggregate: \$2,000,000
 - b. Each Occurrence (Bodily Injury and Property Damage): \$2,000,000

5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;
 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials
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and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Contractor shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.
- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Only to the extent permitted under such policies, Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the
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Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued. Notwithstanding the foregoing, any waiver shall not apply if it violates the provisions of any policy or would eliminate or limit recovery for any loss.

B. Intentionally omitted.

C. Intentionally omitted.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If OWNER has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the CONTRACTOR in accordance with Article 5 on the basis of non-conformance with the Contract Documents, OWNER shall so notify CONTRACTOR in writing within 10 days after receipt of the certificates (or other evidence requested) required by paragraph 2.01.B. CONTRACTOR shall provide to OWNER such additional information in respect of insurance provided as OWNER may reasonably request. If CONTRACTOR does not purchase or maintain all of the Bonds and Insurance required by the Contract Documents, CONTRACTOR shall notify OWNER in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, OWNER may elect to obtain equivalent Bonds or insurance to protect OWNER's interests at the expense of CONTRACTOR, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.
1. At the OWNER’s or ENGINEER’s request, CONTRACTOR shall provide a summary of the superintendent’s relevant experience with current references and their contact information.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer and Owner.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.
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- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Owner or Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Owner for acceptance, and Engineer for acceptance (to the extent indicated in Paragraph 2.07), proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order signed by the Owner.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer and Owner for review under the circumstances described below.
 - 1. *"Or-Equal" Items:* If in Owner's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Owner as an "or-equal" item, in which case review and approval of the proposed item may, in Owner's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Owner, with the assistance of Engineer when requested, determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

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

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

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

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

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

2. *Substitute Items:*

a. If in Owner's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Owner to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Owner from anyone other than Contractor.

c. Owner may request Engineers review and the requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.

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

1) shall certify that the proposed substitute item will:

a) perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified;

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,

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

- c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and
 - 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Owner in Owner's sole discretion. Contractor shall submit sufficient information to allow Owner, in Owner's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. Owner may request Engineer's review and the requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Owner and Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Owner or Engineer may require Contractor to furnish additional data about the proposed substitute item. Owner will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Owner's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Owner will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be
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required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work. A list of Subcontractors, Suppliers, or other individuals or entities shall be required as indicated in the Bid Form or the Agreement.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the
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Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. Intentionally omitted.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits, licenses, bonds, and other costs associated with construction permitting agency requirements. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement.
 - 1. Unless otherwise indicated in the Contract Documents, CONTRACTOR shall pay all charges of utility owners for the establishment of new accounts and physical service connections, and for initiation of utility services. OWNER shall assume such accounts upon Substantial Completion, but CONTRACTOR shall be responsible for fees and usage charges up to and including the date of Substantial Completion, whether or not they are billed by the utility prior to the date of Substantial Completion.

6.09 *Laws and Regulations*

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

- B. If Contractor performs any Work in violation of, or knowing or having reason to know that it is contrary to, any Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times, but only if acceptable to Owner in Owner's sole discretion. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work. Owner is a tax-exempt political subdivision of the Commonwealth of Virginia.
- B. Said taxes shall not be in addition to the contract price between the OWNER and the CONTRACTOR, as the taxes shall be an obligation of the CONTRACTOR and not of the OWNER, and the OWNER shall be held harmless for same by the CONTRACTOR.
- C. Pollution control facilities qualify for exemption from sales and use tax in accordance with Section 58.1-609.3 of the Code of Virginia. If this Project qualifies as pollution control facilities, the Work will be certified to the Virginia Department of Taxation as an approved pollution control facility by the Department of Environmental Quality. CONTRACTOR shall request from the Virginia Department of Taxation the applicable sales and use tax exemption certificate.

6.11 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
 2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
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3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
 - C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
 - D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

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

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
 1. all persons on the Site or who may be affected by the Work;
 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
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3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
 - C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
 - D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
 - E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss directly and solely attributable to the fault of Drawings or Specifications or to the willful misconduct of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
 - F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

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

6.16 *Emergencies*

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

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Submit number of copies specified in the General Requirements.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer and Owner to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

- a. Submit number of Samples specified in the Specifications.
- b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer or Owner may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

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

C. *Submittal Procedures:*

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

- a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
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- d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
3. With each submittal, Contractor shall give Owner specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Owner for review and approval of each such variation.

D. Engineer's Review:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Owner. Engineer's review and approval will not bind the Owner and only Owner may determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. Owner may use Engineer's review in coming to any determination of acceptance.
3. Owner's and Engineer's reviews and approvals shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Owner has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Neither Owner's nor Engineer's review and approval shall relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. Resubmittal Procedures:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
 2. Once preliminarily approved by Engineer, all Shop Drawings and Samples must be approved by Owner in writing.
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6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be completed in a good and workmanlike manner in accordance with the Contract Documents and consistent with industry standards so as to pass without exception in the trade and further all such Work and will be free from defects. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Owner or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Owner and Engineer;
 6. any inspection, test, or approval by others; or
 7. any correction of defective Work by Owner.
- D. The warranty period on all labor and materials being a part of the Work shall be 36 calendar months from the date of final completion. No warranty period time limit shall apply to Work which was defective at the time of Final Completion, as in the case of latent non-conformities.
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6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
 - B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by
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such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefore, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. If OWNER considers such other work to be of such a nature as to be likely to cause interference with the CONTRACTOR's performance of the Work, CONTRACTOR shall be notified prior to starting other work. If CONTRACTOR considers any other work proposed to be performed, or work being performed by the OWNER, to be of such a nature as to be likely to cause interference with the CONTRACTOR's performance of the Work, CONTRACTOR shall provide written notice of such. OWNER shall respond to such notice within 7 working days of receipt.
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefore as provided in Paragraph 10.05.
 - B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions
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for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 3. the extent of such authority and responsibilities will be provided.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner may issue communications to Contractor directly or through Engineer.
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8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

- A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

- A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.
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8.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

- A. The Director of Public Works or the County Administrator shall be Owner's representatives during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

- A. Engineer and Owner's Representatives will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

- A. OWNER will furnish full-time inspection services for extensive observation of the Work. The responsibilities and authority and limitations of the OWNER's inspector shall be as set forth in the Contract Documents for the OWNER.
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9.04 *Authorized Variations in Work*

- A. Only Owner may authorize a variation in the Work, even minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner only if signed by the Owner and in such cases Contractor shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

- A. Only Owner will have authority to reject Work which Owner believes to be defective, or that Owner believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Owner or Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. Owner, with Engineer's guidance which shall not be binding on Owner, will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Owner the Engineer's preliminary determinations on such matters and render a written decision thereon (by recommendation of an Application for Payment or otherwise) only if requested to do so by the Owner. Owner's written decision thereon will be final and binding, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Only Owner may interpret requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the
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performance of the Work, will be referred to the Owner and Engineer in writing within 30 days of the event giving rise to the question.

- B. Engineer will, with reasonable promptness, render a written decision on the issue referred if so requested to do so by the Owner, but only the Owner's written decision shall control. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05.
- C. Owner's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents; and such review will not be binding on the Owner.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.
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ARTICLE 10 – CHANGES IN THE WORK; CLAIMS10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a signed written Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04.

10.03 *Execution of Change Orders*

- A. Owner and Contractor may enter into written Change Orders from time to time covering:
 - 1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 - 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 - 3. changes in the Contract Price or Contract Times; provided that, in lieu of executing any such Change Order, a claim may be pursued under 10.05.

10.04 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

- A. *Claim's Act:* If a Claim cannot be resolved under 10.05(B) and (C) below, then the following provisions applies to such Claims. Contractor shall notify Owner in writing of any Claims hereunder consistent with Section 65 of the County's General Terms, except those waived pursuant to Paragraph 14.09. The County shall respond to all Claims, except those waived
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pursuant to Paragraph 14.09, if and as required by Section 65 of the County's General Terms. If Owner has a Claim against Contractor hereunder, then the Owner may pursue any rights or remedies it may have under the Contract Documents or by Laws and Regulations in respect of such Claims or law, equity or otherwise.

- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to the other party to the Contract. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the other party to the Contract within 60 days after the start of such event. A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to the claimant within 30 days after receipt of the claimant's last submittal.
- C. *The other side will* review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part;
 2. approve the Claim; or
 3. notify the other party that more information is need to determine approval or denial of the Claim.
- D. No Claim by Contractor for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of any and all costs reasonably or necessarily incurred and paid by Contractor in the proper performance of the Work and the parties agree that the full Cost of Work is included in the Contract Price set forth in the Agreement. Notwithstanding any provision of these General Requirements, the total payments made by Owner to Contractor cannot exceed the Contract Price unless the parties execute of a valid written modification, amendment or change order specifically modifying the Contract Price which is signed by the Owner. The costs set forth in Paragraph 11.01.B shall not be charged to the Owner under any circumstances and cannot be factored into the Cost of the Work. The value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price cannot exceed the Cost of the Work; and the costs to be paid to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim and further shall only be those costs agreed to by the Owner in writing. In addition, any such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and may include only the following items:
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1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
 5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
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- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
 - 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 - 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 - 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
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5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* Notwithstanding any of the foregoing, the Contractor shall in no event be paid any amounts in excess of the Contract Price, excepting only if the parties execute of a valid written modification, amendment or change order specifically modifying the Contract Price which is signed by the Owner. Contract Price is as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C and subject to approval in advance by the Owner in Owner's sole discretion.
- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances (if applicable) so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer as set forth in the Agreement.
- B. *Cash Allowances:*
1. Contractor agrees that:
 - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance:*
1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued to reflect actual amounts due Contractor on account of Work covered by allowances if the Work covered by allowances would result in a savings to the Owner and a lower Contract Price, and then the Contract Price shall be correspondingly adjusted down. Engineer will consult with the Owner on a recommended adjustment down, if applicable, for allowances. Notwithstanding any other provision of these General Requirements, Allowances shall never result in an increase in the Contract Price.
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11.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Owner subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense do to the sole fault or negligence of Owner or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

- A. The Contract Price may only be changed by a written Change Order signed by the Owner. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
 - B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
 - 1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2).
 - C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:
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1. a mutually acceptable fixed fee; or
2. at cost with no mark-up of any kind.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a written Change Order signed by the Owner. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the reasonable control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor within no more than ten (10) days of such delay as provided in Paragraph 12.02.A. Delays beyond the control of Contractor are limited to the willful misconduct or gross negligence of Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
 - B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor may be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both, and may submit a Claim to Owner for the same. Owner shall only have to consider a request from Contractor for an adjustment of the Contract Times if it is essential to Contractor's ability to complete the Work within the Contract Times.
 - C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond the reasonable control of Owner and Contractor, then Contractor may be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
 - D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
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- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.
- F. When establishing the contract time, an allowance will be made for four (4) calendar days of work lost per month due to inclement weather conditions. The CONTRACTOR, at the time of each periodic pay request, shall submit to the ENGINEER and OWNER for approval a list of all working days lost due to either inclement weather or site conditions caused by inclement weather for the period. Accompanying his list should be a summary of the specific conditions which caused the loss. This request will be reviewed by the ENGINEER in light of observations made by the ENGINEER and resident inspector. Approval of the periodic payment estimate by the ENGINEER, OWNER, and Agency will also include approval of the weather delay request. After substantial completion, and not until then, a change order must be executed if a time extension for weather related delays is requested by the CONTRACTOR. The time extension must be based solely on the time requested within the periodic payment estimates. Subtracted from this time will be the four (4) days per month allowance assumed in the contract. There cannot be a decrease in contract length if the allowance for inclement weather exceeds the actual number of days lost due to inclement weather. To convert working days into calendar days, multiply the working days by seven (7) and divide by the number of working days in a typical work week.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 Notice of Defects

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.
- B. Owner's failure to notify Contractor of any Defective Work is not a waiver of any claims of actions Owner may have against Contractor relating thereto.

13.02 Access to Work

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 Tests and Inspections

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
 - B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
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1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer and Owner, Contractor shall, if requested by Engineer or Owner, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer and Owner timely notice of Contractor's intention to cover the same and neither Owner nor Engineer has not acted with reasonable promptness in response to such notice. If Owner or Engineer responds within fourteen (14) days of receipt of Contractor's notice, such response is per se prompt.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer or Owner, it must, if requested by Engineer or Owner, be uncovered for Engineer's or Owner's observation and replaced at Contractor's expense.
1. Whether or not the uncovered Work is found to be defective, CONTRACTOR shall pay all claims, costs, losses, and damages as indicated in Paragraph 13.04.B.1.
- B. If Owner considers it necessary or advisable that covered Work be observed by Owner or inspected or tested by others, Contractor, at Owner's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Owner may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
1. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled
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to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

2. If the uncovered Work is not found to be defective, Contractor may request an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within three years after the date of Final Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 1. repair such defective land or areas; or
 2. correct such defective Work; or
 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
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4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Final Completion of all the Work, the correction period for that item may still start to run from Final Completion.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of three years after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Intentionally omitted.*

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Owner to correct defective Work, or to remove and replace rejected Work as required by Owner in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
 - B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.
 - C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be
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issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

- A. The Schedule of Values with those Milestones established as provided in Paragraph 2.07.A, if any and if requested by Contractor in its Bid, will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Owner. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments:*

1. No sooner than the later to occur of any date established in the Agreement for each progress payment based on completion of a Milestone or the actual completion of Work on that Milestone (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment includes materials and/or equipment, then the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner. Owner shall have 45 days from receipt of any valid Application for Payment based on completion of a Milestone to either: (i) determine that the Milestone has been met to the Owner's sole satisfaction and to pay the same (however making payment does not waive any claims Owner may have against Contractor if the Work is later found to be defective, incomplete, or otherwise not in strict conformance with the Contract Documents or Agreement); or (ii) to notify the Contractor that the Work on the Milestone is unsatisfactory and payment is therefore denied. Owner shall not be deemed to have received the Contractor's valid Application for Payment until the Owner has received said Application for Payment and also has received Engineer's recommendation that the Application for Payment be paid as set forth in 14.02(B) below.
 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
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3. The amount of retainage with respect to progress payments for Milestones will be as stipulated in the Agreement.

B. Review of Applications:

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
 3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
 4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
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- c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due:

1. Owner shall have 45 days from receipt of any valid Application for Payment based on completion of a Milestone to either: (i) determine that the Milestone has been met to the Owner's sole satisfaction and to pay the same (however making payment does not waive any claims Owner may have against Contractor if the Work is later found to be defective, incomplete, or otherwise not in strict conformance with the Contract Documents or Agreement); or (ii) to notify the Contractor that the Work on the Milestone is unsatisfactory and payment is therefore denied. Owner shall not be deemed to have received the Contractor's valid Application for Payment until the Owner has received said Application for Payment and also has received Engineer's recommendation that the Application for Payment be paid as set forth in 14.02(B) below.

D. Reduction in Payment:

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
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- c. there are other items entitling Owner to a set-off against the amount recommended;
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A or
 - e. Owner notifies the Contractor that the Work on the Milestone is unsatisfactory or the Work is not in strict conformance with the Contract Documents and payment is therefore denied in whole or part.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for only nominal insubstantial items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
 - B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Owner in writing giving the reasons therefor. If Owner does not consider the Work substantially complete, Owner will notify Contractor in writing giving the reasons therefor.
 - C. If Owner considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner will review the draft certificate of Substantial Completion (with a tentative list of items to be completed or corrected) prepared by Engineer. Owner may revise and shall finalize the certificate of Substantial Completion with a final list of items to be completed or corrected.
 - D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and
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protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Owner will review the recommendation and revise the same as Owner deems appropriate. When the recommendation of the division of responsibilities pending final payment is acceptable to the Owner in its sole discretion, the Owner will deliver it to the Contractor and Engineer.

- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete, and such permission shall not be unreasonably withheld or delayed. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Owner will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor.
 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.
 5. Liquidated Damages, as provided for in the Agreement, will not be reduced or delayed due to partial utilization.

14.06 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and then the Owner will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.
-

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Owner, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, warranty documentation, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work. Such releases or waivers shall be provided in addition to affidavits required by Paragraph 14.02.A.2.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner in the Owner's sole discretion, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Owner and Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Owner's and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Owner and Engineer are satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner that the Work is acceptable to Engineer subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the
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reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due:

1. Owner shall have 45 days from receipt of any valid Application for Payment based on final completion to either: (i) determine that the Work is complete, the Work is in strict conformance to the Contract Documents and Agreement and that no Claims are outstanding to the Owner's sole satisfaction and to pay the same (however making payment does not waive any claims Owner may have against Contractor if the Work is later found to be defective, incomplete, or otherwise not in strict conformance with the Contract Documents or Agreement); or (ii) to notify the Contractor that the Work incomplete or unsatisfactory not in strict conformance to the Contract Documents or Agreement or that a Claim is unresolved and payment is therefore denied. Owner shall not be deemed to have received the Contractor's valid Application for Payment until the Owner has received said Application for Payment and also has received Engineer's recommendation that the Application for Payment be paid as set forth in 14.07(B) above. Notwithstanding any provision of these General Requirements, while any Claim is outstanding, any Work is incomplete or defective, or any Work is not in strict conformance with the Contract Documents, Final Payment shall not be due or owing.
2. A valid Application for Payment and accompanying documentation must not request a payment that exceeds the final amount owed less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages.

14.08 *Final Completion Delayed*

- A. Even if, through no fault of Contractor, final completion of the Work is significantly delayed, the final Application for Payment will be delayed until the Work is complete and payment will be due as described under 14.07(C) above.

14.09 *Waiver of Claims*

- A. The making and acceptance of final payment will not constitute a waiver of any Claims by Owner against Contractor, including without limitation, Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents.
 - B. The making of final payment will not constitute a waiver of any Claims by Owner against Contractor, including without limitation, Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents.
 - C. The acceptance by Contractor of final payment will constitute a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.
-

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION**15.01 *Owner May Suspend Work***

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. If the suspension is due to no fault of Contractor, Contractor may be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05 and upon approval of such adjustment by the Owner in the Owner's sole discretion.

15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's repeated disregard of the authority of Engineer; or
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
 2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be retained by the Owner. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. When
-

exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed. Nothing herein shall limit any claims or actions Owner may have against Contractor.

- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 10 days of receipt of said notice and provides written notice of its plan of correction to Owner and Owner accepts Contractor's plan in its sole discretion. Should Contractor thereafter fail to act to diligently cure its failure in strict conformance with the plan submitted to the Owner, then the Owner shall notify the Contractor of such failure and may immediately terminate for cause.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.
- G. These rights of termination shall be in addition to any rights of termination the Owner may have under the County's General Terms and nothing herein is intended to limit such rights and shall not be construed as a limit on such rights.

15.03 *Owner May Terminate for Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination; and
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If Contractor has pursued all Work diligently and in strict conformance with the Agreement and Contract Documents, and through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Owner fails to act on any valid and undisputed Application for Payment within 45 days after it is submitted, or (iii) Owner fails for 90 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 30 days written notice to Owner and
-

Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on a valid and undisputed Application for Payment within 90 days after it is submitted, or Owner has failed for 90 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – INTENTIONALLY OMITTED.

ARTICLE 17 – MISCELLANEOUS

17.01 Giving Notice

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
1. delivered in person or mailed registered or certified (postage prepaid) to the head administrator of the organization or of the department responsible for matters related to the Project.

17.02 Computation of Times

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period.

17.03 Cumulative Remedies

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 Survival of Obligations

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.
-

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

END OF SECTION

Exhibit G

Exhibit G1

Contractor's Application

Progress Estimate

For (contract):		Application Number:					
Application Period:		Application Date:					
Item Specification Section No.	A Description	B Scheduled Value	Work Completed		E Materials Presently Stored (not in C or D)	F Total Completed and Stored to Date (C + D + E)	G Balance to Finish (B - F)
			C From Previous Application (C+D)	D This Period			
Totals							

Exhibit G2

Certificate of Substantial Completion

Project: Zion Crossroads Water and Sewer System	
Owner: Fluvanna County	Owner's Contract No.:
Contract:	Engineer's Project No.: 50078861

This [tentative] [definitive] Certificate of Substantial Completion applies to:

- All Work under the Contract Documents: The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

A [tentative] [definitive] list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:

- Amended Responsibilities Not Amended

Owner's Amended Responsibilities:

Contractor's Amended Responsibilities:

Exhibit G3

Work Change Directive

No. _____

Date of Issuance: _____ Effective Date: _____

Project: Zion Crossroads Water and Sewer System	Owner: Fluvanna County	Owner's Contract No.:
Contract:		Date of Contract:
Contractor:		Engineer's Project No.: 50078861

Contractor is directed to proceed promptly with the following change(s):

Item No.	Description

Attachments (list documents supporting change):

Purpose for Work Change Directive:

Authorization for Work described herein to proceed on the basis of Cost of the Work due to:

- Nonagreement on pricing of proposed change.
- Necessity to expedite Work described herein prior to agreeing to changes on Contract Price and Contract Time.

Estimated change in Contract Price and Contract Times:

Contract Price \$ _____ (increase/decrease) Contract Time _____ (increase/decrease)
days

Recommended for Approval by Engineer:	Date
Authorized for Owner by:	Date
Received for Contractor by:	Date
Received by Funding Agency (if applicable):	Date:

Exhibit G4

Change Order

No. _____

Date of Issuance: _____ Effective Date: _____

Project: Zion Crossroads Water and Sewer System	Owner: Fluvanna County	Owner's Contract No.:
Contract:		Date of Contract:
Contractor:		Engineer's Project No.: 50078861

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Attachments (list documents supporting change):

CHANGE IN CONTRACT PRICE:

CHANGE IN CONTRACT TIMES:

Original Contract Price:

\$ _____

[Increase] [Decrease] from previously approved Change Orders No. _____ to No. _____

\$ _____

Contract Price prior to this Change Order:

\$ _____

[Increase] [Decrease] of this Change Order:

\$ _____

Contract Price incorporating this Change

\$ _____

Original Contract Times: Working Calendar days

Substantial completion (days or date): _____

Ready for final payment (days or date): _____

[Increase] [Decrease] from previously approved Change Orders

Substantial completion (days): _____

Ready for final payment (days): _____

Contract Times prior to this Change Order:

Substantial completion (days or date): _____

Ready for final payment (days or date): _____

[Increase] [Decrease] of this Change Order:

Substantial completion (days or date): _____

Ready for final payment (days or date): _____

Contract Times with all approved Change Orders:

Substantial completion (days or date): _____

Ready for final payment (days or date): _____

RECOMMENDED:

By: _____
Engineer (Authorized Signature)

Date: _____

Approved by Funding Agency (if applicable):

ACCEPTED:

By: _____
Owner (Authorized Signature)

Date: _____

ACCEPTED:

By: _____
Contractor (Authorized)

Date: _____

Date: _____

Change Order

Instructions

A. GENERAL INFORMATION

This document was developed to provide a uniform format for handling contract changes that affect the Agreement, Contract Price or Contract Times. To be binding on Owner, any changes to the Agreement of any kind, whether that have been initiated by a Work Change Directive, Field Order or otherwise, must be incorporated into a written Change Order signed by the Owner.

Changes, including without limitation those that affect Contract Price or Contract Times, should be promptly covered by a Change Order. The practice of accumulating Change Orders to reduce the administrative burden may lead to unnecessary disputes.

If Milestones have been listed in the Agreement, any effect of a Change Order thereon should be addressed.

For supplemental instructions and minor changes not involving a change in the Contract Price or Contract Times, a Field Order should be used.

B. COMPLETING THE CHANGE ORDER FORM

Engineer normally initiates the form, including a description of the changes involved and attachments based upon documents and proposals submitted by Contractor, or requests from Owner, or both.

Once Engineer has completed and signed the form, all copies should be sent to Contractor for approval. After approval by Contractor, the Change Order shall be sent to the Owner for approval in its sole discretion. Engineer should make distribution of executed copies after approval by both parties.

If a change only applies to price or to times, cross out the part of the tabulation that does not apply.

Exhibit G5

Field Order

No. _____

Date of Issuance: _____ Effective Date: _____

Project: Zion Crossroads Water and Sewer System	Owner: Fluvanna County	Owner's Contract No.:
Contract:		Date of Contract:
Contractor:		Engineer's Project No.: 50078861

Attention:

You are hereby directed to promptly execute this Field Order issued in accordance with General Conditions Paragraph 9.04.A, for minor changes in the Work without changes in Contract Price or Contract Times once approved by the Owner. If you consider that a change in Contract Price or Contract Times is required, please notify the Engineer immediately and before proceeding with this Work.

Reference: _____ (Specification Section(s)) _____ (Drawing(s) / Detail(s))

Description: _____

Attachments: _____

Engineer: _____

Receipt Acknowledged by Contractor: _____ Date: _____

Owner Approval: _____
 Date: _____

Exhibit G6

(Contractor Name)

(Contractor Address)

(Contractor Telephone)

FAX (Contractor Fax)

REQUEST FOR INFORMATION

Project No. _____

RFI No. _____

Date: _____

To: _____

From: _____

Project Name: _____

Contract No.: _____

Owner: _____

Subject: _____

Contract Drawing(s): _____

Specification Section: _____

Question:

Contractor:

Signature _____ Date

Reply:

Engineer/Architect:

Signature _____ Date

Cc: File

Exhibit H

**2018-03 ZION CROSSROADS WATER AND SEWER SYSTEM
TECHNICAL SPECIFICATIONS**

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Division 01 - General Requirements

- Section 01010 – Summary of Work
- Section 01013 – Mobilization
- Section 01200 – Price and Payment Procedure
- Section 01310 – Project Meetings
- Section 01320 – Scheduling of Construction
- Section 01330 – Submittal Procedures
- Section 01400 – Testing and Special Inspections
- Section 01500 – Temporary Facilities and Controls
- Section 01730 – Operating and Maintenance Data
- Section 01770 – Closeout Procedures

Division 02 – Site Construction

- Section 02100 – Site Preparation
- Section 02110 – Clearing and Grubbing
- Section 02120 – Erosion and Sediment Control
- Section 02230 – Dewatering
- Section 02300 – Earthwork for Utilities
- Section 02500 – Pavement
- Section 02665 – Potable Water Systems
- Section 02731 – Sanitary Sewer Systems
- Section 02798 – Utility Location and Identification
- Section 02800 – Horizontal Boring
- Section 02850 – Directional Drilling
- Section 02920 – Turf and Grasses
- Section 02990 – Utility Testing

Division 03 – Concrete

- Section 03300 – Cast-In-Place Concrete
- Section 03481 – Precast Concrete Manholes

Division 11 – Equipment

- Section 11010 – Metering Equipment

Appendix

- Geotechnical Engineering Report

**SECTION 01010
SUMMARY OF WORK**

PART 1- GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. DESCRIPTION

1. All work shown on Drawings and/or called for in these Specifications shall be performed under the General Contract, unless specifically noted to the contrary in the Contract Documents. The Zion Crossroads Water and Sewer System project consists of the installation of approximately 22,921 lf of 12" waterline, 9,825 lf of 10" force main, 12,412 lf of 8" force main, including multiple directional drills and horizontal bores installing casing pipe and carrier pipe, all necessary valves, appurtenances and connections to the existing 12" water line near the intersection of Route 250 and Route 15. This project also consists of connecting into new water lines and force mains being installed under simultaneous projects "Zion Crossroads Water Booster Pump Station and Wastewater Pump Station," and "Zion Crossroads Elevated Storage Tank." These projects are under separate contracts and CONTRACTOR will be responsible for coordination with those projects.

B. CONTRACTOR'S Duties: CONTRACTOR'S duties in performance of the WORK shall include, however are not limited to:

1. Responsibilities: CONTRACTOR shall be:
 - a. Responsible for the management of the Project.
 - b. Responsible for hiring all subcontractors.
 - c. The sole arbitrator of the division of WORK of all trades, associated with WORK provided for in the Contract Documents.
2. Work: Except as specifically noted, provide and pay for all:
 - a. Labor, materials, and equipment.
 - b. Tools, construction equipment and machinery.
 - c. Water, heat, and utilities required for construction.
 - d. Other facilities and services necessary for proper execution and completion of WORK.
3. Permits and Fees: Secure and pay for, as necessary for proper execution and completion of WORK, and as applicable at time of receipt of Bids:
 - a. Permits (including building and trade permits),
 - b. Government fees,
 - c. Bonds,
 - d. Licenses

- e. Insurance.
- 4. Notices: Unless specifically indicated otherwise, give required Notices to ENGINEER, government agencies, (local, state and federal), utility companies, OWNER and others as required and within the time frames identified in the Contract Documents.
- 5. Regulations: Comply with all codes, ordinances, rules regulations, orders, and other legal requirements of public authorities which bear on performance of WORK.
- 6. Written Notice: Promptly submit Written Notice to ENGINEER of observed conflicts in Contract Documents. It is CONTRACTOR'S responsibility to make certain that all work performed as defined in the Drawings and Specifications comply with codes and regulations.
- 7. Coordinate: Coordinate WORK with appropriate authorities, *i.e.*, utility companies, Virginia Department of Health (VDH), and Virginia Department of Transportation (VDOT), etc, and other contractors who may be performing other work at the project site of this work or adjacent to this work.

1.2 ADDITIONAL ENGINEERING SERVICES

- A. In the event that the ENGINEER is required to provide additional engineering services as a result of CONTRACTOR error or omissions; substitution of materials or equipment by the CONTRACTOR that are different from what is specified that results in change in dimensions, layout, power requirements, etc.; or if the ENGINEER is required to examine and evaluate any changes proposed by the CONTRACTOR for the convenience of the CONTRACTOR; or if the ENGINEER is required to witness retests of project components, then the ENGINEER's charges in connection with such additional services shall be charged to the CONTRACTOR by the ENGINEER.

1.3 AGREEMENT

- A. Construct WORK under single, all-inclusive AGREEMENT.

1.4 PLANS AND SPECIFICATIONS

- A. Plans and Specifications describe the scope of work for this project. Should there be a conflict between the drawings and specifications the more stringent shall apply.

1.5 LINES, GRADES, AND REFERENCE POINTS

- A. Project Stakeout: Lines, grades, elevations, locations, pipe inverts and centerlines, and construction staking necessary for the proper execution of all the WORK specified here in will be established by CONTRACTOR at his expense by a Professional Land Surveyor licensed in the Commonwealth of Virginia.
- B. Where the ENGINEER deems that additional survey is required for the proper execution of the Work or verification that the Work was completed per Contract Document

requirements, the CONTRACTOR at his expense shall provide this additional survey by a Professional Land Surveyor licensed in the Commonwealth of Virginia.

- C. **Project Control:** Ground control and Field surveying has been established during design of the Project by ENGINEER. These points will be provided only one (1) time upon request. All existing grade stakes, reference lines, etc. destroyed by CONTRACTOR during the progress of its WORK will be replaced at CONTRACTOR'S expense.
- D. **Field Verification:** Where called for on the Drawings and Specifications or, required for accuracy and fit with existing WORK, CONTRACTOR will make its own field measurements to verify any dimensions shown on the Drawings. Consequently, OWNER and ENGINEER present this information only as an approximation and not a guideline. CONTRACTOR shall be responsible for verification prior to submittal.

1.6 RESPONSIBILITY REGARDING EXISTING UTILITIES AND STRUCTURES

- A. **Tie-ins and Operation of OWNER's Equipment**
 - 1. CONTRACTOR shall not make any tie-ins to existing systems whether in service or not without pre-approval from the OWNER and without an OWNER's representative present. CONTRACTOR shall not operate any valves and/or equipment belonging to the OWNER.
- B. **Existing Structures:** The existence and location of underground utilities indicated on the Drawings are not guaranteed and shall be investigated and verified in the field by CONTRACTOR before WORK is begun. Excavation in the vicinity of existing structures and utilities shall be carefully performed by hand if deemed appropriate by CONTRACTOR.
- C. **Responsibility:** CONTRACTOR shall be held responsible for any damages to, and for maintenance and protection of, existing utilities and structures; and, for repair of such to the complete satisfaction of the respective owner(s).
- D. **Pre-Existing Conditions:** For the protection of both itself and OWNER, CONTRACTOR shall make a survey of adjacent properties before commencing operations. Such a survey shall locate all existing cracks and damage to existing structures by means of drawings and photographs. "Tell tales" shall be placed as directed by ENGINEER. In addition, a videotape shall be made by the CONTRACTOR showing the entire project area prior to commencing work, with copies to be submitted to the ENGINEER and OWNER.
- E. **Documentation:** A copy of this report shall be filed with ENGINEER. Any refusal of owner(s) of adjacent property to permit entry for purposes of inspection shall be noted in the report. The purpose of filing the report is to document the pre-existing conditions. Any liability resulting from this documentation as provided by the contract is solely the CONTRACTOR's responsibility.
- F. **Protection of the Work:** CONTRACTOR shall continuously maintain adequate protection of all its WORK and materials from damage or theft and shall protect OWNER'S property and all adjacent property from injury or loss arising in connection

with activities provided for this Project. CONTRACTOR shall be liable for any such damage, injury, or loss.

- G. Protection of Adjacent Facilities: CONTRACTOR shall take, use, provide, and maintain all necessary precautions, safeguards, and protection to prevent accidents, or injury to persons or property on, about, or adjacent to the site of the WORK. CONTRACTOR shall post danger signs warning against any hazards created by the WORK being done under this CONTRACT. CONTRACTOR shall designate a responsible member of its organization to be responsible for the prevention of accidents on the Project. The name of this person so designated shall be reported in writing to ENGINEER. In an emergency affecting the safety of life, or of the WORK or adjoining property, CONTRACTOR, without special instructions or authorization from ENGINEER or OWNER, is hereby permitted to act, at its discretion, to prevent such threatened loss or injury. It must take such action if so instructed or authorized by ENGINEER or OWNER.
- H. Requirements of Law: CONTRACTOR shall also protect adjacent property as required by law.

1.7 APPLICABLE CODES

- A. Specified Codes: Whenever reference is made to the furnishing of materials or testing thereof to conform to the standards of any technical organization or body, it shall be construed to mean the latest standard, code, specification, or tentative specification adopted and published at the date of Advertisement for Bids, even if reference has been made to an earlier standard; and such standards are made a part thereof to the extent which is indicated or intended.
- B. Non-Specified Codes: When no reference is made to a code, standard, or specification, the standard Specifications of the ASTM, the ASA, the AIEE, the AWWA, or the NEMA or others, as applicable, shall govern.
- C. Permits: CONTRACTOR shall be responsible for compliance with all state and local codes and ordinances.

1.8 COORDINATION

- A. All WORK shall be coordinated with the OWNER and individual property owners and business owners. At least 48 hours Notice will be given for any WORK involving an existing facility.

1.9 SEQUENCE OF WORK

- A. All new lines and equipment shall be tested in accordance with the requirements in the Contract Documents prior to placing into service.

1.10 EQUIPMENT/MATERIAL GUARANTEE

CONTRACTOR shall furnish a written guarantee from the manufacturer of the equipment and material to ENGINEER at the time of completion of WORK and before acceptance of the installation. The guarantee does not apply to any item damaged from misuse, lack of

maintenance, alternation, neglect, accident, or wear from normal use.

- A. Initial Installation: All equipment/material installed per the Contract Documents shall be free from defect in material or workmanship, and CONTRACTOR shall repair or replace at its expense any such defective equipment for a period of 1 year from the date of Substantial Completion unless otherwise noted in the Contract Documents.
- B. After Installation: CONTRACTOR shall be responsible for repair or replacement of any equipment or material which fails to meet the design requirements as specified which are revealed during fabrication, installation, demonstration and/or acceptance testing. Repair or replacement of any such equipment/material shall be completed within 60 days at the expense of CONTRACTOR. Liquidated Damages for failure to complete such repair or replacement within the specified time will be assessed in the manner specified in the General Conditions.

1.11 WORK OUTSIDE REGULAR HOURS

- A. If the CONTRACTOR desires to perform work outside the regular hours or on Saturday, he shall request permission 48 hours in advance of the proposed work to allow arrangements to be made for proper inspection. The OWNER reserves the right to refuse, at his discretion, any work request outside the regular hours or on a Saturday made by the CONTRACTOR. The OWNER may refuse the CONTRACTOR permission to work if the 48-hour notice is not given. Reasonable efforts shall be made by the CONTRACTOR to avoid undue noise during the night and on Sundays, if it is necessary to work at such times. Under normal circumstances the CONTRACTOR will not be permitted to work on Sundays.
- B. Unless specifically scheduled to work outside normal hours by the OWNER in the interest of public safety or convenience, then the CONTRACTOR will be liable for the expense of overtime work required by OWNER's and/or ENGINEER's employees. This expense includes but is not limited to OWNER and ENGINEER called to the job site outside normal working hours to resolve problems directly related to the project. Normal or regular working hours are defined as 7:00 a.m. to 5:00 p.m. Monday through Friday.
- C. IF CONTRACTOR anticipates working outside normal work hours, he shall notify the ENGINEER and OWNER as soon as possible, but in no circumstances less than 48 hours in advance.

1.12 MATERIAL SUBSTITUTIONS

- A. The specifications and project drawings depict equipment and materials which are deemed most suitable for the service anticipated. It is not intended, however, to eliminate other products of equal quality and performance. The CONTRACTOR shall prepare his bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.
- B. After execution of the contract, the CONTRACTOR may offer substitutions to the specified equipment for consideration. The equipment proposed for substitution must be equal to or superior in construction and performance to that specified in the contract, and the quality must be demonstrated by a list of at least five (5) current users of the proposed

equipment in similar installations in Virginia that have been in service for a minimum of five (5) years.

- C. In event the CONTRACTOR obtains ENGINEER's approval for equipment substitution, the CONTRACTOR shall, at his own expense, make all resulting changes to any enclosures, buildings, piping or electrical systems as required to accommodate the proposed equipment. CONTRACTOR shall at his own expense provide detail drawings illustrating the substituted equipment to be submitted to the ENGINEER for approval prior to acceptance.
- D. Should the substitution not be acceptable to the OWNER or ENGINEER, the CONTRACTOR shall resubmit the original equipment specified. The CONTRACTOR shall be responsible for all additional costs accrued by the ENGINEER and OWNER associated with any substitution.
- E. If the cost to the CONTRACTOR is less for the proposed substitution, the saving shall be equably shared by the CONTRACTOR and the OWNER.

1.13 Storage

- A. CONTRACTOR shall store all materials and equipment in accordance with all manufacturers' recommendations. CONTRACTOR shall include in his submittal package the manufacturers' recommended long term and short term storage procedures. Storage procedures shall extend to equipment installed but not put into service and shall continue until project completion.

PART 2- PRODUCTS (Not Applicable).

PART 3- EXECUTION (Not Applicable).

END OF SECTION

**SECTION 01013
MOBILIZATION**

PART 1- GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, and other Division 1 Specifications Sections, apply to this Section.

1.2 DESCRIPTION

- A. The work covered by this section consists of preparatory work and operation, including but not limited to those necessary for the movement of personnel, equipment, trailers, sanitary facilities, temporary electric supplies, and other facilities necessary for work on the project; video taping of job site; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various items on the project site.

PART 2- PRODUCTS

2.1 VIDEO TAPE

- A. High definition digital recording shall be used.

PART 3- EXECUTION

3.1 VIDEO TAPING

- A. Format - The entire project site shall be video taped prior to beginning work and the video tape(s) provided to the OWNER's Representative. CONTRACTOR shall provide video camera and experienced cameraperson who shall walk the entire site. The taping shall be done on a sunny day to provide a clear video. Each taped segment shall begin with the cameraperson verbally noting "Project Name, Company, Camera person's Name, the Date, Time and Brief Description of Segment to be Taped". Each video tape shall be clearly labeled as to project name, date, and volume. Provide log of each video tape which will include footage milestones and segments covered in that volume.
- B. Acceptance - Video tape(s) prepared by the CONTRACTOR shall be delivered to the OWNER's Representative at the preconstruction conference for review. Within seven (7) days of receipt the OWNER's Representative shall review tape to determine and notify the CONTRACTOR if the video is acceptable. Video tape(s) shall be acceptable prior to beginning work. Video recordings shall become the property of the OWNER.

END OF SECTION

**SECTION 01200
PRICE AND PAYMENT PROCEDURES**

PART 1- GENERAL

1.1 SCOPE

Under this section of the specifications, the CONTRACTOR shall furnish all necessary labor, machinery, apparatus, tools, materials, equipment, services, and other necessary supplies and perform all work including excavation and backfilling at the unit or lump sum prices for the following items.

PART 2- PRODUCTS

2.1 PAYMENT FOR STORED MATERIALS

- A. Payment will be made for materials stored on-site in accordance with requirements of Contract Documents and for which a paid invoice or other proof of payment is provided.
- B. All stored materials shall be stored in strict accordance with manufacturer's long term storage requirements. Contactor shall submit a maintenance schedule for stored materials to the ENGINEER for approval. Maintenance schedule shall be approved by the manufacturer in writing. No payment for stored material shall be made without the receipt of the above and approved by OWNER and/or ENGINEER.
- C. The Maintenance schedule shall be strictly adhered to, witnessed by the OWNER's representative and documented as having been completed. Should the maintenance schedule not be adhered to, payment for additional stored materials shall be withheld from pay applications until the situation is corrected.
- D. Payment for stored materials shall be subject to retainage.

2.2 ITEMS INCIDENTAL TO THE WORK

- A. Any item not specifically referenced in the Bid Schedule but required by the plans and specifications shall be considered incidental to the work. The cost for these items shall be included in the most appropriate Bid Item.

2.3 BID FORM ITEMS

- A. The bid price shall be for furnishing all products (excluding all other items listed below), and perform all labor and furnishing equipment to install and erect those products and that equipment, for the construction of the Work as shown and specified including all site work, piping, valving, electrical, mechanical, plumbing, building improvements, building additions, new buildings, concrete work, and all other work shown or specified.
- B. The bid price will be based on furnishing equipment and materials in compliance with the specifications. Should the CONTRACTOR fail to provide a manufacturer of equipment

which complies with the specifications, the OWNER reserves the right to select approved specified equipment of his choice without an increase in the contract price.

- C. The CONTRACTOR shall be solely responsible for ensuring that all equipment meets all requirements in the technical specifications. If, during shop drawing submittal review, it is found that a manufacturer does not meet the requirements of the technical specifications, the CONTRACTOR shall be responsible for all additional costs to remedy the situation without an increase in the contract price or schedule duration.

2.4 ROCK

- A. Rock excavation is classified for this Project.
- B. Definitions:
 1. For mass excavation, rock is defined as any material which cannot be dislodged by a Caterpillar Model No. D-8 heavy-duty tractor, or equivalent, equipped with a hydraulically operated, single-toothed power ripper without the use of hoe ramming or blasting.
 2. For trench and pit excavations, rock is defined as any material which cannot be dislodged by a Caterpillar Model No. 330 hydraulic excavator, or equivalent, equipped with a hydraulically operated, single-toothed power ripper without the use of hoe ramming or blasting.
- C. The above classifications do not include materials such as hardpan, loose rock, concrete, cemented gravel, or other materials that can be removed by means other than hoe-ramming or blasting, but for reasons of economy in excavating, the Contractor chooses to remove by hoe-ramming or blasting. Mass rock and trench rock do not include boulders less than 1 cubic yard in volume. Boulders larger than 1 cubic yard will be considered rock for payment purposes.

PART 3- EXECUTION

3.1 PAY ITEMS

- A. The items listed herein before are the same items listed in the Bid herein before and constitute all of the pay items in this contract. Any other items of work listed in the Specifications, or shown on the Drawings, shall be considered incidental to the above items.

3.2 REQUIREMENTS FOR PARTIAL PAYMENTS

- A. Partial Payment requests will be made on an approved form. The CONTRACTOR will attach copies of invoices for all materials included in the Payment Request. Payments will be made on all major items of materials stored on site; however, the OWNER will not pay for miscellaneous incidental materials stored on site, nor for any materials stored off site.

- B. The effective date for Partial Payment shall be established during the Pre-Construction Conference. Requests for payment shall be evaluated on the basis of work completed as of the effective date, not on the basis of projected work completed.
- C. Retainage for Partial Payments from the OWNER shall be in accordance with the General Conditions.
- D. The work to be performed under the Contract will commence with the date established in the Notice to Proceed. Substantial Completion shall be achieved within the time period stated in the Bid Proposal.
- E. Prior to the Pre-Construction Conference, the CONTRACTOR shall submit the following:
 - 1. List of principal Subcontractors and Suppliers
 - 2. Schedule of Values
 - 3. Progress Schedule and first progress report
 - 4. Schedule of Submittals and Shop Drawings
 - 5. Copies of building permits, other required permits, and similar start-up authorization certifications

3.3 FINAL PAYMENT

- A. Final Payment may be requested when the ENGINEER is satisfied and the following conditions have been fulfilled:
 - 1. Complete close-out requirements shall be in accordance with Division 1.
 - 2. Complete work listed as incomplete at time of Substantial Completion or otherwise assure OWNER of subsequent completion of individual incomplete items. Cost of uncompleted items required under the contract shall be assessed by the ENGINEER and an amount equal to double the estimated cost to complete the item(s) shall be withheld until the work is completed and approved by the ENGINEER.
 - 3. Settle liens and other claims or assure OWNER of subsequent settlement. Execute and submit to ENGINEER for approval, five (5) copies each of Contractor's Affidavit of Payment of Debts and Claims and Contractor's Affidavit of Release of Liens.
 - 4. Submit proof of payment on fees, taxes, and similar obligations.
 - 5. Transfer operational, access, security, and similar provisions to OWNER and remove temporary facilities, tools, and similar items.
 - 6. Obtain consent of surety for final payment. Execute and submit to ENGINEER for approval, five (5) copies of Consent of Surety to Final Payment.

END SECTION

**SECTION 01310
PROJECT MEETINGS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Project meeting minutes will be taken and distributed by the Engineer.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:
 - 1. Preconstruction conferences.
 - 2. Pre-installation conferences.
 - 3. Progress meetings.
 - 4. Coordination meetings.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Submittals" for submitting the CONTRACTOR's Construction Schedule.

1.3 PRECONSTRUCTION CONFERENCE

CONTRACTOR shall schedule and hold the conference at the Project Site or another convenient location agreeable to OWNER and ENGINEER. Conduct the meeting to review responsibilities and personnel assignments.

- A. Attendees: Authorized representatives of the OWNER, OWNER's Representative, ENGINEER, and other consultants; the CONTRACTOR and its superintendent; major subcontractors; manufacturers; suppliers; funding agency representatives; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
- B. Agenda: Discuss items of significance that could affect progress, including the following:
 - 1. Sign-in and agenda.
 - 2. Introduction of official representatives.
 - 3. Status of contract documents.
 - a. Contracts.
 - b. Notice to Proceed.

4. Contract time issues.
 - a. Total contract time.
 - b. Project schedule.
5. Contract price issues.
 - a. Status of contract price.
 - b. Schedule of values.
 - c. Payment requests.
 - d. Change in the work.
6. Submittals.
7. Responsibilities of each stakeholder.
 - a. OWNER's representative.
 - b. OWNER.
 - c. CONTRACTOR.
 - d. Funding Agency
8. Comments, questions, discussion points.

1.4 PRE-INSTALLATION CONFERENCES

- A. Conduct a pre-installation conference at the Project Site before each construction activity that requires coordination with other construction. In addition to those listed below, any additionally required meetings will be determined during the preconstruction conference.
- B. Pre-installation meetings shall consist of, but are not limited to, the following:
 1. Directional Drilling
 2. Connection to existing facilities (DOC Property and Louisa County waterlines)
- C. Attendees: The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the OWNER's Representative of scheduled meeting dates.
 1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:
 - a. Sign-in sheet and agenda distribution.
 - b. Review of minutes from the previous meeting.
 - c. Status of contract time.
 - d. Status of contract price.
 - e. Status of submittals.
 - f. Status of RFI's.
 - g. Status of change orders.

- h. OWNER's concerns.
 - i. CONTRACTOR's concerns.
 - j. Engineer's concerns.
 - k. Schedule next meeting (as needed) and close.
 - l. Site visit.
- 2. Record significant discussions and agreements and disagreements of each conference, and the approved schedule. Promptly distribute the record of the meeting to everyone concerned, including the OWNER and the OWNER's Representative.
 - 3. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 PROGRESS MEETINGS

Can be requested and coordinated by CONTRACTOR, OWNER, OWNER's Representative, or ENGINEER as the need arises. Otherwise:

- A. Conduct progress meetings at the Project Site at regular intervals no greater than every 30 days. The OWNER and the OWNER's Representative and CONTRACTOR shall agree on the schedule for monthly meetings.
- B. Attendees: In addition to the OWNER and the OWNER's Representative, each subcontractor, supplier, funding agency or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.
 - 1. CONTRACTOR's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the CONTRACTOR's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.
 - 2. Review the present and future needs of each entity present, including the following:
 - a. Interface requirements.
 - b. Time.
 - c. Sequences.
 - d. Schedule
 - e. 30-day "Look Ahead"
 - f. Status of submittals.

- g. Deliveries.
- h. Off-site fabrication problems.
- i. Access.
- j. Site utilization.
- k. Temporary facilities and services.
- l. Hours of work.
- m. Hazards and risks.
- n. Housekeeping.
- o. Quality and work standards.
- p. Change Orders.
- q. Documentation of information for payment requests.

D. Reporting: After each meeting, the ENGINEER will distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

- 1. Schedule Updating: Revise the CONTRACTOR's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

1.6 COORDINATION MEETINGS

- A. Conduct project coordination meetings at regular intervals convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.
- B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.
- C. Record meeting minutes and results, and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.7 MEASUREMENT AND PAYMENT

- A. Payment for work described in this section shall be based on the schedule of values and approved completion percentages of the various bid items for this project. No direct measurement shall be made.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION

**SECTION 01320
SCHEDULING OF CONSTRUCTION**

PART 1 - GENERAL

1.1 SUMMARY

This Specification shall cover all work on the project including work on or at existing facilities which must remain in operation.

- A. Intent: It shall be CONTRACTOR'S responsibility to propose a construction schedule to complete all work in the contract completion time noted in the Information for Bidders and as supplemented herein.
- B. Existing Facility: It shall be CONTRACTOR'S responsibility to ensure that existing facilities remain in operation at all times during construction. The CONTRACTOR shall provide all necessary bypass pumping, temporary facilities, equipment, and utilities required to allow for uninterrupted operation of the existing facility during construction.
- C. Use of Facility: OWNER shall have the right to the use of completed facilities as they become available, this shall not relieve CONTRACTOR of his responsibility to complete work on any such facilities.
- D. Sequence of Construction: It shall be CONTRACTOR'S responsibility to sequence construction as needed to incorporate the Work into existing facilities without interrupting operation of the existing facility.
- E. Schedule: The CONTRACTOR is responsible for the sequencing, scheduling and coordinating of the Work, for monitoring the progress of the Work, and for taking appropriate action to keep the Work on schedule. The CONTRACTOR shall prepare and submit a preliminary schedule for accomplishing the Work based upon the completion time stated in the Contract. A copy of the preliminary schedule will be available at the Pre-Construction Conference. A fully complete progress schedule for accomplishing the work must be submitted in like manner no later than thirty (30) days after signing the Contract. No progress payments will be made to the CONTRACTOR until after he has submitted a preliminary schedule which is acceptable to the OWNER. Neither the second progress payment nor any subsequent payment shall be made to the CONTRACTOR until he has submitted a fully complete and updated progress schedule.
- F. Failure to provide a satisfactory preliminary or final schedule for accomplishing the Work within the time provided above shall be a breach of contract for which the OWNER may terminate the Contract in the manner provided in the General Conditions.
 - 1. The schedule shall indicate the estimated starting and completion dates for each major element of the work. The actual progress of those elements of the work will be reported monthly at the time of submission of the request for payment. If any elements of the Work are behind schedule, regardless of whether they may prevent the Work from being completed on time, the CONTRACTOR must indicate in writing what measures he is taking and plans to take to bring each

such element back on schedule and to insure that the time of completion is not exceeded.

2. In the event the completion date indicated by the schedule exceeds the Contract completion date, the assumptions and time estimates used to develop the schedule and plan will be reviewed, changes made, and a new schedule developed. This procedure shall be repeated, as necessary, to provide a Plan and Schedule meeting the Contract completion date.
- G. **Project Control:** The CONTRACTOR shall review progress no less than each month, but as often as necessary to properly manage the project and stay on schedule. The CONTRACTOR shall collect and preserve information on Change Orders, including extensions of time. The CONTRACTOR shall evaluate this information and update the schedule as necessary to finish within the contractually allowed time. The scheduled completion date shall be within the period of time allowed by the Contract for completion of construction, as amended by Change Order.
- H. **Progress Graph:** A progress graph showing the work completed to date in comparison with the work scheduled for completion and the overall project work schedule shall be provided with each monthly request for payment. The form of the graph shall be approved by the Engineer and the OWNER; however, a bar graph/chart or a CPM schedule marked, colored or annotated to reflect the above will usually satisfy this requirement.
- I. **Progress Delay:** Should any of the following conditions exist, the Engineer or OWNER may require the CONTRACTOR to prepare, at no extra cost to the OWNER, a plan of action and a recovery schedule for completing the Work by the contractual completion date. The plan of action and recovery schedule shall explain and display how the CONTRACTOR intends to regain compliance with the original schedule. The plan of action and recovery schedule, when required, shall be submitted and approved prior to submission of the next monthly request for payment.
1. Should the CONTRACTOR's monthly progress report indicate delays such that a recovery schedule is required.
 2. Should the schedule show the CONTRACTOR to be thirty (30) or more days behind schedule at any time during construction up to thirty (30) days prior to the scheduled substantial completion date.
 3. Should the CONTRACTOR request to make changes in the schedule which, in the opinion of the Engineer or the OWNER, are of a major nature.
- J. The CONTRACTOR shall prepare a schedule satisfactory to the Engineer and the OWNER fixing the dates for the beginning and completion of the placing of orders for and the manufacture, the testing and the installation of materials, supplies and equipment, which schedule shall be subject to change from time to time in accordance with the progress of the work.
- K. The CONTRACTOR shall plan on four (4) days each month during allowable work days where work on items on the critical path for the completion of the project will be delayed due to weather. The four (4) days per month shall be a cumulative amount that will apply

to each month of the project to Substantial Completion, resulting in a total number of weather days built into the construction timeline to be calculated as four (4) days per month multiplied by the number of days to Substantial Completion, divided by 30 calendar days per month. If the total number of weather days encountered through the duration of the project exceeds the allotted number of weather days as calculated above, then the CONTRACTOR may request for a time extension to the contract time. Request for time extensions due to abnormal weather will not be approved by the OWNER unless work on items on the critical path are impacted by weather that causes delays of more than four (4) days in a given month. A request for an extension in contract time for delays to work on items not on the critical path caused by weather will not be considered. It is the CONTRACTOR's responsibility to document the days where critical path work was impacted by weather, the critical path work that was impacted, and the nature of the delay caused by weather. Extensions in time requested due solely to high moisture content of soils from earlier precipitation events will only be considered if the CONTRACTOR is making reasonable efforts, as judged in the sole opinion of the ENGINEER, to dry soils. The CONTRACTOR shall make any request for an extension in contract time due to weather at the next progress meeting following the abnormal weather day(s). If a request is not made at a progress meeting, no extension in time for abnormal weather will be approved for the period of time since the last progress meeting. The CONTRACTOR shall be required to coordinate with the INSPECTOR to verify that weather had a negative impact and prohibited work within two (2) business days of the weather event; providing documentation that the weather event negatively impacted the critical path with be the sole responsibility of the CONTRACTOR.

1.2 RELATED SECTIONS

- A. Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications.

1.3 SUBMITTALS

- A. Project Schedule: CONTRACTOR will provide a tentative project schedule at the Pre-Construction Conference for discussion. Progress graphs and updated schedules shall be submitted as required.
- B. Demolition and Plan: CONTRACTOR shall submit for ENGINEER'S and OWNER'S approval a demolition plan, if demolition is included in the project, including sequence of events to prevent disruption of the existing unit operation during construction.
- C. Project Cost Breakdown: CONTRACTOR shall submit for ENGINEER'S and OWNER'S approval a tabulated cost breakdown of the project (Schedule of Values). The cost breakdown will be a format, using lump sum, units, unit pricing, etc. such that ENGINEER and OWNER will be able to assess the percentage of completion of the project and determine a prorated payment for work in place and materials on hand for each pay period. CONTRACTOR shall submit a draft of the cost breakdown at the Pre-Construction conference for discussion.

- D. List of Shop Drawing Submittals: CONTRACTOR shall submit for ENGINEER'S and OWNER'S approval a list of Shop Drawing submittals for project at the Pre-Construction Conference. The submittals will be arranged by technical specification section.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION

**SECTION 01330
SUBMITTAL PROCEDURES**

PART 1- GENERAL

1.1 GENERAL REQUIREMENTS

- A. The CONTRACTOR shall provide samples and shop drawings for all materials and equipment furnished and installed under this contract as described in the specifications in accordance with the following requirements. When the Work of the Project is divided into separate Contracts, each Prime CONTRACTOR shall provide submittals directly to the ENGINEER. No materials shall be used in the work which do not equal the approved samples or shop drawings.
- B. Transmit each item with a Submittal cover attached.
1. Number submittals by specification section and revision number (e.g. 01330-1 for initial submission of schedule of submittals.)
 2. Submit only one item per transmittal cover.
 3. CONTRACTOR shall identify all deviations from the Contract Documents by paragraph number, and provide an explanation/justification for deviation.
 4. Incomplete submittals or submittals without identified deviations will be returned un-reviewed.
- C. Materials or appliances requiring approval must not be fabricated or incorporated into the work until approval has been given. The approval or acceptance of samples shall not preclude the rejection of any material upon the discovery of defects prior to the final acceptance of the complete work.
- D. After a material has been approved, no change in brand or manufacturer will be permitted unless satisfactory written evidence is presented to, and approved by the ENGINEER, that the manufacturer cannot make scheduled delivery of approved material, or that other conditions are apparent which indicate the approval of such substitute materials to be in the best interest of the OWNER.
- E. Samples, shop drawings, material lists, manufacturers' literature, and other required information shall be submitted in sufficient time, and clearly marked, to permit proper consideration and action on same before any materials which such samples, shop drawings, and information represent are delivered to the site. The CONTRACTOR shall be held responsible for any delay in the progress of the Work which may be due to his failure to observe these requirements.
- F. Shop drawings and samples shall be submitted to the ENGINEER in sufficient quantity to permit the ENGINEER to retain four (4) copies and return the number of copies required by the CONTRACTOR.
- G. Any submittal which requires the selection of color by the ENGINEER shall be submitted such that all color selections can be made at the same time. Submittals shall be held by the CONTRACTOR for a single submittal of all items requiring color choice or

sufficient time will be allowed for the ENGINEER to receive all submittals to prepare a comprehensive color selection.

- H. Shop drawings shall include installation instructions and long and short term storage requirements.
- I. No payment shall be made for unapproved materials or equipment purchased or installed by the CONTRACTOR even if the materials or equipment meet all the requirements of the specifications and/or is the named product or equipment.
- J. See General Conditions GC 6.17 for additional submittal requirements.

1.2 SAMPLES

- A. Samples and mock-ups shall be submitted in duplicate except where a greater number is specifically required by the specifications.
- B. Samples and manufacturers' literature shall be forwarded (prepaid) to ENGINEER's office accompanied with a transmittal letter containing the following information: name of project, contractor, description of product, manufacturer, model number, ASTM or Federal Specification number where applicable. Catalogs shall be marked to indicate specific items submitted for approval.
- C. Samples which are rejected by the ENGINEER must be re-submitted as soon as possible after notification of rejection and shall be marked "Re-submitted Sample" in addition to other required information.
- D. Engineer shall have the right to require submission of samples of any material or any material lists, whether or not particularly mentioned in the Specifications.

1.3 SHOP DRAWINGS

- A. Submission of shop drawings shall comply with the following requirements:
 1. The shop drawings shall be clearly marked and submitted sufficiently in advance of the work which they cover to afford ample time for checking, correcting, and rechecking if necessary. No claim for delay will be granted to the CONTRACTOR if caused by his failure to comply with the requirements of this Section.
 2. Before submitting for approval, the CONTRACTOR shall check all shop drawings, including those submitted by subcontractors, for accuracy and to ascertain that all work contiguous with and having bearing on other work shown on the shop drawings is accurately drawn, and that the work shown is in conformity with the contract requirements.
 3. Shop drawings submitted for approval shall bear the CONTRACTOR's stamp of approval as evidence that such drawings and details have been checked by the CONTRACTOR. The submission of shop drawings (in either the original submission or when resubmitted with corrections) constitutes evidence that the CONTRACTOR has checked all information therein, and that he accepts and is

willing to perform the work, as shown, in a workmanlike manner and in accordance with the best standard practices.

4. No claim for an extra shall be based on work shown on the shop drawings. Note: all claims for extra shall be submitted by procedures established elsewhere.

B. The CONTRACTOR's approval stamp shall contain the following statement:

"The equipment and material shown and marked in this submittal is that proposed to be incorporated into this Project, and has been checked for and is in compliance with the Contract Documents unless otherwise shown in bold face type or lettering and listed on a page or pages headed "DEPARTURES FROM CONTRACT DOCUMENTS," and can be installed in the allocated spaces.

Checked By: _____ Date: _____

The person signing the stamp shall be one designated in writing by the CONTRACTOR as having that authority. The signature shall be handwritten in ink. Stamped signatures are not acceptable.

1. The ENGINEER's approval of shop drawings and schedules shall not relieve the CONTRACTOR from responsibility for deviation from drawings and specifications. The ENGINEER's approval shall not relieve CONTRACTOR from responsibility for errors of any sort on shop drawings or schedules.

C. ENGINEER'S ACTION:

1. Review is only for conformance with the design concept of the project. Markings or comments do not relieve the CONTRACTOR from compliance with the contract documents nor allow departure therefrom. The CONTRACTOR remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for technique of assembly, for coordination of the work with all trades, and for performing this work in compliance with the contract documents.
2. Where action and return is required or requested, ENGINEER will review each submittal, mark with "Action".
3. Final Unrestricted Release: Work may proceed, provided it complies with Contract Documents, when submittal is returned with the following marking:

"Reviewed No Exceptions"
4. Final-But-Restricted Release: Work may proceed, provided it complies with notations and corrections on submittal and with Contract Documents, when submittal is returned with the following marking:

"Reviewed Exceptions Noted"
5. Returned for Re-submittal: Do not proceed with work. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain a

different action marking. Do not allow submittals with the following marking (or unmarked submittals where a marking is required) to be used in connection with performance of the work:

"Revise and Resubmit"

6. Returned for Non-Compliance: Do not proceed with work. Product submitted does not comply with Contract Documents. Resubmit for product complying with the requirements of the Contract Documents. Do not allow submittals with the following marking to be used in connection with performance of the work:

"Not Approved" or "Rejected"

1.4 REQUESTS FOR INFORMATION

- A. CONTRACTOR shall submit to ENGINEER and OWNER, in writing, any requests for information (RFI) on the form contained in the Project Manual.
- B. ENGINEER and OWNER shall review RFI within 7 days and, once a response has been agreed upon, the ENGINEER shall respond to the RFI in writing to the CONTRACTOR.
- C. If a question is not submitted to the ENGINEER and the OWNER in writing, than any response made by the ENGINEER or OWNER is not binding. Only written responses will have the authority to change and/or clarify the Contract Documents.
- D. If the response to the RFI will require a change in the Contract Documents that results in a change to the Contract Time or Price, the CONTRACTOR shall follow those procedures as outlined in the Contract Documents for submission of a change request. Any change requests will be subject to review and approval from the ENGINEER and OWNER.

PART 2- PRODUCTS

Not Applicable

PART 3- EXECUTION

Not Applicable

END OF SECTION

**SECTION 01400
TESTING AND SPECIAL INSPECTIONS**

PART 1- GENERAL (NOT APPLICABLE)

PART 2- PRODUCTS (NOT APPLICABLE)

PART 3- EXECUTION

3.1 TESTING AND SPECIAL INSPECTIONS

- A. All Special Inspections as required by the Fluvanna County Building Inspections Office will be the responsibility of the OWNER. A list of Special Inspections has been included as part of the Appendix of these documents.
- B. All other testing, special inspections, sampling, etc. as required by these Contract Documents and necessary for the completion of the WORK will be the sole responsibility of and paid for by the CONTRACTOR.
- C. This specification section supersedes any testing or inspection responsibilities outlined in other specification sections of these Contract Documents.
- D. The CONTRACTOR shall submit copies of all test and inspection results to the ENGINEER and OWNER within 24 hours of receiving such information. If a failing result is received, the CONTRACTOR shall submit a subsequent test result or documentation showing how any deficiency was corrected.

END OF SECTION

SECTION 01500
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Refer to General Conditions for requirements for the CONTRACTOR to provide temporary facilities as required for performance of the Work and fulfillment of the Contract. This section specifies certain minimum temporary facilities to be provided by CONTRACTOR regardless of methods and means selected for performance of the Work. This section is not intended to limit the CONTRACTOR's provisions for temporary facilities nor does it assure compliance with local governing regulations. Use of alternate provisions for temporary facilities is the CONTRACTOR's option, subject to the ENGINEER's acceptance. Temporary facilities are defined to exclude tools and construction machines, testing, demolition, alterations, soil borings, mock-ups and similar items.

1.2 SEPARATE PRIME CONTRACTORS

- A. The CONTRACTOR will be responsible for maintaining temporary facilities. The CONTRACTOR will be responsible for all temporary facilities described herein as part of this WORK.
- B. The CONTRACTOR will be responsible for providing his own Field Office and Materials Storage.
- C. Installation of temporary electrical and water service shall be provided by the CONTRACTOR.

1.3 RELATED SERVICES

- A. Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specification.

PART 2 - PRODUCTS

2.1 MATERIALS STORAGE

- A. Provide suitable and sufficient enclosed and covered spaces, with raised flooring, to protect materials and equipment subject to damage by weather or construction. Materials stored on site which have not been properly protected will not be acceptable for use in construction or approved for payment.

2.2 FENCING AND BARRICADES

- A. Provide fences and barricades and protection devices sufficient to prevent injury to persons or damage to property in accordance with Safety Requirements of applicable standards, codes, ordinances, and insurance agencies.
- B. Provide temporary walkways as necessary for safe, uninterrupted pedestrian traffic.

2.3 SCAFFOLDING AND SHORING

- A. Provide scaffolding, ramps, runways, platforms, guards, rails, stairs, and ladders as necessary for this work.
- B. Meet safety requirements of applicable Virginia and County standards, codes, and ordinances.
- C. Provide lights and signs to prevent damage or injury.
- D. Provide all shoring, bracing and sheeting as required for safety and proper execution of the Work. Remove when no longer required.

2.4 LIFTING AND HOISTING

- A. Provide hoists, temporary elevators, lifts, cranes, and towers necessary for expediting the handling of materials.

2.5 TOILETS

- A. Provide adequate and sanitary temporary outside toilet facilities for use of persons working at site. Provide toilet facilities with adequate light and ventilation and toilet tissue in suitable holder. Comply with applicable legal and health requirements. Toilet facilities shall be secluded from public observation and shall not create nor allow a public nuisance. Temporary sanitary facilities shall be removed upon completion of the work and the premises shall be left clean. Workmen shall not use permanent washroom facilities in existing facilities or new work except by written permission of the OWNER.

2.6 ELECTRICITY

- A. Make arrangements for, and provide temporary equipment, poles, wiring, switches, and outlets necessary to provide an adequate supply of electricity for lighting and power for construction purposes. Cost of temporary service shall be borne by the CONTRACTOR.
- B. The CONTRACTOR shall make arrangements for meter installation, service connections, and wiring to meet the requirements of the completed project.

2.7 WATER

- A. Make arrangements for, and provide temporary equipment and piping necessary to provide an adequate supply of water for construction purposes. Cost shall be borne by the CONTRACTOR. CONTRACTOR shall be responsible for providing water for flushing and testing activities.

- B. The CONTRACTOR shall make arrangements for main connection, and incoming pipes to meet requirements of the completed project.

2.8 HEAT

- A. The CONTRACTOR shall provide temporary heat during the course of the project to provide protection for the workmen and all installed materials and equipment during cold weather. The technical specifications outline minimum temperatures required for various portions of the Work.
- B. The CONTRACTOR shall pay for fuel and attendance of the permanent heating system for all heat during construction to maintain the integrity of the building and all installed equipment until the project is accepted by the OWNER as Substantially Complete.
- C. Temporary Heating shall be of a type approved by the ENGINEER and complying with all applicable safety and fire code regulations.

2.9 PUMPING AND DRAINING

- A. Provide pumping equipment to keep construction and storage areas free from standing water that could cause damage or that would interfere with the work.

2.10 ACCESS

- A. The Project Site shall at all times be accessible for delivery of construction materials and equipment. Maintenance of access points and access roads, loading and unloading areas and directional signage shall be the responsibility of the CONTRACTOR.
- B. Provide signage and barricades to clearly and safely direct pedestrian and construction traffic.
- C. Any damage to existing paved surfaces, curbing, landscaping, etc. shall be restored or repaired by the CONTRACTOR.
- D. Stabilize parking areas and access roads with a base of crushed stone as soon as practicable after finish grading.

2.11 FINISHES

- A. The CONTRACTOR shall protect all finished surfaces, including the jambs and soffits of all openings used as passageways or through which materials are handled, against any possible damage resulting from the conduct of work by all trades.
- B. All finished surfaces, including factory finished and job finished items, shall be clean and not marred upon delivery of the building to the OWNER. CONTRACTOR shall be responsible for its Subcontractors compliance with this section.
- C. Protect all types of finished floor surfaces in traffic areas with plywood, planking, reinforced non-staining kraft paper, or other approved material.

2.12 FIRST AID FACILITIES AND ACCIDENTS

A. First Aid Facilities

1. The CONTRACTOR shall provide at the site, such reasonable equipment and facilities as are necessary to supply first aid to any of his personnel who may be injured in connection with the work.

B. Accident

1. The CONTRACTOR shall promptly report in writing to OWNER and ENGINEER all accidents whatsoever arising out of, or in connection with, the performance of the work, whether on or adjacent to the site, which cause death, personal injury or property damage, giving full details and statements of witnesses.
2. If death or serious injuries or serious damages are caused, following notification of the appropriate emergency services and agencies, the accident shall be reported immediately by telephone or messenger to both the OWNER and the ENGINEER.
3. If any claim is made by anyone against the CONTRACTOR or a subcontractor on account of any accidents, the CONTRACTOR shall promptly report the facts in writing to the OWNER and ENGINEER, giving full details of the claim.

2.13 BARRICADES, WARNING SIGNS AND LIGHTS

A. General

1. CONTRACTOR shall provide, erect and maintain as necessary, strong and suitable barricades, fencing, danger signs and warning lights and as may be required for the safety of all those employed in the work, visiting the construction site, and for the general public.

B. Accommodation of Traffic

1. All work in the VDOT right-of-way or local right-of-ways shall be done in accordance with VDOT regulations or local regulations.
2. During the progress of the work, streets, driveways, sidewalks, and crossings shall be kept open for the passage of traffic and pedestrians and shall not be unnecessarily obstructed unless authorized by the authority having jurisdiction over same. The CONTRACTOR shall take such measures at his own expense, as may be necessary to keep the street open for traffic, and shall give advance notice to the Fire and Police Departments of his proposed street operations.
3. Warning signs shall be provided along all highways while work is in progress; and where traffic direction is required flagmen shall be designated by the CONTRACTOR to direct traffic past the equipment, machinery, or construction operations. Barricades and lights shall be provided as required to protect traffic. Where trenches have been cut in road shoulders on which traffic may pass at

times, red flags and warning signs shall be placed at frequent intervals and maintained until the shoulder is safe for travel. The traveling public shall be warned of the construction with signing that is in accordance with VDOT policy.

4. The CONTRACTOR shall notify the VDOT five working days in advance of work in highway right-of-way, and shall fully cooperate with the Department.
5. The CONTRACTOR shall construct and maintain, without extra compensation, such adequate and proper bridges over excavations as may be necessary or directed for the purpose of accommodating pedestrians or vehicles.
6. All temporary means constructed by the CONTRACTOR for maintaining traffic shall be removed upon completion of the work unless otherwise specified by the ENGINEER and any damage done to public or private property shall be made good by the CONTRACTOR.
7. All dirt spilled from the CONTRACTOR's trucks on existing pavements over which it is hauled or which has otherwise been deposited thereon shall be removed by the CONTRACTOR at the end of the work day.

2.14 PUBLIC CONVENIENCE AND PROTECTION

- A. During progress of the work, the convenience and protection of the public must be provided for, and interferences held to a minimum.
- B. The CONTRACTOR shall, at all times, conduct the work in such a manner as to insure the least practicable obstruction to public travel. The convenience of the general public and of the residents along or adjacent to the area of the work shall be provided for in a satisfactory manner, consistent with the operation and local conditions. Road and streets must be kept open at all times or suitable detours provided. Access to fire hydrants and other fire extinguishing equipment shall be provided and maintained at all times.
- C. When necessary, for the protection of the public, the CONTRACTOR shall provide watchmen and/or lights to burn between twilight and sunrise, and shall erect and maintain barriers and all other necessary protection around the work at his own expense. He shall also take other precautions as may be necessary to protect life, and property. The OWNER reserves the right to remedy any neglect on the part of the CONTRACTOR as regards to the protection of the work after twenty-four (24) hours notice in writing; and, in cases of emergency, the OWNER shall have the right to remedy any neglect without previous notice, and in either case deduct the cost of such remedy from money due the CONTRACTOR.

2.15 PERIODIC CLEAN UP; BASIC SITE RESTORATION

- A. During construction, the CONTRACTOR shall regularly remove from the site of the work all accumulated debris and surplus materials of any kind which result from his operations. Unused equipment and tools shall be stored at the CONTRACTOR's yard or base of operations for the project.
- B. When the work involves installation of sewers, drains, water mains, manholes, underground structures, or other disturbance of existing features in or across streets, rights-of-way, easements, or private property, the CONTRACTOR shall (as the work progresses) promptly

backfill, compact, grade, and otherwise restore the disturbed area to the basic condition which will permit resumption of pedestrian or vehicular traffic and any other critical activity or functions consistent with the original use of the land. All work within 500 feet of the forward progress shall be complete with the exception of testing. The CONTRACTORs forward progress is subject to being suspended if in the opinion of the ENGINEER the above requirement is not met. The requirements for temporary paving of streets, walks, and driveways are specified elsewhere. Unsightly mounds of earth, large stones, boulders, and debris shall be removed so that the site presents a neat appearance.

- C. The CONTRACTOR shall perform the clean-up work on a regular basis and as frequently as ordered by the ENGINEER. Basic site restoration in a particular area shall be accomplished immediately following the installation or completion of the required facilities in that area. Furthermore such work shall also be accomplished, when ordered by the ENGINEER, if partially completed facilities must remain incomplete for some time period due to unforeseen circumstances.
- D. Upon failure of the CONTRACTOR to perform periodic clean-up and basic restoration of the site to the ENGINEER's satisfaction, the OWNER may, upon five (5) days prior written notice to the CONTRACTOR, without prejudice to any other rights or remedies of the OWNER, cause such work for which the CONTRACTOR is responsible to be accomplished to the extent deemed necessary by the ENGINEER, and all costs resulting there-from shall be charged to the CONTRACTOR and deducted from the amounts of money that may be due him. The CONTRACTOR shall receive no consideration for time extension or compensation for production time lost while not in compliance with the requirements for clean up.

PART 3 - EXECUTION

3.1 GENERAL

- A. Maintain all temporary facilities until the project has reached Substantial Completion and is accepted by the OWNER. Project sign(s) shall be maintained until Final Acceptance by the OWNER.
- B. Provide sheds and covered spaces suitable for storage of materials and equipment requiring protection as approved by the ENGINEER.
- C. Erect and maintain scaffolding, ramps, platforms, guards, rails, stairs, and ladders as necessary for this work to meet all applicable safety laws and ordinances.
- D. Maintain safety lights, signage, and other safety provisions. Keep safety lights burning from dark to dusk.
- E. Install lifting and hoisting equipment to meet all applicable safety requirements.
- F. Maintain adequate toilet facilities and keep toilets in clean and sanitary condition.
- G. Make arrangements and install temporary water, electric, and telephone service required for the project.

- H. Maintain temporary heating system during cold weather to adequately protect the work in place or work being placed. Specific requirements for environmental conditions can be found in the technical sections of the Specifications.
- I. Pump or drain water to keep work and storage area free from water which could interfere with the work, or could cause damage. Distribute discharge to prevent erosion.
- J. Remove all temporary work at the completion of the project, unless directed otherwise by the ENGINEER.
- K. Clean spaces that were occupied by temporary work. Periodically, and as directed by the ENGINEER, remove all debris and rubbish from the site.

3.2 PAYMENT

- A. Work specified under this Section shall be included for payment in the CONTRACTOR's bid price for other Pay Items of this Contract. No specific payment will be made under this Section.

END OF SECTION

**SECTION 01730
OPERATING AND MAINTENANCE DATA**

PART 1- GENERAL

1.1 REQUIREMENTS

- A. Operation and Maintenance manuals are required for all materials and equipment provided and installed in the project.
- B. Prior to substantial completion, submit to ENGINEER for review and approval, six (6) copies of a loose-leaf type manual properly indexed and bound in hard back, three-ring D-binder(s) and one (1) PDF digital version that contains complete operation and maintenance instructions including but not limited to the following:
 - 1. Nameplate data, model numbers and serial numbers for all equipment and motors. This information shall be summarized in the front of the Manual for all of the equipment in the manual. This information shall be tabbed and included in the table of contents.
 - 2. The three ring binder shall be provided with cover and spline inserts for equipment identification. The cover and spline identification inserts shall at minimum include equipment name, manufacturer name, project name, ENGINEER, OWNER, specification section and any additional pertinent information.
 - 3. Names, phone numbers and company address of local representatives for all of the equipment included in the Manual. This information shall be summarized in the front of the Manual for all of the equipment in the manual. This information shall be tabbed and included in the table of contents.
 - 4. Equipment warranties;
 - 5. Operating and maintenance data;
 - 6. Troubleshooting information and procedures;
 - 7. Lubrication information and schedules;
 - 8. Preventative Maintenance information and schedules;
 - 9. Wiring diagrams;
 - 10. Assembly drawings with part numbers;
 - 11. Approved shop drawings, plan elevation and section drawings showing all details as equipment has been installed.
 - 12. All appurtenances provided with equipment including pipe, valves, fittings, supports and brackets;

13. All electrical components, control panels, switches, floats, electronic components, relays, sensors, starters, contactors and enclosures
 14. Names, telephone numbers, and addresses of applicable subcontractors, equipment and service suppliers and manufacturers;
 15. Adequate information to satisfy State regulatory agency requirements; and,
 16. Any other information concerning operation or maintenance of equipment readily available to CONTRACTOR and as required to repair and order parts.
- C. At a minimum, operating and maintenance data shall be supplied for the following equipment:
1. Control Systems (including dialer, etc.);
 2. Process equipment and devices
 3. Pumps;
 4. Electrical Devices
 5. Generator Set (including transfer switch);
 6. Control Valves (check, pressure reducing/sustaining, etc.);
 7. Pipe valves and fittings;
 8. Instrumentation
 9. SCADA systems
 10. Flow measuring devices;
 11. Pressure measuring devices;
 12. Sensors
 13. Unit Heaters;
 14. Lighting
 15. Air Handling Equipment
 16. Electrical switch gear

PART 2- PRODUCTS Not USED

PART 3- EXECUTION

- 3.1 Information included in the O & M Manual shall be specific to the equipment or item installed. Data sheets that include information not pertinent to the specific equipment or product should be omitted. Where data sheets have multiple information all non pertinent information shall be edited out and pertinent information shall be highlighted to make it clear which information applies.
- 3.2 Drawings shall be provided which clearly indicate the item and the installation. These should include plan views, elevation views and section views as required. Drawings should be scaled and dimensioned. Drawings from the approved submittals should be included and corrected if required to indicate the "as-built" condition.
- 3.3 Information shall include serial numbers, order numbers, dates, contact information or other pertinent information that are required to trace a piece of equipment back to the manufacturer.

END OF SECTION

**SECTION 01770
CLOSEOUT PROCEDURES**

PART 1- GENERAL

1.1 SUMMARY

- A. This Section provides for the orderly and efficient transfer of the WORK from the CONTRACTOR to OWNER.

1.2 RELATED SECTIONS

- A. The provisions and intent of the AGREEMENT, including the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications.

1.3 SUBMITTALS

- A. Guarantees/Warranties: Four (4) copies of all guarantees, warranties and bonds called for in these Specifications commencing on the date of Substantial Completion.
- B. Governmental Compliance: Provide evidence of compliance with requirements of governmental agencies having jurisdiction, but not necessarily limited to:
1. Certificates of Inspection
 2. Certificates of Occupancy
 3. Certificate to Operate
- C. Affidavit of Payment of Claims: Provide evidence of payment and release of liens.
- D. Affidavit of Release of Liens
- E. Consent of Surety for Final Payment.
- F. Contractor's Certification of Completion.
- G. Final Pay Application
- H. List of Project Participants: Provide a list of subcontractors, service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency service at all times including nights, weekends, and holidays.

1.4 WARRANTEES AND GUARANTEES

- A. Contractor shall provide Warrantees and Guarantees on all materials, equipment, workmanship, installations, labor and operation items provided and /or installed by the Contractor or any of its subcontractors and /or suppliers.
- B. Warrantees and Guarantees shall be for a period of one year after:

1. Being placed in service by owner for the owners use before substantial completion of the project.
 2. Date of substantial completion of the project.
 3. Being installed and put in service after substantial completion of the project.
 4. Equipment installed does not constitute being "in service".
- C. Guarantee: CONTRACTOR warrants the equipment and/or materials delivered and installed under the AGREEMENT are free from defects in design, material or workmanship, and against damage caused prior to final inspection.
- D. Prompt Repair: CONTRACTOR shall promptly repair or replace all defective or damaged items delivered under the AGREEMENT. CONTRACTOR may elect to have any replaced item returned to its plant at its sole expense.
- E. Owner's Option: In the event of equipment and/or materials failure, during such time or in such a location that immediate repairs are mandatory, CONTRACTOR shall respond promptly, regardless of time. If CONTRACTOR is not available, OWNER personnel or other contractors, secured by OWNER, will affect repairs. CONTRACTOR shall then reimburse OWNER for parts and labor and/or other contractors costs necessary to correct deficiencies as defined within the warranty clause and time.
- F. This specification shall apply to all sections of the specifications as applicable whether mentioned in a specific specification or not. Should the specific specification section have additional requirements or more stringent requirements that this section the more stringent shall apply.
- G. The warranty shall not cover any item that has been subjected to external damage, disassembled and/or repaired by unauthorized persons, flooded or otherwise mistreated. Items normally consumed in service such as grease, oil, v-belts, fuses, filters, seals, etc., shall not be warranted.

PART 2- PRODUCTS

2.1 SUBSTANTIAL COMPLETION

- A. Record Drawings: The CONTRACTOR shall maintain an accurate set of Record Drawings and Specifications. Prior to Substantial Completion CONTRACTOR shall prepare marked prints showing the installed locations and sizes of all underground or concealed portions of the WORK that are different from those shown in the Contract Documents. These Drawings shall be based on the set kept at the Project site and shall also show any other changes made to the Project during construction. These Drawings shall be submitted to ENGINEER at completion of the WORK.

Record drawing information shall include the following as a minimum, where applicable:

1. Size, horizontal and vertical location of any existing utilities uncovered during the course of the work. This shall include telephone cables and conduits, fiber-

optic cables and conduits, television cables, electrical cables and conduits, gas lines, water lines, sewer force mains, sanitary sewers, storm sewers, and the like.

2. Horizontal and vertical location of all water lines, sewer mains and force mains installed at every 100 foot station.
3. Location of all cleanouts new and existing, size of service lines installed, and the like.
4. Northing and Easting of all surface fixtures, i.e. valve boxes, manholes, etc.
5. Location of lines plugged or capped.
6. Swing ties to all structures installed such as manholes, air vents, hydrants, valve boxes, blowoffs, cleanouts, and the like.
7. Depth from rim of valve box to top of operating nut on all valves, and length of valve extensions installed.
8. Sizes and types of materials used and changes in sizes and types of materials. Rims and inverts of all manholes installed or tied into shall be provided.
9. Location of all sleeves, bends, and other fittings including method of restraint used; for example, thrust block, retainer glands, tie rods, and the like.
10. The Record Documents are a specific contract requirement of the Contractor. Final payment will not be issued until said documents have been submitted to the Engineer in an acceptable form.

B. Owner's Manuals: Not Applicable.

2.2 WARRANTIES

A. Four (4) copies of all warranties shall be submitted prior to substantial completion.

2.3 TRAINING

A. CONTRACTOR shall provide a written schedule of all training that will be provided to the OWNER to be reviewed and approved, a minimum of 1 month before the first scheduled training session.

B. Training shall consist of, at a minimum, the level of training as recommended by the manufacturers of the equipment to be installed.

C. CONTRACTOR shall give the OWNER at least 2 weeks advance notice of each anticipated training session to allow for proper personnel to be present at the training.

D. The OWNER reserves the right to request specific training on equipment as he deems necessary for the successful transfer of ownership of the equipment from the CONTRACTOR to the OWNER.

- E. All training shall be completed prior to issuance of Substantial Completion.

PART 3- EXECUTION

3.1 SUBSTANTIAL COMPLETION PROCEDURES

- A. Owner's Use: The following procedures are to be applied towards OWNER'S utilizing the Project:
 1. Initial Punch List: Within a reasonable time after receipt from CONTRACTOR of a comprehensive list of items which need to be completed or corrected, the ENGINEER will determine status of completion.
 2. Incomplete Work: Should ENGINEER determine that the WORK is not substantially complete:
 - a. Notification: ENGINEER will promptly so notify CONTRACTOR, in writing, given the reasons therefore. Contractor Remedy: CONTRACTOR shall promptly remedy the deficiencies and notify ENGINEER when ready for inspection.
 - b. Additional Cost: The cost of re-inspection for Substantial Completion will be borne by CONTRACTOR.
 3. Completed Work: When ENGINEER concurs that the WORK is substantially complete:
 - a. Engineer's Acceptance: ENGINEER will submit the Certificate to OWNER and to CONTRACTOR for their written acceptance of the responsibilities assigned to them in the Certificate.
 4. Occupancy: Upon Substantial Completion, CONTRACTOR shall obtain a temporary Certificate of Occupancy or other permission from the inspecting authority for OWNER to begin moving in its equipment and furnishings.

3.2 INSTRUCTIONS TO OWNER

- A. Operation and Maintenance: CONTRACTOR shall instruct OWNER or its authorized representative in the proper operation and maintenance of all elements of the Project systems as specified.

3.3 CLEAN-UP/RESTORATION

- A. Definition: Except as otherwise specifically provided, "clean" (for the purpose of this Section) shall be interpreted as meaning the level of cleanliness generally provided by VDOT roadway construction projects.
- B. General: Prior to completion of the WORK, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described above. Restore all disturbed areas to a condition equal to or better than that prior to construction.

- C. Site: Unless otherwise specifically directed by ENGINEER, hose down all paved areas on the site. Completely remove all resultant debris.
- D. Structure: Not Applicable.
- E. Timing: Schedule final cleaning as approved by ENGINEER, to enable OWNER to receive a completely clean Project.

3.4 FINAL COMPLETION

- A. Notification: Prepare and submit to ENGINEER a written notice that the Project is complete and ready for final inspection and acceptance.
- B. Releases/Consent of Surety: Contractor shall forward a completed "Release of Liens", "Release and Waiver of Debts and Claims" and "Consent of Surety" to ENGINEER prior to Final Payment.
- C. Verification: CONTRACTOR shall provide written documentation that the CONTRACTOR has verified that all work has been completed prior to notifying the ENGINEER of such. ENGINEER shall verify that Work is complete prior to Final Payment.
- D. Certification: CONTRACTOR shall certify that:
 1. Review: Contract Documents have been reviewed
 2. Inspection: WORK has been inspected for compliance with the Contract Documents.
 3. Completeness: WORK has been completed in accordance with the Contract Documents.
 4. Testing: Equipment and systems have been tested as required, and are operational.
 5. Final Inspection: WORK is completed and ready for final inspection.
- E. Incomplete Determination: Should ENGINEER determine that the WORK is incomplete or defective:
 1. Notification: ENGINEER will promptly so notify CONTRACTOR, in writing, listing the incomplete or defective WORK.
 2. Contractor Remedy: CONTRACTOR shall remedy the deficiencies promptly, and notify ENGINEER when ready for inspection.
 3. Additional Cost: The cost of re-inspection for Final Completion will be borne by CONTRACTOR.

- F. Acceptance: When ENGINEER determines that the WORK is acceptable under the Contract Documents, it will request the final Application for Payment from CONTRACTOR.
- G. Reimbursement: CONTRACTOR shall reimburse OWNER for all trips to the Project site by ENGINEER after Substantial Completion in excess of two (2) trips if such excess trips are necessitated due to the Project's remaining incomplete.
- H. Retainage: Retainage will be released per the provisions of the Contract Documents.

3.5 FINAL PAYMENT

- A. Application: Submit a final Application for Payment to ENGINEER, showing all adjustments to the agreed to sum.
- B. Change Order: If so required, ENGINEER will prepare a final Change Order showing adjustments to the AGREEMENT which were not made previously by Change Orders.

END OF SECTION 01770

**SECTION 02100
SITE PREPARATION**

PART 1- GENERAL

1.1 SCOPE

- A. The CONTRACTOR shall be responsible for preparation of the site for construction of the project in accordance with the Contract Documents and as specified herein.

PART 2- PRODUCTS

Not Applicable

PART 3- EXECUTION

3.1 STAKING AND LAYOUT OF WORK

- A. The CONTRACTOR shall locate bench marks, monuments, base lines, reference lines, and other reference points for the staking and layout of the WORK. Locations of bench marks, base line control points, and other reference points which were established during design of the project by the ENGINEER will be made available to the CONTRACTOR one time only upon request without charge. The CONTRACTOR shall complete the layout of the WORK and shall be responsible for all measurements that may be required for the execution of the WORK, to the location and limits that may be required for the execution of the WORK, to the location and limit marks prescribed in the Contract Documents, subject to such modifications as the ENGINEER may require to meet changed conditions in the contract WORK. All WORK under this contract shall be done to the lines and grades shown on the Contract Drawings.
- B. The CONTRACTOR shall furnish competent men, tools, stakes, and other material as required, without charge, for properly staking out the WORK. He shall furnish the ENGINEER with one (1) copy of all field notes of such surveys. Final "cut" sheets/grade sheet shall be provided to the ENGINEER and OWNER. All staking and layout shall be performed under the supervision of a surveyor licensed in the Commonwealth of Virginia.
- C. It shall be the duty of the CONTRACTOR and his employees to call to the attention of the ENGINEER any reference lines or points, or any bench marks which may have been disturbed or which seem to be off line or grade.
- D. Where called for in the Contract Documents or required for accuracy and fit with existing WORK, the CONTRACTOR will make his own field measurements to verify any dimensions shown on the Contract Drawings.

3.2 PROTECTION OF EXISTING PROPERTY IRONS AND MONUMENTS

- A. The CONTRACTOR shall use care in protecting existing property irons and monuments adjacent to his working area. If a property iron or monument must be removed to install new

facilities, the CONTRACTOR shall be responsible for locating the iron or monument in such a manner that it can be accurately replaced after construction of the new facilities by a properly registered surveyor. If a property iron or monument is destroyed because of neglect on the part of the CONTRACTOR, it shall be replaced at his expense by a properly registered surveyor.

3.3 RIGHT-OF-WAYS AND LIMITS OF CONSTRUCTION

- A. The CONTRACTOR shall confine his construction operations to the immediate vicinity of the location shown on the Contract Drawings and in no case shall he encroach beyond the limits of the OWNER'S property, easements, or rights-of-way. He shall place materials, equipment, supplies, etc. so as to cause the least possible damage to property and interference with traffic. His method of operation and placing of equipment and materials shall be subject to the review of the ENGINEER.
- B. It shall be the duty of the CONTRACTOR to locate the limits of the rights-of-way, easements, and/or property lines, prior to beginning construction. He shall be solely responsible for damage to trees, crops or other property outside the boundaries of the rights-of-way and easements and shall make satisfactory settlement for any damage directly with the property OWNER involved.
- C. Where timber is located within the limits of construction and inside the easements on the property or rights-of-way, the CONTRACTOR shall preserve and protect from damage all trees that do not directly interfere with the prosecution of the WORK. The CONTRACTOR shall not cut any tree greater in diameter than six (6) inches and located more than eight (8) feet from the centerline of ditch or structure without first consulting the ENGINEER.
- D. Where shrubbery or grass is located on the construction rights-of-way and easements, the CONTRACTOR shall be fully responsible for any damage thereto. He shall remove, protect and replant all shrubbery to the full satisfaction of the ENGINEER, OWNER, and property OWNER and shall either remove and resod or replant all lawns or pasture grass damaged by the construction WORK. Topsoil shall be replaced and grass of the same type found shall be planted, fertilized, mulched and watered in accordance with the Specifications, until a satisfactory stand of grass is secured. Unless otherwise notified, all timber located on rights-of-way and easements is the property of the land OWNER, and the land OWNER must be given a reasonable amount of notice and time by the CONTRACTOR to remove any timber. Prior to removing any timber the land OWNER and the OWNER must be notified by the CONTRACTOR.
- E. Construction Rights-of-Way shall be defined as the designated property, easements, and public rights-of-way which comprise the work area for the project.
- F. Excavation, grading, fill, storm drainage, paving and any other construction or installations in rights-of-ways of streets, highways, public carrier lines, utility lines (either aerial, surface or subsurface), etc., shall be done in accordance with requirements of the authorities having jurisdiction and of applicable requirements of these Specifications. CONTRACTOR shall make all necessary arrangements with the proper authorities, including the obtaining of permits, approval of construction methods, etc., and shall pay all costs charged in connection with the WORK.

3.4 PROTECTION OF PROPERTY AND EXISTING UTILITIES AND STRUCTURES

- A. CONTRACTOR shall be responsible for the preservation and protection of property adjacent to the WORK site against damage or injury as a result of his operations under this WORK. Any damage or injury occurring on account of any act, omission or neglect on the part of the CONTRACTOR shall be restored in a proper and satisfactory manner as determined by the ENGINEER and OWNER or replaced by and at the expense of the CONTRACTOR.
- B. CONTRACTOR shall comply promptly with such safety regulations as may be prescribed by the ENGINEER, OWNER or the local, state and federal authorities having jurisdiction and shall when so directed, properly correct any unsafe conditions created by, or unsafe practices on the part of his employees. In the event of the CONTRACTOR's failure to comply, the ENGINEER or OWNER may take the necessary measures to correct the conditions or practices complained of, and all costs thereof will be deducted from any monies due the CONTRACTOR. Failure of the ENGINEER to direct the correction of unsafe conditions or practices shall not relieve the CONTRACTOR of his responsibility hereunder.
- C. In the event of any claims for damage or alleged damage to property as a result of WORK under this WORK, the CONTRACTOR shall be responsible for all costs in connection with the settlement of or defense against such claims.
- D. Where existing utilities and structures are indicated on the Drawings, it shall be understood that all of the existing utilities and structures affecting the WORK may not be shown and that the locations of those shown are approximate only. It shall be the responsibility of the CONTRACTOR to ascertain the actual extent and exact location of existing utilities and structures. In every instance the CONTRACTOR shall notify the proper authority having jurisdiction and obtain all necessary directions and approvals before performing any WORK in the vicinity of existing utilities.
- E. The WORK shall be carried out in a manner to prevent disruption of existing services and to avoid damage to the existing utilities. Temporary connections shall be provided, as required, to ensure uninterrupted of existing services. Any damage resulting from Construction of this WORK shall be repaired within 24 hours. The CONTRACTOR shall make these repairs at his own expense in a manner approved by the ENGINEER, and further, subject to the requirements of any authority having jurisdiction, that they perform their own repairs or have them done by others, the CONTRACTOR shall be responsible for all costs thereof.
- F. Where excavations by the CONTRACTOR require any utility lines or appurtenant structure to be temporarily supported and otherwise protected during the construction WORK, such support and protection shall be provided by the CONTRACTOR. All such WORK shall be performed in a manner satisfactory to the ENGINEER and the respective authority having jurisdiction over such WORK. In the event the CONTRACTOR fails to provide proper support or protection to any existing utility, the ENGINEER may, at his direction, have the respective authority provide such support or protection as may be necessary to insure the safety of such utility, and the costs of such measures shall be paid by the CONTRACTOR.

3.5 OBSTRUCTIONS

- A. The CONTRACTOR shall be responsible for removing and disposing of any obstructions or obstacles at the site of the WORK or along the right-of-way therefore, to the satisfaction of the ENGINEER. Minor obstruction shall be removed and properly disposed of or protected and re-erected to as good condition as found, at the same or adjacent locations, as directed by the ENGINEER.

3.6 FENCES

- A. Fences at the site or along rights-of-way, which interfere with the construction operations, shall be maintained by the CONTRACTOR until completion of the WORK unless written permission is obtained from the OWNER thereof to leave the fence dismantled until construction is completed. He shall remove, rebuild and extend fences as necessary.

3.7 DEMOLITION

- A. Demolition shall be as specified in Division 2.

END OF SECTION

**SECTION 02110
CLEARING AND GRUBBING**

PART 1 - GENERAL

1.1 SUMMARY

The CONTRACTOR shall be responsible for preparation of the site for construction of the project in accordance with the Contract Documents and as specified herein.

This section includes the following:

- A. Protection of existing trees.
- B. Removal of trees and other vegetation in the project area.
- C. Clearing and grubbing.

1.2 RELATED SECTIONS

Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications.

1.3 REFERENCES

Virginia "Erosion and Sediment Control Handbook", latest edition.

1.4 SUBMITTALS

- A. Submittals shall be in accordance with Division 1.
- B. Off-Site Borrow Areas: If applicable, provide written assurance to ENGINEER that CONTRACTOR has the right to excavate and remove off-site borrow materials for use at the site.
- C. Erosion and Sediment Control: Submit and maintain on-site a copy of Erosion and Sediment Control permit issued by the local approving authority for both on-site and off-site operations. These permits are to be obtained by the CONTRACTOR.

1.5 DELIVERY, STORAGE AND HANDLING

Deliver materials to, store at the site, and handle in a manner which will maintain the materials in their original manufactured or fabricated condition until ready for use.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 TRAFFIC

Conduct site clearing operations to ensure minimum interference with roads, streets, walks, businesses, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without prior permission from ENGINEER, OWNER, DPW, VDOT, private business and/or property owners on which WORK is conducted, and/or authorities having jurisdiction.

3.2 PROTECTION

- A. General: Provide temporary fences, barricades, coverings, or other protection to preserve existing items indicated to remain and to prevent injury or damage to persons or property. Provide protection for adjacent properties as required.
- B. Existing Trees/Vegetation: Protect existing trees and other vegetation adjacent to the actual WORK area from physical damage by providing temporary guards as follows:
 - 1. At a minimum, the limits of clearing shall be located outside the drip line of any tree to be retained and, in no case closer than 5 feet to the trunk of any tree.
 - 2. Marking: Prior to construction and before the preconstruction conference, individual trees and stands of trees to be retained within the limits of clearing shall be marked at a height visible to equipment operators.
 - 3. Equipment Operation and Storage: Heavy equipment, vehicular traffic, or stockpiles of any construction materials (including topsoil) shall not be permitted within the drip line of any tree to be retained. Trees being removed shall not be felled, pushed or pulled into trees being retained. Equipment operators shall not clean any part of their equipment by slamming it against the trunks of trees to be retained.
 - 4. Storage and Disposal of Toxic Materials: No toxic materials shall be stored closer than 100 feet to the drip line of any trees to be retained. Paint, acid, nails, gypsum board, wire, chemicals, fuels, and lubricants shall not be disposed of in such a way as to injure vegetation.
 - 5. Fencing and Armoring: Any device may be used which will effectively protect the roots, trunk and tops of trees retained on the site. However, trees to be retained within 40 feet of a proposed building or excavation shall be protected by fencing. Personnel must be instructed to honor protective devices. The devices described are suggested only, and are not intended to exclude the use of other devices which will protect the trees to be retained.
 - a. Snow Fence - Standard 40-inch high snow fence shall be placed at the limits of clearing on standard steel posts set 6 feet apart.
 - b. Board Fence - Board fencing consisting of 4-inch square posts set securely in the ground and protruding at least 4 feet above the ground shall be placed at

the limits of clearing with a minimum of two horizontal boards between posts. If it is not practical to erect a fence at the drip line, construct a triangular fence nearer the trunk. The limits of clearing will still be located at the drip line, since the root zone within the drip line will still require protection.

- c. Cord Fence - Posts with a minimum size of 2 inches square or 2 inches in diameter set securely in the ground and protruding at least 4 feet above the ground shall be placed at the limits of clearing with two rows of cord 1/4-inch or thicker at least 2 feet apart running between posts with strips of colored surveyor's flagging tied securely to the string at intervals no greater than 3 feet.
- d. Plastic Fencing - 40-inch high "international orange" plastic (polyethylene) web fencing secured to conventional metal "T" or "U" posts driven to a minimum depth of 18 inches on 6-foot minimum centers shall be installed at the limits of clearing. The fence should have the following minimum physical qualities:

Tensile yield:	Average 2,000 lbs. per 4-foot width (ASTM D638)
Ultimate tensile yield:	Average 2,900 lbs. per 4-foot width (ASTM D638)
Elongation at break (%):	Greater than 1000% (ASTM D638)
Chemical resistance:	Inert to most chemicals and acids

- e. Additional Trees - Additional trees may be left standing as protection between the trunks of the trees to be retained and the limits of clearing. However, in order for this alternative to be used, the trunks of the trees in the buffer must be no more than 6 feet apart to prevent passage of equipment and material through the buffer. These additional trees shall be reexamined prior to the completion of construction and either be given sufficient treatment to ensure survival or be removed.
- f. Trunk Armoring - As a last resort, a tree trunk can be armored with burlap wrapping and 2-inch studs wired vertically no more than 2 inches apart to a height of 5 feet encircling the trunk. If this alternative is used, the root zone within the drip line will still require protection. Nothing should ever be nailed to a tree.
- g. Fencing and armoring devices shall be in place before any excavation or grading is begun, shall be kept in good repair for the duration of construction activities, and shall be the last items removed during the final cleanup after the completion of the project.

- C. Roads and Walks: Keep roads and walks free of dirt and debris at all times.
- D. Utility Lines: Protect existing utility lines from damage. Notify ENGINEER immediately of damage to or an encounter with unknown existing utility lines. CONTRACTOR shall be

responsible for the repairs of damage to existing utility lines that are indicated or made known to CONTRACTOR prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, CONTRACTOR shall notify ENGINEER and OWNER and Utility Owner in ample time to minimize interruption of the service.

3.3 RESTORATION & REPAIR

- A. General: Restore damaged items to condition existing prior to start of WORK.
- B. Existing Trees/Vegetation: In spite of precautions, some damage to protected trees may occur. In such cases, the following maintenance guidelines should be followed:
 - 1. Soil Aeration - If the soil has become compacted over the root zone of any tree, the ground shall be aerated by punching holes with an iron bar. The bar shall be driven 1-foot deep and then moved back and forth until the soil is loosened. This procedure shall be repeated every 18 inches until all of the compacted soil beneath the crown of the tree has been loosened.
 - 2. Repair of Damage: Any damage to the crown, trunk, or root system of any tree retained on the site shall be repaired immediately.
 - a. Whenever major root or bark damage occurs, remove some foliage to reduce the demand for water and nutrients.
 - b. Damaged roots shall immediately be cut off cleanly inside the exposed or damaged area. Cut surfaces shall be painted with approved tree paint, and moist peat moss, burlap, or top-soil shall be spread over the exposed area.
 - c. To treat bark damage, carefully cut away all loosened bark back into the undamaged area, taper the cut at the top and bottom, and provide drainage at the base of the wound.
 - d. All tree limbs damaged during construction or removed for any other reason shall be cut off above the collar at the preceding branch junction.
 - e. Care for serious injuries shall be prescribed by a forester or a tree specialist at CONTRACTOR's expense.
 - 3. Fertilization: Broadleaf trees that have been stressed or damaged shall receive a heavy application of fertilizer to aid their recovery.
 - a. Trees shall be fertilized in the late fall (after October 1) or the early spring (from the time frost is out of the ground until May 1). Fall applications are preferred, as the nutrients will be made available over a longer period of time.
 - b. Fertilizer shall be applied to the soil over the feeder roots (see Plate 3.38-9). In no case should it be applied closer than 3 feet to the trunk. The root system of

conifers extends some distance beyond the drip line. Increase the area to be fertilized by one fourth the area of the crown.

- c. Fertilizer shall be applied using approved fertilization methods and equipment.
- d. Formulations and application rates shall conform to the guidelines given in the following table:

Tree Type	Special Conditions	Application Rate & Method		Formulation
Broad-Leaf Deciduous	Greater than 6 inches dbh* except American Beeches and Crabapples	Normal	2-4 lbs. per inch dbh; broadcast	Commercial 10-8-6 or 10-6-4
		Grade Change	4-5 lbs. per inch dbh; broadcast	Commercial 10-6-4
	Smaller than 6 inches dbh, including all American Beeches and Crabapples	Normal	1-2 lbs. per inch dbh; broadcast	Commercial 10-8-6 or 10-6-4
		Grade Change	2-3 lbs. per inch dbh; broadcast	Commercial 10-6-4
Narrow-Leaf Evergreen	Greater than 6 inches dbh, located in groups	2-4 lbs. per 100 sf of bed area; broadcast		Commercial 10-6-4
	Greater than 6 inches dbh, single specimens in open area	2 lbs. per inch dbh; broadcast		Commercial 10-6-4
	Smaller than 6 inches dbh	5 lbs. per 100 sf of bed area; incorporated into soil		Tankage or Cottonseed Meal
Broad-Leaf Evergreen	Where nitrogen in soil is sufficient	Liberal quantities incorporated into soil and applied as mulch		Acid Peat Moss or Rotted Oak Leaf Mold
	Where additional nitrogen is necessary	Also add 5 lbs. per 100 sf of bed area incorporated into soil		Tankage or Cottonseed Meal

*dbh: Diameter at breast height (4.5 feet above ground level).

- e. Maintain a ground cover of organic mulch around trees that is adequate to prevent erosion, protect roots, and hold water.

3.4 EROSION/SEDIMENT CONTROL FOR OFFSITE BORROW AREAS

Provide appropriate erosion and sediment control measures for any off-site borrow areas in full compliance with the Virginia Erosion and Sediment Control Handbook and regulations of the local jurisdiction. CONTRACTOR shall be solely responsible for all borrow sites outside of the Project area.

3.5 CLEARING

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Cut off flush with or below the original ground surface trees, stumps, roots, brush, and other vegetation in areas to be cleared, except for trees and vegetation indicated or directed to be left standing.

3.6 TREE REMOVAL

Where indicated, remove designated trees and stumps and grub roots. A tree trimming permit shall be obtained from VDOT by CONTRACTOR to remove/trim any trees located within the VDOT right-of-way.

3.7 GRUBBING

Remove and dispose of roots larger than 3 inches in diameter, matted roots, and stumps from the indicated grubbing areas. Excavate this material together with logs, organic and metallic debris, brush, and refuse and remove to a depth of not less than 18 inches below the original soil surface in areas indicated to be grubbed and in areas indicated as construction areas for this Project. Fill depressions made by grubbing with suitable material and compact in accordance with the requirements of the Contract Documents to make the new surface conform with the existing adjacent surface of the ground.

3.8 DISPOSAL OF CLEARED AND GRUBBED MATERIALS

- A. CONTRACTOR shall make available all Saleable Timber to the property owner of the area that was cleared and grubbed. Property owner shall have thirty (30) days to claim material. After thirty (30) days, CONTRACTOR shall be responsible for the disposal of said material.
- B. Nonsalable Materials: Disposal shall be CONTRACTOR's responsibility.

3.9 STORING MATERIALS

Strip and stockpile topsoiling material and other cleared materials that will be reused in the WORK.

3.10 EXISTING IMPROVEMENTS/FACILITIES

Remove existing improvements, both above-grade and below-grade to extent indicated or as otherwise required to permit new construction and provide for proper disposal off-site. Existing improvements and facilities such as mailboxes, signs, ornamental or decorative items, etc. that require temporary removal to permit new construction shall be promptly replaced and/or restored to the location and condition prior to construction. Improvements and facilities that are damaged by the CONTRACTOR during the course of construction shall be promptly replaced at the CONTRACTOR'S expense.

3.11 SALVABLE ITEMS

If applicable, carefully remove items indicated to be salvaged, and store on OWNER's premises where indicated or directed.

3.12 FUGITIVE DUST

Control air pollution caused by dust and dirt; comply with governing regulations. Provide a water truck as required.

3.13 FILLING

Fill depressions and voids resulting from site clearing operations. Using satisfactory soil materials, place in maximum 6 inches deep horizontal layers and compact each layer to density of surrounding original

ground.

3.14 GRADING

Grade ground surface to conform to required contours and to provide positive surface drainage away from the WORK or borrow area.

3.15 DISPOSAL

Dispose of waste materials, including trash and debris, and excess topsoil, off-site at the CONTRACTOR'S expense.

3.16 BURNING

Burning of waste material on-site is prohibited for this project.

END OF SECTION

**SECTION 02120
EROSION AND SEDIMENT CONTROL**

PART 1- GENERAL

1.1 SUMMARY

- A. This work shall be performed in accordance with the erosion and sediment control plan of the Construction Drawings and the details provided therein, and as described, detailed and required by the Virginia Erosion and Sediment Control Handbook, latest edition, and land disturbance permit. The land disturbance permit shall be obtained by the CONTRACTOR from Fluvanna County

The CONTRACTOR shall be responsible for providing an employee who will serve as the Responsible Land Disturber for the project. This person will be responsible for the erosion and sediment control plan and requirements for the project and shall be certified by the Virginia Department of Conservation and Recreation as a Responsible Land Disturber (RLD). The name of the CONTRACTOR's RLD and copy of his current certification shall be provided to the OWNER, ENGINEER, and Erosion and Sediment Control Plan Approving Authority.

- B. The erosion and sediment control measures and devices shown on the Drawings and described herein have been reviewed and approved by the appropriate governing State and/or Local agencies. The CONTRACTOR is responsible for stabilizing all disturbed areas, fill slopes, borrow areas, etc. with whatever means necessary to ensure a dense, well vegetated ground cover. If the CONTRACTOR has not installed, repaired, or maintained these devices, or seeded disturbed areas at optimum dates, additional measures or devices may be required at no additional cost to the OWNER.

The CONTRACTOR's selected construction methods may require modifications to the erosion and sediment control measures shown on the Drawings. The CONTRACTOR is responsible for complying with the land disturbance permit and obtaining approval for any modifications to the approved Erosion and Sediment Control Plan.

1.2 RELATED SECTIONS

Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications.

1.3 REFERENCES

Virginia Erosion and Sediment Control Handbook

1.4 SUBMITTALS

- A. Submittals shall be in accordance with Division 1.
- B. Permanent Seed Mixture: Provide written notification as to the permanent seed mixture to be used.
- C. Temporary Seed Mixture: Provide written notification as to the temporary seed mixture to be used.
- D. Erosion and Sediment Control: Submit and maintain on-site a copy of the Erosion and Sediment Control permit issued by the local approving authority for both on-site and off-site operations.
- E. Responsible Land Disturber: Copy of Certification to be submitted at the pre-construction meeting.

1.5 MAINTENANCE

- A. Maintain all erosion and sediment control structures to be utilized during the life of the Project in compliance with the regulations of the Division of Soil and Water Conservation and the requirements of the County DPW until vegetative cover is acceptable to the Division's and DPW's field personnel and approval acceptance is received.

PART 2- PRODUCTS

2.1 PRODUCTS

- A. All products shall comply with details shown on the Drawings and the requirements of the Virginia Erosion and Sediment Control Handbook, latest edition.

PART 3- EXECUTION

3.1 EROSION AND SEDIMENT CONTROL MEASURES

- A. Sequencing: All WORK shall be performed to limit the area of disturbance necessary to install Erosion and Sediment control devices prior to conducting WORK.
- B. Siltation and Erosion Control Measures: Inlet protection, slope protection, mat linings, ditch linings, diversion dikes, silt fence, construction entrances, temporary & permanent vegetation, sediment traps & ponds, diversion ditches and all other items for siltation and erosion control shall be constructed in the locations shown or designated on the plans in accordance with the details provided, or as directed by the ENGINEER or local E&S inspector.
 - 1. The CONTRACTOR shall institute the erosion control program as part of clearing and grubbing, and prior to rough grading. The initial program shall include, but not be limited to, the installation of construction entrance, inlet protection, silt fence, as shown on the Drawings at the limits of clearing and grubbing where silt-carrying surface water runoff may be diverted and/or filtered prior to leaving the disturbed area.

2. All siltation and erosion control devices installed during the course of construction shall be maintained in proper working order at all times, and shall not be removed until final stabilization of all disturbed areas or at the direction of the ENGINEER or local regulating authority.
- C. Temporary Seeding: All disturbed areas that have no construction activity in close proximity shall be temporarily seeded within 7 days of completion of the disturbing activities. Establish temporary cover for erosion control by seeding and/or mulching. This shall be accomplished as soon as rough grading work is done.
1. When construction schedule requires seeding outside of the appropriate seeding dates, temporary seeding shall be installed per the detailed seeding schedules on the Drawings. CONTRACTOR shall reseed at an appropriate time. All reseeding shall be at the CONTRACTOR's expense.
- D. Steep Slopes: On all steep slopes, where erosion is probable, hydroseed areas as soon as possible in strict accordance with applicable provision, of Section 603, of the VDOT *Road and Bridge Specifications*. Maximum allowable slope to be seeded is 2:1.
- E. Cleaning of Roads and Streets: The CONTRACTOR shall maintain a vehicle wash rack or gravel bed at all vehicle egress areas (construction entrance). All vehicles shall be thoroughly cleaned of mud and silt before leaving the construction site to avoid tracking mud and silt onto roads, streets, and highways. In the event that tracking does occur, the CONTRACTOR shall immediately clean the street or road of all debris, mud or silt and shall pay all damages resulting therefrom. A daily survey of the condition of the adjacent streets and roads shall be made and recorded in the field log.
- F. Protection of Stormwater Systems: Stormwater structures which will receive runoff from the construction shall be protected from the buildup of mud or silt as detailed on the Drawings and shall be cleaned out as silt loading occurs and prior to end of construction.
- G. Fines for Siltation and Erosion Control: Any fines that are assessed upon the CONTRACTOR or OWNER by the governing agency due to negligence of the CONTRACTOR shall be paid by the CONTRACTOR.

END OF SECTION

**SECTION 02230
DEWATERING**

PART 1 - GENERAL

1.1 SUMMARY

Keep all excavations and site structures free from water during construction.

1.2 RELATED SECTIONS

Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this section. WORK related to this Section is described throughout the Specifications.

1.3 SUBMITTALS

- A. Dewatering Plan: CONTRACTOR shall submit, for ENGINEER'S review, Drawings and data showing its proposed plan and required equipment for dewatering of all WORK areas. The Drawings and data shall include the planned method of dewatering excavations, wells, well points, sumps, collection and discharge lines, standby units proposed, and protective fills and ditches required for control of ground water, leachate and surface water.
- B. Schedule: The plan for dewatering shall be submitted within 15 days before the start of work. CONTRACTOR shall furnish such other information as may be required for ENGINEER'S complete understanding and analysis of the dewatering, grading and excavation plan.
- C. Engineer's Review: Review by ENGINEER shall not relieve CONTRACTOR of the responsibility for the adequacy of the dewatering plan or for furnishing all equipment, labor and materials necessary for dewatering the various parts of the WORK. If, during the progress of the WORK, it is determined by ENGINEER that the dewatering system grading and excavation Drawings, text and proposed methodology are inadequate, or that CONTRACTOR'S plan of construction is inoperative, CONTRACTOR shall, at its sole expense, furnish, install and operate such additional dewatering equipment and make such changes in other features of the Dewatering Plan or operation as may be necessary to perform the WORK in a manner satisfactory to ENGINEER.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION**3.1 METHODS**

- A. Method: Dewatering can be accomplished by ordinary pumping methods, by the use of underdrains or deep well points, whichever will produce the above results. The CONTRACTOR shall ensure that continuous dewatering can be provided through the method chosen.
- B. Location: All site WORK areas shall be dewatered where surface and/or ground water flows, if any, will adversely impact construction.
- C. Maintenance: All permanent improvements shall be constructed in areas free from water. Construct and maintain all permanent or temporary slopes, dikes, levees, drainage ditches, sumps, and observation wells necessary for the removal of water from WORK areas. Design, furnish, install, maintain, and operate all necessary pumping and other dewatering equipment required for dewatering the various site WORK areas and for keeping the foundation and other areas free from water from any and all sources.
- D. Schedule: All dewatering shall be performed in advance of grading, excavation and/or filling. The dewatering shall be accomplished in a manner that will prevent loss of fines from the foundation, will maintain stability of all excavated slopes and bottoms of excavations, and will permit all construction operations to be performed in the dry. Dewatering of excavations shall be performed to the extent required to permit placement of compacted fill materials in the dry and to prevent sloughing of the excavation side slopes.
- E. Requirements: Lower the ground water level a minimum of 3 feet below sub-foundation grade or as recommended by Geotechnical Engineer prior to sub-foundation preparation and placement of foundation materials. During the placement and compaction of fill or bedding materials, the water level shall be maintained at this level in order that the required compaction can be achieved.

Where conditions are such that running or standing water occur in the trench bottom or the soil in the trench bottom displays a "quick" tendency, the water shall be removed by pumps and suitable means such as well points or previous underdrain bedding until the pipe has been installed and the backfill has been placed to a efficient height to prevent pipe flotation.

No installation will be permitted in trenches unless the subgrade is dry. If, in the opinion of the ENGINEER, the CONTRACTOR has failed to obtain a dry subgrade by use of all known methods of trench dewatering, the ENGINEER may then order the CONTRACTOR to excavate below grade and place sufficient selected fill material over the trench bottom. Additional excavation and fill shall meet the requirements of Division 2 and be at no extra cost.

3.2 PROTECTION OF FOUNDATIONS AND EXISTING FACILITIES

- A. Contingency: Furnish standby equipment of sufficient size and capacity to insure continuous operation of the dewatering system. Any damage to structures due to a failure of dewatering equipment shall be repaired by CONTRACTOR at its expense, to the satisfaction of ENGINEER. CONTRACTOR may consider the use of recharge systems or other methods of protection of existing facilities.
- B. Completion: Dewatering shall be maintained in the WORK areas for as long as is necessary for the completion of WORK. Upon completion of the dewatering and control of water operation, all temporary dewatering facilities shall be removed in a manner satisfactory to ENGINEER.

3.3 DISPOSAL OF DRAINAGE WATER

The disposal of all water from the dewatering and control of water operation and surface drainage shall be accomplished in a manner to have no detrimental effect on any of the new or existing facilities or cause siltation of existing streams. The method and location of disposal of all water shall be subject to the approval of ENGINEER and OWNER; in addition, no water shall be drained into WORK completed or under construction without prior consent of ENGINEER or OWNER. All Commonwealth of Virginia erosion and sediment control requirements shall be met.

END OF SECTION 02230

**SECTION 02300
EARTHWORK FOR UTILITIES**

PART 1 - GENERAL

1.1 SUMMARY

The CONTRACTOR shall furnish all labor and equipment for excavation, installation, backfill, and testing of all force main and gravity sewer lines, and appurtenances as shown on the Drawings and specified herein. This section specifies excavation and backfill for all underground utilities.

1.2 RELATED SECTIONS

Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplemental Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications.

1.3 REFERENCES

- A. American Society of Testing and Materials (ASTM)
- B. VDOT Road and Bridge Specifications
- C. American Society of Civil Engineers (ASCE), Manual No. 37
- D. American Association of State Highway and Transportation Officials (AASHTO)
- E. Federal Highway Administration (FHA), Bulletin No. 373
- F. Occupational Safety and Health Administration Regulations (OSHA)

1.4 QUALITY ASSURANCE

Standards: Backfill material shall comply with the standards of the American Association of State Highway and Transportation Officials:

- T-191 "Density of Soil In-Place by the Sand-Cone Method"
- T-180 "Moisture-Density Relations of Soils using a 10 lb. Hammer and an 18 inch Drop"

PART 2 - PRODUCTS

2.1 BACKFILL MATERIALS

- A. See details on plan sheets.
- B. (Select Fill) Initial backfill materials shall conform to the following:
 - 1. Classification: USCS Soil Classification System (FHA Bulletin No. 373).
 - 2. Class I: Angular, 6 to 25 mm (3 to 1 inch) graded stone.
 - 3. Class II: Coarse sands and gravels with maximum particle size of 25 mm (1 inch including variously graded sands and gravels containing small percentages of fine, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW, and SP are included in this class.
 - 4. Class III: Fine sand and clayey gravels less than 1 inch including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil types GM, GC, SM, and SC are included in this class.
- C. Pipeline backfill should consist of material classifying CH, MH, CL, ML, SC, SM, SP, SW, GC, GM, GP, or GW per ASTM D-2487. Non-organic, on-site soils are expected to meet this criterion. The more highly plastic CH and MH soils should not be used within 2 ft of the

pavement subgrade level or the ground surface in structural areas. If off-site borrow soils are needed, they should classify SC, SM, SP, SW, GC, GM, GP or GW per ASTM D-2487.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. General: All excavation shall be open-cut type except where otherwise shown on the Drawings. The slope of the sides of the excavation shall be kept as nearly vertical as possible consistent with the types of materials encountered. Where trenches would become unreasonably large due to a deep excavation or extremely wet condition, CONTRACTOR shall slope or bench the trench walls to maintain safe working conditions per OSHA Trenching Criteria. A clear area shall be maintained a sufficient distance back from the top edge of the excavation to avoid overloading which may cause slides, cave-ins or shifting of the pipe. Any damage to pipes or structures occurring through settlements, heaving, water or earth pressures, slides, cave-ins or other causes shall be repaired by CONTRACTOR at its expense. CONTRACTOR has the option of shoring, including sheet piling, which shall be installed during excavation where required for the protection of workmen, banks, roadways and adjacent paving, structures, and utilities or as directed by ENGINEER. All excavation shall be performed in accordance with the current OSHA guide lines and any other regulatory authorities having jurisdiction. Provide adequate equipment to comply with OSHA regulations. At no time shall more than 100 feet of trench be open ahead of lines in streets and highways and not more than 200 feet in other locations.

All excavated materials shall be placed on the up gradient side of the trench.

- B. Excavation consists of removal and disposal of material encountered when establishing required trench elevations. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimension without specific direction of ENGINEER.
- C. Protection: Protect existing structures, utilities, sidewalks, pavements, and other facilities from damage created by work or other operations in the area. Barricades for open excavations or work area shall be provided. All such barricades shall be in accordance with the requirements of the authorities or agencies within whose jurisdiction the design exists.
- D. Sheeting, Shoring and Bracing: Provide sheeting, shoring and bracing as necessary to prevent cave-in of excavation or damage to existing structures on or adjoining site. Shoring or sheeting shall be removed as the WORK progresses, unless left in place by written order of ENGINEER.
1. Requirements that are established for trench shoring and bracing should comply with codes and authorities having jurisdiction over the work being performed. The CONTRACTOR's attention is called to Rules and Regulations Governing the Safety and Health of Employees Engaged in Construction as adopted by the Safety and Health Codes Commission of the State of Virginia and all latest revisions thereto and issued by the Department of Labor and Industry.

The CONTRACTOR shall perform all construction operations in accordance with the U.S. "Occupational Safety and Health Act of 1970", the Standards of the U.S. Department of Labor, Occupational Safety and Health Administration and the latest amendments thereto.

2. Shoring, sheeting and bracing shall be removed as the WORK progresses, unless left in place with the approval of the ENGINEER. If left in place, shoring, sheeting and

bracing must be cut off to a depth of not less than 2 feet below the surface.

- E. Trench Excavation: CONTRACTOR shall comply with all local, state and federal guidelines when excavating trenches. The width of the trench at and below the top of the pipe shall not exceed the outside diameter of the pipe plus 24 inches. The width of the trench above the top of the pipe may be as wide as necessary for sheeting and bracing and the proper performance of the WORK.
- F. Sidewalls: The sidewalls of pipe trenches shall be as nearly vertical as practicable to a point one pipe diameter above the top of the pipe.
- G. Overexcavation: Trenches shall be excavated to the design grade of the pipe to provide uniform bearing and support along the entire length of pipe. Care shall be taken not to over excavate. Over excavation of otherwise suitable material shall be replaced with suitable material as directed by ENGINEER. The cost of such fill shall be borne by CONTRACTOR.
- H. Rock: Where the bottom of the pipe trench occurs in rock, the rock shall be excavated to the trench depth specified in the bedding details for ductile iron pipe and plastic pipe provided on the plans. Overdepths in rock excavation and unauthorized overdepths shall be backfilled with VDOT No. 57 stone or gravel.
- I. Unsuitable Material: Whenever wet or otherwise unsuitable material, which is incapable of properly supporting the pipe, is encountered in the trench bottom, such material shall be overexcavated to a depth necessary to allow for construction of a stable pipe bedding. The trench shall be backfilled with suitable materials to proper grade. The CONTRACTOR shall notify ENGINEER immediately when such conditions are encountered and the ENGINEER will determine the amount of overexcavation required. No additional compensation will be considered for additional excavation.
- J. Installation of Identification: See Division 2 for requirements.

3.2 SEPARATION OF WATERLINES AND SANITARY SEWERS

- A. Sewer Lines and Manholes shall be laid at least ten feet horizontally from water mains, the distance shall be measured edge-to-edge. When separation cannot be obtained, the sewer shall be constructed of AWWA approved water pipe, pressure-tested in place to 30 psi without leakage prior to back-filling; and the sewer manhole shall be of watertight construction and tested in place.
- B. Crossing: Sewer line crossing under water mains shall be laid to provide a separation of at least 18 inches between the bottom of the waterline and the top of the sewer whenever possible.
- C. When local conditions prevent a vertical separation described above, the following construction shall be used: (1) sewers passing over or under waterlines shall be constructed of AWWA approved water pipe, pressure tested in place to 30 psi without leakage prior to back-filling; (2) waterlines passing under sewers shall, in addition, be protected by providing:
 - 1. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the waterline.
 - 2. Adequate structural support for the sewer to prevent deflection of joints.
 - 3. That the length of waterline be centered at the point of the crossing so that joints shall be equidistant from the sewer.

4. Sewer Manholes: If a waterline passes within 10 feet of a sewer manhole, the sewer manhole shall be tested and made watertight.
5. Sewers and Sewer Manholes: No water pipes shall pass through or come in contact with any part of a sewer manhole.

3.3 BEDDING

- A. Pipe shall have minimum bedding as shown on the plans. Pipe bedding shall be VDOT #57 stone or other material approved by the ENGINEER. Large clods, sticks, stones, and other unsatisfactory material must be excluded from the initial backfill around and to 12 inches above the pipe.

3.4 BACKFILLING

- A. Operation: CONTRACTOR shall keep trenches backfilled on a daily basis. Prior to the end of the working day, each trench will be completely backfilled. All backfill shall be brought up equally along each side of the pipe in such manner as to avoid displacement of or damage to the pipe.
- B. Material: The backfill material shall consist of material which has been excavated from the trench except rubbish, frozen material, broken pavement or other debris, stones greater than a maximum dimension 6 inches, organic muck, or other materials considered deleterious by ENGINEER. In no case shall rock or asphalt be placed closer than two (2) feet vertically to the installed pipe.
- C. Disposal of Unsatisfactory Material: When, in the opinion of ENGINEER, the excavated material is not satisfactory for use as backfill, the material shall be disposed of under direction of ENGINEER. Select material shall be brought in by CONTRACTOR. No extra payment will be made for disposing of unsatisfactory material or bringing in select material.
- D. Compaction: The material to be used for backfill shall contain a moisture content that will facilitate compaction. The initial backfill shall be brought up in layers not exceeding 6 inches in compacted depth for the full length of pipe. Each layer shall be thoroughly compacted by rolling, or with mechanical tampers or hammers. This method of filling and compacting shall continue until the fill has reached an elevation 12 inches above the top of the pipe.

The remainder of the trench shall be backfilled and compacted in layers not exceeding 12 inches. Other methods of achieving the compaction may be used, however, only after review by Licensed Geotechnical Engineer and written approval of ENGINEER.

- E. Open Areas: Backfill in open areas shall be compacted to a maximum density at optimum moisture equal to that of the existing ground or 90% as determined by ASTM D-698, whichever is higher.
- F. Roadways: Backfill under roadways, VDOT Right of Ways, or other similar installations shall be compacted to a maximum density of 95 percent at optimum moisture as determined by ASTM D-698.
- G. Clay Dams: Where required, clay dams shall be installed in the trench to prevent groundwater from flowing down the trench and damaging the subgrade as directed by the inspector. Clay material with an imperviousness of 1×10^{-3} cm/sec shall be used in clay dams. Remaining trench backfill materials shall be compacted as indicated above. Inspector shall approve clay material prior to use.

- H. Testing: CONTRACTOR is responsible for all costs associated with testing. All pipe in VDOT Right-of-Way shall be tested per the VDOT Permit for compaction. In other areas, the backfill shall be tested every 400 feet or at the discretion of the OWNER/ENGINEER to insure that the required density is being achieved. ENGINEER shall select the depth at which the test is to be taken. Backfill not compacted to the required density shall be removed, recompact, and retested at CONTRACTOR'S expense until the requirements are met.
- I. Excess Disposal: Excess material shall be disposed of at the CONTRACTOR's expense.
- J. Settlement: All backfilled areas where settlement occurs shall be filled and maintained during the life of the Project and for a period of 1 year following the date of final acceptance of all WORK.
- K. Hazards: When the CONTRACTOR is notified by ENGINEER or OWNER that any backfill presents a hazard, CONTRACTOR shall correct such hazardous condition at once.

3.5 BORROW

- A. Availability: Where satisfactory materials are not available in sufficient quantity from required excavations, suitable materials shall be obtained from approved off-site borrow areas.
- B. Placement: Borrow material shall be placed and compacted only when approved by ENGINEER and a Licensed Geotechnical Engineer.
- C. Payment: No separate payment will be made for furnishing and placing approved borrow material. Compensation in full is included in the agreed to price paid for this Project.

3.6 COMPACTION

- A. Method: Where sands and/or gravels are used for backfill, the material shall be compacted to maximum possible density with a plate-type vibrating compactor of standard manufacture, consisting of a variable speed power unit attached to a vibratory plate. The vibrator may be single or multiple type and shall provide sufficient unit pressure on the vibratory plate to obtain maximum density. When the proper moisture content is obtained for all other soils to be used for backfill, they shall be compacted to a density of 90 percent of maximum density or increased as required in pavement areas.
- B. Moisture: Moisture density relations, specified for materials used for fills and backfill, shall be determined and the degree of compaction controlled (except where otherwise specified) in accordance with the requirements of ASTM D-698.

3.7 BLASTING

- A. Blasting can be used only if specifically approved by OWNER/ENGINEER and Appropriate Governing Agencies. Blasting shall be in accordance with local and state laws and regulations. CONTRACTOR shall be required to obtain all required permits and approvals prior to beginning any blasting operations.
- B. Regulations: Blasting operations shall be in strict accordance with "Rules and Regulations Governing Manufacture, Storage, Handling, Use and Sale Explosives" issued by the Department of Labor and Industry of Virginia and any County ordinances. All blasting shall be done at the sole risk of the CONTRACTOR and shall be done only by experienced licensed personnel.

Occupants of nearby structures shall be notified prior to beginning blasting operations.

- C. CONTRACTOR shall be responsible for monitoring blasting activities via placement of calibrated and accurate seismographs. Additional seismographs may be required in the vicinity of structures of concern within one-quarter mile (1,320 feet +/-) of the blasting activity at the discretion of the OWNER and ENGINEER at no additional project cost.
- D. CONTRACTOR shall submit accurate and complete Blasting Reports, to include sketches with seismograph locations, for each blast completed. Blast Reports shall be submitted to the ENGINEER and OWNER within seven (7) days of the blast or with the next pay application, whichever is longer.
- E. When blasting is required, the CONTRACTOR shall conform to the following requirements:
1. Blasting shall not be permitted before 9:00 AM or after 5:00 PM on Monday through Friday unless otherwise authorized by the County.
 2. Blasting on Saturdays, Sundays or holidays shall not be permitted unless specifically authorized by the County.
 3. The CONTRACTOR shall, each day when necessary to blast, set up an approximate schedule of blasting operations and provide 24 hours notice to the County and property owners with occupied buildings within 1,000 feet of blasting.
 4. The CONTRACTOR shall use mats to minimize noise and control flying debris.
 5. The CONTRACTOR shall obtain all required permits including a permit from the OWNER.
- F. Protection: It shall be the responsibility of the CONTRACTOR to protect the public and existing structures (exposed and subsurface) from injury. The blast will be secured in a manner that will prevent the escape of flying material. Care shall be taken to protect facilities.
- G. Damage: In the event damage occurs, it shall be promptly repaired by the CONTRACTOR at its sole expense.
- H. Storage of Materials: Where there are no local ordinances governing blasting and the storage of materials, all blasting supplies shall be stored in a manner approved by the ENGINEER, and a watchman shall be stationed at all times at the place of storage. In no case shall caps or other exploders be kept at the place where dynamite or other explosives are stored.

END OF SECTION

SECTION 02500 PAVEMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The CONTRACTOR shall provide all labor, materials, equipment and services necessary for, and incidental to, the construction or repair of all paved areas, as shown on the Drawings, as specified herein and in accordance with the VDOT's Road and Bridge Standards and Specifications (See 2.1 A).

PART 2 - PRODUCTS

2.1 ASPHALT CONCRETE PAVEMENT

- A. Asphalt Concrete Pavement shall be in accordance with the requirements of Virginia Department of Transportation "Road and Bridge Specifications", dated July 2016, with the latest incorporated revisions, and the "2017 Supplement to the 2016 VDOT Road and Bridge Specifications", with the latest incorporated revisions, also referred to as the Standard Specifications.
- B. Pavement shall be furnished as shown on the Drawings, to the following cross-section and in accordance with the Standard Specifications.
 - 1. Dense Graded Aggregate Base Course shall consist of VDOT No. 21A or 21B, to the limits and depths shown on the details on the Contract Drawings, compacted to a density of at least 95% of maximum dry density as determined by ASTM D 698.
 - 2. Asphalt Concrete Base Course shall consist of BM-25.0 to the limits and thicknesses shown in the details on the Contract Drawings.
 - 3. Asphalt Concrete Surface Course shall consist of SM-9.5A, to the limits and thicknesses shown in the details on the Contract Drawings.
 - 4. Tack coat shall be Grade RC-250 or CSS-1h.
 - 5. Prime coat shall be Grade RC-250 or CSS-1h.
 - 6. Seal coat shall be Grade CRS-2 or CMS-2 or CMS-2h.
 - 7. Line markings shall conform to VDOT specifications.

PART 3 - EXECUTION

3.1 GENERAL

- A. The work includes the removal of existing pavement and the provision of new pavement where

trenches, pits, and other excavations are made in the existing pavement.

- B. Pavement shall be constructed to the finished grades shown on the Drawings or to match existing grade, and shall match and tie into the surrounding pavement in a neat and acceptable manner.
- B. Subgrades shall be prepared in accordance with Division 2 Specifications.
- C. Asphalt concrete surface courses for paved areas shall not be placed until completion of all earthwork, backfilling, and finish grading. Upon completion, tracked vehicles shall be prohibited from traveling on paving.

3.2 AGGREGATE AND PAVING

- A. Gravel Roads, Drives, and Shoulders: Disturbed gravel roads, driveways and shoulders shall be replaced with aggregate stone as specified in VDOT, Section 309, a minimum of 6 inches or equal to the original thickness, whichever is greater.
- B. Open Pavement Cuts: All open cuts through pavement on existing dedicated streets shall be replaced with a minimum of 10" crushed stone #21B, asphalt concrete BM-25 minimum 3" or 1-1/2 times the existing pavement thickness, whichever is greater, and bituminous concrete SM-9.5A minimum 1.5", or 1-1/2 times the existing pavement thickness, whichever is greater; or as otherwise directed by VDOT.
- C. Paved Drives/Private Streets: Existing paved driveways and undedicated streets that are disturbed shall be paved with bituminous concrete SM-9.5A minimum 2", or equal to its original thickness, whichever is greater

END OF SECTION 02500

**SECTION 02665
POTABLE WATER SYSTEMS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Extent of potable water system piping work is indicated on drawings and by requirements of this Section.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the AGREEMENT, including General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications.

1.3 QUALITY ASSURANCE

- A. Manufacturer's qualifications: Firms regularly engaged in manufacture of potable water systems materials and products, of types and sizes required, whose products have been in satisfactory use in similar service.
- B. Codes and Standards:
 - 1. The Virginia Department of Health Waterworks Regulations
 - 2. AWWA

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for potable water system piping and products, in accordance with requirements of Division 1.
- B. Record drawings: At project closeout, submit record drawings of installed potable water system piping and products, in accordance with requirements of Division 1.
- C. Maintenance Data: Submit maintenance data and parts lists for potable water system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

1.5 JOB CONDITIONS

- A. Design Control: All quantities shown on Drawings are estimated. ENGINEER will provide location and benchmark controls as shown on the Drawings. Benchmark locations shown are approximate. CONTRACTOR should use B.M. (benchmark) description to locate.
- B. Field Control: CONTRACTOR will be responsible for establishing field controls for construction purposes.
- C. Quality Control: CONTRACTOR shall provide a level on the site at all times to be used by

OWNER and/or ENGINEER for checking grade.

- D. Locations of Items Shown on Drawings: The exact locations of all utility poles, brace poles, guy wires, signs, and buried utilities are unknown and may not be shown on the Drawings. Existing utility locations shown on the Drawings may indicate conflicts with the utility company's (power, telephones, gas, cable, etc.) property or equipment. All such conflicts may not be indicated on the Drawings.
- E. Field Verification: It is the responsibility of CONTRACTOR to field locate and verify items impacting or impacted by the construction and to contact the utility company prior to the start of excavation near existing underground utilities.
- F. Utility Notification: CONTRACTOR shall notify the utility company of its intent to construct the Project and inquire as to the possibility of such conflicts occurring with the utility's property or equipment. CONTRACTOR shall request the utility to field locate and mark existing underground utilities.
- G. Conflicts: CONTRACTOR shall notify ENGINEER of conflicts prior to the start of excavation. In the event CONTRACTOR requests work to be done by the utility, it shall be responsible for providing a written authorization to the utility stating the nature of the work required and CONTRACTOR will reimburse the utility company for their work. This work shall be included in the price for the pipe and no additional compensation will be allowed for temporary construction items required of the utility by OWNER. It shall be the responsibility of CONTRACTOR to fix utilities damaged during construction at no additional charge OWNER.
- H. Resetting Monuments: It is CONTRACTOR'S responsibility to replace property corners damaged at no additional charge. A surveyor licensed in the Commonwealth of Virginia shall accomplish resetting of monuments.
- I. Paving Verification: CONTRACTOR is responsible for identifying paved, concrete, and unpaved roads and parking lots. All property disturbed shall be restored to its original condition including fences, underground structures, etc.

PART 2 - PRODUCTS

2.1 IDENTIFICATION

Utility identification shall be in accordance with Division 2.

2.2 PIPE AND FITTINGS

Water mains four (4) inches or larger may be either PVC, HDPE or DI, except where specified on the drawings:

A. PVC Pipe:

- 1. Pipe and Fittings: PVC 4-inches to 12-inches in diameter shall conform to the requirements of AWWA Specification C909, with gasket joints, Pressure Class 235 with cast iron pipe O.D. Pipe shall be certified by the National Sanitation Foundation. Joints shall be locked-in factory assembled rubber ring type. Joint material including gaskets and lubricants shall conform to AWWA C909.

2. Fittings for PVC pipe shall be ductile iron ANSI/AWWA C153/A21.53, compact fittings with minimum pressure class of 350 psi. Manufacturer's standard asphaltic coating (one-mil thickness) shall be provided on the exterior of all fittings. Fittings shall have a double thickness cement-mortar lining in accordance with ANSI A21.4 (AWWA C104). Joint restraint shall be used where specified.

B. High Density Polyethylene Pipe:

1. HDPE pressure pipe and fittings shall meet AWWA Standard C906 for water main applications. The pressure rating shall be DR-9 for 4-inch through 8-inch diameters and DR-11 for 10-inch through 24-inch diameters for water main applications. Pipe shall be DIPS.
2. **Due to the wall thickness of HDPE, where "12" WATERLINE" is shown on the plans, the HDPE pipe shall be 14" nominal diameter.**
3. Pipe and fittings shall be joined by thermal butt fusion, flange assemblies or mechanical methods in accordance with the manufacturer's recommendations and the requirements of AWWA C906. The HDPE pipe supplier shall provide the fusion equipment necessary for connecting the pipe and fittings. All butt fusions shall be done by McElroy fusion equipment or approved equal.
4. Pipe and fittings shall be marked with the manufacturer, date of manufacturer, lot number, size, PE code, pressure class, DR #, AWWA designation number, and other information as described in AWWA C906. All HDPE pipe shall be marked to distinguish between potable water and sewage force main. There shall be a minimum of two stripes at 180 degrees, colored blue for waterline and purple for force main.

C. Ductile Iron Pipe:

1. Ductile iron standard mechanical joint pipe shall conform to ANSI/AWWA C151/A21.51 or latest revision and shall be double-lined with cement mortar, seal coated and have a protective exterior coating. Thickness class shall be minimum Class 52. A greater thickness class may be required where conditions so dictate. Polyethylene encasement, in accordance with ANSI A21.5 (AWWA C105) may be required under certain soil conditions.
2. Where restrained joint pipe is to be used, it shall conform to ANSI/AWWA C151/A21.51, and shall be as manufactured by U.S. Pipe, TR Flex Restrained Joint Pipe, or approved equal.
3. Maximum allowable joint deflection for DI pipe shall be 2.5°. Should additional deflection be needed, Contractor shall provide appropriate bends to maintain alignment at no additional cost.

D. Service Lines:

1. Polyethylene tubing shall be CTS, O.D., Class 200, SDR-9, and shall be "indent" marked with class, size, and NSF-PW rating.

2.3 POLYETHYLENE (PE) PIPE

1. 3 Inches and Smaller – Pipe shall be manufactured from a PE 3408 resin listed with the Plastic

Pipe Institute (PPI) as TR-4. The resin material will meet the specifications of ASTM D3350-02 with a cell classification of PE:345464C. Pipe shall have a manufacturing standard of ASTM D2737 (copper tubing size), ASTM D2239 (iron pipe size, controlled inside diameter) and ASTM D 3035 (iron pipe size, controlled outside diameter). Pipe shall have a pressure class as specified on the plans. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipes shall be suitable for use as pressure conduits, and per AWWA C901, have nominal burst values of three times the Working Pressure Rating (WPR) of the pipe. Pipe shall also have the following agency listing of NSF 61.

2. Polyethylene Pipe Fittings

1. Fittings for polyethylene pipe shall be manufactured specifically for the intended use and be approved by the piping manufacturer to be compatible with their product. All fittings shall have a working pressure rating equal to or greater than the pipe, and shall meet all requirements of NSF 61.

2. Butt Fusion Fittings

a. Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-02, and approved for AWWA use. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified in the plans. Fabricated fittings are to be manufactured using Data Loggers. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records. All fittings shall be suitable for use as pressure conduits, and per AWWA C906, shall have a nominal burst values of three and one-half times the Working Pressure Rating (WPR).

3. Coupling Style Fittings

a. Pipe fittings 2" and smaller may be Dresser style 90, and Ford Meter Products Quick Joint or pack joint fittings or approved equal upon approval of the ENGINEER or OWNER.

2.4 JOINT RESTRAINT FOR PVC PIPE

A. Where PVC pipe is connected to fittings, mechanical joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility and minimal deflection of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536-80. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. There shall be no dissimilar metals allowed. Dimensions of the gland shall be such that it can be used with all AWWA approved standardized mechanical joint bell and tee-head bolts conforming to the latest revision of ANSI A21.11 and ANSI A21.53/AWWA C153. The mechanical joint restraint device shall have a working pressure of at least twice the working pressure of the pipe with a minimum of 150 psi. Twist-off nuts shall be used to ensure proper actuating of the restraining devices.

- B. All bell and spigot end joints within this length shall be restrained with a clamping ring and an additional ring designed to fit behind the bell end of the PVC pipe. The rings shall be connected with T-head bolts or rods.
- C. All clamping rings shall incorporate serrations on the inside surface to provide positive restraint on the outside surface of the pipe and shall provide full support around the circumference of the pipe to maintain roundness.
- D. Restraining devices shall have a pressure rating equal to or greater than the PVC pipe, and shall be capable of withstanding a minimum test pressure of two times the pressure rating of the device.
- E. Restraining devices and T-bolts shall be manufactured from high strength ductile iron, ASTM A536, Grade 65-45-12. Clamping bolts and nuts shall be manufactured from corrosion-resistant material as approved by the ENGINEER.

2.5 TRANSITION COUPLINGS

- A. Transition couplings shall be DIPS Bell MJ Adapter with Kit, by ISCO Industries or approved equal. Transition couplings shall be required where transitioning from 14" HDPE pipe to 12" PVC pipe for the waterline. PVC pipe shall be restrained with the use of a mechanical joint restraint system.

2.6 GATE VALVES

A. Resilient Seat Gate Valves

1. All resilient seat gate valves shall fully comply with AWWA C509 (3-inches-12-inches) or C515 (4-inches-12-inches), latest revision.
2. All valves shall be manually operated, unless otherwise specified, and the valve body shall be ductile iron or high strength cast iron with reinforced flanges.
3. All buried valves shall utilize a non-rising stem, equipped with operating nut, unless otherwise specified.
4. All above-ground valves or exposed valves in vaults shall utilize outside screw and yoke (OS&Y) with rising stem, for installation in a vertical position, unless otherwise specified.
5. All iron surfaces, internal and external must be coated with a minimum 8 mils thickness of hand applied epoxy or 3-5 mils thickness fusion bonded epoxy.
6. The valve stem shall have an independent stem nut (not rigidly attached to the gate) which allows the gate to flex without stressing the stem.
7. All valves shall have either a bronze stem collar bushing with two O-rings above the stem or a stem collar with one O-ring below and one O-ring above the stem collar.

8. Seating shall use compression closure. The gate shall be of a true bi-directional, mirror image design.
9. Valves shall have a smooth bottom design.
10. All valves shall open left (counter-clockwise).
11. In general, interior or exposed gate valves shall have flanged ends, with handwheel, and exterior valves shall have mechanical joint ends with non-rising stem and valve box. The handwheel or operating nut of each valve shall have an arrow cast on it showing the direction of opening.
12. For AWWA C509 valves, the bodies, bonnets and other cast iron parts shall conform in all respects to ASTM Specification Designation A126, Class B for valve sizes 2 inches through 12 inches.

For AWWA C515 valves, the bodies and bonnets shall conform in all respects to ASTM Specification Designation A536, Class 70-50-6 for valve sizes 4 inches through 12 inches.

All castings whether ductile or cast iron shall be clean and perfect without blow or sand holes or defects of any kind. No plugging, welding or repairing of cosmetic defects will be allowed.

13. Valves must have a 250 psi working and 400 psi test pressure.
14. If the standard valve provided by a manufacturer does not fully comply with these specifications, but compliance can be attained by providing optional features, then each valve must be permanently marked to indicate the option or options that have been provided. The method of marking valves to indicate that options are included must be approved by the OWNER.
15. All internal and external bolts, **including the bonnet bolts**, shall be a minimum Type 304 stainless steel.
16. Valves shall be manufactured by American Flow Control, Kennedy, Mueller, or approved equal.

B. Resilient Seat Wedge Tapping Valves:

1. Tapping valves shall meet above specifications except, the body seat rings shall have a clear inside opening sufficient to pass a cutter of full diameter and equal to the nominal size of the valve. The outlet end shall be suitable for use with the type of pipe being utilized.
2. Tapping valves shall be suitable for use with all approved manufactured tapping sleeves without modification.

2.7 VALVE KEY EXTENSIONS

- A. The extension shall be 1-1/2 inch solid core steel with the upper operating nut and bottom coupling welded to the stem.
- B. The 2 inch square operating nut on top shall be welded to form a complete box with no openings.
- C. 2-1/2 inch square socket section on bottom shall be tapped on four sides for minimum 5/16 inch N.C. socket head stainless steel set screws and screws shall be provided.
- D. Valve extensions shall be coated with oil-based enamel or other rust preventative coating.
- E. The operating nut of the valve shall be drilled on all four sides to allow insertion of the setscrews.
- F. A 4-1/2 inch diameter steel plate, 1/4 inch thick centering disc, shall be welded to the stem 2 inches below the bottom of the top operating nut.

2.8 TAPPING SLEEVES (STAINLESS STEEL)

- A. The body of the tapping sleeve shall be of 18-8 type 304 stainless steel.
- B. Branch/flange to be 304 stainless steel, 150 lb. drilling.
- C. Gaskets shall be Grade 60 compounded for use with water, alkalis, mild acids and most hydro-carbon fluids, up to 212 degrees Fahrenheit.
- D. Clamping hardware (nuts, bolts and washers) shall be 18-8 type 304 stainless steel, with plastic anti-gall washers. Drop-in bolts or welded-on studs are acceptable.

2.9 TAPPING SLEEVES (FABRICATED STEEL WITH MECHANICAL JOINT ENDS)

- A. Sleeve body, valve flange, gaskets, hardware and coating to be the same as the fabricated steel tapping sleeve.
- B. The mechanical joint glands to be ASTM-A36 iron or ductile iron.
- C. The gland retaining hardware (nuts, bolts and washers) to be 18-8 type 304 stainless steel.

2.10 TAPPING SLEEVES (CAST IRON WITH MECHANICAL JOINT ENDS)

- A. The body and glands of the tapping sleeve shall be of ASTM-126, Class B cast or ductile iron. Sleeve shall be furnished complete with all mechanical joint accessories (bolts, nuts, gaskets and glands), and shall have a bituminous seal coating.
- B. Valve flange, body gaskets and clamping hardware (bolts, nuts and washers) shall be as

specified for the fabricated steel tapping sleeve.

2.11 FIRE HYDRANTS

- A. Fire hydrants shall be manufactured in full compliance with this specification and shall also comply with the AWWA Fire Hydrant Specification C-502, latest revision and the following:
1. Type: Compression – Dry Standpipe: Valve shall open against and close with the pressure. The design shall be such that all internal operating parts can be removed through the standpipe and main valve rod extended without excavating.
 2. Size: Internal valve diameter shall be minimum 5-1/4”.
 3. Inlet Size and Type: 6” mechanical joint end with accessories.
 4. Hose Nozzles: Each hydrant shall be equipped with two 2-1/2” I.D. hose nozzles with National Standard threads, one quarter turn bayonet lock or threaded in with O-ring seal and suitable locking arrangement.
 5. Steamer Nozzle: Each hydrant shall be equipped with one 4-1/2” Steamer Nozzle having National Standard Threads, one quarter turn bayonet lock or threaded in with O-ring seal and suitable locking arrangement.
 6. Direction of Open: Left, counter-clockwise.
 7. Size and Shape of Operating Nut and Cap Nuts: to be 1-1/2” point to flat pentagon. Each hydrant shall be equipped with a weather cap or weather seal.
 8. Seal Plate: The hydrant shall be so constructed that a moisture-proof lubricant chamber is provided which encloses the operating threads, thereby automatically lubricating the threads each time the hydrant is operated. The lubricant chamber shall be enclosed with at least three O-rings. The two lower O-rings will serve as pressure seals; the third O-ring will serve as a combined dirt and moisture seal to prevent foreign matter from entering the lubricant chamber. The hydrant shall be equipped with either an anti-friction washer or bronze bushing to reduce operating torque. The bonnet will be secured to the hydrant using bolts and nuts.
 9. Standpipe – Groundline Safety Construction: The standpipe sections shall be connected at the groundline by a two part, bolted safety flange or breakable lugs. The main valve rod sections shall be connected at the groundline by a frangible coupling. The standpipe and groundline safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling and removing the top operating components and the top section of the standpipe. The minimum inside diameter of the standpipe shall be 6”.
 10. Main Valve, Rod Assembly: The main valve rod assembly shall be so constructed to allow removal of all operating parts through the standpipe regardless of depth of bury, using a removal wrench which does not extend below the groundline of the

hydrant. The main valve seat ring shall be bronze and its assembly into the hydrant shall involve bronze to bronze thread engagement, and the valve assembly pressure seals shall be obtained without the employment of torque compressed gaskets. The design of the main valve rod shall be such that the operating threads at the top of the rod and the valve assembly threads at the bottom of the rod are isolated from contact with water in the standpipe or in the hydrant inlet shoe.

11. Drain Valve: The operation of the drain mechanism shall be correlated with the operation of the main valve and shall involve a momentary flushing of the drain ports each time the hydrant is opened. The drain ports shall be fully closed when the hydrant valve is more than 2-1/2 turns open and the drainage channel in the bronze valve seat ring shall connect two or more outlet drain ports. No springs may be employed in the hydrant valve or drain valve mechanism.
 12. Weep hole: in areas where the ground water stands at levels above that of the hydrant drain, the hydrant drain shall be plugged at the time of installation. Weep hole shall be plugged in accordance to manufacturers recommendations. If the drain is plugged, hydrants in service in cold climate areas should be pumped out after usage. Contractor shall mark such hydrants to indicate the need for pumping out after usage. Marking system shall be coordinated with Owner.
 13. Depth of Bury: Normally hydrants shall be suitable for installation in trenches 4 feet 6 inches deep. Required parts and materials to adjust fire hydrants to different depth of bury shall be provided by the manufacturer to meet actual field conditions as required.
 14. Painting Instruction: At least two prime coats and one finish color coat shall be used and must be applied by the original manufacturer, unless otherwise specified. Exposed area of fire hydrant shall receive one field coat of color Rust-Oleum paint after installation, unless otherwise directed by the inspector. Final field coat shall be brush applied. The wetted surface of the hydrant shoe shall be epoxy coated to prevent corrosion of the waterway. All fire hydrants that arrive at the job site that are not factory painted with color selected by Owner will be rejected. Color to be coordinated with Owner.
 14. Pressure Rating: Test pressure 400 psi, working pressure 200 psi.
- B. If the standard hydrant provided by the manufacturer does not fully comply with these specifications, but compliance can be attained by providing optional features, then each hydrant must be permanently marked to indicate the option or options that have been provided. The method of marking hydrants to indicate that options are included must be approved by the OWNER.
- C. Hydrants shall be traffic model either Mueller Centurion, Kennedy K81-A, or approved equal.

2.12 WATER SERVICE ASSEMBLY FOR 5/8 x 3/4 INCH WATER METERS

All materials for the installation of water services shall be as follows or approved equal.

- A. Water meter boxes shall be 18" x 30" round concrete or PVC pit setter, or approved equal..
- B. Meter box lids shall have a 1-3/4 inches diameter hole located in its center. The hole shall either be cast in place, at the foundry or, after casting, be retrofitted via a plasma arc torch. Holes shall be compatible with the OWNER's touch read meter system. Lid shall be Ford Type 'A32-T' or 'C32-T' Meter Box Cover. Top to be set between 1/2" and 2" above finished grade.
- C. Water meter boxes in areas subject to vehicular traffic shall be made of cast iron and rated for vehicular traffic. Material shall consist of gray iron per ASTM A-48 (latest revision) Class 30.
- D. Meter yokes shall be Ford Y502 with angle valve. Expanders shall be Ford YN-23 or approved equal supplied by the yoke manufacturer.
- E. Corporation stop with corporation cock thread inlet shall be as specified in the approved materials list. Corporation stops shall be of the ball type with CTS pack joint outlet. Inlet threads shall be AWWA taper thread for all corporation stops used on direct taps. Ball-type corporation stops shall be of brass construction, shall meet AWWA C-800-84, and shall be as manufactured by Ford, Mueller, or approved equal.
- F. "Pig-Tail" to terminate 2' to 3' from meter barrel.
- G. Service Saddles shall be of the non-corrosive material (e.g. bronze, stainless steel, or epoxy-coated ductile iron). They shall have a rubber gasket or "O"-ring type seal. Service saddles with a single strap shall have a minimum strap width of 1-1/2 inches. Double-strap saddles shall have minimum 3/4 inch flat-faced straps. Straps and fasteners shall be constructed of stainless steel. Service saddles shall be as manufactured by Ford, Mueller, or approved equal and shall meet the applicable sections of ANSI/AWWA C-800.
- H. Angle valve with padlock wings shall be Ford BA94-323W-G or approved equal. Angled Dual Check Valve shall be cartridge style with drain on the meter side of the check valve, as manufactured by Ford HHCA94-323D-G or approved equal.

2.13 VALVE BOXES

- A. All underground valves shall be installed in approved cast iron valve boxes, having suitable base and shaft sections and covers to protect the valve and permit easy access and operation. Box assemblies shall have screw adjustment. Valve boxes shall be as manufactured by Bingham & Taylor, Tyler Union, or approved equal.

2.14 COMBINATION AIR RELEASE AND VACUUM VALVES

- A. Description and Service
 - 1. Valve shall have four functions of uninterrupted discharge of air/gas during filling, continuous discharge of dis-entrained pressurized air/gas, unrestricted vacuum break,

and pipeline surge protection in a single chamber. Valves shall be anti-surge and anti-shock air release and vacuum break valves.

- a. The large orifice shall allow air to escape during pipeline filling and allow air intake during pipeline draining.
- b. The small orifice shall release air accumulations after the pipeline is filled, under pressure and in operation.
- c. The valve shall be equipped with an integral surge alleviation mechanism that automatically dampens surge pressures due to rapid air discharge or the subsequent rejoining of separated water columns.

B. Construction and Design

1. The intake/discharge orifice area is equal to the nominal size of the valve, i.e., an 8" valve shall have 8" full flow inlet and 8" outlet.
2. Valve shall utilize solid unbreakable HDPE floats with EPDM O-Ring seals. Floats must not deform, leak or experience damage of any kind at twice the design pressure, with floats providing continuous discharge of pressurized air release without levers, pins, springs that can break.
3. Manufacturer shall have ISO 9001, and third party testing of vacuum and air release flow coefficient to certify sizing and performance of all functions. CFD, FEA or other types of theoretical modeling are not acceptable.
4. Valve shall have a 10 year in-service warranty for all internal components.
5. The valves furnished shall be standard products in regular production by the manufacturer and shall have been in satisfactory and successful operation for a period of at least five (5) years.

C. Materials of Construction:

1. 304 Stainless Steel Barrel, Tie Rods, and Fasteners. 316 Stainless Steel Nozzle. Fusion bonded, epoxy coated ductile iron top and bottom Flanges with ABS Polylac Top Cover.
2. 304 Stainless Steel Barrel, Flanges, Tie Rods and Fasteners. 316 Stainless Steel Nozzle and ABS Polylac Top Cover.
3. 316 Stainless Steel Barrel, Flanges, Tie Rods, Nozzle and Fasteners. ABS Polylac Top Cover.
4. Floats: High Density Polyethylene

D. Manufacturer & Model

1. Vent-O-Mat Series RBX by RF Valves, Inc. Hanover, Maryland U.S.A.

PART 3 - EXECUTION

3.1 INSPECTION

General: Examine areas and conditions under which potable water system's materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the OWNER.

3.2 INSTALLATION OF IDENTIFICATION

Installation of utility identification shall be in accordance with Division 2.

3.3 INSTALLATION OF NEW WATER SYSTEMS

A. General

1. Installation of pipe, fittings, valves, and associated appurtenances shall be in accordance with the requirements of the appropriate material specifications.
2. Every precaution shall be taken to insure that the entire length of pipe is supported evenly with the joints mated securely together. Pipe bedding shall be as specified by the pipe manufacturer.

B. Handling

All materials shall be shipped, unloaded, and stored in accordance with the manufacturer's recommendations. All materials shall be handled in such a manner as to avoid damage to the material. When such damage cannot be repaired to the ENGINEER's satisfaction, the item shall be replaced at the CONTRACTOR's expense. The interior of all pipe and accessories shall be kept free from dirt and foreign matter at all times.

Pipe, fittings and accessories shall be handled in such a manner as to ensure that sound, undamaged items, entirely suitable in all respects to the specific requirements of each particular fitting, pipe and accessory, are provided and installed. Equipment, tools and methods used in loading, reloading, unloading, hauling, and laying pipe and fitting shall be such that no damage is done thereto or thereon. Where hooks are used for lifting, they shall have broad well-padded contact surfaces and shall be of such design and length that they will provide uniform support for a distance back from the end of the pipe not less than one-half of the internal pipe diameter.

C. Trench Preparation

Trench preparation shall be in accordance with Division 2.

D. Dewatering

Dewatering shall be in accordance with Division 2.

E. Excavating and Backfilling

1. CONTRACTOR shall do all excavating of any and all materials encountered in the course of excavating for all underground utility systems in accordance with Division 2.
 - a. After the pipe is in place, backfill with suitable earth free from rocks, organic material, etc.

- b. Provide all necessary shoring required for the protection of excavations, existing utilities and workmen and do all necessary pumping required to keep excavation and pipe free of water from any source at all times.
 - c. Provide sufficient barricades, etc., adjacent to excavations to safeguard against injury to workmen and the public. Provide and maintain sufficient warning lanterns at walks, roadways, and parking areas to provide safety at all times.
 - d. Where roots of live trees are encountered in excavations, they shall be carefully protected during construction.
 - e. Exercise special care in backfilling trenches to guard against disturbing pipe joints.
 - f. Remove and dispose of any material not used for backfill.
2. Removal of subsurface obstructions which are uncovered during excavation for installation of the water systems shall be performed by the CONTRACTOR at his expense. This shall include removal of existing concrete or brick of existing building foundations, footings, abandoned utility piping, wires, structures, rock boulders, etc., which may not be visible from surface investigations before construction, but will interfere with new installations. If such obstructions are encountered they shall be removed 2 feet from around the area of new facility and backfilled with a suitable material as specified.

F. Pipe Installation:

- 1. Take all precautions to ensure that pipe and related items are not damaged in unloading, handling and placing in trench. Examine each piece of material just prior to installation to determine that no damage has occurred. Remove any damaged material from the site and replace with undamaged materials.
- 2. Keep pipe clean. Exercise care to keep foreign material and dirt from entering pipe during storage, handling and placing in trench. CONTRACTOR shall be responsible for plugging or capping line at the end of each day.
- 3. Do not lay pipe when weather or trench conditions are unsuitable.
- 4. Line and grade hubs shall be set by a registered surveyor at intervals to accurately insure proper location of waterline and appurtenances. This shall include finished grade centerline stakes for fire hydrants, stakes at all fittings referencing all property pins, etc. Cut sheets are required where the waterline is to be laid to a grade according to the profiles in the plans, or where the future road grade is not yet to within six (6) inches of its final location.
- 5. Water Pipe Laying:
 - a. Laying of water pipe shall be accomplished only after the trench has been dewatered and the foundation and/or bedding has been prepared. Mud, silt, gravel, and other foreign material shall be kept out of the pipe and off the jointing surfaces.
 - b. All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe

in place. All pipe shall be laid to conform to the prescribed line and grade shown on the plans and shall include digging out for bell ends.

- c. Water pipe runs intended to be laid straight shall be so laid. Deflection from a straight line may be made by deflecting the joints only when permission has been given by the OWNER and/or ENGINEER. Joint deflection in pipe shall not exceed one-half that recommended by AWWA Standards or the manufacturer whichever is less (ductile iron installations only). Changes in grade or alignment which cannot be made by deflecting pipe joints shall be made by use of proper bends, offsets or special fittings as required (ductile iron only).
- d. The water pipe, unless otherwise approved by the inspector, shall be laid upgrade from point of connection of the existing water main or from a designated starting point. Water pipe shall be installed with the bell end forward or upgrade.
- e. The pipe shall be fitted and matched so that when laid in the work, units will form a smooth, uniform invert.
- f. Prior to joining the pipe, all surfaces of the pipe to be joined and the surfaces of factory made jointing materials shall be clean and dry. Lubricants, primers, adhesives, etc., shall be applied and the pipes joined as recommended by the manufacturer's specifications. Sufficient pressure shall be applied in making the joint to assure that the pipe is "home". The interior of the pipe shall be cleaned of all foreign material as the work progresses. At the end of the work day, the last pipe laid shall be blocked to prevent creep, and closed with a watertight plug or cap.
- g. Joining Pipe:

1) Ductile iron pipe to be joined as follows:

(a) Mechanical joint pipe:

- (1) When installing PVC pipe into M.J. fittings, the beveled end of the pipe must be cut off to allow for maximum insertion depth and sealing area to avoid leaks. Thoroughly clean inside of the bell and 8 inches of the outside of the spigot end of the joining pipe to remove oil, grit, excess coating and other foreign matter from the joint. Paint the bell and spigot with soap solution (1/2 cup granulated soap dissolved in 1 gallon water). Slip cast-iron gland on spigot end with lip extension of gland toward end of pipe. Paint rubber gasket with or dip into the soap solution and place on the spigot end with thick edge toward the gland.
- (2) Push the spigot end forward to seat in the bell. Then carefully press the gasket into the bell so that it is located evenly around the joint. The gland is moved into position, bolts inserted and nuts turned finger tight.

Tighten all nuts to torque listed below:

Bolt Size (inches)	Torque (ft – lbs)
5/8	40 – 60
3/4	60 – 90
1	70 – 100
1 – 1/4	90 – 120

- (3) Tighten nuts on alternate sides of the gland until pressure on the gland is equally distributed, and torque value is reached.
- (4) Permissible deflection in mechanical joint pipe shall not be greater than one-half of that listed in AWWA C600.

(b) Push-on joint ductile iron pipe:

- (1) Thoroughly clean inside of the bell and 8 inches of the outside of the spigot end of the joining pipe to remove oil, grit, excess coating, and other foreign matter. Flex rubber gasket and insert in the gasket recess of the bell socket. Apply a thin film of gasket lubricant supplied by pipe manufacturer, to the gasket and spigot end of the joining pipe.
- (2) Start spigot end of pipe into socket with care. The joint shall then be completed by forcing the plain end to the bottom of the socket with a forked tool or jack type device. Field cut pipe shall have the end filed to match the manufactured spigot end.
- (3) Permissible deflection in push-on joint pipe shall not be greater than 1/2 of that listed in AWWA C600.

2) Polyvinyl Chloride (PVC) Push-on Joint Pipe:

- (a) Thoroughly clean inside of the bell and 1 inch beyond the reference mark on the spigot end of the joining pipe. Make certain the bell and rubber gasket have no foreign material that could interfere with the proper assembly of the pipe spigot.
- (b) Lubricate the gasket and spigot end of the pipe, using lubricant supplied by pipe manufacturer.
- (c) Insert the spigot end into the bell. Align the pipe sections and push the spigot end in until the reference mark on the spigot end is flush with the end of the bell. Use a bar and block of wood to push pipe home.
- (d) Field cut pipe shall be square cut and beveled to insure proper assembly. Use a factory finished beveled end as a guide to produce an equivalent angle and length of taper.

- (e) Deflection of the length of pipe by bending is strictly prohibited for PVC pipe.

Waterline bend locations shall be included in the construction stake out.

- h. A tracing wire shall be installed and taped directly on top of the pipe in a manner that a continuous trace results. Wire is to be wrapped around hydrants, blow offs and corporation stops and shall be accessible for test hook-up at all water meter boxes, and test stations. The tracing wire must be continuous and completely insulated from ground. The tracing wire will be attached to the top of the pipe using duct tape at an interval no greater than 16 feet. Tracing wire within test stations and meter boxes shall be stripped 3/4 inch from the end and capped with a wire nut to minimize electrical ground contact. Test stations shall be installed within 2 feet of all fire hydrants and at intervals no greater than 1,000 feet. All connections at the main line must be electrically sound and physically secure with screw connections or clamps. All connections must be taped with electrical tape and sealed with an electrical coating sealant. See Division 2 for tracing wire material requirements.
- i. Place underground warning tape directly above all installed utilities, 18 inches above top of pipe. See Division 2 for tracing wire and warning tape requirements.

G. Installation of Valves, Fittings, and Hydrants

1. General: Valves, fittings and hydrants shall be set and joined to the piping system as specified for cleaning, laying and joining pipe.
2. Valves and Valve Boxes: Cast iron valve boxes shall be firmly supported, centered and plumb over the operating unit of valve. Box cover shall be set flush with the surface of finished pavement or at such other level as may be directed by the inspector. Valve rod extension with guide shall be required to maintain a maximum distance of two-feet-four-inches from operating nut to top of box. All valves shall be properly restrained.

Valve boxes not located in pavement or concrete shall have a two foot square by 4 inches thick concrete pad poured around them. Concrete pad shall be neatly formed with a troweled finish. Concrete shall be minimum 3,000 psi concrete. In limited circumstances, such as when the valve box is located in a narrow ditch bottom (a situation that should be avoided if possible) and pouring the pad would require widening the ditch, the inspector may waive the requirement for the concrete pad or reduce the dimensions of the concrete pad.
3. Cross Connections: Drainage branches or blow offs shall not be connected to any sewer, submerged in any stream or installed in any manner which in the opinion of the inspector will constitute a contamination or cross-connection hazard.
4. Hydrants:

Connection to Main: Each hydrant shall be restrained and connected to the main as shown in the Standard Details. Each hydrant shall be provided with a minimum six inch diameter ductile iron branch, controlled by an independent six inch resilient seat gate valve.

Setting of Hydrants: When hydrants are set, a drainage pit 2 feet in diameter and 2 feet below the bowl of the hydrant shall be excavated.

All hydrant valves shall be restrained to the hydrant tee on the main line.

The pit shall be filled with coarse gravel or #57 clean stone, mixed with coarse sand, to a level of 6 inches above the weep hole. No hydrant drainage pit shall be connected to a sewer. The bowls of all hydrants shall be restrained to the pipe with approved restraint systems. All hydrants shall be thoroughly cleaned of dirt or foreign matter before setting.

5. Anchorage of Fittings: All fittings (i.e., each bend, tee, plug, valve and cap) shall be prevented from moving by means of adequate mechanical restraints in accordance with these specifications and approved by the inspector.

H. Installation of Services:

1. 3/4 inch and 1 inch:
 - a. Services shall be installed per details shown on the plans and as required in the Fluvanna County Standards.
 - b. Taps shall be made on a 60 degree angle and utilizing a saddle.
 - c. Corporation stops shall have "cc" thread inlet and compression fitting outlet.
 - d. Tap shall be made with a tapping machine equipped with a bit designed for the type of pipe being tapped.
 - e. Distance between taps or from a joint or bell shall be a minimum of 18 inches.
 - f. Services shall be installed with 36 inches minimum cover up to meter yoke where yoke shall be installed so that meter will set 12 inches to 18 inches below finished grade.
 - g. Meter yoke and box shall be set 1 foot inside right-of-way or easement or as directed by the inspector. Meters shall be installed on reasonably level ground or conform to the angle of the slope. Meter locations shall be staked by a licensed surveyor in order to assure that they are properly located in reference to the right-of-way boundary, utility easement boundaries, and adjacent properties' separating boundary line.
 - h. Backfill shall be hand tamped up to service pipe at tap to prevent corporation stop from being broken off during backfilling.
 - i. Water meter boxes in areas subject to vehicular traffic to be constructed of cast iron.

3.4 CONNECTION TO EXISTING WATERLINE

- A. All waterline tie-ins to the existing distribution system including vertical and horizontal relocations shall be coordinated with the OWNER. Tie-ins shall be scheduled Monday thru Thursday from 9:00 a.m. to 4:00 p.m. Tie-ins may be required outside of this time and/or during nighttime hours.
- B. The OWNER reserves the right to require the CONTRACTOR to perform tie-ins outside of the normal working hours detailed above in the interest of public safety or customer service. No claim for additional compensation shall be made by the CONTRACTOR when such occasions occur.
- C. Proper preparation including field verification of the plans shall be accomplished to minimize shutdown time and prevent the tie-in from exceeding scheduled shutdown time. Sufficient personnel, equipment and materials shall be on-site prior to the water being shut off. Where applicable, excavation and preassembling of fittings shall be performed, and if in the opinion of the inspector sufficient resources are not available, the tie-in will be cancelled and rescheduled.
- D. Tie-ins involving fittings shall include provisions for temporary blocking until concrete blocking has cured unless mechanical restraint systems are used. All pipe and fittings used for a tie-in are to be swabbed with a one percent (1%) chlorine solution prior to connection.
- E. Before a tie-in will be allowed, all new valves, including fire hydrant valves, shall be accessible and verified fully open by the CONTRACTOR unless there are valves designated as "normally closed". Prior to tie-in, the inspector shall verify that all valves, including fire hydrant valves are fully open and accessible. Immediately after a tie-in has been made, all valves used during the shutdown shall be verified fully open by the inspector. All fire hydrants shall be checked by the inspector to ensure water is available and each hydrant is in working order.

3.5 TESTING

Testing shall be completed in accordance with Division 2.

END OF SECTION

**SECTION 02731
SANITARY SEWER SYSTEM**

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of sanitary sewer piping WORK is indicated on drawings and by requirements of this Section.

1.2 RELATED SECTIONS

- A. Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications.

1.3 QUALITY ASSURANCE

- A. Manufacturer's qualifications: Firms regularly engaged in manufacture of sanitary sewer piping materials and products, of types and sizes required, whose products have been in satisfactory use in similar service.

- B. Codes and Standards:

1. The Virginia Department of Environmental Quality *Sewage Collection and Treatment Regulations*
2. Force Main Pipe
 - a. Ductile Iron: AWWA C150, latest revision.
 - b. PVC: AWWA C900, latest revision.
 - c. HDPE: AWWA C906, latest revision.
3. Gravity Sewer Pipe
 - a. Polyvinyl Chloride: ASTM D3034, latest issue.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for sanitary sewer system piping and products, in accordance with requirements of Division 1.
- B. Record drawings: At project closeout, submit record drawings of installed sanitary sewer system piping and products, in accordance with requirements of Division 1.
- C. Maintenance Data: Submit maintenance data and parts lists for sanitary sewer system materials and products. Include this data, product data, shop drawings, and record drawings in operation and maintenance manual; in accordance with requirements of Division 1.

1.5 JOB CONDITIONS

- A. Design Control: All quantities shown on Drawings are estimated. ENGINEER will provide location and benchmark controls as shown on the Drawings. Benchmark locations shown are

approximate. CONTRACTOR should use B.M. (benchmark) description to locate.

- B. Field Control: CONTRACTOR will be responsible for establishing field controls for construction purposes.
- C. Quality Control: CONTRACTOR shall provide a level on the site at all times to be used by OWNER and/or ENGINEER for checking grade.
- D. Locations of Items Shown on Drawings: The exact locations of all utility poles, brace poles, guy wires, signs, and buried utilities are unknown and may not be shown on the Drawings. Existing utility locations shown on the Drawings may indicate conflicts with the utility company's (power, telephones, gas, cable, etc.) property or equipment. All such conflicts may not be indicated on the Drawings.
- E. Field Verification: It is the responsibility of CONTRACTOR to field locate and verify items impacting or impacted by the construction and to contact the utility company prior to the start of excavation near existing underground utilities.
- F. Utility Notification: CONTRACTOR shall notify the utility company of its intent to construct the Project and inquire as to the possibility of such conflicts occurring with the utility's property or equipment. CONTRACTOR shall request the utility to field locate and mark existing underground utilities.
- G. Conflicts: CONTRACTOR shall notify ENGINEER of conflicts prior to the start of excavation. In the event CONTRACTOR requests work to be done by the utility, it shall be responsible for providing a written authorization to the utility stating the nature of the work required and CONTRACTOR will reimburse the utility company for their work. This work shall be included in the price for the pipe and no additional compensation will be allowed for temporary construction items required of the utility by OWNER. It shall be the responsibility of CONTRACTOR to fix utilities damaged during construction at no additional charge OWNER.
- H. Resetting Monuments: It is CONTRACTOR'S responsibility to replace property corners damaged at no additional charge. A surveyor licensed in the Commonwealth of Virginia shall accomplish resetting of monuments.
- I. Paving Verification: CONTRACTOR is responsible for identifying paved, concrete, and unpaved roads and parking lots. All property disturbed shall be restored to its original condition including fences, underground structures, etc.

PART 2 - PRODUCTS

2.1 IDENTIFICATION

Utility identification shall be in accordance with Division 2.

2.2 PRESSURE PIPE

Force mains four (4) inches or larger may be either PVC or HDPE, except where specified on the drawings:

- A. PVC Pipe:

1. Pipe and Fittings: PVC 4-inches to 12-inches in diameter shall conform to the requirements of AWWA Specification C909, with gasket joints, Pressure Class 235 with cast iron pipe O.D. Pipe shall be certified by the National Sanitation Foundation. Joints shall be locked-in factory assembled rubber ring type. Joint material including gaskets and lubricants shall conform to AWWA C909.
 2. Fittings for PVC pipe shall be ductile iron ANSI/AWWA C153/A21.53, compact fittings with minimum pressure class of 350 psi. Manufacturer's standard asphaltic coating (one-mil thickness) shall be provided on the exterior of all fittings. Fittings shall have a double thickness cement-mortar lining in accordance with ANSI A21.4 (AWWA C104). Joint restraint shall be used where specified.
- B. High Density Polyethylene Pipe:
1. HDPE pressure pipe and fittings shall meet AWWA Standard C906 for force main applications. The pressure rating shall be DR-9 for 4-inch through 8-inch diameters and DR-11 for 10-inch through 24-inch diameters for water main applications. Pipe shall be DIPS.
 2. **Due to the wall thickness of HDPE, where "10" FORCE MAIN" is shown on the plans, the HDPE pipe shall be 12" nominal diameter. Where "8" FORCE MAIN" is shown on the plans, the HDPE pipe shall be 10" nominal diameter.**
 3. Pipe and fittings shall be joined by thermal butt fusion, flange assemblies or mechanical methods in accordance with the manufacturer's recommendations and the requirements of AWWA C906. The HDPE pipe supplier shall provide the fusion equipment necessary for connecting the pipe and fittings. All butt fusions shall be done by McElroy fusion equipment or approved equal.
 4. Pipe and fittings shall be marked with the manufacturer, date of manufacturer, lot number, size, PE code, pressure class, DR #, AWWA designation number, and other information as described in AWWA C906. All HDPE pipe shall be marked to distinguish between potable water and sewage force main. There shall be a minimum of two stripes at 180 degrees, colored blue for waterline and purple for force main.

2.3 JOINT RESTRAINT FOR PVC PIPE

- A. Where PVC pipe is connected to fittings, mechanical joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility and minimal deflection of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536-80. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. There shall be no dissimilar metals allowed. Dimensions of the gland shall be such that it can be used with all AWWA approved standardized mechanical joint bell and tee-head bolts conforming to the latest revision of ANSI A21.11 and ANSI A21.53/AWWA C153. The mechanical joint restraint device shall have a working pressure of at least twice the working pressure of the pipe with a minimum of 150 psi. Twist-off nuts shall be used to ensure proper actuating of the restraining devices.
- B. All bell and spigot end joints within this length shall be restrained with a clamping ring and an additional ring designed to fit behind the bell end of the PVC pipe. The rings shall be connected with T-head bolts or rods.

- C. All clamping rings shall incorporate serrations on the inside surface to provide positive restraint on the outside surface of the pipe and shall provide full support around the circumference of the pipe to maintain roundness.
- D. Restraining devices shall have a pressure rating equal to or greater than the PVC pipe, and shall be capable of withstanding a minimum test pressure of two times the pressure rating of the device.
- E. Restraining devices and T-bolts shall be manufactured from high strength ductile iron, ASTM A536, Grade 65-45-12. Clamping bolts and nuts shall be manufactured from corrosion-resistant material as approved by the County.

2.4 TRANSITION COUPLINGS

- A. Transition couplings shall be Alpha Restrained Joint Coupling by Romac or approved equal. Transition couplings shall be required where transitioning from 12" HDPE pipe to 10" PVC pipe, or transitioning from 10" HDPE to 8" PVC pipe for the force main. PVC pipe shall be restrained with the use of a mechanical joint restraint system.

2.5 DUCTILE IRON GRAVITY SEWER PIPE

- A. Ductile Iron Pipe shall meet the requirements of ANSI/AWWA C151/A21.51 and ANSI/AWWA C150/A21.50.
- B. Wall thickness shall be Thickness Class 50 conforming to the requirement of AWWA/ANSI Standard C104/A21.4.
- C. Pipe shall be manufactured by Griffin Pipe Products Co., U.S. Pipe and Foundry Co., Atlantic States Cast Iron Pipe Co., or approved equal.
- D. The inside of buried pipe and fittings shall be lined with ceramic epoxy Protecto 401. The outside of buried pipe and fittings will be bituminous coated to meet the requirements of ANSI/AWWA C151/A21.51.
- E. Joints may be mechanical or rubber (or synthetic rubber) gasket push on type meeting all applicable requirements of AWWA/ANSI C-111-90/A21.11 or Federal Specification WW-P-421C. Joints may be compression gasket per ASTM C 564-7-0.

2.6 PVC GRAVITY SEWER PIPE

- A. PVC non-pressure pipe (4" to 15") shall meet the requirements of ASTM D3034, SDR 26 and fittings shall meet the requirements of ASTM 3034-26 PVC sewer pipe with elastomeric gasket joints meeting requirements of ASTM D3212, for heavy wall PVC as manufactured by North American Pipe Corporation, Diamond Plastics Corporation, or approved equal.
- B. PVC pipe shall be joined by bell and spigot type connections. The pipe joint shall be tightly sealed against infiltration and exfiltration by means of a locked-in rubber-sealing ring conforming to ASTM D3212. The connection shall also permit the thermal expansion or contraction of the pipe. PVC pipe joints (seals) shall meet ASTM F 477.

2.7 COMBINATION AIR RELEASE AND VACUUM VALVE

A. Description and Service

1. Valve shall have four functions of uninterrupted discharge of air/gas during filling, continuous discharge of dis-entrained pressurized air/gas, unrestricted vacuum break, and pipeline surge protection in a single chamber. Valves shall be anti-surge and anti-shock air release and vacuum break valves.
 - a. The large orifice shall allow air to escape during pipeline filling and allow air intake during pipeline draining.
 - b. The small orifice shall release air accumulations after the pipeline is filled, under pressure and in operation.
 - c. The valve shall be equipped with an integral surge alleviation mechanism that automatically dampens surge pressures due to rapid air discharge or the subsequent rejoining of separated water columns.

B. Construction and Design

1. The intake/discharge orifice area is equal to the nominal size of the valve, i.e., an 8" valve shall have 8" full flow inlet and 8" outlet.
2. Valve shall utilize solid unbreakable HDPE floats with EPDM O-Ring seals. Floats must not deform, leak or experience damage of any kind at twice the design pressure, with floats providing continuous discharge of pressurized air release without levers, pins, springs that can break.
3. Manufacturer shall have ISO 9001, and third party testing of vacuum and air release flow coefficient to certify sizing and performance of all functions. CFD, FEA or other types of theoretical modeling are not acceptable.
4. Valve shall have a 10 year in-service warranty for all internal components.
5. The valves furnished shall be standard products in regular production by the manufacturer and shall have been in satisfactory and successful operation for a period of at least five (5) years.

C. Materials of Construction:

1. 304 Stainless Steel barrel, flanges, top cover and fasteners.
2. Floats: High Density Polyethylene

D. Manufacturer & Model

1. Vent-O-Mat Series RGX by RF Valves, Inc. Hanover, Maryland U.S.A.

2.8 PLUG VALVES

- A. Plug valves for sewage and sludge shall be permanently lubricated eccentric plug valves, suitable for at least 125 psi working pressure. Valves installed in horizontal runs of pipe shall be mounted with the plug horizontal and at the top of the body when the valve is open, except as otherwise specified. Valves installed in pipe lines carrying suspended or settleable solids shall be mounted with higher pressure (upstream) against plug face (seat side) when valve is in closed position.

- B. Plug valve pressure ratings shall be as follows and shall be established by hydrostatic tests as specified by ANSI Standard B16-1-1967. Pressure ratings shall be 175 psi for valves through 12", 150 psi for valves in sizes 14" through 36" and 125 psi for valves in sizes 42" and larger. Valves shall be capable of providing drip-tight shutoff up to the full rating with pressure in either direction. Valve bodies shall be of ASTM A126 Class B cast iron, in compliance with AWWA Standard C-504, Section 54. All exposed nuts, bolts, springs, washers, etc. shall be zinc plated. Resilient plug facings shall be neoprene, suitable for use with sewage. Valves shall be furnished with corrosion resistant seats which comply with AWWA Standard C507, Section 7, paragraph 7.2, and with AWWA Standard C504 Section 8.3. Seats in 3" and larger valves shall have a welded-in overlay of not less than 90% pure nickel on all surfaces contacting the plug face.
- C. Plug valves shall be furnished with replaceable, sleeve-type bearings in the upper and lower journals. These bearings shall comply with AWWA Standard C507, Section 8, paragraphs 8.1, 8.3, and 8.4, and with AWWA Standard C504, Section 9. Valves through 20" shall have stainless steel permanently lubricated upper and lower plug stem bushings. Valves 24" and larger shall have stainless steel upper and lower plug stem sleeves and bronze bushings. Valve shaft seals shall comply with AWWA Standard C507, Section 10, and with AWWA C504 Section 10. Stem bushings with "O" ring seals must be in accordance with AWWA C504, Section 10.3, relative to a removable corrosion resistant recess. All valves 4" and larger shall be of the bolted bonnet design. Valves shall be designed so that they can be repacked without removing bonnet from valve. Packing on all valves shall be adjustable.
- D. Flanged plug valves shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical joint ends shall be to the AWWA Standard C111.
- E. Bell ends shall be in accordance with AWWA Standard C100, Class B. Screwed ends shall be in accordance with the NPT Standard.
- F. Port areas for plug valves through 20" shall be at least 80% of full pipe area. Port areas of 24" and larger valves shall be at least 100% of full pipe area. The port shall be smoothly shaped with an unobstructed waterway when open.
- G. All plug valves 4" and larger shall be equipped with gear actuators. All gearing shall be enclosed, suitable for running oil, with seals provided on all shafts to prevent entry of dirt and water into the actuator. All shaft bearings shall be furnished with permanently lubricated bronze, bearing bushings. Actuator shall clearly indicate valve position, and an adjustable stop shall be provided to set closing torque. Valve packing adjustment on non-submerged valves shall be accessible without removing the actuator from the valve. Construction of actuator housing shall be semi-steel. All exposed nuts, bolts and washers shall be zinc plated.
- H. Plug valves and actuators for submerged or buried service shall have seals on all shafts, and gaskets on valve and actuator covers, to prevent the entry of water. Actuator mounting brackets for submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs and washers for submerged valves shall be stainless steel.
- I. Gear actuators shall be of the type that can be mounted for remote operation and a high head extension, waterproof, enclosure pipe.

- J. Plug Valve Floor Stand - Where specified floor stands shall be the handwheel actuated type with valve position indicator. Buried valves shall have pipe encasements around the shaft extension for protection.
- K. 4" plug valves shall be capable of passing a 3" spherical solid.
- L. Plug valves shall be Dezurik, Milliken or approved equal.

2.9 VALVE BOXES

Each valve on underground piping not located under pavement shall be provided with a screw-type adjustable cast iron valve box. They shall have a round shaft, a flared base, and a coat of bituminous paint applied to both surfaces. Also, the head shall be cast iron, round and have the word "sewer" cast on it. Valve boxes shall be adjusted flush with the finish grade.

2.10 VALVE KEY EXTENSIONS

- A. The extension shall be 1-1/2 inch solid core steel with the upper operating nut and bottom coupling welded to the stem.
- B. The 2 inch square operating nut on top shall be welded to form a complete box with no openings.
- C. 2-1/2 inch square socket section on bottom shall be tapped on four sides for minimum 5/16 inch N.C. socket head stainless steel set screws and screws shall be provided.
- D. Valve extensions shall be coated with oil-based enamel or other rust preventative coating.
- E. The operating nut of the valve shall be drilled on all four sides to allow insertion of the setscrews.
- F. A 4-1/2 inch diameter steel plate, 1/4 inch thick centering disc, shall be welded to the stem 2 inches below the bottom of the top operating nut.

2.11 MECHANICAL JOINT SLEEVES

Mechanical Joint Sleeves shall be long body cast iron and meet ANSI/AWWA - C110/A21.10 and ANSI/AWWA - C111/A21.11 Standards. Both ends shall be restrained with restrained joints per Specification Section 02731.

2.12 MANHOLES

Refer to Division 3 of these Specifications.

PART 3 - EXECUTION

3.1 INSPECTION

General: Examine areas and conditions under which potable water system's materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the OWNER.

3.2 INSTALLATION OF IDENTIFICATION

Utility identification shall be in accordance with Division 2.

3.3 INSTALLATION OF PIPE, PIPE FITTINGS, AND ACCESSORIES

A. General

1. Installation of pipe, fittings, valves, and associated appurtenances shall be in accordance with the requirements of the appropriate material specifications.
2. Every precaution shall be taken to insure that the entire length of pipe is supported evenly with the joints mated securely together. Pipe bedding shall be as specified by the pipe manufacturer.

B. Handling

All materials shall be shipped, unloaded, and stored in accordance with the manufacturer's recommendations. All materials shall be handled in such a manner as to avoid damage to the material. When such damage cannot be repaired to the ENGINEER's satisfaction, the item shall be replaced at the CONTRACTOR's expense. The interior of all pipe and accessories shall be kept free from dirt and foreign matter at all times.

Pipe, fittings and accessories shall be handled in such a manner as to ensure that sound, undamaged items, entirely suitable in all respects to the specific requirements of each particular fitting, pipe and accessory, are provided and installed. Equipment, tools and methods used in loading, reloading, unloading, hauling, and laying pipe and fitting shall be such that no damage is done thereto or thereon. Where hooks are used for lifting, they shall have broad well-padded contact surfaces and shall be of such design and length that they will provide uniform support for a distance back from the end of the pipe not less than one-half of the internal pipe diameter.

C. Trench Preparation

Trench preparation shall be in accordance with Division 2.

D. Dewatering

Dewatering shall be in accordance with Division 2.

E. Excavating and Backfilling

1. CONTRACTOR shall do all excavating of any and all materials encountered in the course of excavating for all underground utility systems in accordance with Division 2.
 - a. After the pipe is in place, backfill with suitable earth free from rocks, organic material, etc.
 - b. Provide all necessary shoring required for the protection of excavations, existing utilities and workmen and do all necessary pumping required to keep excavation and pipe free of water from any source at all times.

- c. Provide sufficient barricades, etc., adjacent to excavations to safeguard against injury to workmen and the public. Provide and maintain sufficient warning lanterns at walks, roadways, and parking areas to provide safety at all times.
 - d. Where roots of live trees are encountered in excavations, they shall be carefully protected during construction.
 - e. Exercise special care in backfilling trenches to guard against disturbing the joint.
 - f. Remove and dispose of any material not used for backfill.
2. Removal of subsurface obstructions which are uncovered during excavation for installation of the utility systems shall be removed by the CONTRACTOR at his expense. This shall include removal of existing concrete or brick of existing building foundations, footings, abandoned utility piping, wires, structures, rock boulders, etc., which may not be visible from surface investigations before construction, but will interfere with new installations. If such obstructions are encountered they shall be removed 2 feet from around the area of new facility and backfilled with a suitable material as specified.

F. Pipe Installation:

1. Take all precautions to ensure that pipe and related items are not damaged in unloading, handling and placing in trench. Examine each piece of material just prior to installation to determine that no damage has occurred. Remove any damaged material from the site and replace with undamaged materials.
2. Keep pipe clean. Exercise care to keep foreign material and dirt from entering pipe during storage, handling and placing in trench. CONTRACTOR shall be responsible for plugging or capping line at the end of each day.
3. Do not lay pipe when weather or trench conditions are unsuitable.
4. Line and grade hubs shall be set by a registered surveyor at intervals to accurately insure proper location of waterline and appurtenances. This shall include finished grade centerline stakes for fire hydrants, stakes at all fittings referencing all property pins, etc. Cut sheets are required where the waterline is to be laid to a grade according to the profiles in the plans, or where the future road grade is not yet to within six (6) inches of its final location.
5. Sewer Pipe Laying:
 - a. Laying of water pipe shall be accomplished only after the trench has been dewatered and the foundation and/or bedding has been prepared. Mud, silt, gravel, and other foreign material shall be kept out of the pipe and off the jointing surfaces.
 - b. All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place. All pipe shall be laid to conform to the prescribed line and grade shown on the plans and shall include digging out for bell ends.
 - c. Water pipe runs intended to be laid straight shall be so laid. Deflection from a straight line may be made by deflecting the joints only when permission has been given by the County. Joint deflection in pipe shall not exceed one-half

that recommended by AWWA Standards or the manufacturer whichever is less (ductile iron installations only). Changes in grade or alignment which cannot be made by deflecting pipe joints shall be made by use of proper bends, offsets or special fittings as required (ductile iron only). PVC pipe joint deflection is not permitted.

- d. The water pipe, unless otherwise approved by the inspector, shall be laid upgrade from point of connection of the existing water main or from a designated starting point. Water pipe shall be installed with the bell end forward or upgrade. When pipe is not being laid, the forward end of the pipe shall be kept tightly closed with a watertight plug or cap; plywood or plastic is not acceptable.
- e. The pipe shall be fitted and matched so that when laid in the work, units will form a smooth, uniform invert.
- f. Prior to joining the pipe, all surfaces of the pipe to be joined and the surfaces of factory made jointing materials shall be clean and dry. Lubricants, primers, adhesives, etc., shall be applied and the pipes joined as recommended by the manufacturer's specifications. Sufficient pressure shall be applied in making the joint to assure that the pipe is "home". The interior of the pipe shall be cleaned of all foreign material as the work progresses. At the end of the work day, the last pipe laid shall be blocked to prevent creep, and closed with a watertight plug or cap.
- g. Joining Pipe:

- 1) Ductile iron pipe to be joined as follows:

- (a) Mechanical joint pipe:

- (1) When installing PVC pipe into M.J. fittings, the beveled end of the pipe must be cut off to allow for maximum insertion depth and sealing area to avoid leaks. Thoroughly clean inside of the bell and 8 inches of the outside of the spigot end of the joining pipe to remove oil, grit, excess coating and other foreign matter from the joint. Paint the bell and spigot with soap solution (1/2 cup granulated soap dissolved in 1 gallon water). Slip cast-iron gland on spigot end with lip extension of gland toward end of pipe. Paint rubber gasket with or dip into the soap solution and place on the spigot end with thick edge toward the gland.
- (2) Push the spigot end forward to seat in the bell. Then carefully press the gasket into the bell so that it is located evenly around the joint. The gland is moved into position, bolts inserted and nuts turned finger tight.

Tighten all nuts to torque listed below:

Bolt Size (inches)	Torque (ft – lbs)
5/8	40 – 60
3/4	60 – 90
1	70 – 100

1 – 1/4

90 – 120

- (3) Tighten nuts on alternate sides of the gland until pressure on the gland is equally distributed, and torque value is reached.
- (4) Permissible deflection in mechanical joint pipe shall not be greater than one-half of that listed in AWWA C600.

(b) Push-on joint ductile iron pipe:

- (1) Thoroughly clean inside of the bell and 8 inches of the outside of the spigot end of the joining pipe to remove oil, grit, excess coating, and other foreign matter. Flex rubber gasket and insert in the gasket recess of the bell socket. Apply a thin film of gasket lubricant supplied by pipe manufacturer, to the gasket and spigot end of the joining pipe.
- (2) Start spigot end of pipe into socket with care. The joint shall then be completed by forcing the plain end to the bottom of the socket with a forked tool or jack type device. Field cut pipe shall have the end filed to match the manufactured spigot end.
- (3) Permissible deflection in push-on joint pipe shall not be greater than 1/2 of that listed in AWWA C600.

2) Polyvinyl Chloride (PVC) Push-on Joint Pipe:

- (a) Thoroughly clean inside of the bell and 1 inch beyond the reference mark on the spigot end of the joining pipe. Make certain the bell and rubber gasket have no foreign material that could interfere with the proper assembly of the pipe spigot.
- (b) Lubricate the gasket and spigot end of the pipe, using lubricant supplied by pipe manufacturer.
- (c) Insert the spigot end into the bell. Align the pipe sections and push the spigot end in until the reference mark on the spigot end is flush with the end of the bell. Use a bar and block of wood to push pipe home.
- (d) Field cut pipe shall be square cut and beveled to insure proper assembly. Use a factory finished beveled end as a guide to produce an equivalent angle and length of taper.
- (e) **Deflection of the joint or the length of pipe by bending is strictly prohibited for PVC pipe. PVC pipe is to be laid on a straight line and all deflections made using the appropriate degree bend.**

Waterline bend locations shall be included in the construction stake out.

- h. A tracing wire shall be installed and taped directly on top of the pipe in a manner that a continuous trace results. Wire is to be wrapped around hydrants, blow offs and corporation stops and shall be accessible for test hook-up at all water meter boxes, and test stations. The tracing wire must be continuous and completely insulated from ground. The tracing wire will be attached to the top of the pipe using duct tape at an interval no greater than 16 feet. Tracing wire within test stations and meter boxes shall be stripped 3/4 inch from the end and capped with a wire nut to minimize electrical ground contact. Test stations shall be installed within 2 feet of all fire hydrants and at intervals no greater than 1,000 feet. All connections at the main line must be electrically sound and physically secure with screw connections or clamps. All connections must be taped with electrical tape and sealed with an electrical coating sealant. Tracing wire for water mains shall be color coded blue.
- i. Place underground warning tape directly above all water mains, 12 inches below finished grade. Tape shall be polyethylene tape with a metallic core, two inches in width, with the continuous printed message "Caution - Waterline Buried Below". Tape shall be manufactured by the Seton Name Plate Corp. or approved equal.

G. Placement

1. Installation of all piping, fittings, valves, and appurtenances shall be to the lines, grades and locations shown on the Contract Drawings. All pipe, fittings, and accessories shall be carefully lowered into the trench using suitable equipment in such a manner as to prevent damage to pipe fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. The pipe or accessories shall be inspected for defects prior to lowering into the trench. Any foreign matter or dirt shall be removed from the interior of pipe before lowering into position in the trench.
2. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. If the pipe-laying crew cannot put the pipe in the trench and in place without getting earth into the pipe, the ENGINEER may require that before lowering the pipe into the trench, a heavy tightly woven canvas bag of suitable size be placed over each end left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe. When pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the ENGINEER. This provision shall apply during any suspense of work such as the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.
3. The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner, without damage to the pipe so as to leave a smooth end at right angles to the axis of the pipe. Care shall be taken to avoid damaging the lining of the pipe. Flame cutting of iron pipe with oxyacetylene torch shall not be permitted.

H. Deflection of Pressure Pipe

Where it becomes necessary to deflect the line of pipe, in either a vertical or horizontal plane, to avoid obstructions or in locations where long-radius curves are permitted, the amount of deflection shall not exceed 50% of that recommended in the applicable specification for the particular pipe material.

I. Valves and Fittings

1. Installation of valves and fittings shall be done as per the details on the Contract Drawings.
2. General: Valves, fittings and hydrants shall be set and joined to the piping system as specified for cleaning, laying and joining pipe.
3. Valves and Valve Boxes: Cast iron valve boxes shall be firmly supported, centered and plumb over the operating unit of valve. Box cover shall be set flush with the surface of finished pavement or at such other level as may be directed by the inspector. Valve rod extension with guide shall be required to maintain a maximum distance of two-feet-four-inches from operating nut to top of. All valves shall be properly restrained.

Valve boxes not located in pavement or concrete shall have a two foot square by 4 inches thick concrete pad poured around them. Concrete pad shall be neatly formed with a troweled finish. Concrete shall be minimum 3,000 psi concrete. In limited circumstances, such as when the valve box is located in a narrow ditch bottom (a situation that should be avoided if possible) and pouring the pad would require widening the ditch, the inspector may waive the requirement for the concrete pad or reduce the dimensions of the concrete pad.

J. Testing

Testing shall be completed in accordance with Division 2.

END OF SECTION 02731

**SECTION 02798
UTILITY LOCATION AND IDENTIFICATION**

PART 1 - GENERAL

1.1 SUMMARY

The purpose of this Section is to specify the requirements for utility location tape, tracer wire, and test stations. In general, all utility pipelines shall be marked by appropriately marked metallic tape 18 inches over all installed utilities.

1.2 RELATED SECTIONS

Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications.

1.3 REFERENCES

Code of Virginia

1.4 SUBMITTALS

Shop Drawings shall be submitted for all products specified in this Section as outlined in Division 1.

1.5 SEQUENCING

The tape shall be installed at the same time as the pipeline.

PART 2 - PRODUCTS

2.1 WARNING AND IDENTIFICATION TAPE

- A. Polyethylene plastic and metallic core or metallic-faced, acid-and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 2-inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

Warning Tape Color Codes

Yellow:	Gas, Oil, and Dangerous Materials
Blue:	Water
Green:	Sewer

- B. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi otherwise, and

1250 psi crosswise, with a maximum 350 percent elongation.

- C. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection. Color coded tape shall be installed flat with color side up 18 inches over all installed utility lines including main line and service lateral or service connection.

2.2 UTILITY MARKING

- A. For purposes of future line location, all utility lines will include 3M-Brand ScotchMark water/sewer full-range disc type line marker devices, or approved equal. The markers are to be placed on top of the pipe, along the pipe route, at each change in direction, tee, cross, corporation stop, and all other fittings. In any case, the maximum spacing between markers shall be 40 feet. No external power source shall be needed for the markers. Markers shall be resistant to the elements. Marker color shall be selected by the OWNER to be in accordance with the utility being marked.

END OF SECTION

SECTION 02800 HORIZONTAL BORING

PART 1 - GENERAL

1.1 SUMMARY

The CONTRACTOR shall furnish all labor, materials, and equipment for installation of water mains, sewer mains, force-mains, and appurtenances utilizing horizontal boring methods as shown on the Drawings and specified herein.

1.2 HORIZONTAL BORING IN ROCK

Rock encountered during boring operations is UNCLASSIFIED. No extra payment will be made, regardless of the type of material encountered during bores, including the need for specialized boring equipment required for boring through rock. Contractor shall be responsible for conducting any field investigations he deems necessary for the successful completion of all horizontal bores.

1.3 RELATED SECTIONS

Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplemental Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications.

1.4 REFERENCES

- A. American Society of Testing and Materials (ASTM)
- B. VDOT Road and Bridge Specifications
- C. American WaterWorks Association (AWWA)
- D. Occupational Safety and Health Administration Regulations (OSHA)

1.5 WARRANTY

All materials and workmanship shall be warranted for a period of one (1) year after the date from substantial completion.

1.6 SUBMITTALS

- A. The CONTRACTOR shall furnish qualifications of the drilling/boring contractor and engineering data covering products, design and installation. Submittals shall be made in a timely manner so that the project schedule can be met but no less than thirty (30) days prior to the start of the boring/drilling. The data to be submitted shall be one (1) package and include the following:
 - 1. The CONTRACTOR shall submit qualifications of the drilling/boring subcontractor using a Contractor's Qualifications Statement.
 - 2. The CONTRACTOR shall submit a written "work plan" with descriptions of the proposed construction and installation methods, procedures, schedule, equipment to be used, and locations necessary for equipment and material access, drilling fluid (mud) collection and containment areas.

3. The CONTRACTOR shall submit technical data with complete physical properties for all materials. A certificate of compliance with the specifications shall be furnished for all material supplied.
4. The CONTRACTOR shall submit license and certification for welding work prior to beginning WORK.

PART 2 - PRODUCTS

2.1 CARRIER PIPE

The carrier pipe and fittings shall be as specified in Section 02665 "Potable Water Systems."

2.2 CASING PIPE

- A. The casing pipe shall be either nonspiral welded or seamless steel having a minimum yield strength of 36,000 pounds per square inch (psi) and shall meet the requirements of ASTM A 139, Grade B. All joints shall be butt welded, watertight in accordance with the American Welding Society's recommended procedures.
- B. If vent piping is required, it shall be galvanized piping. The threads shall be coated upon installation.
- C. The Casing pipe shall be installed where shown on the Contract Drawings. The minimum size casing pipe used for road crossings shall conform to the following schedule:

<u>Carrier Pipe Size (Nominal)</u>	<u>Casing Pipe Size (Minimum)</u>	<u>Wall Thickness</u>
8"	18"	1/2"
10"	18"	1/2"
12"	24"	1/2"

- D. All welds shall be completed by certified welder.

2.3 CASING SPACERS

Casing spacers shall be Model No S12-G2 as manufactured by PSI, Inc. or approved equal. The spacers shall be sized to fasten securely onto the carrier pipe barrel O.D. and specified with a minimum runner height to keep the pipe from resting or sliding on its joint during installation. Casing spacers shall be bolt on style with a shell made in two sections of 14 gauge 0.074-inch mild steel or 304 stainless steel. Connecting flanges shall be ribbed for extra strength. They shall be lined with a PVC liner 0.090-inch thick with 85-90 Durometer or neoprene rubber. All nuts and bolts shall be 18-8 stainless steel. Runners shall be made of ultra high molecular weight polymer and shall be supported by risers made of heavy 304 stainless steel.

PART 3 - EXECUTION

3.1 BORING

- A. The CONTRACTOR shall cooperate closely with the OWNER, VDOT, and the ENGINEER in the construction of highway, street, and road crossings. Extreme care shall be taken to hold the pipe on line and grade.
- B. All work and operations shall be carried out in strict accordance with all applicable OSHA, State, and local regulations, safety standards, and permits.
- C. The location of the bore pit and receiving pit shall be excavated in the location shown on the Contract Drawings. Should the CONTRACTOR need to relocate any pit, a written request shall be submitted. The written request shall include any appropriate sketches deemed necessary by the ENGINEER. The CONTRACTOR shall be responsible for obtaining necessary permits and approvals as they relate to the new location should they be approved by the ENGINEER and OWNER.
- D. The bore pit and receiving pit shall be performed with a minimum of interference with or damage to the adjacent areas.
- E. The CONTRACTOR shall make all joints prior to the pipe being installed. Excavation of the head of the casing shall not exceed one foot ahead of the casing pipe. Any damage done to the joints during installation shall be carefully repaired. The ends of the casing pipe shall be sealed with brick and mortar.
- F. The CONTRACTOR shall be responsible for all Erosion and Sediment Control measures and protection of all streams, ditches, and waterways from runoff from the horizontal boring operations.
- G. The bore pit shall be kept in a dewatered state throughout the duration of construction. When the work is completed the pits shall be closed by proper backfilling and compaction, and the disturbed areas shall be restored to original or better condition.
- H. The CONTRACTOR shall be responsible for disposal of all drilling fluid at an approved site.
- I. The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that no unsupported excavation is ahead of the pipe.
- J. The contractor shall maintain the boring auger just far enough ahead of the casing being jacked to provide clearance for proper installation. The contractor shall provide a continuous operation until the casing is installed. The bore equipment shall be of adequate size and capacity to perform the work.
- K. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered.
- L. The casing excavation should not be more than one-inch greater than the casing's outside diameter. Should the casing excavation be more than one-inch larger than the outside diameter of the casing pipe, the void area shall be pressure grouted at the contractor's expense.
- M. The elevation of the finished casing shall conform to the approved plans.

- N. Welding shall be a full penetration circumferential weld performed by a qualified welder.
- O. The contractor shall install sheeting, shoring and bracing as required to insure work area safety at all times.

3.2 PIPE INSTALLATION

- A. The carrier pipe installed in the casing shall be HDPE supported with casing spacers as described herein and shown in the Standard Details on the Construction Drawings. HDPE shall be installed in accordance with Section 02665 "Potable Water Systems."
- B. Every precaution shall be taken to insure that the entire length of pipe is supported evenly.
- C. All materials shall be shipped, unloaded, and stored in accordance with the manufacturer's recommendations. All materials shall be handled in such a manner as to avoid damage to the material. When such damage cannot be repaired to the Engineer's satisfaction, the item shall be replaced at the Contractor's expense. The interior of all pipe and accessories shall be kept free from dirt and foreign matter at all times.
- D. Trench preparation shall be in accordance with Section 02300 – "Earthwork for Utilities". Dewatering shall be in accordance with Section 02230 – "Dewatering".
- E. Installation of all piping, fittings, valves, and appurtenances shall be to the lines, grades and locations shown on the Contract Drawings. All pipe, fittings, and accessories shall be carefully placed using suitable equipment in such a manner as to prevent damage to pipe or fittings. Under no circumstances shall pipe or accessories be dropped. The pipe or accessories shall be inspected for defects prior to installation.

3.3 TESTING

All testing shall be completed in accordance with Section 02665 "Potable Water Systems."

END OF SECTION 02800

SECTION 02850 DIRECTIONAL DRILLING

PART 1 - GENERAL

1.1 SUMMARY

The CONTRACTOR shall furnish all labor, materials, and equipment for installation of water mains and appurtenances utilizing directional drilling methods as shown on the Drawings and specified herein.

1.2 DIRECTIONAL DRILLING IN ROCK

Rock encountered during drilling operations is UNCLASSIFIED. No extra payment will be made, regardless of the type of material encountered during drilling, including the need for specialized drilling equipment required for boring through rock. Contractor shall be responsible for conducting any field investigations he deems necessary for the successful completion of all directional drills.

1.3 RELATED SECTIONS

Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications.

1.4 REFERENCES

- A. American Society of Testing and Materials (ASTM)
- B. VDOT Road and Bridge Specifications
- C. American Water Works Association (AWWA)
- D. Occupational Safety and Health Administration Regulations (OSHA)

1.5 WARRANTY

All materials and workmanship shall be warranted for a period as specified in the General Conditions.

1.6 QUALITY ASSURANCE

- A. Experience: The Contractor shall be regularly engaged in horizontal directional drilling for a minimum of 5 years.
- B. Field supervisory personnel shall be experienced in the performance of the work and tasks as stated herein for a minimum of 5 years.

1.7 SUBMITTALS

- A. The CONTRACTOR shall furnish qualifications of the drilling contractor and engineering data covering products, design and installation. Submittals shall be made in a timely manner so that the project schedule can be met but no less than thirty (30) days prior to the start of the drilling. The data to be submitted shall as one (1) package and include the following:
 - B. Qualifications of the drilling contractor shall be submitted using the "*Contractor Qualification*

Statement" form found in Division 0.

- C. The CONTRACTOR shall submit a written "work plan" with descriptions of the proposed construction and installation methods, procedures, schedule, equipment to be used, and locations necessary for equipment and material access, drilling fluid (mud) collection (if applicable) and containment areas.
- D. The CONTRACTOR shall submit technical data with complete physical properties for all materials. A certificate of compliance with the specifications shall be furnished for all material supplied.

PART 2 - PRODUCTS

2.1 CARRIER PIPE

- A. The carrier pipe and fittings shall be a PE4710 High Density Polyethylene (HDPE) Pipe and comply with the requirements of ASTM D3350, ASTM D3035, AWWA C901 (2" through 3"), AWWA C906 (4" through 63"), and NSF Standards 14 and 61. Materials used in the manufacture of HDPE Pipe and fittings shall have the following minimum physical properties:

<u>Property</u>	<u>Test Method</u>	<u>Value</u>
Cell Classification	ASTM D3350	445474 C
Density	ASTM D1505	0.955 g/cm ³
Melt Index	ASTM D1238	< 0.15 gm/10 min
Flexural Modulus	ASTM D790	135,000 psi
Tensile Strength	ASTM D638	3,500 psi
Slow Crack Growth		
ESCR	ASTM D1693	> 5,000 hours in 100% igepal
PENT	ASTM F1473	> 500 hours
HDB @ 73 deg F	ASTM D2837	1,600 psi
UV Stabilizer	ASTM D1603	2 to 2.5% C

- B. The outside diameter and minimum wall thickness shall be manufactured to Ductile Iron Pipe sizes.
- C. The carrier pipe shall have a Dimension Ratio (DR) of 11 and a pressure rating of 200 psi.
- D. All fittings shall be pressure rated to match the system piping to which they are joined. At the point of fusion, the outside diameter and minimum wall thickness of the fitting shall meet the outside diameter and minimum wall thickness specification of AWWA C901/C906 for the same size pipe. All fittings shall be properly rated and clearly labeled. The fitting manufacturer shall be the same as the pipe manufacturer. Molded fitting shall be made from PE4710 and have fusion capability with the pipe. Fitting shall meet the requirements of ASTM D3261 for butt-type fittings.
- E. Pipe and fittings shall be joined by thermal butt fusion, flange assemblies or mechanical methods in accordance with the manufacturer's recommendations and the requirements of AWWA C901/C906. The HDPE pipe supplier shall provide the fusion equipment necessary for connecting the pipe and fittings. All butt fusions shall be done by McElroy fusion equipment or approved equal.

- F. Pipe and fittings shall be marked with the manufacturer, date of manufacturer, lot number, size, PE code, pressure class, DR #, AWWA designation number, and other information as described in AWWA C901/C906.

PART 3 - EXECUTION

3.1 DRILLING

- A. The CONTRACTOR shall cooperate closely with the OWNER and the ENGINEER during construction. Extreme care shall be taken to hold the pipe on line and grade.
- B. All work and operations shall be carried out in strict accordance with all applicable OSHA, State, and local regulations, safety standards, and permits.
- C. The location of access point shall be as shown on the Contract Drawings. Should the CONTRACTOR need to relocate any access point or obtain additional access points, a written request shall be submitted with the "work plan" described above. The written request shall include any appropriate sketches deemed necessary by the ENGINEER. The CONTRACTOR shall be responsible for obtaining necessary permits and approvals as they relate to the new location should they be approved by the ENGINEER and OWNER.
- D. The CONTRACTOR shall take an adequate number of measurements along the route to ensure that the pipeline on line and grade as shown on the Contract Drawings.
- E. The CONTRACTOR shall be responsible for disposal of all drilling fluid (mud) at an approved site. The OWNER shall provide, at a reasonable location near the site, all make-up water necessary for the directional drilling operations.
- F. The CONTRACTOR shall be responsible for all Erosion and Sediment Control measures and protection of all streams, ditches, and waterways from runoff from the directional drilling operations.
- G. Upon completion of the directional drilling operations, all disturbed areas shall be restored in accordance with other sections of the Contract Documents.

3.2 PIPE INSTALLATION

- A. The HDPE Pipeline shall be installed in accordance with the requirements of AWWA C901/C906 and the manufacturer's recommendations.
- B. Every precaution shall be taken to insure that the entire length of pipe is supported evenly. Pipe bedding shall be as specified by the pipe manufacturer.
- C. All materials shall be shipped, unloaded, and stored in accordance with the manufacturer's recommendations. All materials shall be handled in such a manner as to avoid damage to the material. When such damage cannot be repaired to the Engineer's satisfaction, the item shall be replaced at the Contractor's expense. The interior of all pipe and accessories shall be kept free

from dirt and foreign matter at all times.

- D. Trench preparation shall be in accordance with Division 2 of these Specifications.
- E. Installation of all piping, fittings, valves, and appurtenances shall be to the lines, grades and locations shown on the Contract Drawings. All pipe, fittings, and accessories shall be carefully placed using suitable equipment in such a manner as to prevent damage to pipe or fittings. Under no circumstances shall pipe or accessories be dropped. The pipe or accessories shall be inspected for defects prior to installation.
- F. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed installed. When pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Engineer.
- G. Pipe and fittings shall be joined by thermal butt fusion, flange assemblies or mechanical methods in accordance with the manufacturer's recommendations and the requirements of AWWA C901/C906. The HDPE pipe supplier shall provide the fusion equipment necessary for connecting the pipe and fittings. All butt fusions shall be done by McElroy fusion equipment or approved equal.
- H. To minimize thermal stresses, the pipe shall be allowed to reach thermal equilibrium with the ground before being cut to the final installed length.
- I. Pipe shall be allowed to "relax" for at least forty-eight (48) hours before being cut to the final installed length and connected to ductile iron or PVC pipe.

3.3 TESTING

- A. All HDPE pipe, valves, fittings, and appurtenances shall be tested and inspected for water tightness and soundness before being accepted in accordance with the requirements of the Plastic Pipe Institute Technical Report #31 (PPI TR-31) and as directed by the Engineer. All testing shall be done in the presence of the Engineer or his representative, and all costs associated with testing shall be borne by the Contractor.
- B. HDPE pipe, valves, fittings, and appurtenances shall be subject to a hydrostatic pressure of 1.5 times the design pressure rating or a minimum of 150 psi, whichever is greater. The test procedure shall consist of two steps: the initial expansion and the test phases. In order to compensate for the initial expansion of the pipe under test, sufficient make-up water should be added to the system at hourly intervals for 3 hours to return to the test pressure. After the completion of this first phase, i.e., around 4 hours after initially pressurizing the pipe under tests, the actual test then commences. At the conclusion of the 4th hour, the pipe is again filled to stabilize the test pressure at its target value. The pump is then turned off and the final test pressure held for two (2) hours by use of make-up water to compensate for diametral strain at elevated hoop stress. The test phase should not exceed 3 hours. During this testing period, a measured amount of make-up water should be added to return to the test pressure. The amount of make-up water shall not exceed the allowance given in the following table.

ALLOWANCE FOR EXPANSION UNDER TEST PRESSURE

These allowances only apply to the test period and not to the initial expansion phase.

<u>Nominal Pipe</u> (Size, in.)	<u>2-Hour Test</u> (Gallons/100 ft.)
8	1.0
12	2.3
18	4.3

Note: Under no circumstances shall the total time under test exceed eight (8) hours at 1-1/2 times the pressure rating. If the test is not completed due to leakage, equipment failure, etc., the test section shall be permitted to “relax” for eight (8) hours prior to the next testing sequence. All details and/or leaks shall be corrected in accordance with the Manufacturer’s recommendations and Engineers approval.

END OF SECTION

**SECTION 02920
TURF AND GRASSES**

PART 1- GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section includes the following:
1. Seeding.
 2. Hydroseeding.
 3. Sodding.
 4. Plugging.
 5. Sprigging.
 6. In some parts of the U.S., meadows may be called "prairies." If needed for clarity, revise the term "meadow" throughout the Section Text or insert a definition.
 7. Erosion-control material(s).
 8. Grass paving.

1.3 DEFINITIONS

- A. **Duff Layer:** The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- B. **Finish Grade:** Elevation of finished surface of planting soil.
- C. **Manufactured Topsoil:** Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. **Pesticide:** A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- E. **Pests:** Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and

viruses.

- F. **Planting Soil:** Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- G. **Subgrade:** Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- H. **Subsoil:** All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- I. **Surface Soil:** Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 QUALITY ASSURANCE

- A. **Installer qualifications:** A qualified landscape installer whose work has resulted in successful sodded lawn installations.
- B. **Soil-Testing Laboratory Qualifications:** An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. **Pre-installation Conference:** Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. **Seed and Other Packaged Materials:** Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. **Sod:** Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.
- C. **Bulk Materials:**
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

1.6 SCHEDULING

- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.7 LAWN MAINTENANCE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:

1. Seeded Turf: 60 days from date of Substantial Completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
2. Sodded Turf: 30 days from date of Substantial Completion.
3. Plugged Turf: 30 days from date of Substantial Completion.
4. Sprigged Turf: 30 days from date of Substantial Completion.

- B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, re-planting, and other operations. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn:

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.

- C. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass heights.

1. Mow grass 2 to 3 inches (50 to 75 mm) high.

- D. Lawn Postfertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer and application rates recommended in Topsoil Analysis.

1.8 MAINTENANCE SERVICE

- A. Lawns: Sixty days from date of Substantial Completion.

PART 2- PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Retain one of first two paragraphs below if specifying grass seed and mixes by species. Retain first paragraph if grass seed is certified by the State Department of Agriculture. Most states have seed-certification agencies. Retain second paragraph if the State Department of Agriculture does not regulate seed germination, purity, and weed seed or if there is no state seed certification. Delete both paragraphs if specifying proprietary grass seed mixes.
- C. Seed Species: State-certified seed of grass species as follows:
- D. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Full Sun to Partial Shade: Proportioned by weight as follows:
 - a. 75 percent Tall Fescue (*Festuca arundinacea*) varieties, including Jaguar, Mustang, Rebel II, or Olympic.
 - b. 15 percent Kentucky Bluegrass (*Poa pratensis*) varieties, including Medit and South Dakota.
 - c. 10 percent Perennial Ryegrass (*Lolium perenne*).
 - 2. Shade: Proportioned by weight as follows:
 - a. 50 percent Chewings red fescue (*Festuca rubra* spp *rubra*).
 - b. 35 percent Rough Bluegrass (*Poa trivialis*).
 - c. 15 percent redtop (*Agrostis alba*).

2.2 INORGANIC SOIL AMENDMENTS

- A. Inorganic Soil Amendments: Lime, sulfur, iron sulfate, aluminum sulfate, perlite, agricultural gypsum, sand, diatomaceous earth, and zeolite.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.

2.4 FERTILIZER

- A. Fertilizers: Bonemeal and slow-release fertilizer.

2.5 PLANTING SOILS

- A. Planting Soil: Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix surface soil with the following soil amendments per the soils test and recommendations. Use the following amendment materials:
- B. Ratio of Loose Compost to Surface Soil by Volume:
- C. Ratio of Loose Sphagnum Peat to Surface Soil by Volume:
- D. Ratio of Loose Wood Derivatives to Surface Soil by Volume:
- E. Weight of Lime per 1000 Sq. Ft..
- F. Weight of Sulfur or Iron Sulfate or Aluminum Sulfate per 1000 Sq. Ft..
- G. Weight of Agricultural Gypsum per 1000 Sq. Ft..
- H. Volume of Sand Plus 10 Percent Diatomaceous Earth or Zeolites per 1000 Sq. Ft..
- I. Weight of Bonemeal per 1000 Sq. Ft..
- J. Weight of Superphosphate per 1000 Sq. Ft..
- K. Weight of Commercial Fertilizer per 1000 Sq. Ft..
- L. Weight of Slow-Release Fertilizer per 1000 Sq. Ft..

2.6 MULCHES

- A. Mulches: Straw and tackifier for hydroseeded areas.

2.7 PESTICIDES

- A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.8 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
- B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.
- C. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 3-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Invisible Structures, Inc.; Slopetame 2.
 - b. Presto Products Company, a business of Alcoa; Geoweb.
 - c. Tenax Corporation - USA; Tenweb.

PART 3- EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint wash-out, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways

3.3 LAWN PREPARATION

- A. Apply inorganic soil amendments, organic soil amendments and fertilizers as recommended in Topsoil Analysis.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus ½ inch of finish elevation.
- C. Compaction: Compact growing medium sufficiently to reduce settling but not enough to prevent movement of water through growing medium. Compacted medium should feel firm to foot pressure, leaving only slight heel prints.
- D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in Section 3.3 Lawn Preparation.
- B. Retain first two paragraphs below for erosion-control matting.
- C. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
- D. Fill cells of erosion-control mat with planting soil and compact before planting.
- E. Retain first paragraph below for erosion-control blanket or mesh.
- F. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- G. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Revise first paragraph below to suit Project. Sowing rates vary with grass species and mixtures.
- C. Sow seed at a total rate per manufactures seed type recommendations.
- D. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- E. Protect seeded areas with slopes exceeding 1:3 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.
- F. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.
- G. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
- H. Protection in paragraph below is usually required in warm, dry climates.
- I. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch or peat mulch or planting soil within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.6 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
 - 1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
 - 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
 - 3. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than the

specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.

3.7 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to growth media layer or sod during installation. Tamp and roll lightly to ensure contact with growth medium layer, eliminate air pocket, and form a smooth surface. Work growth medium or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
- C. Saturate sod with fine water spray within two hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.8 TURF MAINTENANCE

- A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering.
 - 1. Adjacent to Training and Maintenance Buildings: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
 - a. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - b. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
 - 2. All other areas.

- a. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Revise timing of fertilizer application in paragraph below if a slow-release fertilizer was initially applied.
- D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.9 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Engineer:
 - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities.
 - 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
 - 3. Satisfactory Plugged Turf: At end of maintenance period, the required number of plugs has been established as well-rooted, viable patches of grass, and areas between plugs are free of weeds and other undesirable vegetation.
 - 4. Satisfactory Sprigged Turf: At end of maintenance period, the required number of sprigs has been established as well-rooted, viable plants, and areas between sprigs are free of weeds and other undesirable vegetation.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.10 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.11 CLEANUP AND PROTECTION

- A. Promptly remove growth medium and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.
- C. Remove temporary erosion-control measures after grass establishment period.

END OF SECTION

SECTION 02990 UTILITY TESTING

PART 1 - GENERAL

1.1 SUMMARY

The purpose of this Section is to specify the methods and requirements for testing and quality assurance of utility piping and utility structures.

1.2 RELATED SECTIONS

Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications.

1.3 QUALITY ASSURANCE

- A. Quality assurance testing shall be done in the presence of the ENGINEER or his representative. The first mile or 20% of the total quantity, whichever is less, of the waterline shall be tested prior to proceeding with the project. Thereafter, utility line testing shall be done in increments of one mile or 20% of the total quantity, whichever is less.
- B. Gravity sewer line testing shall be done for each line section upon completion of each manhole back to the previous manhole.
- C. Testing shall be completed before the project will be considered substantially complete.

1.4 WARRANTY

CONTRACTOR shall be responsible for the work for 1 year after the date of substantial completion.

1.5 FEES

The CONTRACTOR shall be responsible for all costs associated with testing.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 TESTING OF WATERLINE AND FORCE MAIN

A. All testing will be performed in accordance with the ANSI/AWWA C600, latest revision. The CONTRACTOR shall provide the OWNER or OWNER'S representative with 48 hours notice prior to undertaking any tests.

B. Pressure Test:

- 1. Each properly isolated section of the piping system including all water services, shall be

- subjected to a hydrostatic pressure test of 150 psi, or 1-1/2 times the working pressure whichever is greater, measured at the high point of the system.
2. Prior to applying pressure to the lines, all reaction blocking, and/or mechanical restraints shall have been completed to the satisfaction of the Inspector.
 3. Pressurization: Each valved section of pipe shall be filled with water slowly and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Inspector. The water and container used to pump up the line to be tested shall be properly disinfected.
 4. Air Removal: Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. All air shall be expelled by providing manual air relief valves at the high points in the system.
 5. Test Pressure Restrictions. Test pressures shall:
 - a. Not exceed pipe or thrust restraint design pressure;
 - b. Be of at least 2-hour duration;
 - c. Not vary by more than ± 5 psi;
 - d. Not exceed twice the rated pressure of the valves or hydrants when the pressure boundary of the test section includes closed gate valves or hydrants;
 - e. Not exceed the rated pressure of the valve.
 6. Examination: All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the Inspector.
 7. Any defects discovered during this test shall be repaired and the test repeated until the results are satisfactory to the inspector. The Contractor shall provide all equipment, materials and labor necessary to conduct the test.

C. Leakage Test: A leakage test shall be conducted concurrently with the pressure test.

1. Leakage Defined: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.
2. Allowable Leakage: No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{148,000}$$

In which L is the maximum allowable leakage, in gallons per hour; S is length of pipe tested in feet; D is the nominal diameter of the pipe, in inches, and P is the average test pressure during leakage test, in pounds per square inch gauge.

3. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/hr/in. of nominal valve size shall be allowed.
4. When hydrants are in the test section, the test shall be made against the closed hydrant valve.

5. Acceptance of Installation: Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than the allowable amount, the CONTRACTOR shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance.
 6. All visible leaks are to be repaired regardless of the amount of leakage.
 7. The Contractor shall provide a suitable test pump and properly calibrated gauge or other means for measuring leakage to include a clean 50 gallon barrel with top cut out, etc., which is satisfactory to the Inspector.
- D. CONTRACTOR shall be responsible for providing water used for flushing, sterilization, and testing. Filling of water mains may be performed provided permission has been obtained from the inspector who will be responsible for coordinating this activity with the County and the appropriate backflow prevention device is installed. Contractor is not permitted to operate valves on existing lines unless approved by the County's inspector.

3.2 DISINFECTION OF WATER MAINS

A. **Contractor is required to keep a copy of ANSI/AWWA C651, latest edition, on site at all times.** Prior to being placed in service, the pipe line and appurtenances shall be disinfected in general accordance with ANSI/AWWA C651, latest edition; AWWA Standard for Disinfecting Water Mains and the supplemental procedures as set forth below.

1. Section 3 of AWWA C651 emphasizes six basic procedures in the disinfection process. These procedures are to:
 - a. prevent contaminating materials from entering the water main during storage, construction, or repair;
 - b. remove by flushing or other means, those materials that may have entered the water main;
 - c. chlorinate any residual contamination that may remain, and flush chlorinated water from the main;
 - d. protect the existing distribution system from backflow due to hydrostatic pressure test and disinfection procedures;
 - e. determine the bacteriological quality by laboratory test after disinfection; and
 - f. make final connection of the approved new water main to the active distribution system.

2. Preliminary Flushing:

The main shall be flushed prior to disinfection at a velocity of not less than 3.0 ft/s unless the County determines that conditions will not permit the required flow. Adequate provisions shall be made by the Contractor for disposal and neutralization of flushing water so that no physical or environmental damage results. Contractor will find additional instructions on flushing in the supplemental procedures within this section.

3. Forms of Chlorine for Disinfection:

It is the CONTRACTOR'S responsibility to be familiar with and have available for his employees the "Product Data Safety Sheets" of any products used as a source of

chlorine and to provide the proper safety instructions and personal protective equipment to the employees mixing and using materials for disinfection of the water facilities.

- a. **Only liquid sodium hypochlorite (household and industrial strength bleach) are acceptable sources of chlorine for disinfection.**

Sources of chlorine shall be in conformance with AWWA B300 Standard for Hypochlorites, and NSF 60 and 61.

- b. The use of chlorine gas is hazardous and is **strictly prohibited** for use of disinfection of public waterlines.
- c. The use of calcium hypochlorite pills affixed to the interior of water pipe for disinfection **shall not be an acceptable form of disinfection.**
- d. The mixing of a source of chlorine to obtain a suitable disinfecting solution shall be as follows:
- 1) Liquid sodium hypochlorite is supplied in strengths from 5.25 percent available chlorine (commercially available household bleach) to 15 percent available chlorine (industrial strength sodium hypochlorite). A water-sodium hypochlorite solution shall be prepared by adding liquid sodium hypochlorite to water.
 - 2) A water calcium hypochlorite solution shall be prepared by dissolving calcium hypochlorite granules containing 65 percent available chlorine by weight in a pre-determined volume of water to make the desired water-calcium hypochlorite concentration. Disinfection of new mains by water calcium hypochlorite solution shall not be used unless a suction or in-line strainer is available on the solution pump to prevent any undissolved solids from entering the piping. An alternative method of straining the solution to remove undissolved granules may be approved by the inspector on a case-by-case basis.

4. Method of Chlorine Application and Testing

- a. The continuous feed method of applying the disinfecting solution shall be as follows: Water from the existing distribution system or other approved sources of potable water supply shall flow through an approved backflow prevention device at a constant, measured rate into the newly laid pipeline. The water shall be mixed with a chlorine-water solution as prepared above, also fed at a constant measured rate. The two rates shall be proportioned so that the chlorine concentration of the water and water/chlorine solution in the pipe is elevated to and maintained at a minimum of 50 mg/l available chlorine. Since the forms of preparation for a water-sodium hypochlorite or water-calcium hypochlorite concentration are a batch process, a method acceptable to the inspector shall be available to replenish the concentration being fed and mixed with the water flow, so there is no interruption of the

flow of disinfection solution. To assure that this concentration is maintained, the chlorine residual shall be measured at intervals not exceeding 1,200 feet and at the end of all branch lines or cul-de-sacs in accordance with the procedures outlined herein. During the application of the chlorine-water solution, valves, hydrants and any other appurtenances shall be operated in order to be thoroughly disinfected. Chlorine-water solution application shall continue until the entire new main is filled with water having a residual of a minimum of 50 mg/l chlorine solution. The chlorinated water shall be retained in the main for at least 24 hours. The free chlorine residual must be at least 10 mg/l after 24 hours in accordance with AWWA C651.

- b. The Owner or Contractor will furnish the personnel and equipment for determining water-chlorine solution strengths and residuals.
- c. After the applicable retention period, the heavily chlorinated water shall be flushed (low-flow) from the main until the chlorine residual of the water leaving the main is equal to the chlorine residual of the incoming system water. Additional instructions for disposal of the heavily chlorinated water are covered in a subsequent section entitled "Flushing".

B. Bacteriological Test

- 1. After low-flow flushing, and before the water main is placed in service, samples shall be collected and tested for bacteriological quality. Two consecutive negative tests from the same location shall show the absence of coliform organisms. At least two samples shall be collected and tested by a State of Virginia certified laboratory at least 16 hours apart at intervals determined by the Inspector (not exceeding 1,200 feet apart and at the end of all branch lines and cul-de-sacs).
- 2. Samples for bacteriological analysis shall be collected in approved sterile bottles or bags treated with sodium thiosulfate. If laboratory results indicate the presence of coliform bacteria, the samples are unsatisfactory and disinfection shall be repeated as prescribed above until the samples are satisfactory. Cleaning, disinfection, and testing shall be under the direction of the Inspector but remains the responsibility of the CONTRACTOR. The CONTRACTOR shall be responsible for any cost associated with the loading, hauling, discharging, and dechlorination of the heavily chlorinated water.

3.3 SUPPLEMENTAL PROCEDURES FOR DISINFECTING, TESTING, AND FLUSHING

A. General:

- 1. All work shall be performed in general accordance with AWWA C651, latest edition.
- 2. The supplemental procedures are developed to compliment the AWWA C651 Standard, particularly with respect to flushing, testing and tie-in to the existing water distribution system.
- 3. These procedures and construction acceptance for final tie-in of new water main are

performance based, predicated on the new construction passing pressure and bacteriological testing. In order to best assure satisfactory bacteriological results, it is essential that all aforementioned preventive and precautionary measures be taken prior to and during construction to protect the interiors of pipe, fittings and valves against contamination. Failure to follow the precautionary measures increases the likelihood of unsatisfactory bacteriological tests and increases the construction requirements necessary for final acceptance. Refer to AWWA C651, Section 4, entitled "Preventive and Corrective Measures During Construction".

4. No contaminated material or any material capable of supporting the growth of microorganisms or causing taste, odor, or other aesthetic water quality concerns shall be used in sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation or sealing gaskets shall be supplied by the pipe manufacturer and suitable for application in a potable water system. It shall be kept clean and applied clean with dedicated applicators.

Note: The County will not accept completed waterlines that exhibit taste and odor conditions as a result of the use of unapproved lubricants.

B. Filling and Testing Procedures:

1. Connection of the new water main to the existing distribution system for filling and testing shall be through a Contractor furnished flushing mechanism. The Contractor is to furnish the single gate valve, double check valve flushing assembly and all necessary fittings, reducers, increases and sleeves to make the piping connections. Assembly shall be approved by the County prior to its use. A suitable valved piping arrangement for the addition of the water-chlorine solution is to be available on the new line side of the flushing assembly. The assembly is to be furnished with 150 psi rated flange connections and installed in a manner approved by the Inspector.
2. System testing will not commence until all administrative items have been resolved and the project is ready for tentative acceptance pending the successful performance of all required testing.
3. Initial flush shall be at a flow rate to achieve a minimum velocity of 3.0 fps and shall be continued for the time needed for two (2) complete turnovers of the segment of water piping and appurtenances.
4. Pressure test the line as noted in these specifications.
5. Make any necessary repairs and pressure test again until the line passes this test.
6. Disinfect the line in accordance with AWWA C651, Section 5. A water-chlorine solution prepared in accordance with these specifications shall be used for disinfection.
7. After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine residual of the water leaving the main is equal to the chlorine residual of the incoming system water.

8. Bacteriological samples will be taken in accordance with AWWA C651, Section 7.
 9. If unsatisfactory bacteriological test results are received, repeat steps 6, 7 and 8.
 10. After receiving satisfactory bacteriological test results, the Contractor shall coordinate with the Inspector the connecting of the new main to the existing system. All connecting pipe and fittings shall be clean and free of debris and shall be swabbed or sprayed with a 1 percent sodium hypochlorite solution before they are installed. The Contractor shall tie-in new waterlines to the existing water system within 10 working days of successful completion of all bacteriological tests; otherwise the disinfection process must be repeated.
 11. Final flush of line shall maintain a minimum of 1 fps in the pipeline and shall continue until the disinfection solution is completely removed from the system.
- C. The Disinfection and Supplemental Procedures may be modified by the Owner for site specific problems that do not physically allow for following the normal disinfection procedures. Modified instructions will be given in writing from the Owner through the Inspector and will be executed by the Contractor in a manner that does not subject the existing distribution system to undue problems and assures that adequate disinfection and flushing will be given to the new main before placing it into service.

- D. The procedure for the disinfection of short leads to fire hydrants and the connector pipe to fire suppression systems/double detector check assemblies shall be as follows:

Connector piping, fittings and valves from an existing main to a fire hydrant or to a fire system double detector check assembly, which does not contain domestic use branches and is equal to or less than 18 feet in length from the main may be spray disinfected or swabbed with a minimum 1 percent solution of chlorine just prior to installation, tied-in and flushed at a velocity of not less than 3.0 ft/sec. Bacteriological sampling will be taken downstream for confirmation of uncontaminated water. Connections to existing mains must be done within 10 working days of the successful completion of bacteriological tests; otherwise, the disinfection process shall be repeated.

- E. Flushing:

The use of water for making the new water main available for service will be as follows:

1. Initial Flush:

See table entitled "Flushing Schedule". This is to be a high velocity flush through all sections of the new line. Since the large volume of water may have effects on the existing distribution system, the initial flushing is to be done only with the approval of and under the direction of the Inspector. System demands may cause this flushing to be done at times when the existing distribution system demands are low.

Because of the large volume of water to be flushed from the fire hydrants or flushing hydrants, the Contractor must inspect the areas of discharge and provide the necessary equipment or materials to prevent any environmental damage or erosion. Sufficient hose length and termination fittings are to be provided so as to discharge the water into

stable, heavily vegetated areas, drainage ponds, storm sewers, paved ditches, etc. The Contractor is to be responsible for any damage that may result from flushing.

2. Flush to remove disinfecting solution:

This is a low velocity, low flow, flush through fire or flushing hydrants to remove the disinfection solution from the new line. The Contractor is to provide sufficient hoses to connect from the hydrants to a suitable discharge point. The flushing of the disinfecting solution must not enter any streams or be discharged in a manner that causes any environmental damage. For site specific locations the Inspector may require the use of a neutralizing chemical and piping arrangement. The expense of a neutralizing station is the responsibility of the Contractor.

3. Final Flush:

See the table below. The final flush is a medium velocity, medium flow flush to clear the line of any chlorine solution used in the tie-in and to provide for fresh water throughout the new lines.

FLUSHING SCHEDULE			
Main size (Nominal)	Double Check Valve Single Gate Size (Note 1)	INITIAL FLUSH (Note 2) Min. Flow (gpm)	FINAL FLUSH (Note 2) Max. Flow (gpm)
6"	4"	265	88
8"	4"	470	160
12"	6"	1060	350
16"	6"	1,900	624
20"	8"	3,000	978
24"	10"	4,250	1,410

Notes:

1. Approximation of flushing flows can be made by using either a pitot tube or a method of measuring the static discharge pressure from a hydrant used for discharge of the flushing water. See Detail "Discharge Flow Rates for Flushing".
2. On a case-by-case basis, dependent upon such variables as length of new water main (<200'); space limitations or other unforeseeable obstacles, the Inspector may authorize the use of a smaller flushing device if the use of this device will provide for adequate flushing of the new water main.

3.4 TESTING OF GRAVITY SEWER SYSTEMS

- A. Testing: All structures required to be watertight and all piping and appurtenances shall be tested for leakage by CONTRACTOR under the direction of ENGINEER.
- B. Sewer testing shall be done by air pressure test as specified herein.
 1. Air Test: CONTRACTOR shall plug the pipe and shall conduct a low pressure air test

to determine the acceptability of the completed WORK. CONTRACTOR shall furnish all men, materials, and supplies necessary to assist in the conducting of this test. This air test shall conform to UNI-BB-6-79 or latest revision.

The air testing equipment shall be Air-Lock, as manufactured by Cherne Industrial, Inc., or approved equal. All air used shall pass through a single control panel. Individual air hoses shall be used from control panel to pneumatic plugs; from control panel to sealed line for introducing low pressure air; and from sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe tested. The plugs shall resist internal test pressures without requiring external bracing or blocking. Plugs shall be tested prior to installation in the pipe run. A joint of pipe shall be sealed at both ends with the plugs to be used in the sewer test. Air shall be introduced into the plugs to 25 psi. The sealed pipe shall then be pressurized to 9 psi. The plugs shall withstand this pressure without bracing or movement. The tested line segment shall be plugged and pressurized to 4.0 psi greater than the ground water back pressure but not to exceed 9 psi. The line shall be allowed to stabilize for 2 minutes after pressurization. After the pressure has stabilized, the air pressure shall be decreased slowly to 3.5 psi (greater than ground water back pressure) and the timing shall commence. The time for the pressure to drop 1 psi from 3.5 psi shall be recorded. The minimum acceptable time durations are shown on Table I. If the elapsed time to drop 1 psi is less than that shown on Table I, then the air loss shall be considered excessive and the section of pipe has failed the test.

TABLE 1**SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP
FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015****PART 1A**

Pipe Diameter (in.)	Minimum Time (min:sec)	Length for Minimum Time (ft)	Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)			
				100'	150'	200'	250'
4	3:46	597	.380 L	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12

PART 1B

Pipe Diameter (in.)	Minimum Time (min:sec)	Length for Minimum Time (ft)	Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)			
				300'	350'	400'	450'
4	3:46	597	.380 L	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	106:57	124:38	142:26	160:15
33	31:10	72	25.852 L	129:16	150:43	172:21	193:53

C. Testing of Manholes

All new and rehabilitated manholes shall be tested by vacuum testing.

1. Vacuum Test: Manholes shall be vacuum tested as follows:

All vacuum testing shall be performed prior to backfilling around all manholes.

All pipe openings shall be plugged by pneumatic or mechanical plugs and braced to sustain 10" mercury vacuum. The rim to cone joint shall be tested on all manholes. No one shall be inside the manhole during testing. The test shall be at 10 in. mercury.

Installation and operation of vacuum equipment and indicating devices shall be in accordance with equipment specifications for which performance information has been provided by the manufacturer.

Minimum Time to hold 1 in. Mercury Drop

<u>MH Dia.</u>	<u>MH Height</u>	<u>Hg</u>	<u>Time (Minimum)</u>
4'	10' or less	1 in.	1 min. 0 sec.
4'	10-15'	1 in.	1 min. 15 sec.
4'	15-25'	1 in.	1 min. 30 sec.

For manholes five feet in diameter, add an additional 15 seconds and for manholes six feet in diameter, add an additional 30 seconds to the time requirements for four-foot diameter manholes.

If a manhole joint mastic is completely pulled out during the vacuum test, the manhole shall be disassembled and the mastic replaced.

- D. Deflection Test for PVC Gravity Pipe: All PVC pipe with a stiffness of 200 psi or greater may be excluded from the deflection test (Manufacturer shall certify stiffness in excess of 200 psi). Deflection tests shall be a test on installation and be performed no sooner than 30 days after final full backfill has been placed. The CONTRACTOR shall test the pipe for deflection by means of a GO-NO-GO mandrel to assure that a deflection of 5 percent has not been exceeded. The mandrel, one for each size pipe, shall be a nine arm mandrel, with proving ring, sized at 5 percent less than the ASTM dimension for the pipe in accordance with TABLE II.

The mandrel shall be pulled through the sewer line manually. Ten percent of all sewer line shall be tested at locations specified by the ENGINEER. Should any of the 10% fail the test, it shall be corrected until it does pass the test, at the CONTRACTOR's expense. Additional sewer shall be tested at the discretion of the ENGINEER, and any sewer not passing the test shall be corrected until it does pass the test.

TABLE II

Nominal Diameter (inches)	L(inches)	PVC-SDR 35 ASTM D3034 D (inches)
8	8	7.50
10	10	9.33
12	12	11.16
15	15	13.60
18	18	16.60

L = Mandrel Arm Length

D = I.D. of Proving Ring

The test shall be made only under the supervision of the ENGINEER. The CONTRACTOR shall provide all equipment and perform all work required for the purposes. In case any section under test shows leakage in excess of the allowable amount, the CONTRACTOR shall make such repairs to the line as are required to bring the loss within the stipulated limits.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
1. Interior Slab-on-grade
 2. Exterior Concrete Pavement.
 3. Exterior equipment pads.
 4. Footings.
 5. Foundation Walls.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- E. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.

5. Vapor Barriers.
6. Curing compounds.
7. Bonding agents.
8. Adhesives.
9. Repair materials.

1.4 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. **Manufacturer Qualifications:** A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. **Testing Agency Qualifications:** An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. **Source Limitations:** Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. **ACI Publications:** Comply with the following unless modified by requirements in the Contract Documents:
 1. ACI 301, "Specification for Structural Concrete,"
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. **Concrete Testing Service:** Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. **Steel Reinforcement:** Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 82.
- C. Deformed-Steel Wire: ASTM A 496.

- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement: ASTM C 150, Type I/II.
 - a. Fly Ash: ASTM C 618, Class F.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate or better, graded. Provide aggregates from a single source.
 1. Maximum Coarse-Aggregate Size: 1 inch nominal unless noted otherwise. Use 3/4 inch nominal at floor slabs.
 2. Fine Aggregate: Fine aggregate shall comply with ASTM C 33 and as herein specified. Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94 and potable. Clean, not detrimental to concrete and free from deleterious amounts of acids, alkali or organic materials.

2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494, Type A.
 2. Retarding Admixture: ASTM C 494, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.7 VAPOR BARRIERS

- A. Sheet Vapor Barrier: ASTM E 1745, Class A with a Perm Rating less than or equal to 0.018 perms (grains / (ft² *hr *in. Hg)) as tested by ASTM E 96.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Reef Industries; Vaporguard.
 - b. Stego Industries; LLC; Stego Wrap (15 mil).
 - c. W.R. Meadows; Perminator (15 mil).
- B. Vapor Barrier Accessories:
 1. Seal Tape: Water vapor transmission rate per ASTM E 96 of 0.3 perms or less.
 2. Vapor Proofing Mastic: Water vapor transmission rate per ASTM E 96 of 0.3 perms or less.
 3. Pipe Boots: Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 1. Available Products:
 - a. Axim Concrete Technologies; Cimfilm.
 - b. Burke by Edoco; BurkeFilm.
 - c. ChemMasters; Spray-Film.
 - d. Dayton Superior Corporation; Sure Film.
 - e. Euclid Chemical Company (The); Eucobar.
 - f. Kaufman Products, Inc.; Vapor Aid.
 - g. Lambert Corporation; Lambco Skin.
 - h. MBT Protection and Repair, Div. of ChemRex; Confilm.
 - i. Meadows, W. R., Inc.; Sealtight Evapre.
 - j. Metalcrete Industries; Waterhold.
 - k. Sika Corporation, Inc.; SikaFilm.
 - l. Symons Corporation, a Dayton Superior Company; Finishing Aid.
 - m. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
 - n. Or approved equal.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

- 1. Available Products:

- a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
- b. Burke by Edoco; Aqua Resin Cure.
- c. ChemMasters; Safe-Cure Clear.
- d. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
- e. Euclid Chemical Company (The); Kurez DR VOX.
- f. Kaufman Products, Inc.; Thinfilm 420.
- g. L&M Construction Chemicals, Inc.; L&M Cure R.
- h. Meadows, W. R., Inc.; 1100 Clear.
- i. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
- j. Tamms Industries, Inc.; Hornure WB 30.
- k. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
- l. Or approved equal.

- E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

- 1. Available Products:

- a. Burke by Edoco; Cureseal 1315 WB.
- b. ChemMasters; Polyseal WB.
- c. Euclid Chemical Company (The); Super Diamond Clear VOX.
- d. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
- e. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
- f. Meadows, W. R., Inc.; Vocomp-30.
- g. Metalcrete Industries; Metcure 30.
- h. Symons Corporation, a Dayton Superior Company; Cure & Seal 31 Percent E.
- i. Tamms Industries, Inc.; LusterSeal WB 300.
- j. Unitex; Hydro Seal 25.
- k. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.
- l. Or approved equal.

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

- D. **Epoxy Bonding Adhesive:** ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. **High-Strength Epoxy Doweling System:** Epoxy doweling system shall consist of an injectable two-part epoxy complying with the requirements of ASTM C881-90, Type IV, Grade 3, Class B and C except gel times. Epoxy doweling system shall be tested in accordance with ICC Acceptance Criteria 308 demonstrating compliance with the performance features of ACI 355. The epoxy doweling system shall be installed according to manufacturer's instructions.
1. Available Products:
 - a. Hilti HIT-HY 200 Epoxy Adhesive Anchoring System (ICC ESR-3187)
 - b. Powers AC100+ Gold Adhesive Anchor System (ICC ESR-2582)
 - c. Simpson Strong-Tie SET-XP Epoxy Adhesive Anchors (Use of SET-PAC system not allowed). (ICC ESR-2508).
 - d. Or approved equal.
- F. **Expansion Wedge Anchors:** Expansion wedge anchors shall consist of threaded stud bolt body and integral wedge expander, nut, and washer complying with the requirements of Federal Specification A-A 1923A, Type 4. Expansion wedge anchors shall be tested in accordance with ICC Acceptance Criteria 193 demonstrating compliance with the performance features of ACI 355.2. Expansion wedge anchors shall have an ICC-ES Evaluation Report (ESR) indicating it is intended for use in both cracked and uncracked normal weight concrete in Seismic Design Categories A through F. Anchors shall be made of zinc-plated carbon steel meeting ASTM B633 or Type 304 stainless steel.
1. Available Products:
 - a. Hilti Kwik Bolt TZ Carbon and Stainless Steel Anchors (ICC ESR-1917)
 - b. Powers Power-Stud+ SD1/SD2 Anchor (ICC ESR-2818/ESR-2502/)
 - c. Simpson STRONG-BOLT/STRONG-BOLT 2 Wedge Anchor (ICC ESR-1771/ESR-3037)
 - d. Or approved equal.

2.10 REPAIR MATERIALS

- A. **Repair Underlayment:** Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent slab elevations.
1. **Cement Binder:** ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. **Primer:** Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent slab elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.
- 2.11 CONCRETE MIXTURES, GENERAL
- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
 - B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 20 percent.
 - C. Limit water-soluble, chloride-ion content in hardened concrete to 0.10 percent by weight of cement.
 - D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions, including vertical wall placements with a height to width ratio greater than 12.
 3. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
- 2.12 CONCRETE MIXTURES FOR STRUCTURAL ELEMENTS
- A. Exterior equipment pads and pavement: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 4,500 psi.

2. Maximum Water-Cementitious Materials Ratio: 0.50.
 3. Slump Limit: 3 to 5 inches.
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
- B. Interior Slab-on-grade and Formed Walls: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4,000 psi.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit: 3 to 5 inches.
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
- C. Footings: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4,000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit for Vibrated Concrete: 3 to 5 inches.
 4. Air Content: 3 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
- 2.13 FABRICATING REINFORCEMENT
- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
- 2.14 CONCRETE MIXING
- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
 2. Provide one copy of delivery ticket with the following information: Batch weights for each mix component, batch time, concrete plant location, and volume of water withheld (in gallons).
- B. Project-Site Mixing: Not Permitted.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class C, 1/2 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

2. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F 12 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by ENGINEER.

3.4 VAPOR BARRIERS

- A. Plastic Vapor Barriers: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by ENGINEER.
1. Unless indicated otherwise on the drawings or approved by the ENGINEER, the unit of operation shall not exceed 30 feet in any horizontal direction. Concrete shall be placed continuously so the unit will be monolithic in construction. At least 7 days shall elapse between the casting of adjoining units unless approved by the ENGINEER.
 2. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 3. Unless indicated otherwise, provide keyways at least 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for purposed may be used.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 6. Provide waterstops in construction joints as indicated. Install waterstops to form a continuous diaphragm in each joint. Support and protect exposed waterstops during progress of work. Field fabricate joints in waterstops according to manufacturer's printed instructions.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE BONDING

- A. General: Before depositing new concrete on or against concrete which has set, the existing surfaces shall be thoroughly roughened in a manner to uniformly expose the bonding aggregate. The existing surface shall be cleaned of all laitance, foreign matter, and loose particles.
- B. Apply epoxy adhesive bonding agent to roughened concrete surface per the epoxy adhesive manufacturer's instructions. Handle, store, and mix the epoxy adhesive agent carefully and in compliance with manufacturer's instructions. Place fresh concrete on bonding agent within allowable time limit set by manufacturer's instructions.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301. CONTRACTOR shall maintain two fully functioning vibrators at all times at the project site.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screenshot slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- F. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is CONTRACTOR's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces to receive trowel finish or broom finish.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Apply trowel finish to all exposed interior floor slabs.
- D. Broom Finish: Apply a broom finish to exterior concrete slabs, pads, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with ENGINEER before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after

loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. **Unformed Surfaces:** Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. **Moisture Curing:** Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. **Moisture-Retaining-Cover Curing:** Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - b. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. **Curing Compound:** Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of any floor covering used on Project.
4. **Curing and Sealing Compound:** Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
 - C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.
- 3.14 CONCRETE SURFACE REPAIRS
- A. Defective Concrete: Repair and patch defective areas when approved by ENGINEER. Remove and replace concrete that cannot be repaired and patched to ENGINEER's approval.
 - B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
 - C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by ENGINEER.
 - D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to ENGINEER's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to ENGINEER's approval.

3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: OWNER shall engage a Special Inspector and a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports per the requirements of the Statement of Special Inspections:
- B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31.
 - a. Cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39; test one (1) laboratory-cured specimen at 7 days and two (2) specimens at 28 days, and retain two (2) specimens for later testing at 56 days if 28 day strength falls below the required specified strength.
 - a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- C. Concrete Test results shall be reported in writing to OWNER's Representative, concrete manufacturer, and CONTRACTOR within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- D. Strength Evaluation of Concrete Structures: The strength of the concrete structure in-place shall be considered deficient if it fails to comply with any of the requirements which control the strength of the concrete, including the following conditions:
1. Failure to meet compressive strength requirements.
 2. Concrete which differs from the required dimensions or locations in such a manner that reduces strength.
 3. Concrete which has been subjected to damaging mechanical disturbances; particularly load stresses, heavy shock, or excessive vibration.
 4. Poor workmanship and quality control which is likely to result in deficient strength.
- E. Testing of In-Place Concrete Structure for Strength: When there are compression test results or other evidence that indicate that the in-place concrete structure does not meet strength specification requirements, then the testing agency shall take cores drilled from hardened concrete for compressive strength determination, complying with ASTM C 42 and as follows:
1. Take at least 3 representative cores from each member or area of the in-place concrete structure that has suspect strength, from locations as directed by the ENGINEER.
 2. Test cores in a saturated-surface-dry condition per ACI 318 if the concrete will be wet during the use of the completed structure.

3. Strength of concrete for each series of cores will be considered satisfactory if their average compressive strength is a least 85 percent and no single core is less than 75 percent of the 28 day required compressive strength.
 4. Report core test results in writing to the ENGINEER within 24 hours of the tests. Reports of core tests shall contain the project identification name and number, date of coring, date of test, name of concrete testing service, location of test core in the structure, concrete type and class represented by the core sample, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, type of break, direction of applied load to core with respect to horizontal plane of the concrete as placed, and the moisture condition of the core at the time of testing.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by OWNER's Representative but will not be used as sole basis for approval or rejection of concrete.
- G. Additional testing and inspecting, at CONTRACTOR's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- H. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.
- I. Structurally Inadequate In-Place Concrete: If in-place concrete is found to be structurally inadequate based on core tests or by results of non-destructive testing, then the rejected in-place concrete work shall be repaired, or removed and replaced, as directed by the OWNER's Representative.

END OF SECTION

SECTION 03481
PRE-CAST CONCRETE MANHOLES

PART 1- GENERAL

1.1 SUMMARY

- A. This work entails providing materials and installation of pre-cast manholes and appurtenances, including appropriate penetrations for piping, grouting the inverts and sealing the pipe penetrations and joints. The Section also has a provision for Constructed In-Place Manholes.
- B. All manholes shall be installed in accordance with these specifications and manhole details on the construction drawings.

1.2 RELATED SECTIONS

- A. Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications

1.3 REFERENCES

- A. Virginia Department of Transportation (VDOT) Road and Bridge Specifications
- B. American Society for Testing and Materials (ASTM)
- C. American Concrete Institute (ACI)

1.4 SUBMITTALS

- A. Submittals shall be in accordance with Division 1.
- B. Submit Shop Drawings including dimensions, reinforcing, and material Specifications.

1.5 QUALITY ASSURANCE

- A. All manholes in Virginia Department of Transportation (VDOT) right-of-ways to be installed as instructed in the permit and CONTRACTOR shall notify the VDOT inspector prior to construction of the manholes, if required.
- B. Manholes shall be manufactured in accordance with the latest ACI, Standard 318, Building Code, ASTM C 478, or as approved by ENGINEER.
- C. Standard manhole frame and cover shall be as specified on the drawings.
- D. Iron castings shall conform to the standard Specifications for Grey Iron Castings ASTM Specification A 4841, Class 20.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. CONTRACTOR shall provide an area on-site for off-loading and storage of pre-cast structures delivered to the site. The surface on which the structures are placed shall not cause eccentric loadings which may damage the items. Prior, and during installation, precast structures will be moved utilizing equipment of sufficient capacity to safely move and place such structures. Any damage to pre-cast structure shall be reported to the ENGINEER for determination as to its ability to meet its intended use. Any structure damaged such that it cannot be used as intended, will be rejected by the ENGINEER and CONTRACTOR shall replace in-kind at its sole expense.

PART 2- PRODUCTS

2.1 MANHOLES

- A. Precast Manhole: Unless authorized by ENGINEER, manholes will be of the precast concrete type as shown on the Drawings. Manholes shall be manufactured in accordance with the latest ACI Building Code, Chapter 13, for Class A, Air-Entrained Concrete or as approved by UCC. Pre-cast manholes shall conform to ASTM C-478. Manholes shall be 4 foot diameter, unless otherwise noted on the Drawings.
- B. Manhole Frame and Cover: Manhole frames and covers shall be heavy duty, traffic resistant, gray cast iron. Frame and cover castings shall conform to the details and dimensions shown in these specifications and plans and shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow-holes and other defects in positions affecting their strength and value for the use intended. They shall be boldly filleted on angles and the arises shall be sharp and perfect. They shall be sand blasted or otherwise cleaned and scaled so as to present a smooth, clean, and uniform surface.
- C. Standard manhole covers shall have one pick hole and the marking "Sewer" cast in their body. Four (4) anchor bolts shall be placed in the cone section to secure the manhole frame to the concrete. Bolt diameters shall be as specified by the manufacturer. All manholes shall include a corrosion proof, shock-resistant plastic inflow protector cover as shown in the details in the Contract Plans. Standard manhole frames and covers shall be Neenah Foundry Company Model R-1642 or approved equal.
- D. Frame and Cover Installations: Manhole frame and cover castings shall be installed so that the cover shall be exposed and flush with the existing pavement street surface. In no case shall the existing pavement surface be raised or lowered to meet the grade of installed manhole frame and cover castings. Where frames and covers are located in off-street areas, they shall be placed raised 12" to 18" above finished grade.
- E. Grade Adjustment Ring: When a manhole is installed in sloped pavement a grade adjustment ring shall be provided to allow for a flush installation.
1. Design Requirements – The manhole grade adjustment rings shall be designed to allow final adjustment of the frame and cover to the grade established by the ENGINEER on the project drawings. The rings shall also be designed to

- accommodate flat or sloping surfaces to within ¼” (one quarter inch). The manhole grade adjustment system shall have a minimum 50 (fifty) year design life.
2. Performance Requirements – The manhole grade adjustment rings shall be capable of supporting the minimum requirements of ASSHTO H-25 and HS-25 and be resistant to chemicals and conditions typically associated with the manhole environment.
 3. Test Report – A test report from an approved third party testing agency showing the manhole grade adjustment ring meets the minimum requirements of ASSHTO H-25 and HS-25.
 4. Certification – The manufacturer of the manhole grade adjustment rings shall provide certification to the ENGINEER stating that the product meets the design life and material requirements of this specification.
 5. The manhole grade adjustment rings shall be manufactured from ARPRO® Expanded Polypropylene (EPP). The rings shall be manufactured using a high compression molding process to produce a finished density of 120 g/l ((7.5 pcf).
 - a. “Grade” rings shall contain upper and lower keyways (tongue and groove) for proper vertical alignment and sealing. “Grade” rings shall be available in 2, 4 and 6 inch heights.
 - b. “Flat” rings shall have keyways (grooves) on the lower surface with a flat upper surface and be available in the same heights as the “Grade” ring.
 - c. “Finish” rings shall have keyways (grooves) on the lower surface with a flat upper surface and be available in heights which will allow final adjustment of the frame and cover to within ¼” (one quarter inch).
 - d. “Angle” rings shall be keyed on the lower and upper surface of the ring for proper alignment and mating to “Finish” rings and to each other if multiple “Angle” rings are required. When required, the “Angle” ring or rings shall allow final adjustment of the frame and cover to within ¼” (one quarter inch).
 6. Any adhesive or sealant used for watertight installation of the manhole grade adjustment rings shall be M-1 Structural Adhesive/Sealant or equal meeting the following specifications:
 - a. ASTM C-920, Type S, Grade NS, Class 25, Uses NT, T, M, G, A and O
 - b. Federal Specification TT-S-00230-C Type II, Class A
 - c. Corps of Engineers CRD-C-541, Type II, Class A
 - d. Canadian Standards Board CAN 19, 13-M82
 - e. AAMA 802.3-08 Type II, AAMA 803.3-08 Type I and AAMA 805.2-08 Group C

7. Acceptable Manufacturer: Pro-Ring™ by Cretex Specialty Products; or approved equal.
 8. Installation and surface preparation shall be in accordance with the manufacturer's instructions.
- F. Frame Sealant: The manhole frame shall be sealed to the concrete manhole section using a bed of mortar on either side of butyl rubber sealant such as "Ramneck" or approved equal. In addition, the frame and cover shall be mortared to the outside of the concrete manhole section.
- G. Pipe Connections: All sanitary manholes shall have factory installed flexible connections for all pipe penetrations when possible service laterals shall enter the sewerage system at manholes.
- H. Cone Section: The uppermost section of the manhole shall be tapered eccentrically and shall be a minimum of three (3) feet in height. Where field connections dictate "flat top" manhole sections can be utilized with the approval of the Authority. The height of the lower section shall be at least three (3) times the inside diameter of the largest sewer pipe entering the section and in no case less than two (2) feet.
- I. Joints: The joints between manhole sections shall be tongue and groove with an "O" ring rubber gasket or "STEP" section with sliding flap seal ring as manufactured by Forsheda, or approved equal conforming to ASTM designation C-443-79 or latest revision. Jointing of the precast manhole sections shall conform to the manufacturer's published recommendations and specifications. A flexible joint sealant such as a "Ramneck", or approved equal, may be required between precast manhole sections.
- J. Inverts: The use of precast inverts are encouraged, however no additional compensation will be afforded the CONTRACTOR for replacements of bases caused by line relocation to avoid existing utilities or structures.
- K. Manhole Landings: All manholes over 15 feet deep shall have a landing section at 10 foot intervals designed with a 24 inch opening lined up with the manhole access to allow safety lines direct access to persons in the manhole.
- L. Manhole Step: Manhole steps shall be 1/2" Grade 60 Steel Reinforcement encased in copolymer polypropylene plastic, designed so that the foot will not slide off, as manufactured by M.A. Industries, Inc. or approved equal. Manhole steps shall be installed at a maximum spacing of 12 inches.
- M. Openings for Pipe: Shall be precast and supplied with a flexible connection boot similar to the KOR-N-SEAL or approved equal the boot shall be of neoprene secured to the manhole by a water tight compression ring seal to provide a flexible joint. The joint shall be of neoprene rubber. The boot shall be installed in accordance with the manufacturing instructions. Manhole section joints shall be of the O-Ring gasket type with butyl rope mastic applied to the joint adjacent to the outside wall and grout applied on the inside wall as shown on the drawings.
- N. Grout: Grout for inverts shall comply with Section 217 of the VDOT Road and Bridge Specifications and other Sections, as applicable.

- O. Manhole Vent: Vent shall be ductile iron with flanged joints above ground with a bug screen affixed.
- P. All manholes shall be lined with Raven 405 epoxy coating as manufactured by Raven Lining Systems, Inc. applied at a thickness of 80 to 100 mils. Coating shall be applied in accordance with all requirements of the manufacturer. All defects shall be repaired in accordance with the manufacturer's recommendations.
- Q. All concrete utilized in manholes shall have ConShield admixture added in accordance with the manufacturer's recommendations. The precast supplier shall provide written certification that ConShield was added per manufacturer's recommendations to all acid resistant manholes delivered. This certification shall be given to the inspector prior to delivery. All sections of manhole with ConShield shall be clearly marked by the supplier at the plant so that the inspector and contractor can identify those manholes with ConShield admixture. The certification provided by the supplier shall indicate the method utilized for marking manholes with ConShield admixture at the plant.

PART 3- EXECUTION

3.1 PLACEMENT

- A. Manholes and distribution boxes shall be placed on a properly compacted foundation after review and approval by ENGINEER and in conformance with the manufacturers recommended practices.

3.2 ARRANGEMENT

- A. Manholes and distribution boxes shall be of watertight construction. In streets, manhole tops shall be set by the road grade. A maximum of 12 inches of adjustment rings may be used to reach grade. In easements a minimum of 12 inches, maximum of 24 inches of manhole shall be above grade. No adjustment rings shall be used to reach this elevation. All lift rings shall be removed and all lift holes sealed. Inverts shall be installed in a workmanlike manner, providing a smooth flow line without obstructions in accordance with the Drawings.

3.3 FINISHING

- A. All exposed vertical exterior surfaces of the manhole to 1 foot below grade shall have a burlap bag (sack) rubbed finish. All joints, bung holes, lifting lug holes and pits and air holes more than a 1/2" deep shall be filled with mortar before applying the rubbed finish.
- B. All concrete protruding above the surface shall be ground smooth before applying the rubbed finish.
- C. Mortar mix for the rubbed finish shall consist of a 50-50 mix of fine sand and cement mixed to a paste consistency and applied with a burlap bag. The concrete is wet and the paste mixture is rubbed over the entire surfaces filling all pits and holes. As the mixture dries the surface shall be rubbed with the burlap to remove all excess mortar mix from the surface leaving a smooth exterior finish. Bonding agent is not required.

- D. All damaged areas of the manhole top when a flat top is specified shall be repaired with a mortar mix using a bonding agent.

3.4 TESTING

- A. Testing of manholes shall be in accordance with Division 15

3.5 MEASURING MANHOLE FRAMES

- A. Manhole frames to be sealed shall be field measured by the Contractor prior to ordering.

END OF SECTION

SECTION 11010 METERING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Under this section the CONTRACTOR shall furnish and install at the location shown on the Drawings, a totally integrated fiberglass Packaged Metering Manhole as manufactured by Tracom, Inc. or approved equal, which shall include the flow instrumentation as described in this Section and on the Drawings.
- B. CONTRACTOR shall furnish and install flow monitoring equipment as manufactured by Teledyne Isco, Inc. or approved equal. A flow meter, as described in this Section, shall be rack mounted next to the Metering Manhole as detailed on the Drawings.

1.2 RELATED SECTIONS

Intent: The provisions and intent of the AGREEMENT, including the General Conditions, Supplementary Conditions, and other requirements of the Contract Documents apply to the WORK as specified in this Section. WORK related to this Section is described throughout the Specifications.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
- B. OSHA General Industry Standards

1.4 SUBMITTALS

Submit Shop Drawings including dimensions, reinforcing, and material Specifications.

1.5 QUALITY ASSURANCE

- A. The same manufacturer shall fabricate and fully assemble the barrel, flume, ladder and accessories as a completely integral unit.
- B. Manufacturers other than the above named companies wishing to quote on equipment in this section shall submit detailed drawings of their proposed equipment, a list of at least five similar installations (with contact names) which have been installed for over five years, and test reports showing full compliance with below specifications to the ENGINEER.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products indoors or in weather protected area until installation. Protect from construction traffic and damage.
- B. During the loading, unloading, and storage, care should be taken to ensure that the manhole is not dropped or otherwise damaged.

- C. The manhole should be stored on a smooth surface free of sharp objects.
- D. Nylon or fabric slings should be used in conjunction with a spreader bar to lift or move the manhole.
- E. UNDER NO CIRCUMSTANCES SHOULD CABLES OR CHAINS BE USED.
- F. If the manhole is stored horizontally, the manhole should be placed in such a way as to avoid damage to the flume, cover, and end adapters.

PART 2 - PRODUCTS

2.1 MANHOLE

- A. Configuration:
 - 1. Size: 48 INCH DIA. X 5 FEET 2 INCHES H.
 - a. The manhole height shall be as measured from:
 - 1) Dome top manholes:
 - a) Inlet invert to surface grade plus 12 inches
- B. Construction:
 - 1. One-piece construction.
- C. Materials:
 - 1. Fiberglass reinforced plastic, complying with ASTM D 3753, latest edition.
 - 2. Factory-assembled, ready for installation except for field-installed equipment.
 - 3. The exterior surface shall be relatively smooth with no sharp projections. The surface shall be free of blisters larger than 1/2 inch in diameter, delamination and fiber show.
 - 4. The interior surfaces shall be resin rich and unpigmented to allow for visual inspection of the manhole laminate. There shall be no exposed fibers. Additionally the interior surface shall be smooth for improved corrosion resistance and reduced sludge build-up. The surface shall be free of crazing, delamination, blisters larger than 1/2 inch in diameter, and wrinkles of 1/8 inch or greater in depth.
 - 5. Minimum 1/2 inch wall thickness.
 - 6. Integral fiberglass ladder bolted and glassed to the manhole wall with 1-1/2 inch diameter pultruded fiberglass rungs with a photoluminescent high visibility non-slip top surface and reinforced with threaded T-304 5/16 inch diameter stainless steel rods and solid 1-1/4 inch diameter pultruded fiberglass spacers.
 - 7. Inlet and outlet end connections molded to the flume and laminated to the manhole barrel. The end connections shall be provided with:
 - a. 15 inch diameter PVC or fiberglass pipe stubs with flexible PVC boots and stainless steel bands to connect to 15 inch diameter, PVC pipe.
 - 8. A 3/4 inch thick expanded polystyrene bead board shall be supplied to place under the manhole on the concrete slab.
 - 9. A 4 inch wide FRP integral mounting flange shall be molded to the base of the manhole barrel for anchoring to the manhole to the concrete slab.
 - 10. An OSHA approved "Confined Space Entry" sign shall be applied to the interior surface of the manhole above the first ladder rung (H-20 type) or on the underside of the manhole top (dome top and aluminum hatch types).

11. One (1) 2 inch NPT coupling to facilitate the installation of sample or bubble tubing, electrical power, or other cabling into the manhole. Run sample lines and electrical lines in separate conduits or cross-talk may occur across unshielded electrical lines.

D. Materials:

1. The resins used shall be unsaturated, supplier certified, isophthalic polyester resins. Mixing lots of resin from different manufacturers or "odd-lotting" of resins shall not be permitted. Quality assurance records on the resin shall be maintained.
2. The manhole interior shall be provided with a resin rich, corrosion resistant interior surface. The interior surface shall be unpigmented to allow for visual inspection for voids, inclusions, and defects as well as for verification that "odd-lotting" has not occurred.
3. 15 mil isophthalic U.V. resistant gel coat on all exterior surfaces
4. Reinforcing materials shall be high performance commercial grade with a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.
5. The manhole laminate shall consist of multiple layers of glass matting and resin. The surface exposed to the sewer / chemical environment shall be resin rich and shall have no exposed fibers.
6. The flume laminate shall be a minimum of 3/16 thick with a 15 mil isophthalic U.V. resistant gel coat, with those portions of the flume extending outside the manhole sufficiently thickened and reinforced as necessary to withstand the forces of the intended application.

E. Material Properties:

1. Manhole Barrel and Reducer:
 - a. Flexural strength (ASTM D 790):

15,400 PSI (reducer - hoop).
17,200 PSI (reducer - axial).
22,500 PSI (reducer - hoop).
14,300 PSI (reducer - axial).
 - b. Compressive Strength (ASTM D 695): 18,900 PSI (barrel)
 - c. Barrel Stiffness (ASTM D2412):

Manhole Length (ft.)	PSI
3-6	0.72
7-12	1.26
13-20	2.01
21-25	3.02
26-35	5.24
2. Flume:
 - a. Tensile strength (ASTM D 638): 14,000 PSI.
 - b. Flexural strength (ASTM D 790): 27,000 PSI.
 - c. Flexural modulus (ASTM D 790): 1,000,000 PSI.
 - d. Barcol hardness (ASTM D 2583): 50.

F. Top Style:

1. Dome Top:
 - a. A fully opening dome top cover rated for 1,000 lb. static top load with a solid FRP hinge block, neoprene gasket for sealing, and stainless steel hardware (consisting of a piano hinge, lockable hasp, and cover support bar with locking pin on a retaining chain).

- G. Flume Type and Size:
1. Nested 3" X 6" Parshall flume with integral inlet and outlet end connections.
 2. Flows: The flume shall be designed to handle a minimum flow of 15 gallons per minute (GPM) and an expected maximum future flow of 1,025 GPM.

2.2 FLOW MONITOR SYSTEM

- A. General: The Signature open channel flow monitoring system shall be suitable for installations for enforcement, compliance, and in-plant process control.
1. The flow meter shall be able to utilize multiple flow and parameter sensing technologies simultaneously.
 - a. Isco TIENet device options for flow measurement technology will include downward looking ultrasonic level measurement.
 - b. The flow meter shall be capable of running up to 9 connected TIENet devices simultaneously.
 2. The flow meter shall be capable of interfacing with an optional Isco wastewater sampler by means of an optional Isco TIENet device.
 3. The flow meter shall accept SDI-12 device data from up to two connected devices.
 4. The flow meter shall be able to record and transmit data from connected monitoring equipment.
 5. The flow meter shall be able to track event data that cannot be altered, in order to ensure that data integrity has not been compromised.
 6. The flow meter shall have a dual 4-20mA output.
 7. The flow meter will have secure, internal rollover data storage with 512Kbytes capacity (180 days with 5 parameters logged at 1 minute intervals, reports once per day).
- B. Flow Meter Construction
1. The flow meter electronics and connections will be housed in a PPO Polyphenylene Oxide, Noryl, NEMA4X/IP66, lockable enclosure suitable for conduit connection.
 2. Basic construction will consist of a two-piece electronics enclosure, front panel, and door.
 3. The enclosure door will have a clear polycarbonate window for viewing the LCD, optional mechanical totalizer, and LED indicator without opening the door.
 4. Connections will be accessible for addition and removal of optional devices by unlatching the door and then opening the front panel on the enclosure.
 5. The flow meter shall include a stainless steel bracket for wall mounting, and shall also be suitable for mounting on a rack or inside a console enclosure.
 6. Operating and storage temperature shall be -20 to 60°C (-4 to 140°F).
 7. The flow meter's primary user interface shall include a tactile keypad with audible feedback, and 4-inch, 320x240, backlit liquid crystal display with graphing functionality.
 8. The flow meter will have a two-color LED indicator next to the display to indicate activated alarms/events.
 9. Input power shall be nominal 12VDC.
 - a. The flow meter's internal mains power supply will operate on 100VAC,50/60Hz or 240VAC,50/60Hz line power.
 - b. The flow meter shall have the provision to be powered by an external 12VDC source.

10. TIENet device connection(s) shall be performed by wiring to easily accessible terminal strips and following simple instructions printed on the circuit board assembly.
 - a. The flow meter shall provide nominal 12VDC output power to connected TIENet devices.

C. Flow Meter Functionality

1. Communication and User Interface
 - a. Primary programming will be directly through the tactile keypad and programming menus on the front panel of the flow meter.
 - b. Alarm status/events shall be indicated by the LED next to the display. Detailed information about the alarm/event(s) indicated will be accessed by pressing a key on the keypad.
 - c. Direct serial connection to a computer or USB flash drive will be through a micro A/B USB port located on the front panel of the flow meter.
 - 1) Updates to the flow meter and optional TIENet device software will be performed by connecting a USB flash drive to the flow meter.
 - 2) The flow meter's program can be downloaded onto the connected flash drive. The saved program can then be duplicated onto other Signature flow meters via the flash drive.
 - 3) Data shall be exported from the flow meter in .ddp format to a USB flash drive.
 - 4) Verifiable text reports shall be exported from the flow meter to a USB flash drive.
 - 5) The flow meter shall include an adaptor for connecting a USB flash drive.
2. Outputs
 - a. The flow meter shall provide industry standard 4-20 mA analog output via a factory- installed internal card.
 - 1) Output range shall be from 4 to 20 mA.
 - 2) Isolation will be monolithic air core transformer technology.
 - 3) Maximum load shall be 500Ω.
 - b. The flow meter shall act as a slave for Modbus interfacing via RS-485 terminal strip connection, using ASCII or RTU transmission coding.
3. Inputs
 - a. The following data shall be received by the flow meter from an optional connected sampler:
 - 1) Sample event
 - 2) Bottle number
 - 3) Sampler voltage
 - b. The flow meter shall record flow and parameter data from optional connected TIENet devices.
 - c. The flow meter shall record parameter data from up to two optional connected SDI-12 devices.
 - d. The flow meter shall be capable of separate, simultaneous interfacing with multiple connected devices of the same type, i.e., one or more sampler interfaces, one or more pH/Temperature devices, etc.
 - e. The flow meter shall be capable of accepting inputs from multiple external TIENet devices via optional expansion box(es). For every expansion box,

- three more devices can be added to the system.
4. Data Storage
 - a. The flow meter will store recorded data and program settings on a recoverable, flash-based, secure, non-volatile digital memory card with standard 512Kbytes capacity (180 days with 5 parameters logged at 1-minute intervals and reports at 24-hour intervals).
 - b. The program memory shall be capable of being updated via the USB port on the flow meter without opening the enclosure.
 5. Data Integrity

The flow meter shall be capable of collecting and storing event data that cannot be altered, to ensure that data integrity has not been compromised. Event types shall be:

 - a. Program Report
Tracks configuration changes to the flow meter.
 - b. Two programmable Summary Reports
Tracks measurement summaries.
 - c. Diagnostic Report
Tracks occurrences and results from diagnostic tests.
 - d. History Report
Tracks user events (such as calibration, etc.).
 6. Flow Measurement Options
 - a. Ultrasonic: Non-Contact Level Sensor with 32.8' integral connect cable.
 7. Level-to-Flow Calculation

Measured liquid level readings shall be converted into corresponding flow rate readings using internal conversion algorithms. The flow meter shall contain conversions for V-notch, rectangular and Cipolletti weirs, and Parshall, Palmer-Bowlus, trapezoidal, and H flumes. The flow meter shall accept 4 sets of level-flow rate points, with up to 50 pairs of points in each set. The flow meter shall accept a user-defined, one- or two-term, level-flow rate polynomial equation. The flow meter shall also be capable of operating in a level-only mode.
 8. The flow meter shall be supplied with a 24" X 20" X 10" NEMA 4X lockable fiberglass enclosure, for system protection.

PART 3 - EXECUTION

3.1 GENERAL

The Packaged Metering Manhole shall be installed in accordance with the ENGINEER's specifications, local codes, and the installation instructions and recommendations of the manufacturer. The CONTRACTOR shall become familiar with the recommended handling and installation procedures used with fiberglass Metering Manholes to ensure that the manhole is not damaged, and that the flume is installed in a manner that is consistent with obtaining good Open Channel flow results.

3.2 PROPER FLOW CONDITIONS

The flume is factory installed in the Metering Manhole so that it is absolutely level from front to back and from side to side, and must be installed on a level concrete pad. Flow entering the flume must be laminar, non-turbulent and have subcritical velocity. This requires that the inlet pipe be level with or slightly lower than the floor of the flume, and have no elbows or excessive line slope ahead of the flume.

Inlet and outlet pipes must be sized to handle peak flows without surcharging, and water must exit the flume in a free-flow manner. Submerged flow conditions must be avoided. This is especially important when peak flows are expected to be more than 80% of the pipe capacity and/or the outlet slope is relatively flat.

3.3 HANDLING AND STORAGE

During loading, unloading and storage, care shall be exercised to ensure that the manhole is not dropped or otherwise damaged through impacting with any solid surface. The manhole shall be stored on a smooth surface, free of sharp objects, and if laid horizontally, shall be placed in such a way as to avoid structural damage to the inlet and outlet channels. Slings will be accomplished using nylon or other fabric material. Under no circumstances shall a cable or chain sling be used in direct contact with the fiberglass structure.

3.4 SITE PREPARATION

The site shall be excavated wide enough to accommodate the manhole and to provide a safe working environment for workers. The CONTRACTOR shall provide a level concrete slab having a minimum thickness of 6" and a smooth troweled surface. Pad elevation shall be as shown on the drawings, and positioned so that the invert of manhole piping matches that of the pipeline. Pad size shall be 6 ft. wide. Expansion anchors or adhesive anchors shall be used to anchor the manhole structure.

3.5 PLACEMENT AND FINAL INSTALLATION

Prior to manhole placement the slab shall be cleaned of all sharp objects and debris. The foam pad supplied with the manhole shall be placed in the proper position. If the pipe is already in place the neoprene boots and S/S bands shall be slipped onto the pipe ends before lowering manhole onto concrete slab.

Packaged Metering Manhole shall be lowered onto pad in accordance with the manufacturer's written recommendations. The neoprene boots can be slipped over pipe ends and the stainless steel clamps tightened securely. Under no circumstances shall petroleum lubricants of any type be used to install neoprene boots. Flume level shall be checked and adjusted if necessary. After the level is confirmed all anchor bolts shall be securely tightened. On larger flumes all open spaces under the flume shall be filled with grout to provide adequate structural support.

3.6 BACKFILLING

Care shall be taken to avoid uneven backfill loads on the FRP manhole and flume. Groundwater or surface water runoff shall not be allowed to accumulate in the open excavation around a manhole that has not been completely backfilled. Backfill materials shall be placed evenly around the packaged manhole in approximately 12 inch lifts. If materials other than pea gravel or sand are to be used as fill there shall be no soil lumps or sharp objects such as rocks or concrete, or other debris larger than 1 inch in size.

All fill work will be in compliance with local codes, and shall meet the inspection standards established by the ENGINEER.

- A. Stable Soils: (Bearing capacity greater than 2000 lbs/sq. ft.) Native soil, 1/4" x 3/8" round aggregate gravel or sand shall be used as backfill material, and placed in accordance with the above specifications.

- B. Unstable Soils and High Water Tables: (Bearing capacity less than 2000/lbs/sq. ft.) Sand or 1/4" x 3/8" rounded aggregate, compacted, shall be used in unstable soils such as expansive clays, marsh and/or where the water table may be less than 5 ft. from finished grade. Selected backfill shall be placed in maximum 12 inch lifts, a minimum of 24 inches surrounding the manhole, and compacted to 85% Standard Proctor Density.

3.7 FINISH TO GRADE

For concentric top, CONTRACTOR shall finish to grade using brick and mortar or precast concrete rings to construct chimney of required height. Mortar bed and first grade ring shall be firmly supported on flat, bearing shoulder of the packaged manhole.

END OF SECTION 11010

**APPENDIX:
GEOTECHNICAL ENGINEERING REPORT**

GEOTECHNICAL ENGINEERING REPORT – Revision No. 1

**Zion Crossroads Water and Sewer
Utility Alignment
Route 250 and Route 15
Fluvanna County, Virginia**

Schnabel Reference 16C13175, Task 01
February 9, 2018

Prepared For:





February 9, 2018

Ms. Melanie Leckey, PE
Dewberry Engineers, Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060

Subject: Geotechnical Engineering Report, Revision No. 1, Zion Crossroads Water and Sewer System, Utility Alignment, Route 250 and Route 15, Fluvanna County, Virginia (Schnabel Reference 16C13175, Task 01)

Dear Ms. Leckey:

SCHNABEL ENGINEERING, LLC (Schnabel) is pleased to submit Revision No. 1 to our geotechnical engineering report for the utility alignment for this project. This study was performed in accordance with our proposal dated September 28, 2015, as authorized by your office on December 14, 2016. This revision includes additional subsurface exploration performed for the water line extension as authorized by you on January 15, 2018.

PROJECT DESCRIPTION

Site Description

The site is located in the nearly 4,700 acre Zion Crossroads Community Planning Area (CPA) in the northeastern portion of Fluvanna County. The CPA begins at the northwest corner of Fluvanna County at the shared border with Albemarle County and Louisa County and extends toward the east. The CPA is generally south of Interstate 64 and generally follows Richmond Road (Route 250) extending roughly ½ to 1 mile beyond the road to the north and south and extends east roughly 1 mile beyond the intersection of Route 250 and James Madison Highway (Route 15). The site begins at Memory Lane; extends east along Richmond Road past the Fluvanna Correctional Center for Women (FCCW); continues east along Richmond Road and a nearby power line easement to the intersection of Route 15; then extends south to Starlite Park; then follows Starlite Park southeast to Route 15; and finally, follows Route 15 about 500 ft south.

Memory lane is an asphalt paved, unmarked roadway. In the vicinity of the FCCW, the site is relatively flat and grass covered. The portion of the site that extends east down Route 250 is a combination of open farm fields and moderately wooded areas and includes several creek crossings. The area of the site that extends south down Starlite Park and Route 15 is moderately wooded with some open farm fields located closer to the intersection of Route 250. Site grades are at about EI 400 south of the FCCW and increase to about EI 450 north of the facility near Route 250. The grades then gradually increase

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towards the east to about El 550 at the intersection of Route 250 and Route 15 and then grade down to about EL 500 at Starlite Park and Route 15.

We obtained the site information from the site plans provided by Dewberry on February 14, 2017, the Request For Proposal (RFP) documents, and through our site reconnaissance.

Project Description

The Zion Crossroads Water and Sewer System includes a series of water and sewer infrastructure additions and upgrades. These upgrades include the construction of approximately 23,000 lf of 10" diameter sewer force main. The sewer will begin at the Department of Corrections Wastewater Treatment Plant (located at the southeast corner of the FCCW) and will extend west and north around the facility; east down Route 250 and a powerline easement north of Route 250; south to Starlite Park; southeast to Route 15; and it will finally end 500 ft south of the intersection of Starlite Park and Route 15. The proposed construction also includes approximately 22,500 lf of 12" diameter waterline. The waterline will begin at the terminus of Memory Lane and extend east down Route 250; south to Starlite Park; southeast to Route 15; and 500 ft south along Route 15. We understand that the water and sewer lines will be placed between 4 and 6 ft below existing grades.

A new water booster station will be constructed at the northeastern corner of the Correctional Facility which is expected to tie-in with the new water line. A new sewage pump station is proposed for construction about 500 ft southeast of the intersection of Starlite Park and Route 15. Water storage capacity will be improved through the construction of an elevated water storage tank. The proposed location of the tank is west of the intersection of Route 250 and Route 15; south of Route 250; and west of Zion Crossroads Court.

We obtained the project information from the project plans provided by Dewberry on February 14, 2017 and January 15, 2018.

SUBSURFACE EXPLORATION AND LABORATORY TESTING PROGRAM

We performed a subsurface exploration and field testing program to identify the subsurface stratigraphy underlying the site and to evaluate the geotechnical properties of the materials encountered. This program included test borings. Exploration methods used are discussed below. The appendices contain the results of our exploration.

Subsurface Exploration Methods

Test Borings

We observed our subcontractor, Ayers & Ayers, Inc., drill 103 test borings from January 12 to January 20, 2017; February 1 to 3, 2017; March 6, 2017; September 20, 2017 and February 6, 2018. The Standard Penetration Test (SPT) was performed at selected depths in the borings. Appendix A includes specific observations, remarks, and logs for the borings; classification criteria; drilling methods; and sampling protocols. Figures 2 through 2H included at the end of this report indicate the approximate test boring locations. We will retain soil samples up to 45 days beyond the issuance of this report, unless you request other disposition.

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Soil Laboratory Testing

Our laboratory performed tests on selected samples collected during the subsurface exploration. The testing aided in the classification of materials encountered in the subsurface exploration and provided data for use in the development of recommendations for design of earthwork and corrosion protection. The results of the laboratory tests are included in Appendix B and are summarized for each stratum in the Site Geology and Subsurface Conditions section of this report. Selected test results are also shown on the boring logs in Appendix A.

Index Testing

We performed index testing on samples collected as part of the exploration to provide soil classifications and to provide parameters for use with published correlations with soil properties. Index testing included performing natural moisture content, Atterberg Limits, and gradation tests on 24 jar samples and three bulk samples of soil representing Strata B1, C1, and C2.

Compaction and CBR Testing

We performed Standard Proctor compaction and CBR testing to evaluate compaction characteristics and to provide soil parameters for pavement design. Testing was performed on three bulk samples representing Stratum C1.

Corrosion Potential Testing

We performed corrosion potential testing to evaluate corrosion characteristics of the site soils. Testing was performed on eight jar samples representing Strata A, B1, C1, and C2.

SITE GEOLOGY AND SUBSURFACE CONDITIONS

Site Geology

We reviewed existing geologic data and information in our files. Based on this review, the geologic stratigraphy consists of existing fill, cultivated soils, and alluvium overlying residual soils. Residual soils are derived through the in-place physical and chemical weathering of the underlying rock. The underlying parent rock consists of metagraywacke, quartzose schist, and mélange of Cambrian to late Proterozoic age.

Generalized Subsurface Stratigraphy

We characterized the following generalized subsurface stratigraphy based on the exploration and laboratory test data included in the appendices.

Ground Cover:

At the ground surface, 95 borings encountered a 2 to 12 inch thick layer of rootmat and topsoil. One boring encountered 2 inches of asphalt overlying 6 inches of dense-graded aggregate. Two of the borings encountered a 2 to 6 inch thick layer of crushed stone at the ground surface, and boring B-87

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encountered a 6 inch thick layer of crushed stone beneath a 2 inch thick layer of rootmat and topsoil. Four of the borings had no ground cover.

Stratum A: Existing Fill

Below the ground cover and at the ground surface, 28 of the borings encountered existing fill soils of Stratum A. These soils consisted of elastic silt and lean clay (MH, CL) with varying amounts of sand; as well as clayey sand and silty sand (SC, SM). The fill soils contained root fragments, rock fragments, organic matter, and various other construction debris. This stratum was encountered to depths of 0.8 to 7 ft. The natural moisture contents measured were about 7 to 33 percent. Based on the Standard Penetration Tests performed, this stratum is medium stiff to very stiff and very loose to medium dense: N = 3 to 20.

Testing was performed on one sample of soil from Stratum A to evaluate the corrosivity of the stratum. The test resulted in a pH value of 5.1, a Redox Potential value of 490 mV, a Resistivity value of 8,300 ohm-cm, and a negative test for sulfides. Based on these test results, the soils of Stratum A are considered to have a low potential for corrosion affecting buried metallic structures in accordance with AWWA Standards.

Stratum B1: Fine-Grained Alluvium

Below the ground cover and fill soils of Stratum A, four of the borings encountered a fine-grained alluvial deposit consisting of sandy fat clay, sandy elastic silt, and sandy lean clay (CH, MH, CL) with varying amounts of gravel, root fragments, and organic matter to depths of 2 to 7 ft. These soils were generally of moderate plasticity having liquid limits of 28 and 35, and plasticity indices of 8 and 13. The natural moisture contents measured were about 20 to 25 percent. Based on the Standard Penetration Tests performed, this stratum is generally soft to stiff: N = 4 to 12. One sample from Stratum B1 had N = 31, but this sample appears to be an outlier.

Testing performed to evaluate the corrosivity of Stratum B1 soils resulted in pH values of 4.1 and 5, Redox Potential values of 442 and 443 mV, Resistivity values of 6,800 and 16,000 ohm-cm and negative tests for sulfides. Based on these test results, the soils of Stratum B1 are considered to have a low potential for corrosion affecting buried metallic structures in accordance with AWWA Standards.

Stratum B2: Coarse-Grained Alluvium

Below the ground cover, fill soils of Stratum A, and alluvial soils of Stratum B1, five of the borings encountered a coarse-grained alluvial deposit consisting of clayey sand and clayey gravel with sand (SC, GC) with varying amounts of root fragments to depths of 2 to 5 ft. Based on the Standard Penetration Tests performed, this stratum is loose to medium dense: N = 6 to 26.

Stratum C1: Fine-Grained Residuom

The borings generally encountered fine-grained residual soils below the ground cover, fill soils of Stratum A, and alluvial soils of Stratum B; as well as interlayered with the coarse-grained residual soils of Stratum C2. These soils were encountered to depths of 2 to 50 ft, and they consist of fat clay, elastic silt, lean clay, and silt (CH, MH, CL, ML) with varying amounts of sand, rock fragments, and mica. These soils were generally of moderate to high plasticity having liquid limits between 38 and 103, and plasticity

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indices of 5 to 45. Based on the Standard Penetration Tests performed, this stratum is soft to hard: N = 3 to 55.

We performed Standard Proctor Compaction tests and CBR tests on three bulk samples representing this stratum. The samples consisted of elastic silt with sand (MH/A-7-5), lean clay with sand (CL/A-7-6), and silt with sand (ML/A-5) in accordance with ASTM and AASHTO classification systems. The results of the testing are shown in Table 1 below.

Table 1: Compaction and CBR Testing Results

Boring	Sample Depth (ft)	ASTM/AASHTO Classification	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	CBR Value	CBR Percent Swell
B-12	1 – 5	CL/A-7-6	111.1	15.6	5.0	1.9
B-75	2 – 5.5	MH/A-7-5	102.1	19.7	3.4	3.8
B-90	4 – 9	ML/A-5	106.5	16.4	1.1	6.0

Natural moisture content values of Stratum C1 soils tested in our laboratory varied from 12 to 39 percent, or 4 to 8 percent below and 19 to 23 percent above the optimum value.

Testing performed to evaluate the corrosivity of Stratum C1 soils resulted in pH values of 4.1 to 5.9, Redox Potential values of 385 to 448 mV, Resistivity values of 1,000 to 5,100 ohm-cm and negative tests for sulfides. Based on these test results, one sample of soil from Stratum C1 (Boring B-02) had a ranking of 11 and is considered to have a high potential for corrosion affecting buried metallic structures in accordance with AWWA Standards. However, the other three samples of soils representing Stratum C1 are considered to have a low potential for corrosion in accordance with the same standard.

Stratum C2: Coarse-Grained Residuuum

About half of the borings encountered coarse-grained residual soils below the ground cover, fill soils of Stratum A, and alluvial soils of Strata B; as well as interlayered with the fine-grained residual soils of Stratum C1. These soils were encountered to depths of 1 to 47 ft, and they consist of clayey sand, silty sand, and poorly graded sand with silt (SC, SM, SP-SM) with varying amounts of rock fragments and mica. These soils were generally of high plasticity, with one sample being non-plastic. Two samples had liquid limits of 54 and 66, and plasticity indices of 22 and 27. The natural moisture contents measured were about 11 to 30 percent. Based on the Standard Penetration Tests performed, this stratum is loose to very dense: N = 4 to 68.

Testing performed to evaluate the corrosivity of a sample of Stratum C2 soils resulted in a pH value of 4.4, a Redox Potential value of 438 mV, a Resistivity value of 12,000 ohm-cm and a negative test for sulfides. Based on these test results, this sample of soil of Stratum C2 is considered to have a low potential for corrosion affecting buried metallic structures in accordance with AWWA Standards.

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Stratum D: Disintegrated Rock

Below the soils of Strata B and C, about one-third of the borings encountered disintegrated rock classifying as elastic silt with sand, sandy lean clay, sandy silt, and silty sand (MH, CL, ML, SM) with varying amounts of rock fragments and mica. Based on the Standard Penetration Tests performed, this stratum is very hard and very dense: $N > 60$.

Residual soils are derived through the in-place physical and chemical weathering of the underlying rock. Disintegrated rock is defined as residual material with SPT N values between 60 blows per foot and refusal. Refusal is defined as an N value of 50 blows for a penetration of one inch or less.

We encountered disintegrated rock at depths of 3 to 22 ft, in 34 of the borings. We observed refusal on rock at depths of 13 to 21.5 ft in Borings B-33, B-58, and B-59.

Groundwater

We observed groundwater in six borings at depths of 7 to 22 ft. The remaining borings caved dry at depths of 1.5 to 14 ft. The test boring logs in Appendix A include groundwater observations obtained during our subsurface exploration. These data include depths to groundwater encountered during drilling, upon drilling completion, and following completion of the boring.

Our drilling subcontractor installed water observation wells in Borings B-77 and B-89. We observed groundwater in these wells at depths of 3.9 to 24 ft, 14 to 53 days after completion of the borings. We did not obtain long-term water level readings in the remaining borings since we backfilled them upon completion for safety.

The groundwater levels on the logs indicate our estimate of the hydrostatic water table at the time of our subsurface exploration. The final design should anticipate the fluctuation of the hydrostatic water table depending on variations in precipitation, surface runoff, pumping, evaporation, leaking utilities, stream levels, and similar factors.

Based on our groundwater observations, we do not expect groundwater will be encountered in excavations for the water and sewer lines, except in the vicinity of creeks and the proposed sewer pump station. Recommendations to address the impact of groundwater are discussed in subsequent sections.

Seismic Site Classification

We evaluated the Seismic Site Class and Seismic Site Coefficients for this project according to the International Building Code (IBC) Section 1615 (2012). Our analysis indicates Site Class D for this location. This Site Class was evaluated based on observed and extrapolated SPT values.

GEOTECHNICAL RECOMMENDATIONS

We based our geotechnical engineering analysis on the information developed from our subsurface exploration and soil laboratory testing, along with the project development plans, site plans, and structural loading furnished to our office. The following sections of the report provide our detailed recommendations.

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Rock Excavation

Test boring data indicates that rock and disintegrated rock (DR) may be encountered during excavation of the water and sewer lines. Conditions encountered during excavation may be different than those observed in the test boring data. Therefore, we recommend the contract documents include unit prices for rock excavation.

Table 2 provides our estimate of elevations where rock excavation methods, such as hoe-ramming or blasting, should be expected at specific boring locations:

Table 2: Estimated Top of Rock Elevations

Boring	Estimated Elevation Where Rock Excavation Methods will likely be Required (EL)
18B-01	429
18B-02	433
18B-03	426
18B-05	416
18B-06	414
B-01	399
B-02	408
B-03	420
B-04	439
B-06	436
B-07	440
B-08	438
B-11	430
B-16	441
B-17	428
B-20	473
B-21	453
B-23	435
B-25	484
B-26	486
B-31	436
B-32	459
B-33	429
B-37	465
B-39	461
B-47	427
B-53	490
B-54	471

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Boring	Estimated Elevation Where Rock Excavation Methods will likely be Required (EL)
B-55	441
B-56	449
B-58	442
B-59	438
B-64	489
B-66	498
B-71	519
B-72	518
B-74	535
B-77	522
B-93	514

Variations in rock conditions should be expected since the rock surface can fluctuate across the site. Also, the extent of rock excavation will depend on the Contractor's methods, rock jointing, and rock foliation. The above elevations apply for excavation of rock in utility and footing excavations.

A sample definition of rock for excavation specifications is provided below:

For mass excavation, rock is defined as any material that cannot be dislodged by a Caterpillar Model No. D-8 heavy-duty tractor, or equivalent, equipped with a hydraulically operated, single-tooth power ripper without the use of hoe-ramming or blasting. For trench, footing and pit excavations, rock excavation shall be defined in terms of a Caterpillar Model No. 330 hydraulic excavator, or equivalent. This classification does not include material such as loose rock, concrete, cemented gravel, or other materials that can be removed by means other than hoe-ramming or blasting, but which for reasons of economy in excavating, the Contractor chooses to remove by hoe-ramming or blasting. Rock does not include boulders less than one cubic yard in volume. Boulders larger than one cubic yard in volume will be considered rock for payment purposes.

Where the rock cannot be removed with conventional excavation equipment, special means of excavation may be needed. Removal of rock may require the use of blasting, air-powered tools, rock splitters, or large hoe rams.

Pipe Bedding and Backfill

Water and sewer line subgrades are generally expected to consist of the residual soils of Strata C1 and C2 based on our subsurface exploration. The soils of Strata C1 and C2 are expected to be suitable for support of the utilities. Bedding should consist of at least 6 inches of VDOT No. 25 or 26 stone in areas without flowing water in the excavation and VDOT No. 57 stone in areas with flowing water in the excavation. We recommend that the pipe subgrades be evaluated by the Geotechnical Engineer. Unsuitable subgrades should be undercut and backfilled with additional bedding stone, or as directed by the engineer.

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Existing fill soils of Stratum A were encountered to depths of 5 to 7 ft in Borings B-44, B-52, and B-70. The existing fill soils are also expected to be suitable for support of the utilities. However, some undercutting of soft or otherwise unsuitable existing fill soils should be expected during construction.

Estimated elevations where rock excavation methods will likely be required are presented in Table 1. These elevations are generally 7 or more ft below the existing ground surface expect in the areas of Borings B-16, B-37, B-47, B-53, B-55, B-58, B-59, and B-71 where disintegrated rock was encountered at depths of about 3 to 6.5 ft below the existing ground surface.

The pipe should be backfilled up to the spring line with VDOT Class I backfill. VDOT Class I backfill can include crusher run, flowable fill, or VDOT No. 25, 26, 21A, or 21B stone. If flowing water is encountered in the utility excavation VDOT No. 57 stone should be used as backfill to the spring line of the pipe. Above the spring line or midpoint of the pipe, soils excavated for installation of the pipe are generally considered suitable for backfilling the pipe. Backfill should be placed in loose layers not exceeding 6 inches in thickness and compacted to at least 95% of the maximum Standard Proctor dry density per ASTM D-698 in structural areas (e.g. below pavements) and 90% per ASTM D-698 in non-structural areas (e.g. grass and wooded areas).

Pipeline backfill should consist of material classifying CH, MH, CL, ML, SC, SM, SP, SW, GC, GM, GP, or GW per ASTM D-2487. Non-organic, on-site soils are expected to meet this criterion. The more highly plastic CH and MH soils should not be used within 2 ft of the pavement subgrade level or the ground surface in structural areas. If off-site borrow soils are needed, they should classify SC, SM, SP, SW, GC, GM, GP or GW per ASTM D-2487.

Successful reuse of the excavated, on-site soils as compacted structural fill will depend on the natural moisture content of soils encountered during excavation. We anticipate that moisture conditioning of portions of the on-site soils will be needed before the recommended compaction can be achieved.

Pipe Corrosion Potential

Laboratory testing consisting of pH, resistivity, oxidation reduction potential, and sulfides was performed on soil samples obtained near the expected proposed pipe invert elevations. The results of the soil laboratory testing are summarized in Table 3 and are presented in detail in Appendix B.

Table 3: Summary of Corrosion Testing of Soil

Boring	Depth (ft)	Stratum	pH	Oxidation Reduction Potential (mV)	Resistivity (Ω -cm)	Sulfides Present	USCS Classification (ASTM D-2487)
B-02	2 – 5	C1	5.9	385	1,000	No	CL
B-09	2 – 5.5	C1	4.13	448	5,100	No	MH
B-21	2 – 5.5	C1	4	435	4,800	No	MH
B-35	4 – 7.5	C1	4	435	4,800	No	MH
B-40	7 – 10.5	C2	4.4	438	12,000	No	SM

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Boring	Depth (ft)	Stratum	pH	Oxidation Reduction Potential (mV)	Resistivity (Ω -cm)	Sulfides Present	USCS Classification (ASTM D-2487)
B-60	0 – 3.5	B1	5	442	6,800	No	MH
B-70	0 – 3.5	A	5.1	490	8,300	No	MH
B-82	2 – 5.5	B1	4.1	443	16,000	No	CH

Based on the laboratory testing performed, the majority of the soils on this site have a low potential for corrosion of buried steel structures. However, one sample from Stratum C1 (B-02) had a high potential for corrosion of buried steel structures (AWWA ranking of 11). It should be noted that there are other factors that affect the corrosion of buried steel structures, such as freezing and thawing, permeability, and corrosion protection. We have not made our recommendations based on any of these factors. It is the responsibility of the corrosion engineer to evaluate the corrosion protection required for these other factors.

Spread Footings

We consider spread footings suitable for support of the proposed junction box structures. Footings should be founded on suitable natural soils consisting of the residual soils of Strata C1, C2, and D or on compacted structural fill. Compacted structural fill should meet the requirements for backfill placed in structural areas, as outlined in the Pipe Bedding and Backfill section of this report. We recommend footings supported on these materials be designed for a net allowable soil bearing pressure of 3,000 psf. This bearing pressure provides a factor of safety against general bearing capacity failure of at least 3.0.

The above allowable soil bearing pressure may be increased by 33 percent for wind and seismic loads when used in conjunction with load combinations defined in IBC 2012 Section 1605.3.2, Alternative Basic Load Combinations for use with allowable stress design. This increase is not applicable for other allowable stress load combinations, strength design, or load and resistance factor design.

We anticipate suitable natural soils will be encountered at shallow depths (less than 2 ft) below the proposed pipe subgrades. All footing subgrades should be observed by the Geotechnical Engineer prior to placement of concrete to evaluate if subgrade materials are as anticipated.

If unsuitable soils are encountered at the design bearing grade, these soils should be removed and replaced as recommended by the Geotechnical Engineer. Unsuitable soils should be replaced with compacted fill, open graded crushed stone such as controlled low strength material (CLSM) or concrete.

Footings should be at least 24 inches wide, respectively, for shear considerations. Footings should be founded at least 3 ft below final exterior grades for frost and shrink/swell protection. Where bearing grades between adjacent footings vary, the slope between the bottom edges of adjacent footings should not be steeper than 45 degrees (1H:1V).

Dewberry Engineers, Inc.
Zion Crossroads Water and Sewer System – Utility Alignment

CONSTRUCTION CONSIDERATIONS

Earthwork

The test boring data indicate the approximate depth of topsoil based on our visual identification procedures. The depth of stripping needed to provide a suitable base for earthwork may include topsoil and other softer surficial layers. Stripping depths in wooded or previously cultivated areas will be greater, particularly during periods of wet weather. The depth of required stripping should be determined by the excavation Contractor prior to construction using test pits, probes, or other means.

The on-site soils are susceptible to moisture changes, will be easily disturbed, and will be difficult to compact under wet weather conditions. Drying and reworking of the soils are likely to be difficult during periods of wet months. We recommend that the earthwork phases of this project be performed during the warmer, drier times of the year to limit the potential for disturbance of on-site soils.

The soils at this site consist primarily of moderately to highly plastic clays and silts. These soils are moisture sensitive, and will become readily disturbed by construction traffic on exposed surfaces of wet subgrades. We recommend avoiding wet weather site preparation and grading activities. If wet weather work is performed, the quantities of disturbed soils to be excavated can be expected to increase.

The Contractor should provide site drainage to maintain subgrades free of water and to avoid saturation and disturbance of the subgrade soils before placing compacted structural fill and backfill. This site drainage will be important during all phases of the construction work. The Contractor should be responsible for reworking of subgrades and compacted structural fill that were initially considered suitable but were later disturbed by equipment and/or weather.

Dewatering

Based on the groundwater levels encountered during drilling and in our observations wells, excavation activities may encounter groundwater in the vicinity of creek and stream crossings. In addition, groundwater may be encountered in the vicinity of the proposed sewer pump station. Therefore, we recommend that excavations for the water and sewer lines be dewatered to at least 2 ft below the proposed subgrade elevations. Dewatering by pumping from sumps will likely be effective in controlling groundwater infiltration, but the final dewatering methods should be the responsibility of the Contractor.

Shallow Foundations

The Contractor should exercise care during excavation for spread footings so that as little disturbance as possible occurs at the foundation level. The Contractor should carefully clean loose or soft soils from the bottom of the excavation before placing concrete. A Geotechnical Engineer from our firm should observe footing subgrades prior to concrete placement to evaluate whether subgrade soils are as anticipated in this report.

Footing subgrades needing undercut should be concreted at the elevation of undercut or backfilled to the original design subgrade elevation with lean concrete. We do not recommend open-graded crushed stone backfill since this material provides a path for moisture to reach subgrade soils, resulting in an increased potential for shrink/swell related distress. The Contractor should place footing concrete

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immediately after excavation of the footing to prevent accumulation of water in the excavation or drying of foundation soils.

The potential for variation of moisture content in foundation soils is probably greatest during construction. If the moisture content of foundation soils increases or decreases during construction, a moisture-related change in volume will likely occur as these soils return to their natural moisture content. Therefore, prompt placement of concrete, backfilling, and grading are very important for proper foundation performance.

Engineering Services During Construction

The engineering recommendations provided in this report are based on the information obtained from the subsurface exploration and laboratory testing. However, conditions on the site may vary between the discrete locations observed at the time of our subsurface exploration. The nature and extent of variations between borings may not become evident until during construction.

To account for this variability, we should provide professional observation and testing of subsurface conditions revealed during construction as an extension of our engineering services. These services will also help in evaluating the contractor's conformance with the plans and specifications in accordance with special inspection requirements. Because of our unique position to understand the intent of the geotechnical engineering recommendations, retaining Schnabel for these services will allow the owner to receive consistent service throughout the project construction.

General Specification Recommendations

An allowance should be established to account for possible additional costs that may be required to construct water lines, sewer lines, and foundations as recommended in this report. Additional costs may be incurred for a variety of reasons including variation of soil between borings, greater than anticipated unsuitable soils, need for borrow fill material, wet on-site soils, obstructions, rock excavation, temporary dewatering, etc.

We recommend that the construction contract include unit prices for scarifying and drying wet and/or loose subgrade soils, and provide an allowance for this work. In addition, the construction contract should include an allowance for undercutting soft or loose, near-surface soils, and replacement with compacted structural fill. Add/deduct unit prices should also be established in the contract so adjustments can be made for the actual volume of materials handled.

The project specifications should indicate the Contractor's responsibility for providing adequate site drainage during construction. Inadequate drainage will most likely lead to disturbance of soils by construction traffic and increased volume of undercut.

This report may be made available to prospective bidders for informational purposes. We recommend that the project specifications contain the following statement:

Schnabel Engineering, LLC has prepared this geotechnical engineering report for this project. This report is for informational purposes only and is not part of the contract documents. The opinions expressed represent the Geotechnical Engineer's interpretation of the subsurface

Dewberry Engineers, Inc.
Zion Crossroads Water and Sewer System – Utility Alignment

conditions, tests, and the results of analyses performed. Should the data contained in this report not be adequate for the Contractor's purposes, the Contractor may make, before bidding, independent exploration, tests and analyses. This report may be examined by bidders at the office of the Owner, or copies may be obtained from the Owner at nominal charge.

Additional data and reports prepared by others that could have an impact upon the Contractor's bid should also be made available to prospective bidders for informational purposes.

LIMITATIONS

We based the analyses and recommendations submitted in this report on the information revealed by our exploration. We attempted to provide for normal contingencies, but the possibility remains that unexpected conditions may be encountered during construction.

This report has been prepared to aid in the evaluation of this site and to assist in the design of the project. It is intended for use concerning this specific project. We based our recommendations on information on the site and proposed construction as described in this report. Substantial changes in loads, locations, or grades should be brought to our attention so we can modify our recommendations as needed. We would appreciate an opportunity to review the plans and specifications as they pertain to the recommendations contained in this report, and to submit our comments to you based on this review.

We have endeavored to complete the services identified herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions as this project. No other representation, express or implied, is included or intended, and no warranty or guarantee is included or intended in this report, or other instrument of service.

We appreciate the opportunity to be of service for this project. Please call us if you have any questions regarding this report.

Sincerely,

SCHNABEL ENGINEERING, LLC



Kevin D. Pocta, PE
Project Engineer



Jeremy L. Mydlinski, PE
Senior Associate



KDP:JLM:rm

Dewberry Engineers, Inc.
Zion Crossroads Water and Sewer System – Utility Alignment

Figures

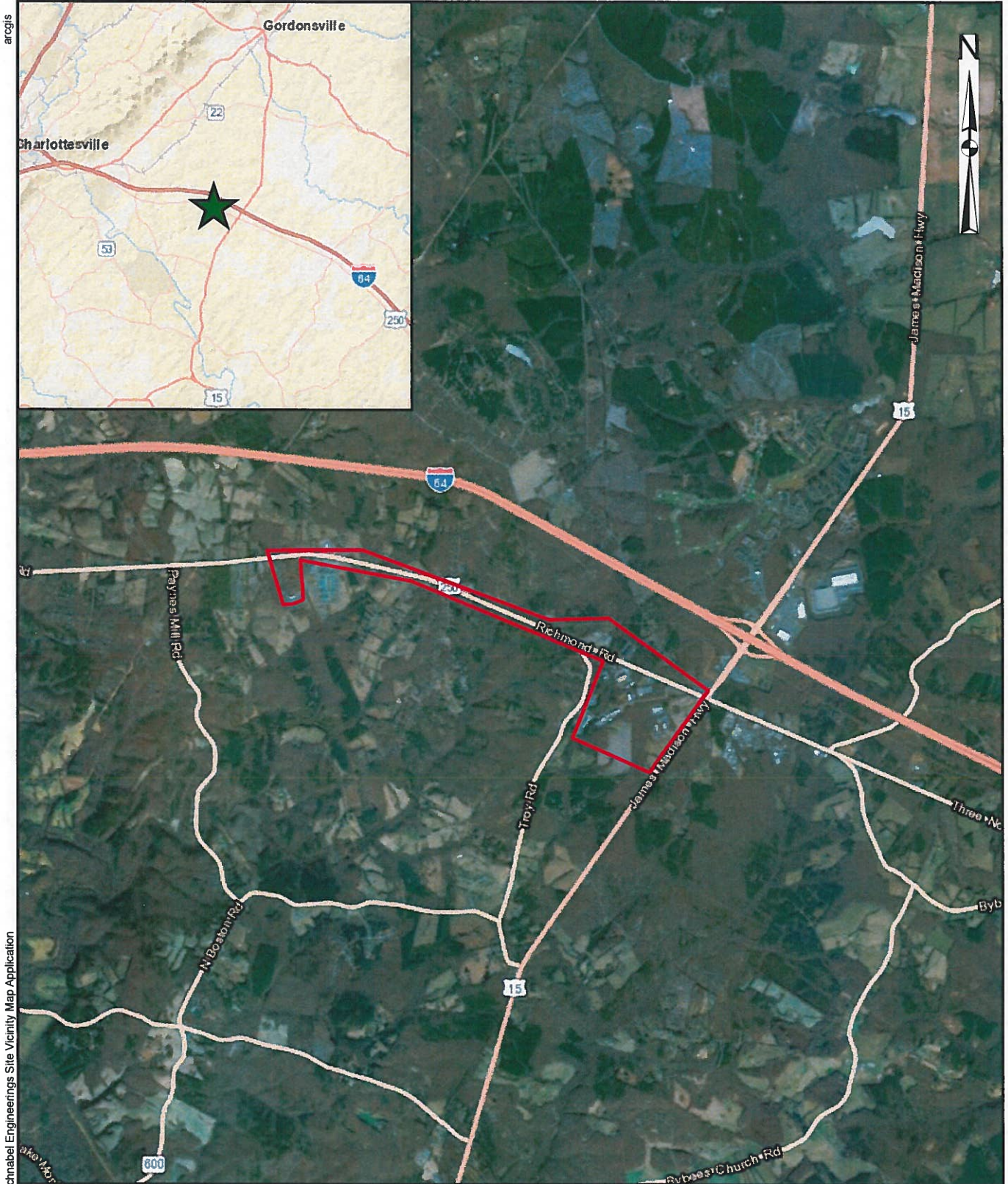
Appendix A: Subsurface Exploration Data

Appendix B: Soil Laboratory Test Data

FIGURES

Figure 1: Site Vicinity Map

Figures 2 through 2H: Boring Location Plans



Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community
 Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors

NOT TO SCALE



ZION CROSSROADS WATER AND SEWER SYSTEM
 ROUTE 250 AND ROUTE 15
 FLUVANNA COUNTY, VIRGINIA
 PROJECT NO. 16C13175 TASK 01

SITE VICINITY
 MAP

FIGURE 1

2/8/2018 This Map was Created in Schnabel Engineering's Site Vicinity Map Application

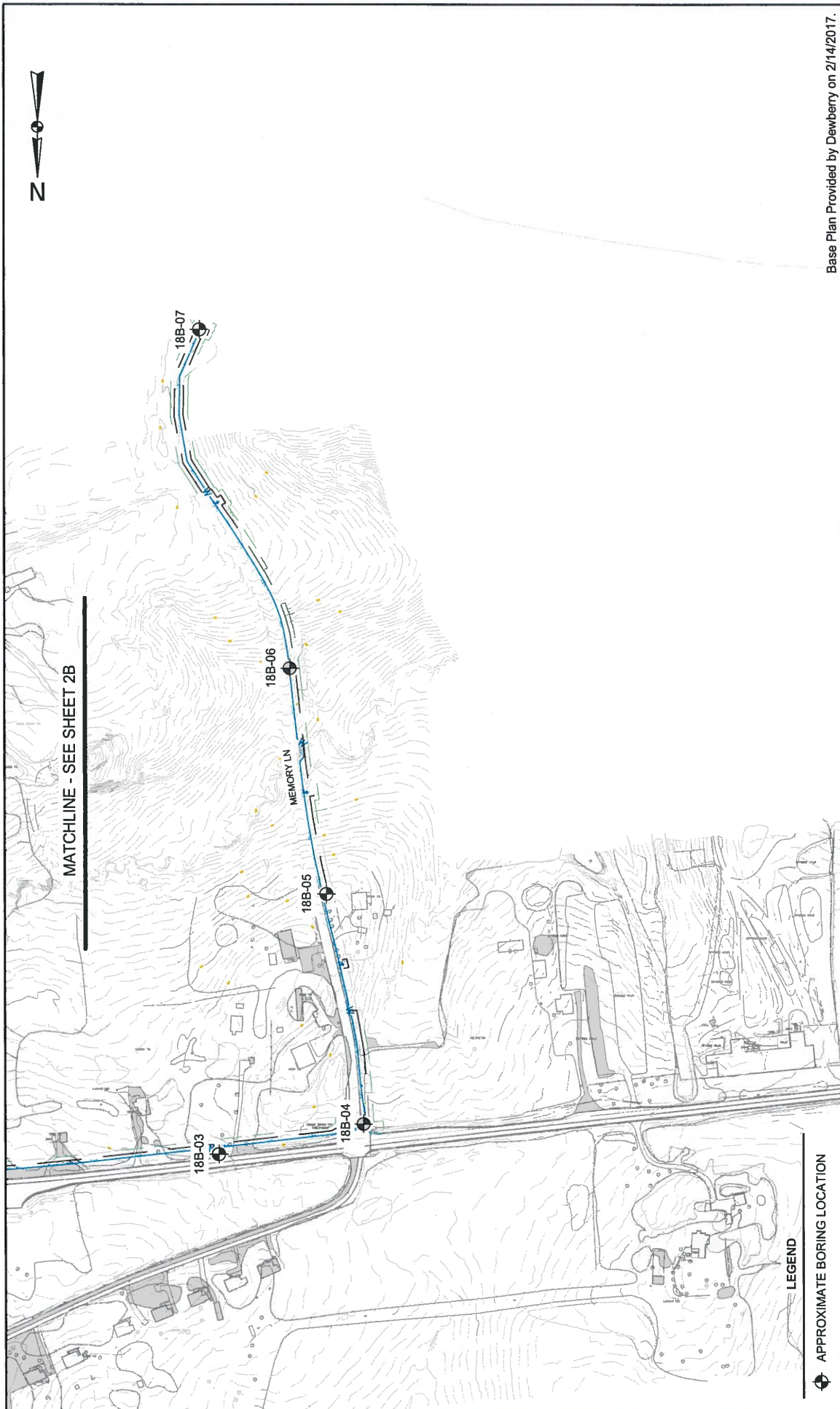


Base Plan Provided by Dewberry on 2/14/2017.

Figure Name:	BORING LOCATION PLAN	Done:	D. KNECH	Figure Number:	2
Project Number:	16C13175, TASK 01	Reviewed:	K. POCTA	Date:	MAR 2017

ZION CROSSROADS WATER AND SEWER SYSTEM
ROUTE 250 AND ROUTE 15
FLUVANNA COUNTY, VIRGINIA





APPROXIMATE BORING LOCATION



LEGEND

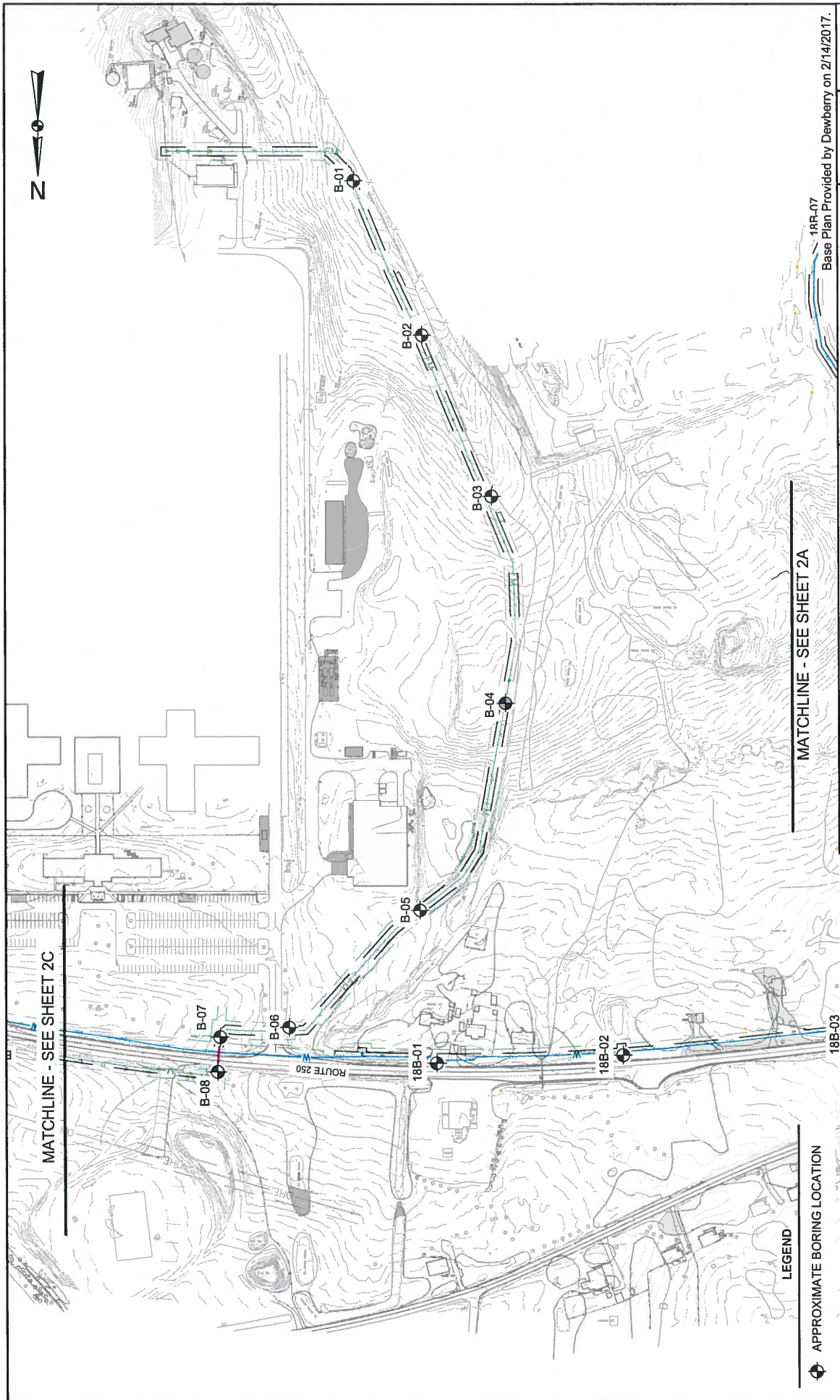


ZION CROSSROADS WATER AND SEWER SYSTEM
ROUTE 250 AND ROUTE 15
FLUVANNA COUNTY, VIRGINIA

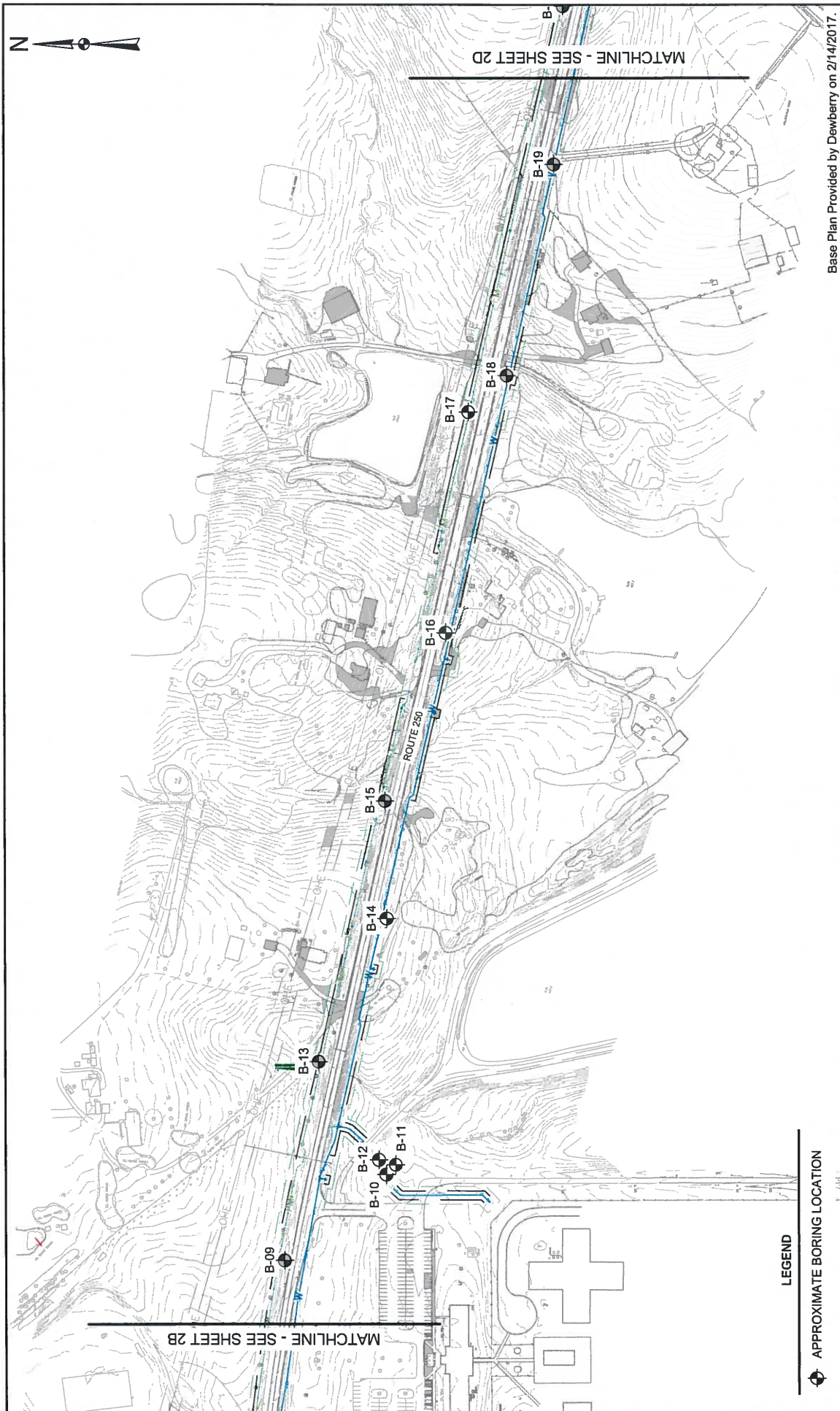
Figure Name: BORING LOCATION PLAN
Project Number: 16C13175, TASK 01

Design: D. KNECH
Reviewed: K. POCTA
Figure Number: 2A
Date: MAR 2017

Base Plan Provided by Dewberry on 2/14/2017.



		ZION CROSSROADS WATER AND SEWER SYSTEM ROUTE 250 AND ROUTE 15 FLUVANNA COUNTY, VIRGINIA	
Figure Name: BORING LOCATION PLAN		Done: D. KNECH	
Project Number: 16C13175, TASK 01		Figure Number: 2B	
MATCHLINE - SEE SHEET 2A		Date: MAR 2017	
MATCHLINE - SEE SHEET 2C		Reviewed: K. POCTA	
Base Plan Provided by Dewberry on 2/14/2017.			



Base Plan Provided by Dewberry on 2/14/2017.

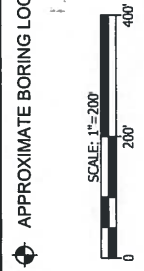
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 Figure Number: 2C

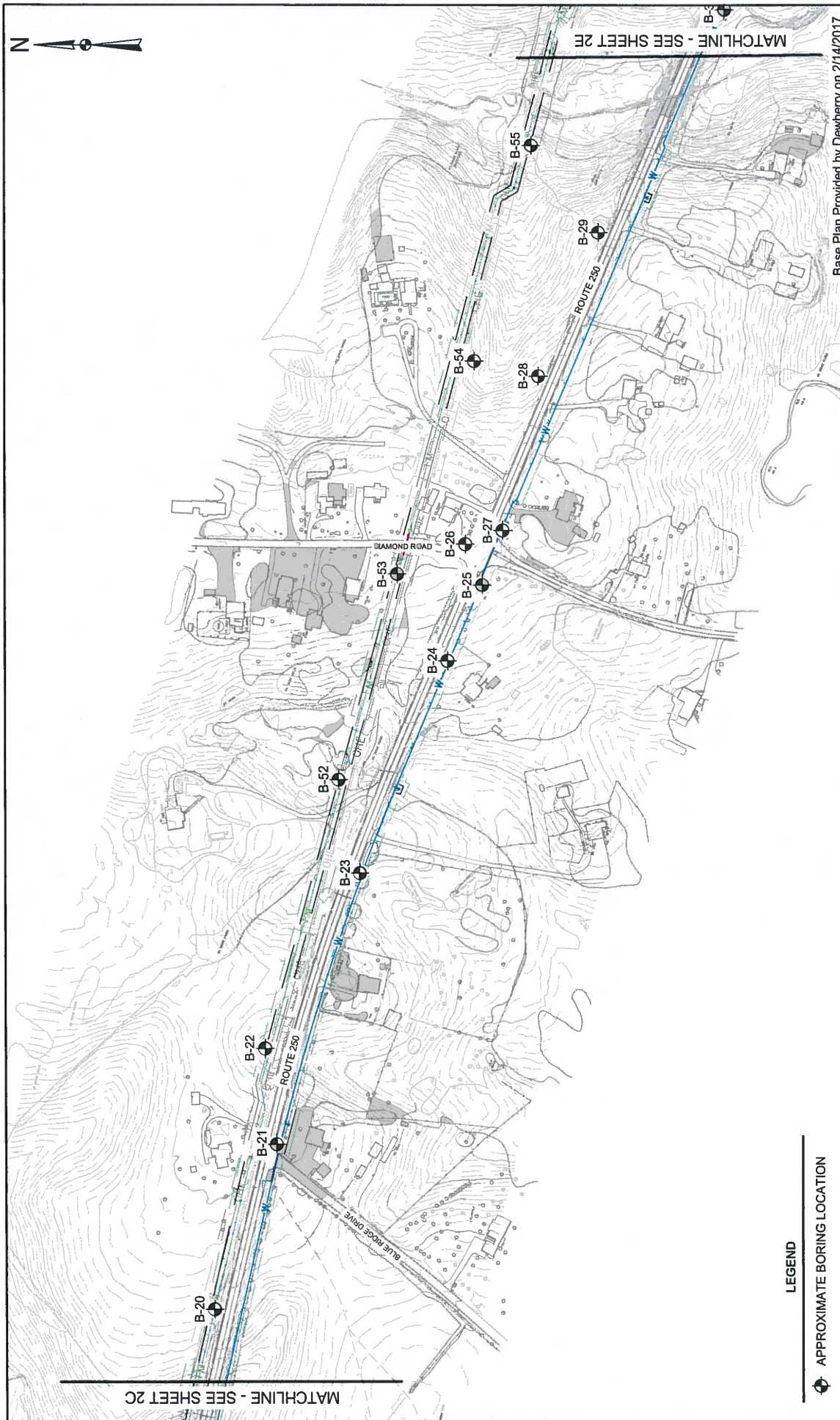
Done: D. KNIECH
 Reviewed: K. POCTA
 Date: MAR 2017

ZION CROSSROADS WATER AND SEWER SYSTEM
 ROUTE 250 AND ROUTE 15
 FLUVANNA COUNTY, VIRGINIA



LEGEND





Base Plan Provided by Dewberry on 2/14/2017.

Figure Name: BORING LOCATION PLAN

Figure Number: 2D

Project Number: 16C13175, TASK 01

Done: D. KNECH

Reviewed: K. POCTA

Date: MAR 2017

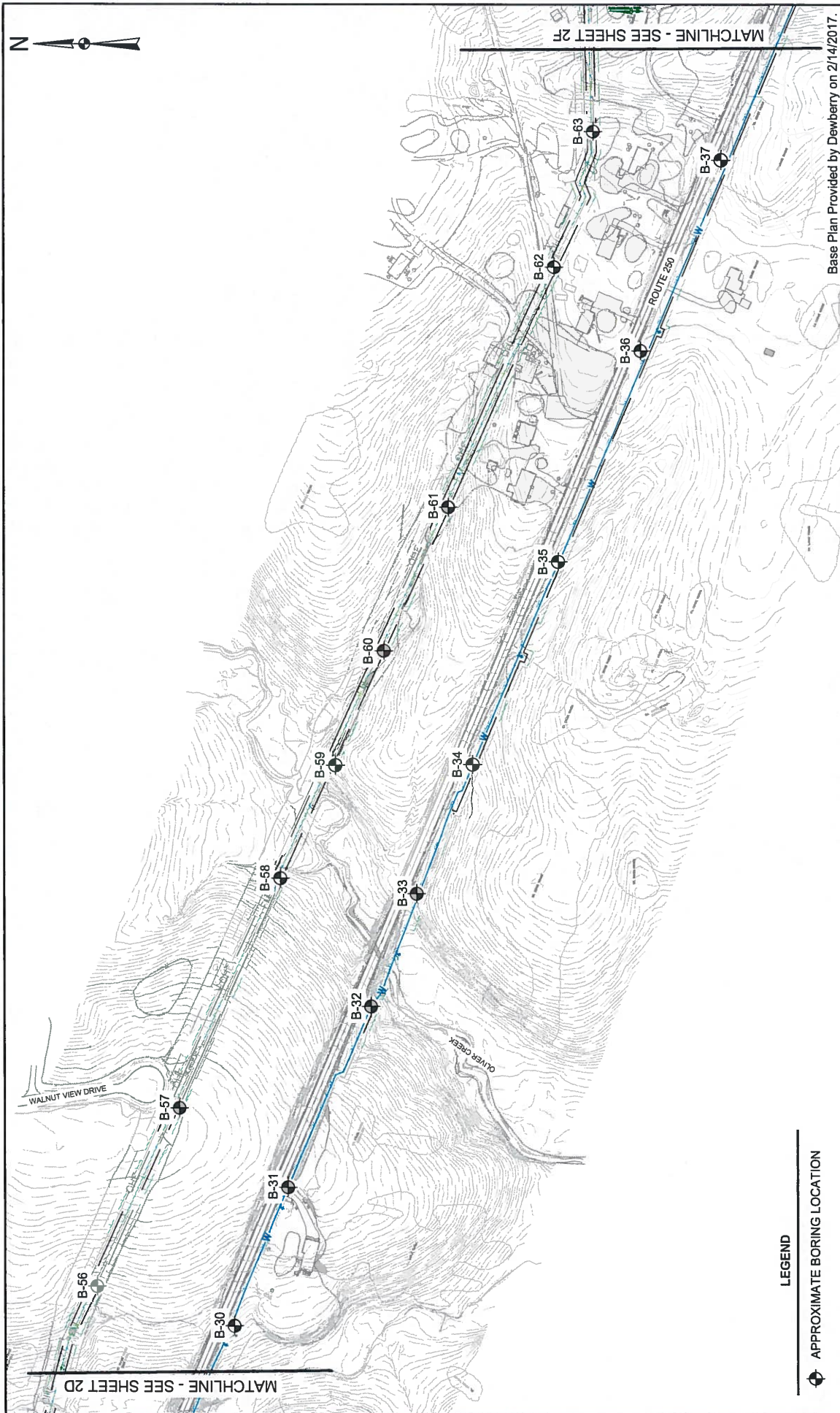
ZION CROSSROADS WATER AND SEWER SYSTEM ROUTE 250 AND ROUTE 15 FLUVANNA COUNTY, VIRGINIA



LEGEND

APPROXIMATE BORING LOCATION





Base Plan Provided by Dewberry on 2/14/2017.

Figure Name: BORING LOCATION PLAN
 Project Number: 18C13175, TASK 01

Done: D. KNECH
 Reviewed: K. POCTA

Figure Number: 2E
 Date: MAR 2017

ZION CROSSROADS WATER AND SEWER SYSTEM
 ROUTE 250 AND ROUTE 15
 FLUVANNA COUNTY, VIRGINIA



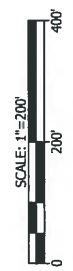
LEGEND
 ○ APPROXIMATE BORING LOCATION





MATCHLINE - SEE SHEET 2E

LEGEND
 ○ APPROXIMATE BORING LOCATION



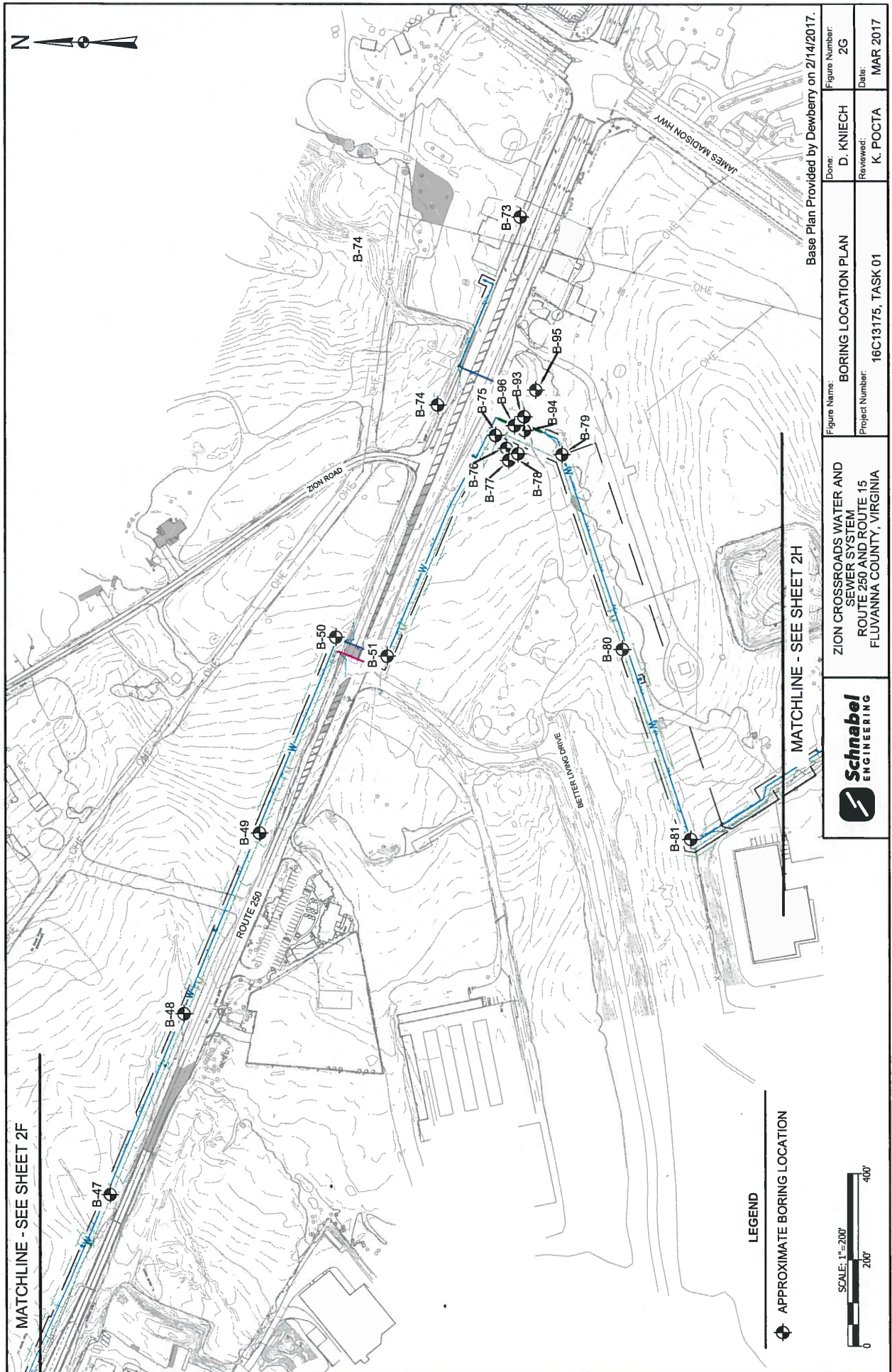
ZION CROSSROADS WATER AND SEWER SYSTEM
 ROUTE 250 AND ROUTE 15
 FLUVANNA COUNTY, VIRGINIA

Figure Name: BORING LOCATION PLAN
 Project Number: 16C13175, TASK 01

Done: D. KNIECH
 Reviewed: K. POCTA
 Figure Number: 2F
 Date: MAR 2017

MATCHLINE - SEE SHEET 2G

Base Plan Provided by Dewberry on 2/14/2017.



Base Plan Provided by Dewberry on 2/14/2017.

Figure Number:	2G
Done:	D. KNECH
Revised:	K. POCTA
Date:	MAR 2017

Figure Name: BORING LOCATION PLAN
 Project Number: 16C13175, TASK 01

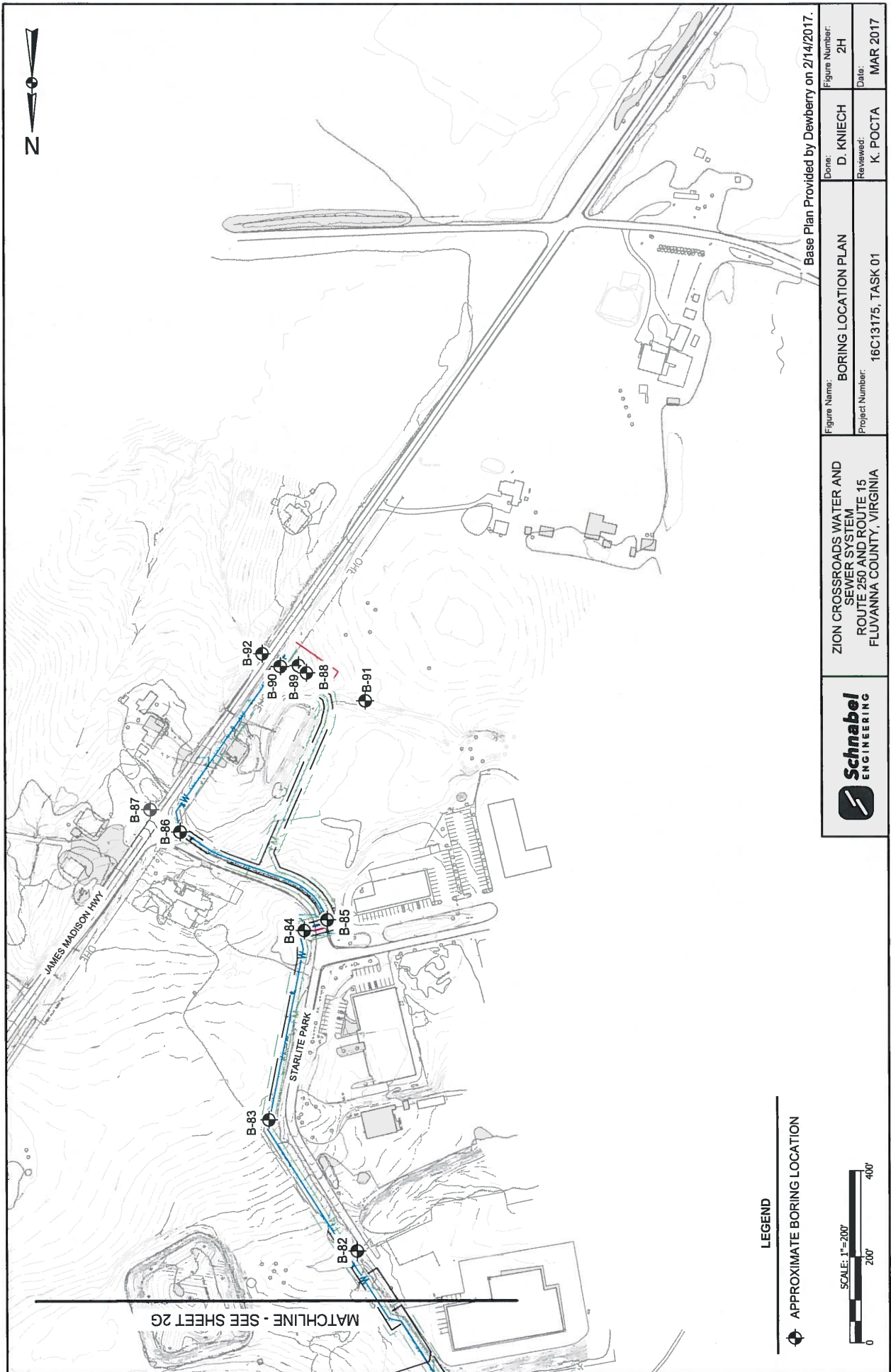
ZION CROSSROADS WATER AND SEWER SYSTEM
 ROUTE 250 AND ROUTE 15
 FLUVANNA COUNTY, VIRGINIA

MATCHLINE - SEE SHEET 2F

MATCHLINE - SEE SHEET 2H

LEGEND
 ◉ APPROXIMATE BORING LOCATION





Base Plan Provided by Dewberry on 2/14/2017.

	Figure Name: ZION CROSSROADS WATER AND SEWER SYSTEM ROUTE 250 AND ROUTE 15 FLUVANNA COUNTY, VIRGINIA	Done: D. KNIECH	Figure Number: 2H
	Project Number: 16C13175, TASK 01	Reviewed: K. POCTA	Date: MAR 2017

APPENDIX A

SUBSURFACE EXPLORATION DATA

Subsurface Exploration Procedures
General Notes for Subsurface Exploration Logs
Identification of Soil
Boring Logs, 18B-01 through 18B-07, B-01 through B-96

SUBSURFACE EXPLORATION PROCEDURES

Test Borings

The borings are advanced by turning a continuous flight auger with a center opening of 2¼ inches. A plug device blocks off the center opening while augers are advanced. Cuttings are brought to the surface by the auger flights. Sampling is performed through the center opening in the hollow stem auger, by standard methods, after removal of the plug. Usually, no water is introduced into the boring using this procedure.

Standard Penetration Test Results

The numbers in the Sampling Data column of the boring logs represent Standard Penetration Test (SPT) results. Each number represents the blows needed to drive a 2-inch O.D., 1½-inch I.D. split-spoon sampler 6 inches, using a 140-pound hammer falling 30 inches. The sampler is typically driven a total of 18 or 24 inches. The first 6 inches are considered a seating interval. The total of the number of blows for the second and third 6-inch intervals is the SPT "N value." The SPT is performed according to ASTM D1586.

Soil Classification Criteria

The group symbols on the logs represent the Unified Soil Classification System Group Symbols (ASTM D2487) based on visual observation and limited laboratory testing of the samples. Criteria for visual identification of soil samples are included in this appendix. Some variation can be expected between samples visually classified and samples classified in the laboratory.

Residual soils are derived through the in-place physical and chemical weathering of the underlying rock. Disintegrated rock is defined as residual material with SPT N values between 60 blows per foot and refusal. Refusal is defined as an N value of 50 blows for a penetration of one inch or less.

Water Observation Wells

Temporary water observation wells were installed in Borings B-77 and B-89 by inserting a hand-slotted, 1¼-inch PVC pipe in each of these borings. Each pipe was capped and the area surrounding the pipe was backfilled with cuttings from the boring.

Boring Locations and Elevations

Borings were located using sub-meter GPS equipment. Approximate boring locations are shown on Figures 2 through 2G. Ground surface elevations at the boring locations were obtained from the site topographic plan and are indicated on the boring logs. Locations and elevations should be considered no more accurate than the methods used to determine them.

GENERAL NOTES FOR SUBSURFACE EXPLORATION LOGS

1. Numbers in sampling data column next to Standard Penetration Test (SPT) symbols indicate blows required to drive a 2-inch O.D., 1¾-inch I.D. sampling spoon 6 inches using a 140 pound hammer falling 30 inches. The Standard Penetration Test (SPT) N value is the number of blows required to drive the sampler 12 inches, after a 6 inch seating interval. The Standard Penetration Test is performed in general accordance with ASTM D1586.
2. Visual classification of soil is in accordance with terminology set forth in "Identification of Soil." The ASTM D2487 group symbols (e.g., CL) shown in the classification column are based on visual observations.
3. Estimated water levels indicated on the logs are only estimates from available data and may vary with precipitation, porosity of the soil, site topography, and other factors.
4. Refusal at the surface of rock, boulder, or other obstruction is defined as an SPT resistance of 50 blows for 1 inch or less of penetration.
5. The logs and related information depict subsurface conditions only at the specific locations and at the particular time when drilled or excavated. Soil conditions at other locations may differ from conditions occurring at these locations. Also, the passage of time may result in a change in the subsurface soil and water level conditions at the subsurface exploration location.
6. The stratification lines represent the approximate boundary between soil and rock types as obtained from the subsurface exploration. Some variation may also be expected vertically between samples taken. The soil profile, water level observations and penetration resistances presented on these logs have been made with reasonable care and accuracy and must be considered only an approximate representation of subsurface conditions to be encountered at the particular location.
7. Key to symbols and abbreviations:



S-1, SPT
5+10+1

Sample No., Standard Penetration Test
Number of blows in each 6-inch increment

LL

Liquid Limit

MC

Moisture Content (percent)

PL

Plastic Limit

%Passing#200

Percent by weight passing a No. 200 Sieve

IDENTIFICATION OF SOIL

I. DEFINITION OF SOIL GROUP NAMES (ASTM D2487)

		SYMBOL	GROUP NAME
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels – More than 50% of coarse fraction retained on No. 4 sieve Coarse, ¾" to 3" Fine, No. 4 to ¾"	Clean Gravels Less than 5% fines	GW WELL GRADED GRAVEL
			GP POORLY GRADED GRAVEL
		Gravels with fines More than 12% fines	GM SILTY GRAVEL
			GC CLAYEY GRAVEL
	Sands – 50% or more of coarse Fraction passes No. 4 sieve Coarse, No. 10 to No. 4 Medium, No. 40 to No. 10 Fine, No. 200 to No. 40	Clean Sands Less than 5% fines	SW WELL GRADED SAND
			SP POORLY GRADED SAND
		Sands with fines More than 12% fines	SM SILTY SAND
			SC CLAYEY SAND
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays – Liquid Limit less than 50 Low to medium plasticity	Inorganic	CL LEAN CLAY
			ML SILT
		Organic	OL ORGANIC CLAY
			OS ORGANIC SILT
	Silts and Clays – Liquid Limit 50 or more Medium to high plasticity	Inorganic	CH FAT CLAY
			MH ELASTIC SILT
		Organic	OH ORGANIC CLAY
			OS ORGANIC SILT
Highly Organic Soils	Primarily organic matter, dark in color and organic odor	PT	PEAT

II. DEFINITION OF SOIL COMPONENT PROPORTIONS (ASTM D2487)

				Examples
Adjective Form	GRAVELLY SANDY	>30% to <50% coarse grained component in a fine-grained soil	GRAVELLY LEAN CLAY	
	CLAYEY SILTY	>12% to <50% fine grained component in a coarse-grained soil	SILTY SAND	
"With"	WITH GRAVEL WITH SAND	>15% to <30% coarse grained component in a fine-grained soil	FAT CLAY WITH GRAVEL	
	WITH GRAVEL WITH SAND	>15% to <50% coarse grained component in a coarse-grained soil	POORLY GRADED GRAVEL WITH SAND	
	WITH SILT WITH CLAY	>5% to <12% fine grained component in a coarse-grained soil	POORLY GRADED SAND WITH SILT	

III. GLOSSARY OF MISCELLANEOUS TERMS

- SYMBOLS** Unified Soil Classification Symbols are shown above as group symbols. A dual symbol "-" indicates the soil belongs to two groups. A borderline symbol "/" indicates the soil belongs to two possible groups.
- FILL**..... Man-made deposit containing soil, rock and often foreign matter.
- PROBABLE FILL**..... Soils which contain no visually detected foreign matter but which are suspect with regard to origin.
- DISINTEGRATED ROCK (DR)**..... Residual materials with a standard penetration resistance (SPT) between 60 blows per foot and refusal. Refusal is defined as a SPT of 100 blows for 2" or less penetration.
- PARTIALLY WEATHERED ROCK (PWR)**..... Residual materials with a standard penetration resistance (SPT) between 100 blows per foot and refusal. Refusal is defined as a SPT of 100 blows for 2" or less penetration.
- BOULDERS & COBBLES**..... Boulders are considered rounded pieces of rock larger than 12 inches, while cobbles range from 3 to 12 inch size.
- LENSES**..... 0 to ½ inch seam within a material in a test pit.
- LAYERS**..... ½ to 12 inch seam within a material in a test pit.
- POCKET**..... Discontinuous body within a material in a test pit.
- MOISTURE CONDITIONS**..... Wet, moist or dry to indicate visual appearance of specimen.
- COLOR**..... Overall color, with modifiers such as light to dark or variation in coloration.



Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: 18B-01
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers, Jr.
Schnabel Representative: C. Jones
Equipment: CME-55 (Truck)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/6/18 **Finished:** 2/6/18
Location: See Location Plan

Ground Surface Elevation: 436± (ft) **Total Depth:** 13.9 ft

Groundwater Observations						
	Date	Time	Depth	Casing	Caved	
Encountered	2/6	---	Dry	---	---	
Completion	2/6	---	Dry	---	---	
Casing Pulled	2/6	---	Dry	---	8.7'	

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches		435.8			S-01, SPT 3+4+3 REC=1", 6%		RESIDUUM
1.5	CLAYEY SAND, fine to coarse grained sand; moist, dark gray, contains rock fragments	SC	434.5	C1		S-02, SPT 2+4+10 REC=8", 44%	PP = 0.50 tsf	
	SANDY LEAN CLAY; moist, tannish brown, contains root fragments Change: orangish brown and light gray	CL			5	S-03, SPT 2+7+12 REC=11", 61%	PP = 1.50 tsf	
7.0	DISINTEGRATED ROCK, sampled as sandy silt; moist, tannish brown	DR	429.0			S-04, SPT 12+28+46 REC=17", 94%		
				10	S-05, SPT 29+50/5" REC=6", 50%			
13.9	Change: contains rock fragments		422.1		S-06, SPT 50/5" REC=4", 67%			

Bottom of Boring at 13.9 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: 18B-02
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers, Jr.
Schnabel Representative: C. Jones
Equipment: CME-55 (Truck)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/6	---	Dry	---	---
Completion	2/6	---	Dry	---	---
Casing Pulled	2/6	---	Dry	---	9.4'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/6/18 **Finished:** 2/6/18
Location: See Location Plan

Ground Surface Elevation: 446± (ft) **Total Depth:** 15.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Asphalt; 2 inches		445.8	A		S-01, SPT 5+5+3 REC=0", 0%		FILL
0.7	Dense Graded Aggregate		445.3					
	CLAYEY SAND, fine to coarse grained sand; moist, gray and brown, contains rock fragments	SC				S-02, SPT 4+7+9 REC=5", 28%		RESIDUUM
4.0	FAT CLAY WITH SAND; moist, tan and light gray	CH	442.0	5	S-03, SPT 3+5+7 REC=7", 39%	PP = 1.25 tsf		
7.0	ELASTIC SILT WITH SAND; moist, orangish brown and bluish gray	MH	439.0	C1		S-04, SPT 6+7+9 REC=12", 67%	PP = 2.00 tsf	
	Change: contains rock fragments					10	S-05, SPT 3+7+11 REC=13", 72%	PP = 2.00 tsf
13.5	DISINTEGRATED ROCK, sampled as silt with sand; reddish brown and light gray	DR	432.5	D		S-06, SPT 22+32+42 REC=12", 67%	PP = 1.25 tsf	
15.0			431.0					15

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: 18B-03
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers, Jr.
Schnabel Representative: C. Jones
Equipment: CME-55 (Truck)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/6	---	Dry	---	---
Completion	2/6	---	Dry	---	---
Casing Pulled	2/6	---	Dry	---	8.7'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/6/18 **Finished:** 2/6/18
Location: See Location Plan

Ground Surface Elevation: 439± (ft) **Total Depth:** 13.9 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Topsoil; 2 inches		438.8	A		S-01, SPT 4+5+3 REC=5", 28%		FILL
2.0	SILTY SAND WITH GRAVEL, fine to coarse grained sand; moist, grayish brown	SM	437.0				S-02, SPT 4+5+8 REC=6", 33%	PP = 0.75 tsf	RESIDUUM
4.0	LEAN CLAY WITH SAND; yellowish brown, contains root fragments	CL	435.0	5		S-03, SPT 3+4+7 REC=6", 33%	PP = 1.00 tsf	
	FAT CLAY WITH SAND; moist, yellowish brown, contains rock fragments, very stiff	CH					S-04, SPT 4+4+8 REC=12", 67%	PP = 2.00 tsf
9.5	SILT WITH SAND; orangish brown and light yellow	ML	429.5	10		S-05, SPT 4+6+17 REC=14", 78%	PP = 1.00 tsf	
13.5 13.9	DISINTEGRATED ROCK, sampled as silt with sand; orangish brown and light yellow	DR	425.5 425.1		D		S-06, SPT 50/5" REC=5", 83%	PP = 1.50 tsf

Bottom of Boring at 13.9 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG: 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: 18B-04
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers, Jr.
Schnabel Representative: C. Jones
Equipment: CME-55 (Truck)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/6	—	Dry	—	—
Completion	2/6	—	Dry	—	—
Casing Pulled	2/6	—	Dry	—	2.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/6/18 **Finished:** 2/6/18
Location: See Location Plan

Ground Surface Elevation: 433± (ft) **Total Depth:** 15.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.1	NO GROUND COVER		432.9			S-01, SPT 7+11+10 REC=10", 56%		FILL
2.0	FILL, sampled as silty sand with gravel, fine to coarse grained sand; moist, light gray and dark gray	FILL	431.0	A		S-02, SPT 5+5+6 REC=5", 28%	PP = 0.50 tsf	
4.0	FILL, sampled as sandy lean clay; dark gray, contains root fragments	FILL	429.0			S-03, SPT 1+2+4 REC=5", 28%	PP = 1.25 tsf	RESIDUUM
	SANDY LEAN CLAY; moist, light brown	CL			5			
7.0	FAT CLAY; tannish brown and light gray	CH	426.0	C1		S-04, SPT 6+8+15 REC=17", 94%	PP = 3.00 tsf	
					10	S-05, SPT 6+10+17 REC=14", 78%	PP = 3.75 tsf	
13.5	SILT WITH SAND; light brown and yellow, contains rock fragments	ML	419.5			S-06, SPT 13+17+24 REC=8", 44%	PP = 2.25 tsf	
15.0			418.0		15			

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: 18B-05
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers, Jr.
Schnabel Representative: C. Jones
Equipment: CME-55 (Truck)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/6	—	Dry	—	—
Completion	2/6	—	Dry	—	—
Casing Pulled	2/6	—	Dry	—	8.3'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/6/18 **Finished:** 2/6/18
Location: See Location Plan

Ground Surface Elevation: 429± (ft) **Total Depth:** 14.9 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches		428.7	A		S-01, SPT 4+4+3 REC=6", 33%	PP = 1.50 tsf	FILL
2.0	FILL, sampled as silty sand with gravel, fine to coarse grained sand; moist, light gray and dark gray	FILL	427.0			S-02, SPT 5+10+14 REC=14", 78%		PP = 2.00 tsf	RESIDUUM
	SILT WITH SAND; moist, yellow and tan	ML		C1	5	S-03, SPT 17+22+28 REC=11", 61%	PP = 1.50 tsf	
					10	S-04, SPT 6+8+17 REC=10", 56%		
							S-05, SPT 8+10+16 REC=13", 72%	
							S-06, SPT 23+40+50/5" REC=12", 71%	
13.5	DISINTEGRATED ROCK, sampled as silt with sand; moist, yellow and tan	DR	415.5	D				
14.9			414.1					

Bottom of Boring at 14.9 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: 18B-06
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers, Jr.
Schnabel Representative: C. Jones
Equipment: CME-55 (Truck)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/6/18 **Finished:** 2/6/18
Location: See Location Plan

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/6	---	Dry	---	---
Completion	2/6	---	Dry	---	---
Casing Pulled	2/6	---	Dry	---	8.5'

Ground Surface Elevation: 421± (ft) **Total Depth:** 14.1 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS	
					DEPTH	DATA			
0.3	Rootmat and topsoil; 4 inches SANDY SILT; orange and brown Change: light yellow	ML	420.7	C1		S-01, SPT 3+9+8 REC=11", 61%	PP = 1.00 tsf PP = 2.50 tsf PP = 2.00 tsf	RESIDUUM	
					5	S-02, SPT 8+9+17 REC=10", 56%			
						S-03, SPT 7+19+30 REC=13", 72%			
7.0	DISINTEGRATED ROCK, sampled as sandy silt; orange and brown	DR	414.0	D		S-04, SPT 12+24+37 REC=14", 78%			
						10	S-05, SPT 23+36+42 REC=10", 56%		
							S-06, SPT 33+50/1"		
14.1			406.9						

Bottom of Boring at 14.1 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: 18B-07
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers, Jr.
Schnabel Representative: C. Jones
Equipment: CME-55 (Truck)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/6/18 **Finished:** 2/6/18
Location: See Location Plan

Ground Surface Elevation: 446± (ft) **Total Depth:** 10.0 ft

Groundwater Observations						
	Date	Time	Depth	Casing	Caved	
Encountered	2/6	—	Dry	—	—	
Completion	2/6	—	Dry	—	—	
Casing Pulled	2/6	—	Dry	—	6.0'	

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.4	Rootmat and topsoil; 5 inches SANDY LEAN CLAY; reddish brown, hard Change: dark brown, contains root fragments Change: reddish brown and yellow, contains mica	CL	445.6	C1		S-01, SPT 2+2+3 REC=5", 28%	PP = 2.50 tsf	RESIDUUM
						S-02, SPT 3+4+4 REC=4", 22%		
						S-03, SPT 9+14+27 REC=16", 89%	PP = 4.00 tsf	
7.0	SANDY SILT; reddish brown	ML	439.0			S-04, SPT 9+20+24 REC=14", 78%	PP = 2.00 tsf	
						S-05, SPT 30+34+20 REC=13", 72%		
10.0			436.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-01
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Groundwater Observations


	Date	Time	Depth	Casing	Caved
Encountered	2/2	—	Dry	—	—
Completion	2/2	—	Dry	—	—
Casing Pulled	2/2	—	Dry	—	6.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/2/17 **Finished:** 2/2/17
Location: See Location Plan

Ground Surface Elevation: 406± (ft) **Total Depth:** 8.8 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		405.8					
	CLAYEY SAND, fine to medium grained sand; moist, dark gray	SC		C2		S-01, SPT 3+5+4 REC=14", 78%	MC = 26.8%	RESIDUUM
2.0	SANDY FAT CLAY; moist, orangish brown	CH	404.0			S-02, SPT 4+5+9 REC=14", 78%		
4.0	SANDY SILT; moist, brown, contains root fragments	ML	402.0	C1	5	S-03, SPT 7+15+35 REC=13", 72%		
7.0	DISINTEGRATED ROCK, sampled as sandy silt; moist, brown	DR	399.0	D		S-04, SPT 50/6" REC=7", 117%		
8.8			397.2			S-05, SPT 50/4" REC=3", 75%		

Bottom of Boring at 8.8 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

 Schnabel ENGINEERING TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-02 Contract Number: 16C13175 Task 01 Sheet: 1 of 1																																																
	Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: M. White Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" ID Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 2/2/17 Finished: 2/2/17 Location: See Location Plan Ground Surface Elevation: 415± (ft) Total Depth: 9.8 ft																																																	
		<table border="1"> <thead> <tr> <th colspan="6">Groundwater Observations</th> </tr> <tr> <th></th> <th>Date</th> <th>Time</th> <th>Depth</th> <th>Casing</th> <th>Caved</th> </tr> </thead> <tbody> <tr> <td>Encountered</td> <td>2/2</td> <td>—</td> <td>Dry</td> <td>—</td> <td>—</td> </tr> <tr> <td>Completion</td> <td>2/2</td> <td>—</td> <td>Dry</td> <td>—</td> <td>—</td> </tr> <tr> <td>Casing Pulled</td> <td>2/2</td> <td>—</td> <td>Dry</td> <td>—</td> <td>7.0'</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Groundwater Observations							Date	Time	Depth	Casing	Caved	Encountered	2/2	—	Dry	—	—	Completion	2/2	—	Dry	—	—	Casing Pulled	2/2	—	Dry	—	7.0'																		
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DEPTH (ft)						MATERIAL DESCRIPTION	SYMBOL			ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS																																			
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0.3	Rootmat and topsoil; 3 inches		414.8			S-01, SPT 3+4+3 REC=10", 56%	MC = 23.7% Resistivity = 1000 Ohms-cm Redox = 385 mv Sulfides = 0 pH = 5.9	RESIDUUM																																										
2.0	SANDY SILT; moist, brown, contains root fragments	ML	413.0	C1		S-02, SPT 3+6+7 REC=9", 50%																																												
	LEAN CLAY WITH SAND; moist, light brown	CL			5	S-03, SPT 9+14+13 REC=12", 67%																																												
7.0	DISINTEGRATED ROCK, sampled as sandy silt; moist, orangish brown, contains rock fragments	DR	408.0	D		S-04, SPT 15+43+42 REC=16", 89%																																												
9.8			405.2			S-05, SPT 16+39+50/4" REC=11", 69%																																												

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-03**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia

Contractor Foreman: M. White

Schnabel Representative: E. Bradshaw

Equipment: CME-45B (ATV)

Method: 2-1/4" ID Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)

Dates Started: 2/2/17 **Finished:** 2/2/17

Location: See Location Plan

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/2	—	Dry	—	—
Completion	2/2	—	Dry	—	—
Casing Pulled	2/2	—	Dry	—	7.0'

Ground Surface Elevation: 428± (ft) **Total Depth:** 9.8 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches SANDY SILT; moist, orangish brown, contains root fragments	ML	427.8			S-01, SPT 2+2+3 REC=16", 89%		RESIDUUM
						S-02, SPT 3+7+7 REC=12", 67%		
4.0	FAT CLAY WITH SAND; moist, brownish gray	CH	424.0	C1	5	S-03, SPT 6+6+7 REC=16", 89%	MC = 18.1%	
7.0	SANDY SILT; moist, brown	ML	421.0			S-04, SPT 9+20+24 REC=15.5", 86%		
8.5	DISINTEGRATED ROCK, sampled as sandy silt; moist, brown	DR	419.5			S-05, SPT 14+31+50/4" REC=12", 75%		
9.8			418.2	D				

Bottom of Boring at 9.8 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG. 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18

Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-04
		Contract Number: 16C13175 Task 01 Sheet: 1 of 1	

Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: M. White Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" ID Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 2/2/17 Finished: 2/2/17 Location: See Location Plan Ground Surface Elevation: 448± (ft) Total Depth: 9.5 ft	Groundwater Observations <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Date</th> <th>Time</th> <th>Depth</th> <th>Casing</th> <th>Caved</th> </tr> </thead> <tbody> <tr> <td>Encountered</td> <td>2/2</td> <td>—</td> <td>Dry</td> <td>—</td> <td>—</td> </tr> <tr> <td>Completion</td> <td>2/2</td> <td>—</td> <td>Dry</td> <td>—</td> <td>—</td> </tr> <tr> <td>Casing Pulled</td> <td>2/2</td> <td>—</td> <td>Dry</td> <td>—</td> <td>6.5'</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>		Date	Time	Depth	Casing	Caved	Encountered	2/2	—	Dry	—	—	Completion	2/2	—	Dry	—	—	Casing Pulled	2/2	—	Dry	—	6.5'																								
	Date	Time	Depth	Casing	Caved																																												
Encountered	2/2	—	Dry	—	—																																												
Completion	2/2	—	Dry	—	—																																												
Casing Pulled	2/2	—	Dry	—	6.5'																																												

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches SANDY LEAN CLAY; moist, brown, contains root fragments	CL	447.3	C1	5	S-01, SPT 6+9+10 REC=10", 56%	MC = 33.5%	RESIDUUM
			S-02, SPT 5+7+9 REC=10", 56%					
			S-03, SPT 7+8+9 REC=10", 56%					
7.0	SANDY SILT; moist, reddish brown	ML	440.5	S-04, SPT 3+5+11 REC=16", 89%				
8.5	DISINTEGRATED ROCK, sampled as sandy silt; moist, light brown, contains rock fragments	DR	439.0	S-05, SPT 22+50/6" REC=15", 125%				
9.5			438.0	D				

Bottom of Boring at 9.5 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-05
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/2	—	Dry	—	—
Completion	2/2	—	Dry	—	—
Casing Pulled	2/2	—	Dry	—	7.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/2/17 **Finished:** 2/2/17
Location: See Location Plan

Ground Surface Elevation: 436± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches		435.8					RESIDUUM
	SILTY SAND, fine; moist, brown, contains root fragments	SM		C2		S-01, SPT 5+6+7 REC=10", 56%		
2.0	SANDY SILT; moist, reddish brown	ML	434.0	C1		S-02, SPT 9+13+17 REC=11", 61%		
4.0	CLAYEY SAND, fine to coarse grained sand; moist, brownish gray	SC	432.0	C2	5	S-03, SPT 12+21+18 REC=8", 44%		
7.0	SANDY LEAN CLAY; moist, brownish gray	CL	429.0			S-04, SPT 16+20+20 REC=10", 56%	LL = 40 PL = 25 MC = 12.2% % Passing #200 = 65.4	
8.5	SANDY SILT; moist, light gray	ML	427.5	C1		S-05, SPT 7+12+16 REC=15", 83%		
10.0			426.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-06**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia

Contractor Foreman: M. White

Schnabel Representative: E. Bradshaw

Equipment: CME-45B (ATV)

Method: 2-1/4" ID Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)

Dates Started: 2/2/17 **Finished:** 2/2/17

Location: See Location Plan

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/2	---	Dry	---	---
Completion	2/2	---	Dry	---	---
Casing Pulled	2/2	---	Dry	---	7.0'

Ground Surface Elevation: 444± (ft) **Total Depth:** 9.8 ft

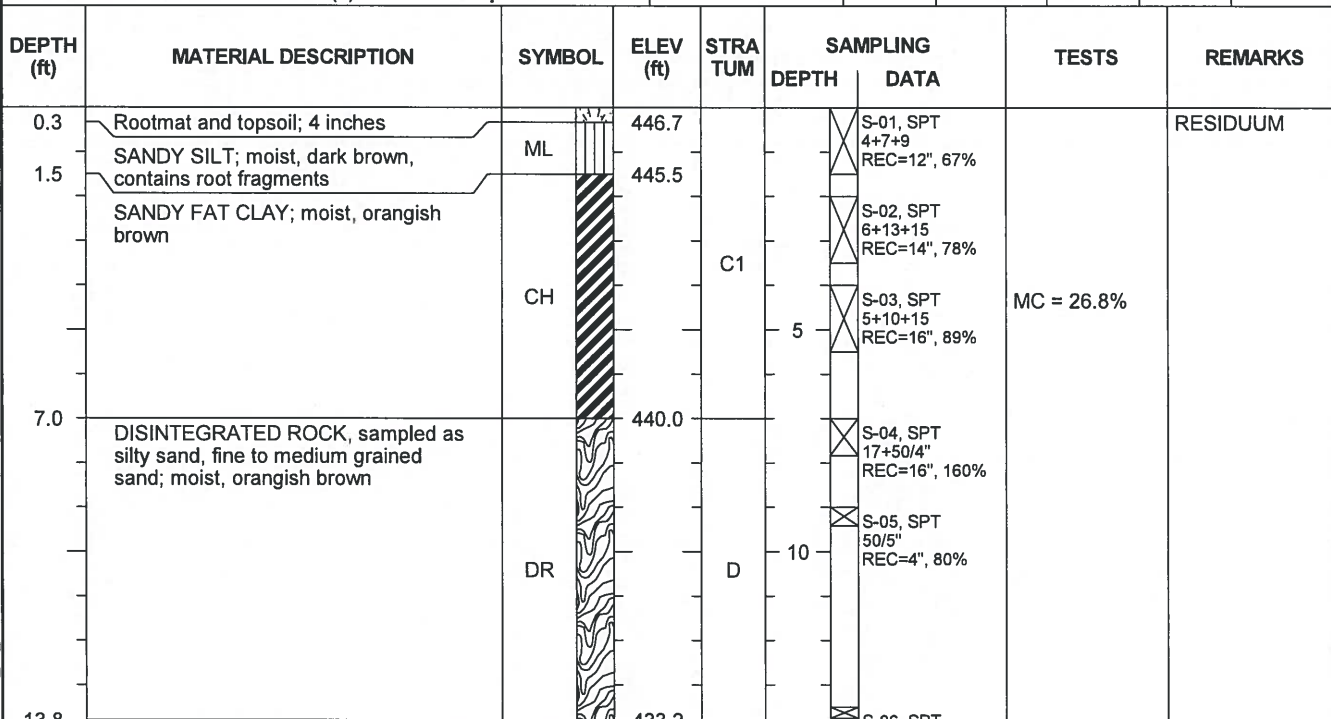
DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches	SM	443.8	C2		S-01, SPT 3+4+5 REC=10", 56%	MC = 22.3%	RESIDUUM
1.0	SILTY SAND, fine to medium grained sand; moist, brown, contains root fragments	CL	443.0					
	SANDY LEAN CLAY; moist, orangish brown, contains root fragments							
4.0	SANDY SILT; moist, light gray with mottles of brown, contains rock fragments	ML	440.0	C1	5	S-02, SPT 5+8+5 REC=14", 78%		
						S-03, SPT 6+11+15 REC=14", 78%		
8.5	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, orangish brown, contains rock fragments	DR	435.5	D		S-04, SPT 5+10+21 REC=16", 89%		
9.8			434.2					
						S-05, SPT 5+31+50/3" REC=10", 67%		

Bottom of Boring at 9.8 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT_2/9/18

Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-07 Contract Number: 16C13175 Task 01 Sheet: 1 of 1
		Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: M. White Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" ID Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 2/2/17 Finished: 2/2/17 Location: See Location Plan Ground Surface Elevation: 447± (ft) Total Depth: 13.8 ft	

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	2/2	—	Dry	—	—
Completion	2/2	—	Dry	—	—
Casing Pulled	2/2	—	Dry	—	9.0'



Bottom of Boring at 13.8 ft.
 Boring terminated at selected depth.
 Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-08
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/2/17 **Finished:** 2/2/17
Location: See Location Plan

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	2/2	---	Dry	---	---
Completion	2/2	---	Dry	---	---
Casing Pulled	2/2	---	Dry	---	9.0'

Ground Surface Elevation: 447± (ft) **Total Depth:** 13.8 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches SANDY LEAN CLAY; moist, brown, contains root fragments	CL	446.2	C1	5	S-01, SPT 2+3+4 REC=10", 56%	LL = 67 PL = 26 MC = 28.2% % Passing #200 = 86.8	RESIDUUM
3.5	FAT CLAY; moist, orangish brown	CH	443.0		S-02, SPT 2+2+3 REC=7", 39%			
5.5	SANDY LEAN CLAY; moist, gray with mottles of brown	CL	441.0		S-03, SPT 3+6+6 REC=8.5", 47%			
					S-04, SPT 12+11+16 REC=18", 100%			
					S-05, SPT 7+20+32 REC=10", 56%			
13.5 13.8	DISINTEGRATED ROCK, sampled as sandy lean clay; moist, gray with mottles of brown	DR	433.0 432.7		D	S-06, SPT 50/4" REC=6", 150%		

Bottom of Boring at 13.8 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-09**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/20/17 **Finished:** 1/20/17
Location: See Location Plan

Ground Surface Elevation: 447± (ft) **Total Depth:** 10.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/20	—	Dry	—	—
Completion	1/20	—	Dry	—	—
Casing Pulled	1/20	—	Dry	—	7.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches ELASTIC SILT WITH SAND; moist, orangish brown and reddish brown	MH	446.3	C1		S-01, SPT 4+5+7 REC=16", 89%	MC = 35.7% Resistivity = 5100 Ohms-cm Redox = 448 mv Sulfides = 0 pH = 4.13	RESIDUUM
					S-02, SPT 7+8+10 REC=15", 83%			
					S-03, SPT 5+10+11 REC=11", 61%			
					S-04, SPT 4+6+8 REC=15", 83%			
					S-05, SPT 4+8+15 REC=16", 89%			
10.0			436.5		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-10
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/3	—	Dry	—	—
Completion	2/3	—	Dry	—	—
Casing Pulled	2/3	—	Dry	—	1.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/3/17 **Finished:** 2/3/17
Location: See Location Plan

Ground Surface Elevation: 447± (ft) **Total Depth:** 20.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		446.3	C2		S-01, SPT 5+9+8 REC=2", 11%	LL = 71 PL = 33 MC = 35.7% % Passing #200 = 86.4 MC = 39.4% MC = 24.3%	RESIDUUM
2.0	SILTY SAND, fine to coarse grained sand; moist, brown, contains root fragments	SM	444.5			S-02, SPT 5+4+5 REC=3", 17%		
4.0	SANDY SILT; moist, brown, contains root fragments	ML	442.5	5	S-03, SPT 3+5+8 REC=10", 56%			
7.0	FAT CLAY; moist, orangish brown, trace sand	CH	439.5	10	S-04, SPT 6+8+11 REC=18", 100%			
	SANDY SILT; moist, orangish brown			15	S-05, SPT 6+9+15 REC=14", 78%			
				20	S-06, SPT 9+21+24 REC=14", 78%			
20.0			426.5		S-07, SPT 7+10+13 REC=14", 78%			

Bottom of Boring at 20.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-11**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/3	—	Dry	—	—
Completion	2/3	—	Dry	—	—
Casing Pulled	2/3	—	Dry	—	7.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/3/17 **Finished:** 2/3/17
Location: See Location Plan

Ground Surface Elevation: 446± (ft) **Total Depth:** 19.5 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		445.3			S-01, SPT 3+4+6 REC=8", 44%	MC = 22.2%	RESIDUUM
2.0	SANDY SILT; moist, brown, contains root fragments	ML	443.5	C1		S-02, SPT 2+2+3 REC=7.5", 42%	LL = 51 PL = 23 MC = 29.3% % Passing #200 = 71.2 MC = 21.7%	
	FAT CLAY WITH SAND; moist, light brown, contains rock fragments	CH			5	S-03, SPT 3+4+4 REC=10", 56%		
7.0	SILTY SAND WITH GRAVEL, fine to coarse grained sand; moist, brown, contains rock fragments		438.5	C2		S-04, SPT 5+15+23 REC=12", 67%	LL = 54 PL = 32 MC = 20.5% % Passing #200 = 43.0	
		SM			10	S-05, SPT 3+9+18 REC=11", 61%		
					15	S-06, SPT 7+14+16 REC=10", 56%		
17.0	DISINTEGRATED ROCK, sampled as silty sand, fine; moist, brown, contains rock fragments	DR	428.5	D		S-07, SPT 19+50 REC=9", 75%	MC = 11.8%	
19.5			426.0					

Bottom of Boring at 19.5 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-12
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/3/17 **Finished:** 2/3/17
Location: See Location Plan

Ground Surface Elevation: 447± (ft) **Total Depth:** 5.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Casing Pulled	2/3	—	Dry	—	—
Completion	2/3	—	Dry	—	—
Encountered	2/3	—	Dry	—	—

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		446.8			S-01, SPT 3+5+5 REC=11", 61%	MC = 21.7%	RESIDUUM
2.0	LEAN CLAY WITH SAND; moist, brown, contains root fragments	CL	445.0	C1		S-02, SPT 7+8+12 REC=11", 61%	LL = 41 PL = 23 MC = 24.9% % Passing #200 = 75.5	
5.0	SANDY FAT CLAY; moist, orangish brown	CH	442.0			S-03, SPT 3+6+6 REC=9", 50%		

Bottom of Boring at 5.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-13**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/20	---	Dry	---	---
Completion	1/20	---	Dry	---	---
Casing Pulled	1/20	---	Dry	---	6.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/20/17 **Finished:** 1/20/17
Location: See Location Plan

Ground Surface Elevation: 456± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches SILT WITH SAND; moist, light brown	ML	455.8	C1		S-01, SPT 4+5+8 REC=14", 78%	MC = 22.0%	RESIDUUM
2.0	SANDY ELASTIC SILT; moist, light gray and orangish brown	MH	454.0			S-02, SPT 8+16+14 REC=16", 89%		
					5	S-03, SPT 9+12+16 REC=10", 56%		
7.0	SANDY SILT; moist, orangish brown	ML	449.0			S-04, SPT 5+9+10 REC=15", 83%		
10.0			446.0		10	S-05, SPT 6+8+10 REC=16", 89%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ SCHNABEL_DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-14**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/20/17 **Finished:** 1/20/17
Location: See Location Plan

Ground Surface Elevation: 460± (ft) **Total Depth:** 10.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/20	---	Dry	---	---
Completion	1/20	---	Dry	---	---
Casing Pulled	1/20	---	Dry	---	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Topsoil; 3 inches		459.8	A	5	S-01, SPT 5+11+9 REC=9.5", 53%	LL = 84 PL = 50 MC = 32.9% % Passing #200 = 95.5	FILL
2.0	FILL, sampled as silty sand, fine to coarse grained sand; moist, brown, contains root fragments, and crushed stone	FILL	458.0			S-02, SPT 11+15+25 REC=12", 67%		RESIDUUM
4.0	ELASTIC SILT; moist, reddish brown, contains mica	MH	456.0	S-03, SPT 12+22+24 REC=14", 78%				
	SANDY SILT; moist, light reddish brown, contains mica	ML		S-04, SPT 7+15+15 REC=12", 67%				
10.0			450.0	S-05, SPT 6+9+14 REC=13", 72%				

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18

Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-15 Contract Number: 16C13175 Task 01 Sheet: 1 of 1
		Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: J. Ayers Jr. Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" I.D. Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 1/20/17 Finished: 1/20/17 Location: See Location Plan Ground Surface Elevation: 451± (ft) Total Depth: 10.0 ft	

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/20	---	Dry	---	---
Completion	1/20	---	Dry	---	---
Casing Pulled	1/20	---	Dry	---	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches	CL	450.2	C1	5	S-01, SPT 4+4+6 REC=14", 78% S-02, SPT 6+9+13 REC=11", 61% S-03, SPT 4+8+11 REC=8", 44% S-04, SPT 8+13+27 REC=10", 56% S-05, SPT 5+10+14 REC=14", 78%		RESIDUUM
2.0	SANDY LEAN CLAY; moist, light brown, contains rock fragments	MH	448.5					
7.0	SANDY ELASTIC SILT; moist, orangish brown and light gray, contains rock fragments	ML	443.5					
10.0	SILT WITH SAND; moist, brown and light greenish gray, contains mica	ML	440.5					
10.0			440.5					

Bottom of Boring at 10.0 ft.
 Boring terminated at selected depth.
 Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-16
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/20/17 **Finished:** 1/20/17
Location: See Location Plan

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/20	—	Dry	—	—
Completion	1/20	—	Dry	—	—
Casing Pulled	1/20	—	Dry	—	6.0'

Ground Surface Elevation: 444± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.1	No ground cover		443.9					FILL
2.0	FILL, sampled as sandy lean clay; moist, light brown, contains roots, and crushed stone	FILL	442.0	A		S-01, SPT 3+3+4 REC=9", 50%	MC = 22.1%	RESIDUUM
4.0	SILTY SAND, fine to medium grained sand; moist, light orangish brown, contains mica	SM	440.0	C2		S-02, SPT 8+12+25 REC=16", 89%		
5.0	DISINTEGRATED ROCK, sampled as silty sand, fine to medium grained sand; moist, light brown, contains mica	DR	440.0	D	5	S-03, SPT 15+40+43 REC=13", 72%		
8.5			435.5			S-04, SPT 28+50/5" REC=8", 73%		
10.0	SILTY SAND, fine to coarse grained sand; moist, orangish brown and light greenish gray, contains mica	SM	434.0	C2	10	S-05, SPT 12+25+18 REC=8", 44%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-17
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/20	—	Dry	—	—
Completion	1/20	—	Dry	—	—
Casing Pulled	1/20	—	Dry	—	7.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/20/17 **Finished:** 1/20/17
Location: See Location Plan

Ground Surface Elevation: 434± (ft) **Total Depth:** 8.8 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.0	No ground cover		434.0			S-01, SPT 2+3+4 REC=11", 61%		RESIDUUM
	SANDY ELASTIC SILT; moist, gray and orangish brown, contains roots, and rock fragments	MH				S-02, SPT 3+6+11 REC=12", 67%		
4.0	SILT; moist, gray, contains mica	ML	430.0	C1	5	S-03, SPT 4+5+9 REC=11", 61%		
7.0	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, gray, contains mica, and rock fragments	DR	427.0			S-04, SPT 28+50/5" REC=7", 64%		
8.8			425.2	D		S-05, SPT 50/3" REC=3", 100%		

Bottom of Boring at 8.8 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-18 Contract Number: 16C13175 Task 01 Sheet: 1 of 1
		Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: J. Ayers Jr. Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" I.D. Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 1/20/17 Finished: 1/20/17 Location: See Location Plan Ground Surface Elevation: 456± (ft) Total Depth: 10.0 ft	

	Groundwater Observations				
	Date	Time	Depth	Casing	Caved
Encountered	1/20	—	Dry	—	—
Completion	1/20	—	Dry	—	—
Casing Pulled	1/20	—	Dry	—	3.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS	
					DEPTH	DATA			
0.3	Rootmat and topsoil; 3 inches		455.3			S-01, SPT 2+3+3 REC=14", 78%		RESIDUUM LL = 38 PL = 23 MC = 21.5% % Passing #200 = 61.5	
	SANDY LEAN CLAY WITH GRAVEL; wet, orangish brown, contains root fragments, and rock fragments	CL				S-02, SPT 8+14+13 REC=8", 44%			
4.0	ELASTIC SILT WITH SAND; moist, light orangish brown		451.5	C1	5	S-03, SPT 7+12+12 REC=12", 67%			
	Change: orangish brown and gray	MH					S-04, SPT 5+8+9 REC=14", 78%		
							S-05, SPT 5+6+5 REC=15", 83%		
10.0			445.5		10				

Bottom of Boring at 10.0 ft.
 Boring terminated at selected depth.
 Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18

Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-19 Contract Number: 16C13175 Task 01 Sheet: 1 of 1
		Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: J. Ayers Jr. Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" I.D. Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 1/20/17 Finished: 1/20/17 Location: See Location Plan Ground Surface Elevation: 465± (ft) Total Depth: 10.0 ft	

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/20	---	Dry	---	---
Completion	1/20	---	Dry	---	---
Casing Pulled	1/20	---	Dry	---	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches ELASTIC SILT WITH SAND; moist, reddish brown, contains root fragments	MH	464.8	C1	5	X	S-01, SPT 4+4+7 REC=13", 72%	RESIDUUM
4.0	SANDY SILT; moist, reddish brown and dark gray, contains mica	ML	461.0		X	S-02, SPT 6+8+12 REC=14", 78%		
					X	S-03, SPT 10+9+12 REC=11", 61%		
					X	S-04, SPT 7+19+24 REC=14", 78%		
					X	S-05, SPT 12+17+18 REC=7.5", 42%		
10.0			455.0		10			

Bottom of Boring at 10.0 ft.
 Boring terminated at selected depth.
 Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL_DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-20
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/20	—	Dry	—	—
Completion	1/20	—	Dry	—	—
Casing Pulled	1/20	—	Dry	—	5.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/20/17 **Finished:** 1/20/17
Location: See Location Plan

Ground Surface Elevation: 479± (ft) **Total Depth:** 9.3 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
1.0	Rootmat and topsoil; 12 inches	MH	477.5	C1	5	S-01, SPT 3+3+4 REC=9", 50%	MC = 17.6%	RESIDUUM
4.0	SANDY ELASTIC SILT; moist, brown, contains rock, and root fragments		474.5			S-02, SPT 15+21+24 REC=12", 67%		
7.0	SILTY SAND, fine to medium grained sand; moist, gray and brown, contains mica	471.5	S-03, SPT 8+19+24 REC=9", 50%					
9.3	DISINTEGRATED ROCK, sampled as silty sand, fine; moist, gray and dark brown, contains mica	469.2	S-04, SPT 20+30+50/4" REC=7", 44%					
			S-05, SPT 39+50/3" REC=7", 78%					

Bottom of Boring at 9.3 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL_DATA TEMPLATE 2008_07_06.GDT_2/9/18

Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-21 Contract Number: 16C13175 Task 01 Sheet: 1 of 1
		Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: J. Ayers Jr. Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" I.D. Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 1/20/17 Finished: 1/20/17 Location: See Location Plan Ground Surface Elevation: 461± (ft) Total Depth: 10.0 ft	

	Groundwater Observations				
	Date	Time	Depth	Casing	Caved
Encountered	1/20	—	Dry	—	—
Completion	1/20	—	Dry	—	—
Casing Pulled	1/20	—	Dry	—	6.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches SANDY ELASTIC SILT; moist, reddish brown, contains root fragments	MH	460.8	C1	5	S-01, SPT 2+4+6 REC=12", 67%	MC = 30.5% Resistivity = 4800 Ohms-cm Redox = 435 mv Sulfides = 0 pH = 4.0	RESIDUUM
			S-02, SPT 8+12+15 REC=17", 94%					
			S-03, SPT 5+11+16 REC=12", 67%					
7.0	SILTY SAND, fine to medium grained sand; moist, reddish brown, contains mica	SM	454.0	C2	S-04, SPT 10+14+14 REC=12", 67%			
8.5	DISINTEGRATED ROCK, sampled as silty sand, fine to medium grained sand; moist, reddish brown, contains rock fragments, and mica	DR	452.5	D	S-05, SPT 12+28+32 REC=12", 67%			
10.0			451.0		10			

Bottom of Boring at 10.0 ft.
 Boring terminated at selected depth.
 Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-22
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/19	—	Dry	—	—
Completion	1/19	—	Dry	—	—
Casing Pulled	1/19	—	Dry	—	6.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/19/17 **Finished:** 1/19/17
Location: See Location Plan

Ground Surface Elevation: 479± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches LEAN CLAY WITH SAND; moist, reddish brown, contains rock fragments	CL	478.8	C1	5	S-01, SPT 4+4+3 REC=11", 61%	MC = 32.0%	RESIDUUM
			S-02, SPT 4+6+8 REC=13", 72%					
5.1	SANDY ELASTIC SILT; moist, orangish brown, contains mica, and rock fragments	MH	473.9			S-03, SPT 8+20+18 REC=12", 67%		
			S-04, SPT 6+6+7 REC=17", 94%					
			S-05, SPT 3+5+5 REC=9", 50%					
10.0			469.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG - 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-23
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/18	—	Dry	—	—
Completion	1/18	—	Dry	—	—
Casing Pulled	1/18	—	Dry	—	5.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/18/17 **Finished:** 1/18/17
Location: See Location Plan

Ground Surface Elevation: 443± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches SANDY ELASTIC SILT; moist, brown, contains mica	MH	442.8	C1		S-01, SPT 2+3+3 REC=13", 72%		RESIDUUM
						S-02, SPT 3+4+4 REC=14", 78%		
4.0	POORLY GRADED SAND WITH SILT, fine to medium grained sand; moist, purplish brown, contains mica, and rock fragments	SP-SM	439.0	C2	5	S-03, SPT 5+11+19 REC=14", 78%		
						S-04, SPT 12+22+30 REC=12", 67%	LL = NP MC = 10.5% % Passing #200 = 8.1	
						S-05, SPT 11+27+27 REC=16", 89%		
10.0			433.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-24**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/18	—	Dry	—	—
Completion	1/18	—	Dry	—	—
Casing Pulled	1/18	—	Dry	—	5.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/18/17 **Finished:** 1/18/17
Location: See Location Plan

Ground Surface Elevation: 486± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches SANDY ELASTIC SILT; moist, orangish brown, contains root fragments Change: reddish brown	MH	485.3	C1		S-01, SPT 2+4+6 REC=9", 50%		RESIDUUM
					S-02, SPT 6+8+12 REC=16", 89%			
			5		S-03, SPT 7+11+14 REC=17", 94%			
7.0	SILTY SAND, fine to medium grained sand; moist, pinkish brown	SM	478.5	C2		S-04, SPT 6+9+11 REC=13", 72%		
10.0					10	S-05, SPT 7+9+20 REC=17", 94%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT_2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-25**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/18/17 **Finished:** 1/18/17
Location: See Location Plan

Ground Surface Elevation: 491± (ft) **Total Depth:** 10.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/18	—	Dry	—	—
Completion	1/18	—	Dry	—	—
Casing Pulled	1/18	—	Dry	—	5.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches	FILL	490.8	A		S-01, SPT 4+5+5 REC=11", 61%		FILL
2.0	FILL, sampled as silty sand; moist, brown, contains root fragments, and crushed stone		489.0					
	SANDY ELASTIC SILT; moist, reddish brown Change: contains mica	MH		C1	5	S-03, SPT 7+9+17 REC=10", 56%	MC = 32.1%	
7.0	DISINTEGRATED ROCK, sampled as silty sand, fine to medium grained sand; moist, brown, contains mica							484.0
10.0		DR	481.0	D	10	S-05, SPT 27+40+23 REC=8", 44%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-26**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/18	—	Dry	—	—
Completion	1/18	—	Dry	—	—
Casing Pulled	1/18	—	Dry	—	5.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/18/17 **Finished:** 1/18/17
Location: See Location Plan

Ground Surface Elevation: 494± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches SANDY ELASTIC SILT; moist, brown, contains rock fragments	MH	493.8	C1	5	S-01, SPT 2+4+5 REC=10", 56%	MC = 37.4%	RESIDUUM
			S-02, SPT 5+9+15 REC=13", 72%					
			S-03, SPT 7+11+12 REC=13", 72%					
7.0	SANDY SILT; moist, pinkish brown, contains mica	ML	487.0		S-04, SPT 15+29+23 REC=11", 61%			
					S-05, SPT 18+20+28 REC=8.5", 47%			
10.0			484.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-27**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/18/17 **Finished:** 1/18/17
Location: See Location Plan

Ground Surface Elevation: 484± (ft) **Total Depth:** 10.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/18	—	Dry	—	—
Completion	1/18	—	Dry	—	—
Casing Pulled	1/18	—	Dry	—	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches SANDY ELASTIC SILT; moist, reddish brown, contains root fragments, and rock fragments	MH	483.7	C1		S-01, SPT 2+3+3 REC=9", 50%	LL = 63 PL = 39 MC = 28.3% % Passing #200 = 87.6	RESIDUUM
4.0	SANDY SILT; moist, reddish brown, contains mica	ML	480.0		5	S-02, SPT 5+9+15 REC=13", 72%		
7.0	SILTY SAND, fine to medium grained sand; moist, pinkish brown, contains mica	SM	477.0		S-03, SPT 8+10+10 REC=13", 72%			
10.0			474.0	C2		S-04, SPT 10+15+17 REC=14", 78%		
						S-05, SPT 14+18+14 REC=11", 61%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-28**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/18	—	Dry	—	—
Completion	1/18	—	Dry	—	—
Casing Pulled	1/18	—	Dry	—	5.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/18/17 **Finished:** 1/18/17
Location: See Location Plan

Ground Surface Elevation: 477± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		476.8			S-01, SPT 4+4+5 REC=11", 61%		RESIDUUM
2.0	SANDY ELASTIC SILT; moist, brown, contains root fragments, and rock fragments	MH	475.0	C1		S-02, SPT 8+16+22 REC=10", 56%	LL = 66 PL = 39 MC = 24.0% % Passing #200 = 42.6	
	SILTY SAND WITH GRAVEL, fine to coarse grained sand; moist, reddish brown Change: brown, contains mica				5	S-03, SPT 9+16+23 REC=9", 50%		
						S-04, SPT 28+24+27 REC=6", 33%		
						S-05, SPT 10+13+21 REC=9", 50%		
10.0	Change: reddish brown	SM	467.0	C2	10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-29**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/18	—	Dry	—	—
Completion	1/18	—	Dry	—	—
Casing Pulled	1/18	—	Dry	—	5.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/18/17 **Finished:** 1/18/17
Location: See Location Plan

Ground Surface Elevation: 473± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches SANDY LEAN CLAY; moist, reddish brown	CL	472.8	C1		S-01, SPT 9+18+31 REC=10", 56%	MC = 24.9%	RESIDUUM
						S-02, SPT 12+18+22 REC=13", 72%		
4.2	SILTY SAND, fine to medium grained sand; moist, reddish brown	SM	468.8	C2	5	S-03, SPT 9+18+31 REC=10", 56%		
	Change: reddish brown with streaks of black					S-04, SPT 10+21+21 REC=10", 56%		
						S-05, SPT 10+16+22 REC=10", 56%		
10.0			463.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-30
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/2	—	Dry	—	—
Completion	2/2	—	Dry	—	—
Casing Pulled	2/2	—	Dry	—	6.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/2/17 **Finished:** 2/2/17
Location: See Location Plan

Ground Surface Elevation: 436± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		435.8	A		S-01, SPT 4+6+9 REC=9", 50%	MC = 6.8%	FILL
2.0	FILL, sampled as silty sand, fine to medium grained sand; moist, brown, contains root fragments	FILL	434.0			S-02, SPT 5+11+14 REC=14", 78%		RESIDUUM
	SANDY LEAN CLAY; moist, reddish brown	CL		C1	5	S-03, SPT 7+9+10 REC=14.5", 81%		
7.0	CLAYEY SAND, fine to medium grained sand; moist, orangish brown with streaks of black	SC	429.0	C2		S-04, SPT 6+16+24 REC=11", 61%		
10.0			426.0		10	S-05, SPT 5+8+15 REC=12", 67%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-31**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/1/17 **Finished:** 2/1/17
Location: See Location Plan

Ground Surface Elevation: 446± (ft) **Total Depth:** 10.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/1	—	Dry	—	—
Completion	2/1	—	Dry	—	—
Casing Pulled	2/1	—	Dry	—	7.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.5	Rootmat and topsoil SANDY SILT; moist, pinkish brown, contains rock fragments		445.0	C1	5	S-01, SPT 4+9+7 REC=9", 50%	MC = 21.4%	RESIDUUM
						S-02, SPT 5+8+12 REC=12", 67%		
						S-03, SPT 11+13+14 REC=8", 44%		
						S-04, SPT 9+23+31 REC=12", 67%		
						S-05, SPT 10+24+26 REC=5", 28%		
10.0			435.5		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-32
Contract Number: 16C13175 Task 01
Sheet: 1 of 2

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/1	1:55 PM	19.0'	—	—
Completion	2/1	2:04 PM	19.0'	—	—
Casing Pulled	2/1	—	Dry	—	14.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/1/17 **Finished:** 2/1/17
Location: See Location Plan

Ground Surface Elevation: 468± (ft) **Total Depth:** 28.8 ft

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil SANDY ELASTIC SILT, fine to coarse grained sand; moist, reddish brown	MH	467.7			S-01, SPT 3+3+3 REC=9", 50%		RESIDUUM
						S-02, SPT 4+4+5 REC=8", 44%		
4.5	SILT WITH SAND; moist, brown and gray	ML	463.5	C1	5	S-03, SPT 3+5+7 REC=6", 33%		
						S-04, SPT 5+11+17 REC=11", 61%		
9.5	DISINTEGRATED ROCK, sampled as sandy silt; moist, and gray	DR	458.5	D	10	S-05, SPT 15+30+42 REC=10", 56%		
12.5	SILT WITH SAND; moist, brown and gray	ML	455.5	C1	15	S-06, SPT 11+19+32 REC=16", 89%		
	Change: brown with streaks of black	ML		C1	20	S-07, SPT 4+8+13 REC=16", 89%	MC = 30.8%	
22.5	DISINTEGRATED ROCK, sampled as sandy silt; moist, gray	DR	445.5	D	25	S-08, SPT 21+42+50 REC=7", 39%		

Auger cuttings wet.



(continued)



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-32
Contract Number: 16C13175 Task 01
Sheet: 2 of 2

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
28.8	DISINTEGRATED ROCK, sampled as sandy silt; moist, gray (continued)	DR 	439.2	D		S-09, SPT 50/4" REC=1", 25%		RESIDUUM
Bottom of Boring at 28.8 ft. Boring terminated at selected depth. Boring backfilled with cuttings upon completion.								



Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-33
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	3/6	12:43 PM	18.5'	—	—
Completion	3/6	12:43 PM	18.5'	—	—
Casing Pulled	3/6	—	Dry	—	10.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 3/6/17 **Finished:** 3/6/17
Location: See Location Plan

Ground Surface Elevation: 435± (ft) **Total Depth:** 21.5 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		434.8	A		S-01, SPT 3+1+2 REC=6", 33%		FILL
2.0	FILL, sampled as silty sand, fine to coarse grained sand; moist, brown and black, contains root fragments, and crushed stone	FILL	433.0			S-02, SPT 2+4+5 REC=11", 61%		RESIDUUM
	SILTY SAND, fine to coarse grained sand; moist, brown and black, contains rock fragments	SM		C2	5	S-03, SPT 15+23+27 REC=9.5", 53%		
7.0	DISINTEGRATED ROCK, sampled as sandy silt; moist, gray	DR	428.0			S-04, SPT 12+23+50/5" REC=13", 76%		Augers grinding/scraping.
					10	S-05, SPT 36+50/2" REC=7", 50%		
13.0	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, gray, contains rock fragments	DR	422.0	D	15	S-06, SPT 50/4" REC=3", 75%		
21.5			413.5		20	S-07, SPT 31+50/3" REC=7", 78%		Augers grinding/scraping.
						S-08, SPT 50/0" REC=0"		

Bottom of Boring at 21.5 ft.
Auger refusal at 21.5 ft.
Boring terminated at auger refusal.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-34
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/1	—	Dry	—	7.0'
Completion	2/1	—	Dry	—	—
Casing Pulled	2/1	—	Dry	—	—

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/1/17 **Finished:** 2/1/17
Location: See Location Plan

Ground Surface Elevation: 489± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil		488.2			S-01, SPT 3+4+5 REC=10", 56%	MC = 24.0%	RESIDUUM
	SANDY LEAN CLAY; moist, brown, contains root fragments	CL				S-02, SPT 3+6+9 REC=8", 44%		
5.0	SANDY SILT; moist, brown with streaks of black	ML	483.5	C1	5	S-03, SPT 3+6+10 REC=12", 67%		
						S-04, SPT 8+10+21 REC=12", 67%		
						S-05, SPT 4+13+11 REC=12", 67%		
10.0			478.5		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-35**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/1	—	Dry	—	—
Completion	2/1	—	Dry	—	—
Casing Pulled	2/1	—	Dry	—	7.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/1/17 **Finished:** 2/1/17
Location: See Location Plan

Ground Surface Elevation: 520± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil SANDY ELASTIC SILT; moist, reddish brown, contains mica	MH	519.7	C1		S-01, SPT 2+2+4 REC=11", 61%	MC = 16.4% Resistivity = 3800 Ohms-cm Redox = 475 mv Sulfides = 0 pH = 4.7	RESIDUUM Low recovery due to rock fragment in bottom of spoon.
					S-02, SPT 4+6+9 REC=4", 22%			
					S-03, SPT 5+10+10 REC=10", 56%			
					S-04, SPT 12+26+16 REC=12", 67%			
					S-05, SPT 16+14+12 REC=6", 33%			
8.5	SANDY SILT; moist, pinkish brown, contains rock fragments, and mica	ML	511.5					
10.0			510.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-36
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/1/17 **Finished:** 2/1/17
Location: See Location Plan

Ground Surface Elevation: 485± (ft) **Total Depth:** 10.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	2/1	—	Dry	—	—
Completion	2/1	—	Dry	—	—
Casing Pulled	2/1	—	Dry	—	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil		484.7			S-1, SPT 4+6+10 REC=6", 25%	MC = 31.2%	RESIDUUM
	SANDY ELASTIC SILT; moist, reddish brown	MH		C1	5	S-02, SPT 5+8+13 REC=8", 44%		
						S-03, SPT 5+7+10 REC=12", 67%		
6.5						SANDY SILT; moist, orangish brown, contains rock fragments, and mica			ML	478.5			S-04, SPT 7+12+13 REC=8", 44%
10.0			475.0		10	S-05, SPT 12+20+22 REC=12", 67%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-37**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/1/17 **Finished:** 2/1/17
Location: See Location Plan


Ground Surface Elevation: 469± (ft) **Total Depth:** 10.0 ft

Groundwater Observations						
	Date	Time	Depth	Casing	Caved	
Encountered	2/1	—	Dry	—	—	
Completion	2/1	—	Dry	—	—	
Casing Pulled	2/1	—	Dry	—	5.0'	

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.4	Rootmat and topsoil SANDY LEAN CLAY; moist, brown, contains rock fragments	CL	468.6	C1		S-01, SPT 4+4+3 REC=10", 56%	MC = 24.2%	RESIDUUM
4.5	DISINTEGRATED ROCK, sampled as sandy lean clay; moist, brown, contains rock fragments	DR	464.5	D	5	S-02, SPT 6+19+26 REC=12", 67%		
6.5	SANDY SILT; moist, orangish brown, contains rock fragments, and mica	ML	462.5	C1		S-03, SPT 7+24+45 REC=16", 89%		
						S-04, SPT 9+23+30 REC=11", 61%		
10.0			459.0		10	S-05, SPT 7+21+24 REC=8", 44%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT_2/9/18

 Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-38
		Contract Number: 16C13175 Task 01 Sheet: 1 of 1	

Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: J. Ayers Jr. Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" I.D. Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 1/19/17 Finished: 1/19/17 Location: See Location Plan Ground Surface Elevation: 469± (ft) Total Depth: 15.0 ft	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="6" style="text-align: center;">Groundwater Observations</th> </tr> <tr> <th></th> <th>Date</th> <th>Time</th> <th>Depth</th> <th>Casing</th> <th>Caved</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Encountered</td> <td>1/19</td> <td>—</td> <td>Dry</td> <td>—</td> <td>—</td> </tr> <tr> <td style="text-align: center;">Completion</td> <td>1/19</td> <td>—</td> <td>Dry</td> <td>—</td> <td>—</td> </tr> <tr> <td style="text-align: center;">Casing Pulled</td> <td>1/19</td> <td>—</td> <td>Dry</td> <td>—</td> <td>9.5'</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	Groundwater Observations							Date	Time	Depth	Casing	Caved	Encountered	1/19	—	Dry	—	—	Completion	1/19	—	Dry	—	—	Casing Pulled	1/19	—	Dry	—	9.5'																								
Groundwater Observations																																																							
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Encountered	1/19	—	Dry	—	—																																																		
Completion	1/19	—	Dry	—	—																																																		
Casing Pulled	1/19	—	Dry	—	9.5'																																																		

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches	FILL	468.7	A	X	S-01, SPT 4+5+7 REC=10", 56%		FILL
2.0	FILL, sampled as sandy elastic silt; moist, brown, contains rock fragments	FILL	467.0		X	S-02, SPT 10+10+12 REC=10", 56%		RESIDUUM
	SANDY SILT; moist, reddish brown, contains mica	ML		C1	5	S-03, SPT 16+19+15 REC=13", 72%		
						S-04, SPT 9+13+17 REC=15.5", 86%		
9.0	SILTY SAND, fine to medium grained sand; moist, pinkish brown and gray	SM	460.0		10	S-05, SPT 9+9+16 REC=17", 94%		
15.0			454.0		15	S-06, SPT 12+12+17 REC=16", 89%		

Bottom of Boring at 15.0 ft.
 Boring terminated at selected depth.
 Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-39
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" ID Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 2/1/17 **Finished:** 2/1/17
Location: See Location Plan

Ground Surface Elevation: 475± (ft) **Total Depth:** 15.0 ft

Groundwater Observations						
	Date	Time	Depth	Casing	Caved	
Encountered	2/1	—	Dry	—	—	
Completion	2/1	—	Dry	—	—	
Casing Pulled	2/1	—	Dry	—	9.0'	

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.4	Rootmat and topsoil		474.6			S-01, SPT 8+6+6 REC=11", 61%		RESIDUUM
	SANDY ELASTIC SILT; moist, brown, contains rock fragments	MH				S-02, SPT 3+9+11 REC=12", 67%		
4.0	SANDY SILT; moist, orangish brown, contains rock fragments, and mica		471.0		5	S-03, SPT 4+6+10 REC=1", 6%	LL = 67 PL = 34 MC = 16.8% % Passing #200 = 63.9	Low recovery due to rock fragment in bottom of spoon.
	Change: reddish brown	ML		C1	10	S-04, SPT 6+6+9 REC=8", 44%		
						S-05, SPT 10+11+17 REC=12", 67%		
14.0	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, grayish brown and reddish brown, contains mica	DR	461.0			S-06, SPT 9+21+40 REC=12", 67%		
15.0			460.0	D	15			

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL_DATA_TEMPLATE 2008_07_06.GDT 2/9/18

Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-40
		Contract Number: 16C13175 Task 01 Sheet: 1 of 1	

Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: J. Ayers Jr. Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" I.D. Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 1/19/17 Finished: 1/19/17 Location: See Location Plan Ground Surface Elevation: 493± (ft) Total Depth: 15.0 ft	Groundwater Observations <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Date</th> <th>Time</th> <th>Depth</th> <th>Casing</th> <th>Caved</th> </tr> </thead> <tbody> <tr> <td>Encountered</td> <td>1/19</td> <td>—</td> <td>Dry</td> <td>—</td> <td>—</td> </tr> <tr> <td>Completion</td> <td>1/19</td> <td>—</td> <td>Dry</td> <td>—</td> <td>—</td> </tr> <tr> <td>Casing Pulled</td> <td>1/19</td> <td>—</td> <td>Dry</td> <td>—</td> <td>9.0'</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>		Date	Time	Depth	Casing	Caved	Encountered	1/19	—	Dry	—	—	Completion	1/19	—	Dry	—	—	Casing Pulled	1/19	—	Dry	—	9.0'																														
	Date	Time	Depth	Casing	Caved																																																		
Encountered	1/19	—	Dry	—	—																																																		
Completion	1/19	—	Dry	—	—																																																		
Casing Pulled	1/19	—	Dry	—	9.0'																																																		

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches	[Cross-hatch symbol]	492.8	A	X	S-01, SPT 5+6+6 REC=5", 28%		FILL
2.0	FILL, sampled as sandy elastic silt; moist, dark brown, contains organic matter, and rock fragments	[Dotted symbol]	491.0		X	S-02, SPT 6+12+21 REC=14", 78%		MC = 16.9% Resistivity = 12000 Ohms-cm Redox = 438 mv Sulfides = 0 pH = 4.4	RESIDUUM
	SILTY SAND, fine to coarse grained sand; moist, pinkish brown, contains mica, and rock fragments	[Dotted symbol]		5	X	S-03, SPT 9+11+17 REC=12", 67%		
				10	X	S-04, SPT 9+12+17 REC=13", 72%		
				10	X	S-05, SPT 13+20+24 REC=16", 89%		
				15	X	S-06, SPT 7+15+19 REC=15", 83%		
15.0						478.0		

Bottom of Boring at 15.0 ft.
 Boring terminated at selected depth.
 Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ SCHNABEL_DATA TEMPLATE 2008_07_06.GDT_2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-41
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/19/17 **Finished:** 1/19/17
Location: See Location Plan

Ground Surface Elevation: 479± (ft) **Total Depth:** 15.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/19	—	Dry	—	—
Completion	1/19	—	Dry	—	—
Casing Pulled	1/19	—	Dry	—	9.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches SANDY SILT; moist, light brown, contains mica	ML	478.8	C1		S-01, SPT 3+4+5 REC=12", 67%	MC = 13.3%	RESIDUUM
					S-02, SPT 5+8+12 REC=13", 72%			
					S-03, SPT 4+9+7 REC=3", 17%			
7.0	SILTY SAND, fine to coarse grained sand; moist, light brown and gray, contains mica, and rock fragments Change: orangish brown	SM	472.0	C2		S-04, SPT 17+17+16 REC=9", 50%		
					S-05, SPT 6+14+17 REC=10", 56%			
					S-06, SPT 21+19+17 REC=10", 56%			
15.0			464.0		15			

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL_DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel
ENGINEERING
TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-42**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/19/17 **Finished:** 1/19/17
Location: See Location Plan

Ground Surface Elevation: 497± (ft) **Total Depth:** 10.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/19	—	Dry	—	—
Completion	1/19	—	Dry	—	—
Casing Pulled	1/19	—	Dry	—	7.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS		
					DEPTH	DATA				
0.3	Rootmat and topsoil; 3 inches SANDY SILT; moist, light orangish brown, contains mica, and rock fragments	ML	496.8	C1		S-01, SPT 4+5+9 REC=9", 50%	MC = 22.5%	RESIDUUM		
						S-02, SPT 4+5+7 REC=10", 56%				
4.0	SILTY SAND, fine to coarse grained sand; moist, orangish brown	SM	493.0	C2	5	S-03, SPT 6+9+9 REC=9", 50%				
	Change: contains mica									S-04, SPT 8+12+8 REC=10", 56%
										S-05, SPT 11+16+36 REC=9.5", 53%
10.0			487.0		10					

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-43**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/19/17 **Finished:** 1/19/17
Location: See Location Plan

Ground Surface Elevation: 482± (ft) **Total Depth:** 10.0 ft

Groundwater Observations						
	Date	Time	Depth	Casing	Caved	
Encountered	1/19	—	Dry	—	—	
Completion	1/19	—	Dry	—	—	
Casing Pulled	1/19	—	Dry	—	8.0'	

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS	
					DEPTH	DATA			
0.2	Rootmat and topsoil; 2 inches		481.8			S-01, SPT 4+7+7 REC=13", 72%	LL = 70 PL = 39 MC = 28.7% % Passing #200 = 72.7	RESIDUUM	
	ELASTIC SILT WITH SAND; moist, reddish brown, contains mica, and rock fragments					S-02, SPT 4+5+4 REC=5", 28%			
	Change: light orangish brown and gray	MH		C1	5	S-03, SPT 4+3+4 REC=10", 56%			
	Change: orangish brown								S-04, SPT 5+11+14 REC=10", 56%
									S-05, SPT 11+13+21 REC=15", 83%
10.0			472.0		10				

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-44
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/19/17 **Finished:** 1/19/17
Location: See Location Plan

Ground Surface Elevation: 525± (ft) **Total Depth:** 10.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/19	—	Dry	—	—
Completion	1/19	—	Dry	—	—
Casing Pulled	1/19	—	Dry	—	8.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches FILL, sampled as sandy lean clay; moist, orangish brown, contains crushed stone, and root fragments	FILL	524.8	A		S-01, SPT 4+5+4 REC=11", 61%	MC = 24.8%	FILL
					5	S-02, SPT 6+8+12 REC=11", 61%		
						S-03, SPT 7+8+11 REC=7", 39%		
7.0	SANDY ELASTIC SILT; moist, orangish brown, contains root fragments	MH	518.0	C1		S-04, SPT 5+5+5 REC=3", 17%		RESIDUUM
10.0			515.0		10	S-05, SPT 5+6+7 REC=9.5", 53%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-45
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/19/17 **Finished:** 1/19/17
Location: See Location Plan

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/19	—	Dry	—	—
Completion	1/19	—	Dry	—	—
Casing Pulled	1/19	—	Dry	—	7.0'

Ground Surface Elevation: 516± (ft) **Total Depth:** 15.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.5	Crushed stone; 6 inches SANDY SILT; moist, pinkish brown, contains mica	ML	515.5	C1	5	S-01, SPT 5+7+6 REC=11", 61%		RESIDUUM
					5	S-02, SPT 5+9+11 REC=11", 61%		
					5	S-03, SPT 5+8+6 REC=12", 67%		
	Change: contains rock fragments				10	S-04, SPT 8+12+13 REC=9.5", 53%		
					10	S-05, SPT 6+6+7 REC=11", 61%		
15.0					501.0	15			S-06, SPT 6+12+9 REC=11", 61%

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-46
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/19	---	Dry	---	---
Completion	1/19	---	Dry	---	---
Casing Pulled	1/19	---	Dry	---	8.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/19/17 **Finished:** 1/19/17
Location: See Location Plan

Ground Surface Elevation: 515± (ft) **Total Depth:** 15.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches SANDY SILT; moist, reddish brown and gray, contains mica	ML	514.8	C1		S-01, SPT 3+8+12 REC=15", 83%		RESIDUUM
					S-02, SPT 16+12+18 REC=12", 67%			
					S-03, SPT 11+16+15 REC=11", 61%			
7.0	SILTY SAND, fine to coarse grained sand; moist, orangish brown, contains mica, and rock fragments	SM	508.0	C2		S-04, SPT 8+11+15 REC=12", 67%		
					S-05, SPT 9+12+15 REC=13", 72%			
					S-06, SPT 15+24+30 REC=14", 78%			
15.0			500.0		15			

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-47
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/16	—	Dry	—	—
Completion	1/16	—	Dry	—	—
Casing Pulled	1/16	—	Dry	—	8.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/16/17 **Finished:** 1/16/17
Location: See Location Plan

Ground Surface Elevation: 434± (ft) **Total Depth:** 9.3 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches CLAYEY SAND, fine; moist, yellowish gray, contains root fragments Change: contains gravel	SC	433.2	B2	S-01, SPT 2+4+4 REC=10", 56%			ALLUVIUM
4.0	FAT CLAY WITH SAND; moist, grayish white	CH	429.5	C1	S-02, SPT 7+7+9 REC=11", 61%			RESIDUUM LL = 51 PL = 24 MC = 18.5% % Passing #200 = 77.2
7.0	DISINTEGRATED ROCK, sampled as silty sand, fine to medium grained sand; moist, brown, contains mica, and rock fragments	DR	426.5	D	S-03, SPT 5+8+9 REC=11", 61%			
9.3			424.2		S-04, SPT 26+26+50/5" REC=10", 59%			
					S-05, SPT 17+50/3" REC=9", 100%			

Bottom of Boring at 9.3 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-48
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/16	---	Dry	---	---
Completion	1/16	---	Dry	---	---
Casing Pulled	1/16	---	Dry	---	4.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/16/17 **Finished:** 1/16/17
Location: See Location Plan

Ground Surface Elevation: 510± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches		509.7					
	CLAYEY SAND, fine to coarse grained sand; moist, grayish brown, contains gravel	SC		B2		S-01, SPT 3+3+3 REC=10", 56%		ALLUVIUM
2.0	SILTY SAND, fine to coarse grained sand; moist, gray, contains rock fragments Change: white		508.0			S-02, SPT 14+15+10 REC=12", 67%		RESIDUUM
					5	S-03, SPT 4+4+3 REC=13", 72%		
	Change: brown, contains mica	SM		C2		S-04, SPT 7+10+14 REC=14", 78%		
						S-05, SPT 5+10+22 REC=16.5", 92%		
10.0			500.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-49
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/16/17 **Finished:** 1/16/17
Location: See Location Plan

Ground Surface Elevation: 523± (ft) **Total Depth:** 10.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/16	—	Dry	—	—
Completion	1/16	—	Dry	—	—
Casing Pulled	1/16	—	Dry	—	4.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches		522.7					RESIDUUM
	SANDY SILT; moist, brown, contains root fragments	ML		C1		S-01, SPT 3+2+3 REC=7", 39%		
2.0	SILTY SAND, fine to coarse grained sand; moist, orangish brown, contains rock fragments		521.0					
	Change: contains mica	SM		C2	5	S-02, SPT 11+15+24 REC=12", 67%		
						S-03, SPT 10+11+15 REC=12", 67%		
7.0	SANDY SILT; moist, orangish white, contains mica	ML	516.0	C1		S-04, SPT 5+9+13 REC=13", 72%		
10.0			513.0		10	S-05, SPT 9+15+16 REC=16", 89%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-50**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/12	—	Dry	—	—
Completion	1/12	—	Dry	—	—
Casing Pulled	1/12	—	Dry	—	7.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/12/17 **Finished:** 1/12/17
Location: See Location Plan

Ground Surface Elevation: 438± (ft) **Total Depth:** 15.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches		437.2			S-01, SPT 3+5+6 REC=16", 89%		RESIDUUM
2.0	SILTY SAND, fine to coarse grained sand; moist, yellowish brown, contains root fragments	SM	435.5	C2		S-02, SPT 7+12+18 REC=16", 89%		
		SANDY ELASTIC SILT; moist, orangish brown, no root fragments			MH	5	S-03, SPT 13+24+23 REC=16", 89%	
9.0	SILTY SAND, fine to medium grained sand; moist, yellowish brown, contains mica	SM	428.5	C2		S-04, SPT 10+13+19 REC=14", 78%		
					10	S-05, SPT 13+16+16 REC=10.5", 58%		
15.0			422.5		15	S-06, SPT 5+13+13 REC=14", 78%		

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-51**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/13/17 **Finished:** 1/13/17
Location: See Location Plan

Ground Surface Elevation: 537± (ft) **Total Depth:** 15.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/13	—	Dry	—	—
Completion	1/13	—	Dry	—	—
Casing Pulled	1/13	—	Dry	—	7.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches ELASTIC SILT WITH SAND; moist, reddish brown, contains root fragments, and rock fragments Change: no root fragments	MH	536.3	C1		S-01, SPT 2+7+12 REC=12", 67%	MC = 28.8%	RESIDIUM Augers grinding/scraping
	Change: contains mica				S-02, SPT 5+9+12 REC=14", 78%			
			5		S-03, SPT 11+17+19 REC=14", 78%			
7.0	SANDY SILT; moist, orangish brown, contains mica	ML	529.5		S-04, SPT 8+10+12 REC=16", 89%			
				S-05, SPT 6+9+13 REC=14", 78%				
	Change: orangish brown with mottles of black		10	S-06, SPT 5+6+7 REC=12", 67%				
15.0			521.5		15			

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG -16C13175 COMBINED LOGS.GPJ_SCHNABEL_DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-52
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/18/17 **Finished:** 1/18/17
Location: See Location Plan

Ground Surface Elevation: 475± (ft) **Total Depth:** 10.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/18	---	Dry	---	---
Completion	1/18	---	Dry	---	---
Casing Pulled	1/18	---	Dry	---	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches FILL, sampled as elastic silt; moist, light brown, contains root fragments, and rock fragments Change: gray and orangish brown Change: mostly wood fragments	FILL	474.7	A		S-01, SPT 2+4+7 REC=12", 67% S-02, SPT 5+5+4 REC=12", 67% S-03, SPT 12+4+3 REC=3", 17%		FILL
7.0	SANDY SILT; moist, reddish brown	ML	468.0	C1		S-04, SPT 8+9+10 REC=10", 56% S-05, SPT 8+12+14 REC=17", 94%		RESIDUUM
10.0			465.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-53
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/18	—	Dry	—	—
Completion	1/18	—	Dry	—	—
Casing Pulled	1/18	—	Dry	—	7.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/18/17 **Finished:** 1/18/17
Location: See Location Plan

Ground Surface Elevation: 495± (ft) **Total Depth:** 9.4 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches ELASTIC SILT WITH SAND; moist, brown, contains root fragments, and rock fragments Change: reddish brown	MH	494.3	C1		S-01, SPT 3+5+6 REC=9", 50%	MC = 21.4%	RESIDUUM
4.0	SILTY SAND, fine to medium grained sand; moist, reddish brown, contains mica	SM	490.5	C2	5	S-02, SPT 8+14+15 REC=12", 67%		
7.0	DISINTEGRATED ROCK, sampled as silty sand, fine to medium grained sand; moist, pinkish brown, contains mica	DR	487.5	D		S-03, SPT 13+23+31 REC=12", 67%		
9.4						S-04, SPT 18+40+50 REC=8", 44%		
						S-05, SPT 45+50/5" REC=6", 55%		

Bottom of Boring at 9.4 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-54**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/18/17 **Finished:** 1/18/17
Location: See Location Plan

Ground Surface Elevation: 479± (ft) **Total Depth:** 9.8 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/18	---	Dry	---	---
Completion	1/18	---	Dry	---	---
Casing Pulled	1/18	---	Dry	---	5.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		478.8					RESIDUUM
	ELASTIC SILT; moist, reddish brown, contains root fragments	MH		C1		S-01, SPT 4+5+6 REC=10", 56%		
2.0	SILTY SAND, fine to medium grained sand; moist, yellowish brown, contains mica, and rock fragments	SM	477.0	C2		S-02, SPT 8+10+12 REC=10", 56%		
4.0	SANDY SILT; moist, reddish brown, contains mica, and rock fragments	ML	475.0	C1	5	S-03, SPT 6+9+13 REC=13", 72%		
						S-04, SPT 7+14+29 REC=13", 72%		
8.5	DISINTEGRATED ROCK, sampled as silty sand, fine to medium grained sand; moist, reddish brown, contains rock fragments	DR	470.5	D		S-05, SPT 12+34+50/4" REC=8", 50%		
9.8			469.2					

Bottom of Boring at 9.8 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel ENGINEERING TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-55**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/18	---	Dry	---	---
Completion	1/18	---	Dry	---	---
Casing Pulled	1/18	---	Dry	---	8.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/18/17 **Finished:** 1/18/17
Location: See Location Plan

Ground Surface Elevation: 445± (ft) **Total Depth:** 14.4 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches		444.8			S-01, SPT 3+7+10 REC=9", 50%	MC = 24.7%	RESIDUUM
	SILTY SAND, fine to coarse grained sand; moist, brown, contains root fragments, and rock fragments Change: contains mica	SM		C2		S-02, SPT 4+10+10 REC=11", 61%		
4.0	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, gray, contains mica		441.0		5	S-03, SPT 5+25+47 REC=15", 83%		
		DR		D		S-04, SPT 21+50/5" REC=8.5", 77%		
					10	S-05, SPT 36+50/3" REC=4.5", 50%		
14.4			430.6			S-06, SPT 15+50/5" REC=10", 91%		

Bottom of Boring at 14.4 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHINABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-56**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/17	—	Dry	—	—
Completion	1/17	—	Dry	—	—
Casing Pulled	1/17	—	Dry	—	6.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/17/17 **Finished:** 1/17/17
Location: See Location Plan

Ground Surface Elevation: 458± (ft) **Total Depth:** 9.7 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.4	Rootmat and topsoil		457.6			S-01, SPT 3+3+3 REC=11", 61%		RESIDUUM
2.0	SANDY LEAN CLAY; moist, brown, contains root fragments	CL	456.0			S-02, SPT 7+11+16 REC=16", 89%		
	ELASTIC SILT WITH SAND; moist, reddish brown	MH		C1	5	S-03, SPT 7+12+16 REC=13", 72%		
7.5	SANDY SILT; moist, reddish brown	ML	450.5			S-04, SPT 5+7+10 REC=18", 100%		
9.0	DISINTEGRATED ROCK, sampled as sandy silt; moist, reddish brown	DR	449.0	D		S-05, SPT 4+45+50/2" REC=10", 71%		
9.7			448.3					

Bottom of Boring at 9.7 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-57
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/17/17 **Finished:** 1/17/17
Location: See Location Plan

Ground Surface Elevation: 481± (ft) **Total Depth:** 10.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/17	—	Dry	—	—
Completion	1/17	—	Dry	—	—
Casing Pulled	1/17	—	Dry	—	5.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.4	Rootmat and topsoil		480.1			S-01, SPT 5+5+5 REC=8", 44%		RESIDUUM
2.2	CLAYEY SAND, fine to coarse grained sand; moist, brown, contains root fragments	SC	478.3	C2		S-02, SPT 6+12+18 REC=18", 100%		
	ELASTIC SILT WITH SAND; moist, reddish brown, contains mica Change: contains rock fragments	MH		C1	5	S-03, SPT 8+14+19 REC=18", 106%	MC = 31.0%	
7.5	SILTY SAND, fine to medium grained sand; moist, brown	SM	473.0	C2		S-04, SPT 9+18+19 REC=15", 83%		
10.0			470.5		10	S-05, SPT 7+17+18 REC=12", 67%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-58
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/17	—	Dry	—	—
Completion	1/17	—	Dry	—	—
Casing Pulled	1/17	—	Dry	—	9.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/17/17 **Finished:** 1/17/17
Location: See Location Plan

Ground Surface Elevation: 446± (ft) **Total Depth:** 13.1 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.4	Rootmat and topsoil		445.1			S-01, SPT 3+5+5 REC=15", 83%	LL = 28 PL = 20 MC = 15.1% % Passing #200 = 60.7	ALLUVIUM
2.0	SANDY LEAN CLAY; moist, brown, contains gravel	CL	443.5	B1		S-02, SPT 13+9+8 REC=12", 67%		
4.0	CLAYEY GRAVEL WITH SAND, fine to medium gravel; moist, light gray and light brown	GC	441.5	B2		S-03, SPT 12+23+50/5" REC=13", 76%	RESIDUUM	Augers grinding/scraping.
	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, light grayish brown				5	S-04, SPT 50/6" REC=5", 83%		
		DR		D		S-05, SPT 50/3" REC=2", 67%		
					10	S-06, SPT 50/1" REC=1", 100%		
13.1			432.4					

Bottom of Boring at 13.1 ft.
Auger refusal at 13.0 ft.
Boring terminated at auger refusal.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-59
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/17	—	Dry	—	—
Completion	1/17	—	Dry	—	—
Casing Pulled	1/17	—	Dry	—	9.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/17/17 **Finished:** 1/17/17
Location: See Location Plan

Ground Surface Elevation: 441± (ft) **Total Depth:** 13.1 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.4	Rootmat and topsoil		440.6			S-01, SPT 4+3+4 REC=7", 39%		RESIDUUM
2.0	SANDY ELASTIC SILT; moist, yellowish brown	MH	439.0	C1				
3.0	SILTY SAND, fine to coarse grained sand; moist, light grayish brown and light, contains mica	SM	438.0	C2		S-02, SPT 11+48+50/5" REC=10", 59%		
	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, light grayish brown, contains mica	DR		D	5	S-03, SPT 35+50/1" REC=6", 86%		
						S-04, SPT 50/2" REC=2", 100%		
					10	S-05, SPT 50/5" REC=5", 100%		Augers grinding/scraping.
13.1			427.9			S-06, SPT 50/1" REC=1", 100%		

Bottom of Boring at 13.1 ft.
Auger refusal at 13.0 ft.
Boring terminated at auger refusal.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-60
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/17	—	Dry	—	—
Completion	1/17	—	Dry	—	—
Casing Pulled	1/17	—	Dry	—	6.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/17/17 **Finished:** 1/17/17
Location: See Location Plan

Ground Surface Elevation: 476± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.4	Rootmat and topsoil SANDY ELASTIC SILT; moist, orangish brown, contains gravel	MH	475.1	B1	5	S-01, SPT 4+4+5 REC=10", 56%	MC = 24.6% Resistivity = 6800 Ohms-cm Redox = 442 mv Sulfides = 0 pH = 5.0	ALLUVIUM
	Change: light brown and light gray		S-02, SPT 3+5+7 REC=15", 83%					
5.0	SANDY SILT; moist, light brown and light gray	ML	470.5	C1	10	S-03, SPT 4+5+7 REC=12", 67%		RESIDUUM
			S-04, SPT 5+5+8 REC=10", 56%					
			S-05, SPT 4+4+6 REC=18", 100%					
10.0			465.5					

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-61
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/17	—	Dry	—	—
Completion	1/17	—	Dry	—	—
Casing Pulled	1/17	—	Dry	—	6.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/17/17 **Finished:** 1/17/17
Location: See Location Plan

Ground Surface Elevation: 559± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.4	Rootmat and topsoil	CL	558.6	C1	5	S-01, SPT 3+4+5 REC=12", 67%	MC = 23.9%	RESIDUUM
1.3	SANDY LEAN CLAY; moist, brown	MH	557.7			S-02, SPT 5+9+9 REC=16", 89%		
	ELASTIC SILT WITH SAND; moist, reddish brown, contains mica							
4.0	SANDY SILT; moist, light reddish brown, contains mica	ML	555.0			S-03, SPT 8+6+9 REC=12", 67%		
						S-04, SPT 5+7+10 REC=10", 56%		
				S-05, SPT 6+10+15 REC=10", 56%				
10.0			549.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-62
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/17	—	Dry	—	—
Completion	1/17	—	Dry	—	—
Casing Pulled	1/17	—	Dry	—	7.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/17/17 **Finished:** 1/17/17
Location: See Location Plan

Ground Surface Elevation: 490± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.4	Rootmat and topsoil	MH	489.1	C1	5	S-01, SPT 3+3+5 REC=5", 28%		RESIDUUM
	ELASTIC SILT WITH SAND; moist, reddish brown, contains mica		S-02, SPT 8+15+21 REC=18", 100%					
			S-03, SPT 5+14+16 REC=14", 78%					
7.0	SILTY SAND, fine to medium grained sand; moist, light reddish brown	SM	482.5	C2	10	S-04, SPT 11+14+15 REC=10", 56%		
10.0			479.5			S-05, SPT 5+15+16 REC=10", 56%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-63
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/17/17 **Finished:** 1/17/17
Location: See Location Plan

Ground Surface Elevation: 492± (ft) **Total Depth:** 10.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/17	—	Dry	—	—
Completion	1/17	—	Dry	—	—
Casing Pulled	1/17	—	Dry	—	5.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.4	Rootmat and topsoil ELASTIC SILT WITH SAND; moist, reddish brown	MH	491.1	C1		S-01, SPT 3+5+6 REC=12", 67%		RESIDUUM
						S-02, SPT 5+7+13 REC=10", 56%		
						S-03, SPT 7+16+20 REC=15", 83%		
7.5	SANDY SILT; moist, light reddish brown	ML	484.0			S-04, SPT 8+13+22 REC=18", 100%		
10.0			481.5			S-05, SPT 9+12+18 REC=12", 67%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-64
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/17	—	Dry	—	—
Completion	1/17	—	Dry	—	—
Casing Pulled	1/17	—	Dry	—	5.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/17/17 **Finished:** 1/17/17
Location: See Location Plan

Ground Surface Elevation: 496± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil		495.7			S-01, SPT 5+5+6 REC=15", 83%		FILL
	FILL, sampled as sandy lean clay; moist, brown	FILL		A				
2.0	ELASTIC SILT WITH SAND; moist, reddish brown		494.0			S-02, SPT 6+16+23 REC=15", 83%		RESIDUUM
	Change: contains rock fragments	MH		C1	5	S-03, SPT 8+13+19 REC=15", 83%	MC = 29.5%	
7.0	SILTY SAND, fine to medium grained sand; moist, light reddish brown and light brown, contains mica	SM	489.0	C2		S-04, SPT 8+24+30 REC=15", 83%		
8.5	DISINTEGRATED ROCK, sampled as silty sand, fine to medium grained sand; moist, light reddish brown and light brown, contains mica.	DR	487.5	D		S-05, SPT 9+24+44 REC=16", 89%		
10.0			486.0		10			

Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel ENGINEERING TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-65**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/17	—	Dry	—	—
Completion	1/17	—	Dry	—	—
Casing Pulled	1/17	—	Dry	—	6.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/17/17 **Finished:** 1/17/17
Location: See Location Plan

Ground Surface Elevation: 487± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil		486.2			S-01, SPT 4+5+7 REC=10", 56%		RESIDUUM
2.0	SANDY ELASTIC SILT; moist, reddish brown, contains root fragments	MH	484.5			S-02, SPT 6+9+12 REC=18", 100%		
	SANDY SILT; moist, light reddish brown, contains mica				5	S-03, SPT 6+13+13 REC=16", 89%		
		ML		C1		S-04, SPT 7+10+10 REC=10", 56%	MC = 25.0%	
	Change: contains rock fragments					S-05, SPT 3+6+7 REC=5", 28%		
10.0			476.5		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-66
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: M. White
Schnabel Representative: N. Silman
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/17/17 **Finished:** 1/17/17
Location: See Location Plan

Ground Surface Elevation: 505± (ft) **Total Depth:** 8.8 ft

Groundwater Observations						
	Date	Time	Depth	Casing	Caved	
Encountered	1/17	—	Dry	—	—	
Completion	1/17	—	Dry	—	—	
Casing Pulled	1/17	—	Dry	—	6.5'	

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil		504.7				LL = 35 PL = 22 MC = 19.9% % Passing #200 = 60.8	ALLUVIUM
	SANDY LEAN CLAY; moist, brown and gray, contains organic matter	CL		B1		S-01, SPT 3+5+4 REC=15", 83%		
3.0			502.0					
	CLAYEY SAND, fine to coarse grained sand; moist, light gray, contains gravel	SC		B2		S-02, SPT 6+11+20 REC=15", 83%		
5.0			500.0		5			
	SILTY SAND, fine to medium grained sand; moist, greenish gray, contains mica	SM		C2		S-03, SPT 7+11+15 REC=5", 28%		RESIDUUM
7.0			498.0					
	DISINTEGRATED ROCK, sampled as silty sand, fine to medium grained sand; moist, brown with streaks of black, contains mica, and rock fragments	DR		D		S-04, SPT 50/5" REC=3", 60%		
8.8			496.2					
						S-05, SPT 50/3" REC=1", 33%		

Bottom of Boring at 8.8 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-67
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered ∇	1/16	2:41 PM	7.0'	---	---
Completion	1/16	---	Dry	---	---
Casing Pulled	1/16	---	Dry	---	6.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/16/17 **Finished:** 1/16/17
Location: See Location Plan

Ground Surface Elevation: 481± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches		480.8					ALLUVIUM
2.0	CLAYEY SAND, fine to coarse grained sand; moist, orangish gray, contains root fragments	SC	479.0	B2		S-01, SPT 2+5+5 REC=12", 67%		RESIDUUM
	SILTY SAND, fine to coarse grained sand; moist, dark gray, contains mica, and rock fragments	SM		C2		S-02, SPT 12+15+8 REC=2", 11%		
	Change: orangish gray with streaks of dark brown				5	S-03, SPT 4+8+7 REC=10.5", 58%		
	Change: fine to medium grained sand; orangish brown					S-04, SPT 18+21+18 REC=8", 44%		
10.0			471.0		10	S-05, SPT 4+13+16 REC=9", 50%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-68**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia

Contractor Foreman: J. Ayers Jr.

Schnabel Representative: E. Bradshaw

Equipment: CME-45B (ATV)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)

Dates Started: 1/16/17 **Finished:** 1/16/17

Location: See Location Plan

Ground Surface Elevation: 510± (ft) **Total Depth:** 10.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/16	—	Dry	—	—
Completion	1/16	—	Dry	—	—
Casing Pulled	1/16	—	Dry	—	6.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches ELASTIC SILT WITH SAND; moist, reddish brown, contains rock fragments	MH	509.3	C1	S-01, SPT 6+6+7 REC=11", 61%		LL = 64 PL = 47 MC = 28.0% % Passing #200 = 76.2	RESIDUUM
4.0	SILTY SAND, fine to coarse grained sand; moist, orangish brown, contains rock fragments	SM	505.5	5	S-02, SPT 5+7+12 REC=15", 83%			
	Change: pinkish brown				S-03, SPT 6+8+10 REC=14", 78%			
	Change: orangish brown				S-04, SPT 8+12+18 REC=11", 61%			
10.0			499.5	10	S-05, SPT 11+14+20 REC=10", 56%			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-69
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/16	—	Dry	—	—
Completion	1/16	—	Dry	—	—
Casing Pulled	1/16	—	Dry	—	6.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/16/17 **Finished:** 1/16/17
Location: See Location Plan

Ground Surface Elevation: 506± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches SANDY ELASTIC SILT; moist, orangish brown, contains root fragments	MH	505.3	C1	5	S-01, SPT 2+3+3 REC=13", 72%		RESIDUUM
	Change: orangish gray, contains rock fragments		S-02, SPT 5+5+5 REC=13", 72%					
			S-03, SPT 4+4+5 REC=10", 56%					
7.0	SANDY SILT; moist, grayish brown, contains mica	ML	498.5			S-04, SPT 5+9+14 REC=14", 78%		
10.0			495.5			S-05, SPT 6+10+12 REC=9", 50%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-70
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/16	—	Dry	—	—
Completion	1/16	—	Dry	—	—
Casing Pulled	1/16	—	Dry	—	6.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/16/17 **Finished:** 1/16/17
Location: See Location Plan

Ground Surface Elevation: 519± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.0	no ground cover FILL, sampled as elastic silt with sand; moist, reddish brown	FILL	519.0	A		S-01, SPT 4+8+8 REC=11", 61%	MC = 32.6% Resistivity = 8300 Ohms-cm Redox = 490 mv Sulfides = 0 pH = 5.1	FILL
5.0	Change: dark gray and reddish brown, contains root fragments SANDY SILT; moist, orangish brown, contains mica	ML	514.0	C1	5	S-02, SPT 5+7+9 REC=6.5", 36% S-03, SPT 4+6+5 REC=11", 61%		RESIDUUM
						S-04, SPT 7+11+9 REC=11", 61%		
						S-05, SPT 7+13+10 REC=11", 61%		
10.0			509.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-71
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/16	—	Dry	—	—
Completion	1/16	—	Dry	—	—
Casing Pulled	1/16	—	Dry	—	8.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/16/17 **Finished:** 1/16/17
Location: See Location Plan

Ground Surface Elevation: 525± (ft) **Total Depth:** 15.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Crushed stone; 2 inches		524.8					RESIDUUM
	SANDY ELASTIC SILT; moist, orangish brown	MH		C1		S-01, SPT 7+7+9 REC=11", 61%		
2.0	SILTY SAND, fine to coarse grained sand; moist, reddish brown		523.0					
		SM		C2	5	S-02, SPT 10+21+32 REC=15", 83%		
						S-03, SPT 12+19+32 REC=10.5", 58%		
7.0	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, reddish brown, contains rock fragments, and mica		518.0					
		DR		D	10	S-04, SPT 14+26+43 REC=7", 39%		
						S-05, SPT 45+50/4" REC=6.5", 65%		
13.0	SILTY SAND, fine to coarse grained sand; moist, brownish gray, contains mica		512.0					
		SM		C2	15	S-06, SPT 13+12+22 REC=13", 72%		
15.0			510.0					

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-72
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/16/17 **Finished:** 1/16/17
Location: See Location Plan

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/16	---	Dry	---	---
Completion	1/16	---	Dry	---	---
Casing Pulled	1/16	---	Dry	---	9.5'

Ground Surface Elevation: 525± (ft) **Total Depth:** 13.9 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Topsoil; 2 inches		524.8			S-01, SPT 3+5+7 REC=15", 83%		FILL
2.0	FILL, sampled as sandy elastic silt; moist, orangish brown, contains root fragments	FILL	523.0	A		S-02, SPT 6+11+14 REC=13", 72%		RESIDUUM
	SANDY SILT; moist, orangish gray, contains mica	ML		C1	5	S-03, SPT 8+9+12 REC=14", 78%	MC = 24.3%	
7.0	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, brown, contains mica, and rock fragments Change: intermittent softer layers		518.0			S-04, SPT 23+30+41 REC=9.5", 53%		
		DR		D	10	S-05, SPT 14+24+19 REC=6.5", 36%		
13.9			511.1			S-06, SPT 50/5" REC=4", 80%		

Bottom of Boring at 13.9 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-73
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/16	—	Dry	—	—
Completion	1/16	—	Dry	—	—
Casing Pulled	1/16	—	Dry	—	4.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/16/17 **Finished:** 1/16/17
Location: See Location Plan

Ground Surface Elevation: 545± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Topsoil; 4 inches		544.7	A		S-01, SPT 5+50/2" REC=7", 88%		FILL
2.0	FILL, sampled as sandy lean clay; moist, brown and dark brown, contains root fragments, contains crushed stone	FILL	543.0			S-02, SPT 7+12+18 REC=14", 78%		RESIDUUM
	ELASTIC SILT WITH SAND; moist, red	MH		C1	5	S-03, SPT 9+15+24 REC=15", 83%		
7.0	SANDY SILT; moist, yellowish brown, contains mica	ML	538.0			S-04, SPT 17+26+23 REC=9.5", 53%		
10.0			535.0		10	S-05, SPT 11+16+15 REC=10", 56%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL_DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-74
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/12	—	Dry	—	—
Completion	1/12	—	Dry	—	—
Casing Pulled	1/12	—	Dry	—	8.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/12/17 **Finished:** 1/12/17
Location: See Location Plan

Ground Surface Elevation: 542± (ft) **Total Depth:** 15.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches SANDY LEAN CLAY; moist, brown, contains root fragments, and rock fragments Change: reddish brown	CL	541.8			S-01, SPT 2+2+3 REC=11", 61%		RESIDUUM
4.0	ELASTIC SILT WITH SAND; moist, reddish brown	MH	538.0	C1	5	S-02, SPT 6+9+11 REC=16", 89%		
7.0	DISINTEGRATED ROCK, sampled as sandy silt; moist, orangish brown, contains mica	DR	535.0	D		S-03, SPT 9+13+14 REC=16", 89%		
9.0	SANDY SILT; moist, whitish brown, contains mica	ML	533.0	C1	10	S-04, SPT 6+31+35 REC=13", 72%	MC = 26.4%	
						S-05, SPT 14+13+17 REC=11", 61%		
15.0			527.0		15	S-06, SPT 24+30+24 REC=12", 67%		

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-75
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/12/17 **Finished:** 1/12/17
Location: See Location Plan

Ground Surface Elevation: 545± (ft) **Total Depth:** 15.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/12	—	Dry	—	—
Completion	1/12	—	Dry	—	—
Casing Pulled	1/12	—	Dry	—	8.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		544.3	A		S-01, SPT 4+5+5 REC=11", 61%	LL = 53 PL = 35 MC = 31.1% % Passing #200 = 78.9	FILL
2.0	FILL, sampled as sandy lean clay; moist, reddish brown, contains root fragments	FILL	542.5			S-02, SPT 9+13+14 REC=15", 83%		RESIDUUM
	ELASTIC SILT WITH SAND; moist, reddish brown	MH		5	S-03, SPT 8+12+15 REC=14", 78%			
6.0	SILT WITH SAND; moist, reddish brown and brown	ML	538.5	C1	S-04, SPT 10+10+15 REC=14", 78%			
					10	S-05, SPT 9+11+12 REC=16", 89%		
								S-06, SPT 5+8+11 REC=15", 83%
15.0					529.5	15		

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL_DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-76
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/12	---	Dry	---	---
Completion	1/12	---	Dry	---	---
Casing Pulled	1/12	---	Dry	---	10.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/12/17 **Finished:** 1/12/17
Location: See Location Plan

Ground Surface Elevation: 545± (ft) **Total Depth:** 20.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		544.3	A		S-01, SPT 3+4+5 REC=13", 72%	MC = 39.4%	FILL
2.0	FILL, sampled as sandy lean clay; moist, orangish brown, contains root fragments	FILL	542.5			S-02, SPT 9+10+13 REC=12", 67%		RESIDUUM
4.0	ELASTIC SILT WITH SAND; contains quartz fragments	MH	540.5	C1		S-03, SPT 10+13+17 REC=12", 67%	MC = 15.1%	
6.0	SANDY SILT; moist, orangish brown	ML	538.5		5	S-04, SPT 6+13+15 REC=13", 72%		
	SILTY SAND, fine to medium grained sand; moist, orangish brown with mottles of white	SM		C2	10	S-05, SPT 8+12+14 REC=9", 50%		
					15	S-06, SPT 6+11+15 REC=11.5", 64%		
20.0	Change: contains rock fragments		524.5		20	S-07, SPT 6+10+11 REC=13", 72%		

Bottom of Boring at 20.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-77
Contract Number: 16C13175 Task 01
Sheet: 1 of 2

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/12/17 **Finished:** 1/12/17
Location: See Location Plan

Ground Surface Elevation: 544± (ft) **Total Depth:** 50.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/12	11:38 AM	44.0'	—	—
Completion	1/12	12:15 PM	42.5'	—	—
Observation Well	1/12	12:16 PM	42.5'	—	—
Observation Well	2/9	4:30 PM	23.6'	—	—
Observation Well	3/6	1:36 PM	24.0'	—	—

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		543.8	A		S-01, SPT 4+3+3 REC=14.5", 81%		FILL
2.0	FILL, sampled as lean clay with sand; moist, reddish brown, contains root fragments	FILL	542.0			S-02, SPT 4+10+12 REC=14", 78%		RESIDUUM
	ELASTIC SILT; moist, reddish brown	MH		C1	5	S-03, SPT 6+10+11 REC=14", 78%	LL = 69 PL = 45 MC = 31.1% % Passing #200 = 89.7	
6.0	SILTY SAND, fine to medium grained sand; moist, reddish brown	SM	538.0	C2		S-04, SPT 12+15+17 REC=7", 39%		
8.5	SILT WITH SAND; moist, reddish brown and brown		535.5		10	S-05, SPT 9+15+19 REC=13.5", 75%	LL = 49 PL = 36 MC = 19.3% % Passing #200 = 84.5	
		ML		C1	15	S-06, SPT 6+12+14 REC=10", 56%		
					20	S-07, SPT 10+16+19 REC=10", 56%	MC = 16.8%	
22.0	DISINTEGRATED ROCK, sampled as silt with sand; moist, light brown, contains mica	DR	522.0	D	25	S-08, SPT 12+32+40 REC=16", 89%		
27.0		SM	517.0	C2				

(continued)

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL_DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-77**
Contract Number: 16C13175 Task 01
Sheet: 2 of 2

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
30	SILTY SAND; moist, orangish brown, contains mica (continued)	SM		C2	30	S-09, SPT 7+12+16 REC=16.5", 92%	MC = 29.8%	RESIDUUM
35	Change: light brown with streaks of black, contains rock fragments				35	S-10, SPT 8+11+17 REC=15", 83%		
40	Change: orangish brown with mottles of black				40	S-11, SPT 5+11+15 REC=18", 100%		
45					45	S-12, SPT 15+19+24 REC=11", 61%		
47.0	DISINTEGRATED ROCK, sampled as silty sand; moist, reddish brown, contains rock fragments	DR	497.0	D		S-13, SPT 20+23+43 REC=17", 94%		
50.0			494.0		50			

Bottom of Boring at 50.0 ft.
Boring terminated at selected depth.
Temporary well installed upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-78**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/12/17 **Finished:** 1/12/17
Location: See Location Plan

Ground Surface Elevation: 544± (ft) **Total Depth:** 20.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/12	—	Dry	—	—
Completion	1/12	—	Dry	—	—
Casing Pulled	1/12	—	Dry	—	10.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		543.8	A		S-01, SPT 2+3+4 REC=16", 89%	LL = 80 PL = 48 MC = 36.0% % Passing #200 = 91.5	FILL
2.0	FILL, sampled as sandy lean clay; moist, orangish brown, contains root fragments ELASTIC SILT; moist, reddish brown	FILL	542.0			S-02, SPT 8+9+13 REC=15", 83%		RESIDUUM
		MH		5		S-03, SPT 6+8+12 REC=17", 94%		
6.0	SANDY SILT; moist, pinkish brown				538.0		S-04, SPT 6+11+17 REC=15", 83%	
		ML		10		S-05, SPT 9+12+14 REC=15", 83%		
	Change: light brown, contains mica						S-06, SPT 10+13+14 REC=13", 72%	MC = 19.8%
				15		S-07, SPT 13+23+32 REC=10", 56%		
20.0			524.0		20			

Bottom of Boring at 20.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL_DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-79**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/12/17 **Finished:** 1/12/17
Location: See Location Plan

Ground Surface Elevation: 542± (ft) **Total Depth:** 10.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/12	—	Dry	—	—
Completion	1/12	—	Dry	—	—
Casing Pulled	1/12	—	Dry	—	5.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		541.8					RESIDUUM
	SILTY SAND, fine to coarse grained sand; moist, brown, contains root fragments	SM		C2		S-01, SPT 2+3+2 REC=10", 56%		
2.0	ELASTIC SILT WITH SAND; moist, orangish brown	MH	540.0	C1		S-02, SPT 6+9+14 REC=14", 78%		
4.0	SILTY SAND, fine to medium grained sand; moist, yellowish brown, contains rock fragments, and mica		538.0		5	S-03, SPT 8+12+18 REC=17", 94%		
	Change: pinkish brown	SM		C2		S-04, SPT 6+11+18 REC=8", 44%		
						S-05, SPT 14+27+30 REC=12", 67%		
10.0			532.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18

Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-80
		Contract Number: 16C13175 Task 01 Sheet: 1 of 1	

Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: J. Ayers Jr. Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" I.D. Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 1/13/17 Finished: 1/13/17 Location: See Location Plan Ground Surface Elevation: 515± (ft) Total Depth: 10.0 ft	Groundwater Observations <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Date</th> <th>Time</th> <th>Depth</th> <th>Casing</th> <th>Caved</th> </tr> </thead> <tbody> <tr> <td>Encountered</td> <td>1/13</td> <td>—</td> <td>Dry</td> <td>—</td> <td>—</td> </tr> <tr> <td>Completion</td> <td>1/13</td> <td>—</td> <td>Dry</td> <td>—</td> <td>—</td> </tr> <tr> <td>Casing Pulled</td> <td>1/13</td> <td>—</td> <td>Dry</td> <td>—</td> <td>6.5'</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>		Date	Time	Depth	Casing	Caved	Encountered	1/13	—	Dry	—	—	Completion	1/13	—	Dry	—	—	Casing Pulled	1/13	—	Dry	—	6.5'																								
	Date	Time	Depth	Casing	Caved																																												
Encountered	1/13	—	Dry	—	—																																												
Completion	1/13	—	Dry	—	—																																												
Casing Pulled	1/13	—	Dry	—	6.5'																																												

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches ELASTIC SILT WITH SAND; moist, orangish brown, contains root fragments Change: contains mica	MH	514.7	C1	5	S-01, SPT 3+3+6 REC=9", 50%	LL = 51 PL = 37 MC = 27.3% % Passing #200 = 79.7	RESIDUUM
						S-02, SPT 5+8+12 REC=11", 61%		
						S-03, SPT 9+17+20 REC=12", 67%		
						S-04, SPT 6+8+11 REC=14", 78%		
8.5	SILTY SAND, fine to coarse grained sand; moist, reddish brown, contains rock fragments, and mica	SM	506.5		C2				S-05, SPT 5+9+12 REC=11", 61%
10.0	Bottom of Boring at 10.0 ft. Boring terminated at selected depth. Boring backfilled with cuttings upon completion.							

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-81**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/13/17 **Finished:** 1/13/17
Location: See Location Plan

Ground Surface Elevation: 521± (ft) **Total Depth:** 10.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/13	—	Dry	—	—
Completion	1/13	—	Dry	—	—
Casing Pulled	1/13	—	Dry	—	6.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches	SM	520.7	C2	5	S-01, SPT 2+1+3 REC=16", 89%		RESIDUUM
	SILTY SAND, fine to medium grained sand; moist, yellowish brown, contains root fragments Change: no root fragments		S-02, SPT 10+12+13 REC=10", 56%					
	Change: orangish brown, contains rock fragments		S-03, SPT 5+10+10 REC=9", 50%					
	Change: yellowish brown		S-04, SPT 4+6+8 REC=16", 89%					
	Change: reddish brown and white		S-05, SPT 3+3+6 REC=14", 78%					
10.0			511.0		10			

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT_2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-82**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/13/17 **Finished:** 1/13/17
Location: See Location Plan

Ground Surface Elevation: 533± (ft) **Total Depth:** 10.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/13	—	Dry	—	—
Completion	1/13	—	Dry	—	—
Casing Pulled	1/13	—	Dry	—	7.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches	FILL	532.3	A		S-01, SPT 3+3+5 REC=8", 44%	MC = 22.8% Resistivity = 16000 Ohms-cm Redox = 443 mv Sulfides = 0 pH = 4.1	FILL
0.8	FILL, sampled as clayey sand; moist, reddish brown, contains root fragments	CH	531.7	B1		S-02, SPT 4+4+3 REC=16", 89%		ALLUVIUM
	SANDY FAT CLAY; moist, gray with mottles of brown, contains root fragments							
	Change: wet, dark gray with mottled brown				5	S-03, SPT 1+2+2 REC=8", 44%		
7.0	SILTY SAND, fine to medium grained sand; moist, orangish white, contains rock fragments	SM	525.5	C2		S-04, SPT 2+4+6 REC=12", 67%		RESIDIUM
	Change: contains mica, no rock fragments					10		S-05, SPT 3+8+14 REC=15", 83%
10.0			522.5					

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-83
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/13/17 **Finished:** 1/13/17
Location: See Location Plan

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/13	—	Dry	—	—
Completion	1/13	—	Dry	—	—
Casing Pulled	1/13	—	Dry	—	6.5'

Ground Surface Elevation: 533± (ft) **Total Depth:** 10.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS	
					DEPTH	DATA			
0.3	Rootmat and topsoil; 3 inches		532.8	A		S-01, SPT 2+4+5 REC=12", 67%	MC = 22.6%	FILL	
2.0	FILL, sampled as silty sand, fine to coarse grained sand; moist, brown, contains root fragments, and wood fragments	FILL	531.0	C1		S-02, SPT 11+12+17 REC=12", 67%		RESIDUUM	
4.0	SANDY ELASTIC SILT; moist, reddish brown, contains mica		529.0			S-03, SPT 10+14+15 REC=15", 83%			
	SILTY SAND, fine to medium grained sand; moist, brown, contains mica				5				
	Change: purplish brown						S-04, SPT 14+22+24 REC=11", 61%		
	Change: reddish brown and dark brown						S-05, SPT 12+26+26 REC=7", 39%		
10.0			523.0		10				

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18

Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-84 Contract Number: 16C13175 Task 01 Sheet: 1 of 1
		Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: J. Ayers Jr. Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" I.D. Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 1/13/17 Finished: 1/13/17 Location: See Location Plan Ground Surface Elevation: 545± (ft) Total Depth: 10.0 ft	

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	1/13	—	Dry	—	—
Completion	1/13	—	Dry	—	—
Casing Pulled	1/13	—	Dry	—	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRA TUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches	FILL	544.3	A	X	S-01, SPT 2+3+6 REC=9", 50%	LL = 79 PL = 43 MC = 37.5% % Passing #200 = 96.2	FILL
2.0	FILL, sampled as sandy elastic silt; moist, reddish brown, contains root fragments, and crushed stone	MH	542.5	C1	X	S-02, SPT 5+6+10 REC=13", 72%		RESIDUUM
	ELASTIC SILT; moist, reddish brown, contains root fragments Change: contains rock fragments	MH			X	S-03, SPT 5+10+13 REC=13", 72%		
7.0	SANDY SILT; moist, reddish brown, contains rock fragments	ML	537.5		X	S-04, SPT 10+12+8 REC=8", 44%		
10.0			534.5		X	S-05, SPT 4+8+11 REC=14", 78%		

Bottom of Boring at 10.0 ft.
 Boring terminated at selected depth.
 Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18

Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-85 Contract Number: 16C13175 Task 01 Sheet: 1 of 1
		Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: J. Ayers Jr. Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" I.D. Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 1/13/17 Finished: 1/13/17 Location: See Location Plan Ground Surface Elevation: 531± (ft) Total Depth: 10.0 ft	

	Groundwater Observations				
	Date	Time	Depth	Casing	Caved
Encountered	1/13	—	Dry	—	—
Completion	1/13	—	Dry	—	—
Casing Pulled	1/13	—	Dry	—	9.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches ELASTIC SILT WITH SAND; moist, reddish brown, contains rock fragments	MH	530.3	C1	5	S-01, SPT 4+8+7 REC=16", 89%		RESIDUUM
4.0	SANDY SILT; moist, reddish brown, contains mica		526.5			S-02, SPT 9+15+20 REC=17", 94%		
7.0	SILTY SAND, fine to medium grained sand; moist, brown, contains rock fragments, and mica	523.5	S-03, SPT 9+10+16 REC=15", 83%					
10.0		SM	520.5	C2	10	S-04, SPT 7+9+14 REC=14", 78%		
						S-05, SPT 5+10+11 REC=7", 39%		

Bottom of Boring at 10.0 ft.
 Boring terminated at selected depth.
 Boring backfilled with cuttings upon completion.

TEST BORING.LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18

Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-86
		Contract Number: 16C13175 Task 01 Sheet: 1 of 1	

Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: J. Ayers Jr. Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" I.D. Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 1/13/17 Finished: 1/13/17 Location: See Location Plan Ground Surface Elevation: 519± (ft) Total Depth: 15.0 ft	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="6" style="text-align: center;">Groundwater Observations</th> </tr> <tr> <th></th> <th>Date</th> <th>Time</th> <th>Depth</th> <th>Casing</th> <th>Caved</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Encountered</td> <td style="text-align: center;">1/13</td> <td style="text-align: center;">—</td> <td style="text-align: center;">Dry</td> <td style="text-align: center;">—</td> <td style="text-align: center;">—</td> </tr> <tr> <td style="text-align: center;">Completion</td> <td style="text-align: center;">1/13</td> <td style="text-align: center;">—</td> <td style="text-align: center;">Dry</td> <td style="text-align: center;">—</td> <td style="text-align: center;">—</td> </tr> <tr> <td style="text-align: center;">Casing Pulled</td> <td style="text-align: center;">1/13</td> <td style="text-align: center;">—</td> <td style="text-align: center;">Dry</td> <td style="text-align: center;">—</td> <td style="text-align: center;">9.5'</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	Groundwater Observations							Date	Time	Depth	Casing	Caved	Encountered	1/13	—	Dry	—	—	Completion	1/13	—	Dry	—	—	Casing Pulled	1/13	—	Dry	—	9.5'																								
Groundwater Observations																																																							
	Date	Time	Depth	Casing	Caved																																																		
Encountered	1/13	—	Dry	—	—																																																		
Completion	1/13	—	Dry	—	—																																																		
Casing Pulled	1/13	—	Dry	—	9.5'																																																		

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches	FILL	518.3	A	5	S-01, SPT 6+6+5 REC=11", 61%		FILL
2.0	FILL, sampled as silty sand, fine to medium grained sand; moist, dark brown, contains crushed stone	CL	516.5	C1	5	S-02, SPT 4+6+9 REC=9", 50%		RESIDUUM
	SANDY LEAN CLAY; moist, light brown, contains root fragments	CL		C1	5	S-04, SPT 4+4+7 REC=15", 83%		
7.0	SILTY SAND, fine to medium grained sand; moist, reddish brown	SM	511.5	C2	10	S-03, SPT 4+4+7 REC=15", 83%		
		SM		C2	10	S-05, SPT 4+4+5 REC=16", 89%		
15.0	Change: contains mica	SM	503.5		15	S-06, SPT 6+9+11 REC=16", 89%		

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT_2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-87**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	1/13	---	Dry	---	---
Completion	1/13	---	Dry	---	---
Casing Pulled	1/13	---	Dry	---	9.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 1/13/17 **Finished:** 1/13/17
Location: See Location Plan

Ground Surface Elevation: 518± (ft) **Total Depth:** 15.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches		517.8	A		S-01, SPT 7+2+3 REC=11", 61%	FILL	
0.7	Crushed stone; 6 inches	FILL	517.3					
2.0	FILL, sampled as silty sand, fine to coarse grained sand; moist, light brown, contains root fragments, crushed stone, and asphalt fragments	MH	516.0	C1		S-02, SPT 6+6+9 REC=9", 50%	RESIDUUM	
4.0	SANDY ELASTIC SILT; moist, yellowish brown, contains rock fragments	ML	514.0		5	S-03, SPT 10+12+13 REC=15", 83%		
7.0	SANDY SILT; moist, orangish brown, contains mica		511.0	C2		S-04, SPT 6+8+11 REC=17", 94%	MC = 30.3%	
	SILTY SAND, fine to medium grained sand; moist, yellowish brown, contains mica	SM			10	S-05, SPT 5+7+9 REC=15", 83%		
15.0	Change: yellowish brown and white		503.0			S-06, SPT 4+5+6 REC=15", 83%		

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-88
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	3/6	8:56 AM	14.8'	—	—
Completion	3/6	8:56 AM	14.8'	—	—
Casing Pulled	3/6	—	Dry	—	5.0'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 3/6/17 **Finished:** 3/6/17
Location: See Location Plan

Ground Surface Elevation: 508± (ft) **Total Depth:** 15.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS	
					DEPTH	DATA			
0.3	Rootmat and topsoil; 4 inches		507.7			S-01, SPT 2+5+4 REC=7", 39%		RESIDUUM	
2.0	SILTY SAND, fine to medium grained sand; moist, brown, contains root fragments	SM	506.0	C2		S-02, SPT 5+5+8 REC=11", 61%	LL = 82 PL = 37 MC = 26.3% % Passing #200 = 67.6		
4.0	SANDY ELASTIC SILT; moist, orangish brown, contains root fragments, and rock fragments	MH	504.0		5	S-03, SPT 5+6+9 REC=13", 72%			
	SANDY SILT; moist, light gray					S-04, SPT 5+4+8 REC=11", 61%			MC = 25.0%
	Change: orangish brown					S-05, SPT 6+11+12 REC=13", 72%			
		ML		C1	10				
15.0			493.0		15	S-06, SPT 5+8+8 REC=15", 83%			

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG_16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT_2/9/18

Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-89
		Contract Number: 16C13175 Task 01 Sheet: 1 of 1	

Contractor: Ayers & Ayers, Inc. Powhatan, Virginia Contractor Foreman: J. Ayers Jr. Schnabel Representative: E. Bradshaw Equipment: CME-45B (ATV) Method: 2-1/4" I.D. Hollow Stem Auger Hammer Type: Safety Hammer (140 lb) Dates Started: 3/6/17 Finished: 3/6/17 Location: See Location Plan Ground Surface Elevation: 507± (ft) Total Depth: 25.0 ft	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="6" style="text-align: center;">Groundwater Observations</th> </tr> <tr> <th></th> <th style="text-align: center;">Date</th> <th style="text-align: center;">Time</th> <th style="text-align: center;">Depth</th> <th style="text-align: center;">Casing</th> <th style="text-align: center;">Caved</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Encountered</td> <td style="text-align: center;">3/6</td> <td style="text-align: center;">10:22 AM</td> <td style="text-align: center;">19.0'</td> <td style="text-align: center;">—</td> <td style="text-align: center;">—</td> </tr> <tr> <td style="text-align: center;">Completion</td> <td style="text-align: center;">3/6</td> <td style="text-align: center;">10:22 AM</td> <td style="text-align: center;">10.0'</td> <td style="text-align: center;">—</td> <td style="text-align: center;">—</td> </tr> <tr> <td style="text-align: center;">Observation Well</td> <td style="text-align: center;">3/6</td> <td style="text-align: center;">10:22 AM</td> <td style="text-align: center;">8.0'</td> <td style="text-align: center;">26.5'</td> <td style="text-align: center;">—</td> </tr> <tr> <td style="text-align: center;">Observation Well</td> <td style="text-align: center;">3/6</td> <td style="text-align: center;">2:18 PM</td> <td style="text-align: center;">4.8'</td> <td style="text-align: center;">26.5'</td> <td style="text-align: center;">—</td> </tr> <tr> <td style="text-align: center;">Observation Well</td> <td style="text-align: center;">3/20</td> <td style="text-align: center;">3:30 PM</td> <td style="text-align: center;">3.9'</td> <td style="text-align: center;">26.5'</td> <td style="text-align: center;">—</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Groundwater Observations							Date	Time	Depth	Casing	Caved	Encountered	3/6	10:22 AM	19.0'	—	—	Completion	3/6	10:22 AM	10.0'	—	—	Observation Well	3/6	10:22 AM	8.0'	26.5'	—	Observation Well	3/6	2:18 PM	4.8'	26.5'	—	Observation Well	3/20	3:30 PM	3.9'	26.5'	—												
Groundwater Observations																																																							
	Date	Time	Depth	Casing	Caved																																																		
Encountered	3/6	10:22 AM	19.0'	—	—																																																		
Completion	3/6	10:22 AM	10.0'	—	—																																																		
Observation Well	3/6	10:22 AM	8.0'	26.5'	—																																																		
Observation Well	3/6	2:18 PM	4.8'	26.5'	—																																																		
Observation Well	3/20	3:30 PM	3.9'	26.5'	—																																																		

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRA TUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 4 inches		506.7			S-01, SPT 2+4+3 REC=12", 67%		RESIDUUM
2.0	SILTY SAND, fine to medium grained sand; moist, brown, contains root fragments	SM	505.0	C2		S-02, SPT 4+4+5 REC=12", 67%	MC = 25.9%	
	ELASTIC SILT WITH SAND; moist, orangish brown, contains root fragments	MH			5	S-03, SPT 3+3+5 REC=12", 67%	LL = 60 PL = 34 MC = 33.6% % Passing #200 = 78.4	
7.0	SILT WITH SAND; moist, orangish brown, contains mica		500.0			S-04, SPT 8+14+13 REC=12", 67%		
				C1	10	S-05, SPT 10+9+9 REC=10", 56%		
	Change: orangish brown and dark brown				15	S-06, SPT 4+6+8 REC=16.5", 92%	LL = 49 PL = 44 MC = 38.0% % Passing #200 = 70.2	
18.0	SILTY SAND, fine to medium grained sand; moist, orangish brown, contains mica		489.0			S-07, SPT 5+10+13 REC=15", 83%	MC = 27.7%	
		SM		C2	20			
					25	S-08, SPT 7+12+15 REC=10", 56%	MC = 24.7%	
25.0	Bottom of Boring at 25.0 ft. Boring terminated at selected depth. Observation well installed upon completion.							

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-90**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 3/6/17 **Finished:** 3/6/17
Location: See Location Plan

Ground Surface Elevation: 506± (ft) **Total Depth:** 15.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered ∇	3/6	9:23 AM	14.5'	—	—
Completion	3/6	—	Dry	—	—
Casing Pulled	3/6	—	Dry	—	4.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches		505.8	A		S-01, SPT 2+2+2 REC=13", 72%		FILL
2.0	FILL, sampled as silty sand, fine to medium grained sand; moist, grayish brown, contains root fragments, and glass fragments	FILL	504.0	C1	5	S-02, SPT 1+1+2 REC=10", 56%	LL = 42 PL = 31 MC = 30.4% % Passing #200 = 70.4	RESIDUUM
	SILT WITH SAND; moist, yellowish brown, contains root fragments, rock fragments, and mica	ML				S-03, SPT 2+4+5 REC=9", 50%		
7.0	SILTY SAND, fine to medium grained sand; moist, gray and orangish brown		499.0	C2	10	S-04, SPT 1+2+3 REC=13", 72%		
	Change: orangish brown and dark brown	SM				S-05, SPT 4+8+8 REC=14", 78%		
	Change: contains mica					S-06, SPT 3+5+7 REC=13", 72%		
15.0			491.0		15			

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-91
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 3/6/17 **Finished:** 3/6/17
Location: See Location Plan

Ground Surface Elevation: 514± (ft) **Total Depth:** 25.0 ft

Groundwater Observations						
	Date	Time	Depth	Casing	Caved	
Encountered	3/6	11:14 AM	22.0'	—	—	
Completion	3/6	11:14 AM	19.5'	—	—	
Casing Pulled	3/6	—	Dry	—	14.0'	

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.3	Rootmat and topsoil; 3 inches SILTY SAND, fine to medium grained sand; moist, brown, contains root fragments Change: gray, contains rock fragments	SM	513.3	C2		S-01, SPT 2+2+4 REC=15", 83%	MC = 20.6%	RESIDUUM
					5	S-02, SPT 3+7+7 REC=15", 83%		
						S-03, SPT 9+15+18 REC=15", 83%		
7.0	SANDY ELASTIC SILT; moist, gray and orangish brown	MH	506.5	C1		S-04, SPT 5+8+10 REC=14", 78%	MC = 23.4%	
					10	S-05, SPT 4+6+6 REC=14.5", 81%		
13.0	SILT WITH SAND; moist, purplish brown and black, contains mica	ML	500.5			S-06, SPT 6+6+7 REC=13", 72%		
						S-07, SPT 6+15+13 REC=11", 61%		
25.0			488.5			S-08, SPT 6+11+10 REC=15", 83%		

Bottom of Boring at 25.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG - 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-92
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: E. Bradshaw
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 3/6/17 **Finished:** 3/6/17
Location: See Location Plan

Ground Surface Elevation: 506± (ft) **Total Depth:** 15.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	3/6	—	Dry	—	—
Completion	3/6	—	Dry	—	—
Casing Pulled	3/6	—	Dry	—	2.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.2	Rootmat and topsoil; 2 inches FILL, sampled as sandy lean clay; moist, orangish brown, contains root fragments Change: dark gray, contains wood fragments	FILL	505.3	A		S-01, SPT 2+3+4 REC=7", 39%		FILL
4.0	SILTY SAND, fine to coarse grained sand; moist, gray Change: orangish brown, contains rock fragments Change: orangish brown and black	SM	501.5	C2	5	S-02, SPT 1+1+5 REC=10", 56%		RESIDUUM
						S-03, SPT 15+25+24 REC=10", 56%		
						S-04, SPT 7+12+12 REC=12", 67%		
					10	S-05, SPT 8+9+12 REC=13", 72%		
15.0			490.5		15	S-06, SPT 5+7+10 REC=14", 78%		

Bottom of Boring at 15.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-93
Contract Number: 16C13175 Task 01
Sheet: 1 of 2

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: B. Watson
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 9/20/17 **Finished:** 9/20/17
Location: See Location Plan


Ground Surface Elevation: 544± (ft) **Total Depth:** 50.0 ft

Groundwater Observations					
	Date	Time	Depth	Casing	Caved
Encountered	9/20	11:25 AM	44.0'	—	—
Completion	9/20	11:30 AM	42.5'	—	—
Casing Pulled	9/20	—	Dry	—	8.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS	
					DEPTH	DATA			
0.5	Rootmat and topsoil; 6 inches ELASTIC SILT WITH SAND; moist, reddish brown, contains rock fragments	MH	543.5	C1		S-01, SPT 5+11+12 REC=7", 39%	LL = 83 PL = 46 MC = 31.1% % Passing #200 = 89.4 MC = 13.8% MC = 17.3%	RESIDUUM	
									S-02, SPT 8+13+19 REC=14", 78%
				5		S-03, SPT 9+12+19 REC=15", 83%			
7.0	SANDY SILT; moist, reddish brown, contains mica	ML	537.0			S-04, SPT 11+18+27 REC=13", 72%			
					10				S-05, SPT 12+15+21 REC=14", 78%
					15				S-06, SPT 9+15+23 REC=15", 83%
	Change: contains rock fragments, and mica				20				S-07, SPT 9+17+20 REC=14", 78%
					25				S-08, SPT 7+11+19 REC=17", 94%
	Change: contains mica								

TEST BORING LOG - 16C13175 COMBINED LOGS.GPJ_SCHNABEL DATA TEMPLATE 2008_07_06.GDT_2/9/18

(continued)

 Schnabel ENGINEERING	TEST BORING LOG	Project: Zion Crossroads Water and Sewer System Route 250 and Route 15 Fluvanna County, Virginia	Boring Number: B-93 Contract Number: 16C13175 Task 01 Sheet: 2 of 2
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DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
	SANDY SILT; moist, reddish brown, contains mica <i>(continued)</i> Change: light brown	ML		C1	30	S-09, SPT 18+22+31 REC=14", 78%		RESIDUUM
	Change: reddish brown				35	S-10, SPT 19+22+27 REC=13", 72%		
37.0	DISINTEGRATED ROCK, sampled as sandy silt; moist, brown with mottled gray, contains mica	DR	507.0	D	40	S-11, SPT 16+27+49 REC=13", 72%	MC = 15.1%	
42.0	SANDY SILT; moist, brown with mottled gray, contains mica	ML	502.0	C1	45	S-12, SPT 11+17+23 REC=16", 89%		
50.0	Change: light brown with mottled black	ML	494.0	C1	50	S-13, SPT 6+9+12 REC=18", 100%	MC = 45.6%	
Bottom of Boring at 50.0 ft. Boring terminated at selected depth. Boring backfilled with cuttings upon completion.								

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-94
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: B. Watson
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	9/20	—	Dry	—	—
Completion	9/20	—	Dry	—	—
Casing Pulled	9/20	—	Dry	—	12.5'

Hammer Type: Safety Hammer (140 lb)
Dates Started: 9/20/17 **Finished:** 9/20/17
Location: See Location Plan

Ground Surface Elevation: 544± (ft) **Total Depth:** 20.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.6	Rootmat and topsoil; 7 inches ELASTIC SILT WITH SAND; moist, reddish brown	MH	543.4			S-01, SPT 3+6+9 REC=10", 56%	LL = 103 PL = 60 MC = 31.1% % Passing #200 = 82.5	RESIDUUM
4.0	SANDY SILT; moist, reddish brown		540.0		5	S-02, SPT 10+17+21 REC=13", 72%		
						S-03, SPT 9+18+21 REC=13", 72%		
						S-04, SPT 9+11+14 REC=14", 78%		
				C1	10	S-05, SPT 10+11+14 REC=11", 61%		
		ML			15	S-06, SPT 11+14+16 REC=10", 56%		
						S-07, SPT 6+12+19 REC=13", 72%		
20.0	Change: contains mica		524.0		20			

Bottom of Boring at 20.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



TEST BORING LOG

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: **B-95**
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: B. Watson
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 9/20/17 **Finished:** 9/20/17
Location: See Location Plan

Ground Surface Elevation: 543± (ft) **Total Depth:** 10.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	9/20	---	Dry	---	---
Completion	9/20	---	Dry	---	---
Casing Pulled	9/20	---	Dry	---	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DATA		TESTS	REMARKS
					DEPTH	DATA		
0.5	Rootmat and topsoil; 6 inches ELASTIC SILT WITH SAND; moist, reddish brown	MH	542.5	C1		S-01, SPT 3+6+11 REC=8", 44%	LL = 97 PL = 65 MC = 35.4% % Passing #200 = 93.0 MC = 30.1%	RESIDUUM
						S-02, SPT 9+15+18 REC=9", 50%		
						S-03, SPT 7+9+11 REC=14", 78%		
7.0	SANDY SILT; moist, reddish brown with gray	ML	536.0			S-04, SPT 11+12+15 REC=13", 72%		
10.0	Change: reddish brown		533.0			S-05, SPT 9+16+18 REC=12", 67%		

Bottom of Boring at 10.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18



Schnabel TEST BORING LOG
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, Virginia

Boring Number: B-96
Contract Number: 16C13175 Task 01
Sheet: 1 of 1

Contractor: Ayers & Ayers, Inc.
Powhatan, Virginia
Contractor Foreman: J. Ayers Jr.
Schnabel Representative: B. Watson
Equipment: CME-45B (ATV)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Safety Hammer (140 lb)
Dates Started: 9/20/17 **Finished:** 9/20/17
Location: See Location Plan

Ground Surface Elevation: 544± (ft) **Total Depth:** 20.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	9/20	—	Dry	—	—
Completion	9/20	—	Dry	—	—
Casing Pulled	9/20	—	Dry	—	12.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING		TESTS	REMARKS	
					DEPTH	DATA			
0.5	Rootmat and topsoil; 6 inches ELASTIC SILT WITH SAND; moist, reddish brown	MH	543.5	C1		S-01, SPT 10+12+15 REC=9", 50%		RESIDUUM	
						5			S-02, SPT 10+17+22 REC=13", 72%
									S-03, SPT 9+18+20 REC=14", 78%
7.0	SANDY SILT; moist, reddish brown, contains mica	ML	537.0			S-04, SPT 10+12+17 REC=16", 89%			
					10	S-05, SPT 10+14+19 REC=15", 83%			
						S-06, SPT 6+13+15 REC=13", 72%			
					15	S-07, SPT 11+16+20 REC=13", 72%			
20.0			524.0		20				

Bottom of Boring at 20.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

TEST BORING LOG 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/9/18

APPENDIX B

SOIL LABORATORY TEST DATA

Summary of Laboratory Tests
Summary of Corrosion Tests
Atterberg Limits
Gradation Curves
Moisture Density Relationships

Summary Of Laboratory Tests

Appendix B
Sheet 1 of 5
Project Number: 16C13175 Task 01

Boring No.	Sample Depth ft		Sample Type	Description of Soil Specimen	Testing Laboratory	Stratum	Natural Moisture (%)	Liquid Limit	Plastic Limit	Plasticity Index	% Retained No. 4 Sieve	% Passing No. 40 Sieve	% Passing No. 200 Sieve	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	CBR Dry Density At Compaction (pcf)	CBR Moisture Content (%)	CBR Percent Swell	CBR Value
	Elevation ft																		
B-05	7.0 - 8.5		Jar	SANDY LEAN CLAY (CL), light brown and gray	RICH	C1	12.2	40	25	15	0.0	87.0	65.4	-	-	-	-	-	-
	429.0 - 427.5																		
B-08	4.0 - 5.5		Jar	FAT CLAY (CH), orangish brown and gray	RICH	C1	28.2	67	26	41	3.4	93.3	86.8	-	-	-	-	-	-
	442.5 - 441.0																		
B-10	4.0 - 5.5		Jar	FAT CLAY (CH), trace sand, orangish brown and gray	RICH	C1	35.7	71	33	38	2.2	94.5	86.4	-	-	-	-	-	-
	442.5 - 441.0																		
B-11	2.0 - 3.5		Jar	FAT CLAY WITH SAND (CH), contains rock fragments, orangish brown and gray	RICH	C1	29.3	51	23	28	4.1	85.9	71.2	-	-	-	-	-	-
	443.5 - 442.0																		
B-11	9.0 - 10.5		Jar	SILTY SAND WITH GRAVEL (SM), fine to coarse grained sand, contains rock fragments, light brown and gray	RICH	C2	20.5	54	32	22	18.7	61.8	43.0	-	-	-	-	-	-
	436.5 - 435.0																		
B-12	1.0 - 5.0		Bulk	LEAN CLAY WITH SAND (CL, A-7-6), light brown	RICH	C1	24.9	41	23	18	2.2	89.3	75.5	111.1	15.6	111.9	15.8	1.9	5.0
	446.0 - 442.0																		
B-14	2.0 - 3.5		Jar	ELASTIC SILT (MH), reddish brown	RICH	C1	32.9	84	50	34	0.0	98.8	95.5	-	-	-	-	-	-
	458.0 - 456.5																		

Notes: 1. Soil tests in general accordance with ASTM standards.
2. Soil classifications are in general accordance with ASTM D2487 (as applicable), based on testing indicated and visual classification.
3. Key to abbreviations: NP=Non-Plastic; -- indicates no test performed



Schnabel
ENGINEERING

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, VA

Summary Of Laboratory Tests

Appendix B
Sheet 2 of 5
Project Number: 16C13175 Task 01

Boring No.	Sample Depth ft		Sample Type	Description of Soil Specimen	Testing Laboratory	Stratum	Natural Moisture (%)	Liquid Limit	Plastic Limit	Plasticity Index	% Retained No. 4 Sieve	% Passing No. 40 Sieve	% Passing No. 200 Sieve	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	CBR Dry Density (pcf)	CBR Moisture Content (%)	CBR Percent Swell	CBR Value
	Elevation ft																		
B-18	2.0 - 3.5		Jar	SANDY LEAN CLAY WITH GRAVEL (CL), contains rock fragments, brown	RICH	C1	21.5	38	23	15	15.2	70.8	61.5	-	-	-	-	-	-
	453.5 - 452.0																		
B-23	7.0 - 8.5		Jar	POORLY GRADED SAND WITH SILT (SP-SM), fine to coarse grained sand, reddish brown	RICH	C2	10.5	NP	NP	NP	17.5	17.2	8.1	-	-	-	-	-	-
	436.0 - 434.5																		
B-27	4.0 - 5.5		Jar	ELASTIC SILT(MH), reddish brown	RICH	C1	28.3	63	39	24	0.0	97.0	87.6	-	-	-	-	-	-
	480.0 - 478.5																		
B-28	2.0 - 3.5		Jar	SILTY SAND WITH GRAVEL (SM), fine to coarse grained sand, contains rock fragments, reddish brown	RICH	C2	24.0	66	39	27	24.5	48.2	42.6	-	-	-	-	-	-
	475.0 - 473.5																		
B-39	2.0 - 3.5		Jar	SANDY ELASTIC SILT (MH), contains rock fragments, light brown	RICH	C1	16.8	67	34	33	6.7	80.2	63.9	-	-	-	-	-	-
	473.0 - 471.5																		
B-43	2.0 - 3.5		Jar	ELASTIC SILT WITH SAND (MH), contains rock fragments, reddish brown	RICH	C1	28.7	70	39	31	11.3	81.7	72.7	-	-	-	-	-	-
	480.0 - 478.5																		
B-47	4.0 - 5.5		Jar	FAT CLAY WITH SAND (CH), light gray and brown	RICH	C1	18.5	51	24	27	0.0	95.7	77.2	-	-	-	-	-	-
	429.5 - 428.0																		

Notes:
 1. Soil tests in general accordance with ASTM standards.
 2. Soil classifications are in general accordance with ASTM D2487(as applicable), based on testing indicated and visual classification.
 3. Key to abbreviations: NP=Non-Plastic; - indicates no test performed



Project: Zion Crossroads Water and Sewer System
 Route 250 and Route 15
 Fluvanna County, VA

Summary Of Laboratory Tests

Appendix B
Sheet 3 of 5
Project Number: 16C13175 Task 01

Boring No.	Sample Depth		Sample Type	Description of Soil Specimen	Testing Laboratory	Stratum	Natural Moisture (%)	Liquid Limit	Plastic Limit	Plasticity Index	% Retained No. 4 Sieve	% Passing No. 40 Sieve	% Passing No. 200 Sieve	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	CBR Dry Density At Compaction (pcf)	CBR Moisture Content (%)	CBR Percent Swell	CBR Value
	ft	Elevation ft																	
B-58	0.0 - 1.5		Jar	SANDY LEAN CLAY (CL), contains gravel, brown	RICH	B1	15.1	28	20	8	7.9	78.3	60.7	-	-	-	-	-	-
	445.5 - 444.0																		
B-66	0.0 - 1.5		Jar	SANDY LEAN CLAY (CL), contains gravel, brown and gray	RICH	B1	19.9	35	22	13	13.9	75.2	60.8	-	-	-	-	-	-
	505.0 - 503.5																		
B-68	4.0 - 5.5		Jar	ELASTIC SILT WITH SAND (MH), contains mica and rock fragments, reddish brown	RICH	C1	28.0	64	47	17	10.2	82.9	76.2	-	-	-	-	-	-
	505.5 - 504.0																		
B-75	2.0 - 5.5		Bulk	ELASTIC SILT WITH SAND (MH, A-7-5), contains rock fragments, reddish brown	RICH	C1	31.1	53	35	18	1.9	91.5	78.9	102.1	19.7	101.3	20.4	3.8	3.4
	542.5 - 539.0																		
B-77	4.0 - 5.5		Jar	ELASTIC SILT (MH), reddish brown	CVL	C1	31.1	69	45	24	0.0	97.8	89.7	-	-	-	-	-	-
	540.0 - 538.5																		
B-77	9.0 - 10.5		Jar	SILT WITH SAND (ML), reddish brown	CVL	C1	19.3	49	36	13	0.0	97.9	84.5	-	-	-	-	-	-
	535.0 - 533.5																		
B-78	2.0 - 3.5		Jar	ELASTIC SILT (MH), reddish brown	CVL	C1	36.0	80	48	32	-	98.0	91.5	-	-	-	-	-	-
	542.0 - 540.5																		

Notes:
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Project: Zion Crossroads Water and Sewer System
 Route 250 and Route 15
 Fluvanna County, VA

Summary Of Laboratory Tests

Appendix B
Sheet 4 of 5
Project Number: 16C13175 Task 01

Boring No.	Sample Depth		Sample Type	Description of Soil Specimen	Testing Laboratory	Stratum	Natural Moisture (%)	Liquid Limit	Plastic Limit	Plasticity Index	% Retained No. 4 Sieve	% Passing No. 40 Sieve	% Passing No. 200 Sieve	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	CBR Dry Density At Compaction (pcf)	CBR Moisture Content (%)	CBR Percent Swell	CBR Value
	ft	Elevation ft																	
B-80	7.0 - 5.0		Jar	ELASTIC SILT WITH SAND (MH), contains mica and rock fragments, red, brown and gray	RICH	C1	27.3	51	37	14	0.5	90.8	79.7	-	-	-	-	-	-
	508.0 - 510.0																		
B-84	2.0 - 3.5		Jar	ELASTIC SILT (MH), reddish brown	RICH	C1	37.5	79	43	36	0.0	99.1	96.2	-	-	-	-	-	-
	542.5 - 541.0																		
B-88	2.0 - 3.5		Jar	SANDY ELASTIC SILT (MH), contains rock fragments, light orangish brown	RICH	C1	26.3	82	37	45	3.1	86.7	67.6	-	-	-	-	-	-
	506.0 - 504.5																		
B-89	4.0 - 5.5		Jar	ELASTIC SILT WITH SAND (MH), light gray and brown	RICH	C1	33.6	60	34	26	0.0	91.9	78.4	-	-	-	-	-	-
	503.0 - 501.5																		
B-89	14.0 - 15.5		Jar	SILT WITH SAND (ML), brown	RICH	C1	38.0	49	44	5	0.0	87.4	70.2	-	-	-	-	-	-
	493.0 - 491.5																		
B-90	4.0 - 9.0		Bulk	SILT WITH SAND (ML), A-5), contains mica, light brown	RICH	C1	30.4	42	31	11	1.4	89.1	70.4	106.5	16.4	107.6	15.9	6.0	1.1
	502.0 - 497.0																		
B-93	4.0 - 5.5		Jar	ELASTIC SILT (MH), reddish brown	RICH	C1	31.1	83	46	37	0.0	96.3	89.4	-	-	-	-	-	-
	540.0 - 538.5																		

Notes:
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Project: Zion Crossroads Water and Sewer System
 Route 250 and Route 15
 Fluvanna County, VA

Summary Of Laboratory Tests

Appendix B
Sheet 5 of 5
Project Number: 16C13175 Task 01

Boring No.	Sample Depth		Sample Type	Description of Soil Specimen	Testing Laboratory	Stratum	Natural Moisture (%)	Liquid Limit	Plastic Limit	Plasticity Index	% Retained No. 4 Sieve	% Passing No. 40 Sieve	% Passing No. 200 Sieve	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	CBR Dry Density At Compaction (pcf)	CBR Moisture Content (%)	CBR Percent Swell	CBR Value
	ft	Elevation ft																	
B-94	2.0 - 3.5		Jar	ELASTIC SILT WITH SAND (MH), contains fragments, reddish brown	RICH	C1	31.1	103	60	43	4.8	89.0	82.5	-	-	-	-	-	-
	542.0 - 540.5																		
B-95	2.0 - 3.5		Jar	ELASTIC SILT (MH), reddish brown	RICH	C1	35.4	97	65	32	0.0	97.9	93.0	-	-	-	-	-	-
	541.0 - 539.5																		

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Project: Zion Crossroads Water and Sewer System
 Route 250 and Route 15
 Fluvanna County, VA

Summary Of Laboratory Tests

Boring No.	Sample Depth ft		Sample Type	Description of Soil Specimen	Testing Laboratory	Stratum	Natural Moisture (%)	pH	Resistivity (ohm-cm)	Oxidation Reduction Potential (mv)	Sulfides
	Elevation ft										
B-02	2.0 - 5.0		Jar	LEAN CLAY WITH SAND (CL), light brown (Visual)	RICH	C1	23.7	5.9	1000	385	0
	413.0 - 410.0										
B-09	2.0 - 5.5		Jar	ELASTIC SILT WITH SAND (MH), reddish brown (Visual)	RICH	C1	35.7	4.13	5100	448	0
	444.5 - 441.0										
B-21	2.0 - 5.5		Jar	SANDY ELASTIC SILT (MH), reddish brown (Visual)	NN	C1	30.5	4.0	4800	435	0
	459.0 - 455.5										
B-35	4.0 - 7.5		Jar	SANDY ELASTIC SILT (MH), contains mica, light reddish brown (Visual)	RICH	C1	16.4	4.7	3800	475	0
	516.0 - 512.5										
B-40	7.0 - 10.5		Jar	SILTY SAND (SM), fine to coarse grained sand, contains mica, grayish brown (Visual)	RICH	C2	16.9	4.4	12000	438	0
	486.0 - 482.5										
B-60	0.0 - 3.5		Jar	SANDY ELASTIC SILT (MH), light brown (Visual)	RICH	B1	24.6	5.0	6800	442	0
	475.5 - 472.0										
B-70	0.0 - 3.5		Jar	FILL, sampled as elastic silt with sand (MH), reddish brown (Visual)	RICH	A	32.6	5.1	8300	490	0
	519.0 - 515.5										

Notes:
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Project: Zion Crossroads Water and Sewer System
 Route 250 and Route 15
 Fluvanna County, VA

Summary Of Laboratory Tests

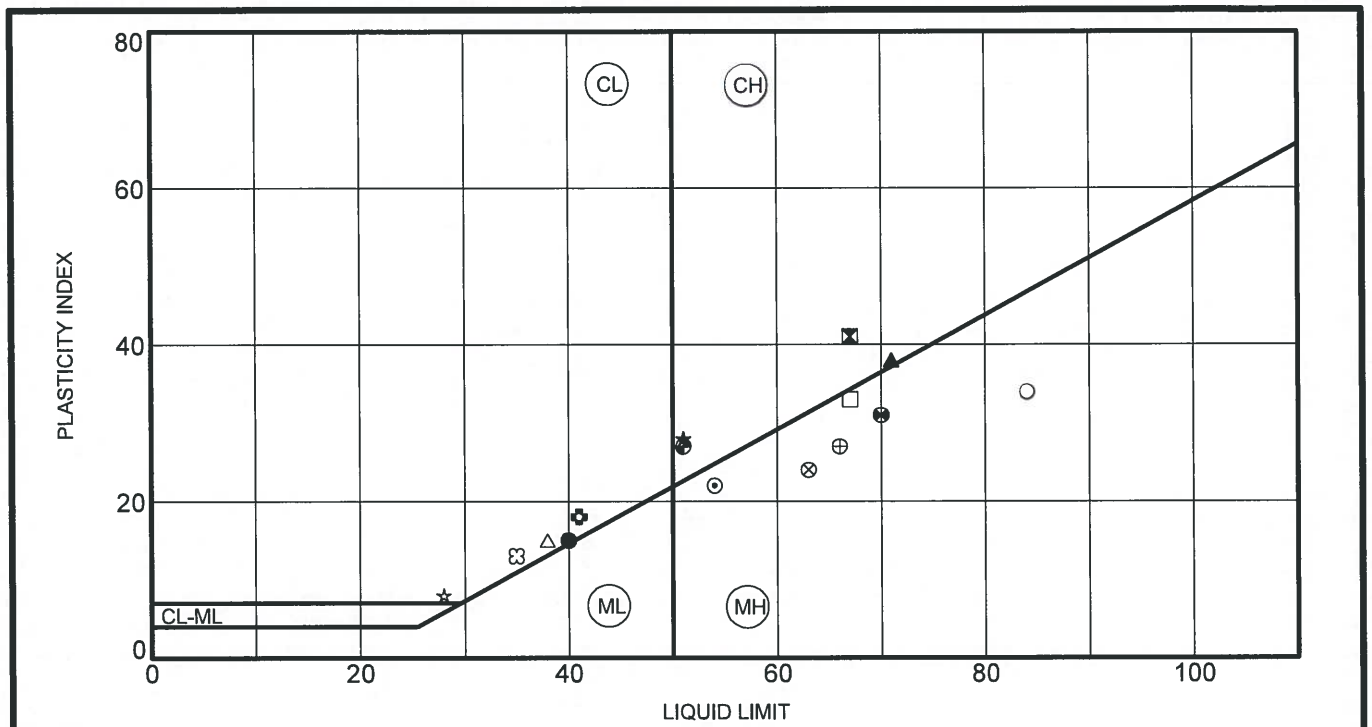
Appendix B
Sheet 2 of 2
Project Number: 16C13175 Task 01

Boring No.	Sample		Sample Type	Description of Soil Specimen	Testing Laboratory	Stratum	Natural Moisture (%)	PH	Resistivity (ohm-cm)	Oxidation Reduction Potential (mV)	Sulfides
	Depth ft	Elevation ft									
B-82	2.0 - 5.5		Jar	SANDY FAT CLAY (CH), gray and brown (Visual)	RICH	B1	22.8	4.1	16000	443	0
	530.5 - 527.0										

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Project: Zion Crossroads Water and Sewer System
 Route 250 and Route 15
 Fluvanna County, VA



PLOTTED DATA REPRESENTS SOIL PASSING NO. 40 SIEVE

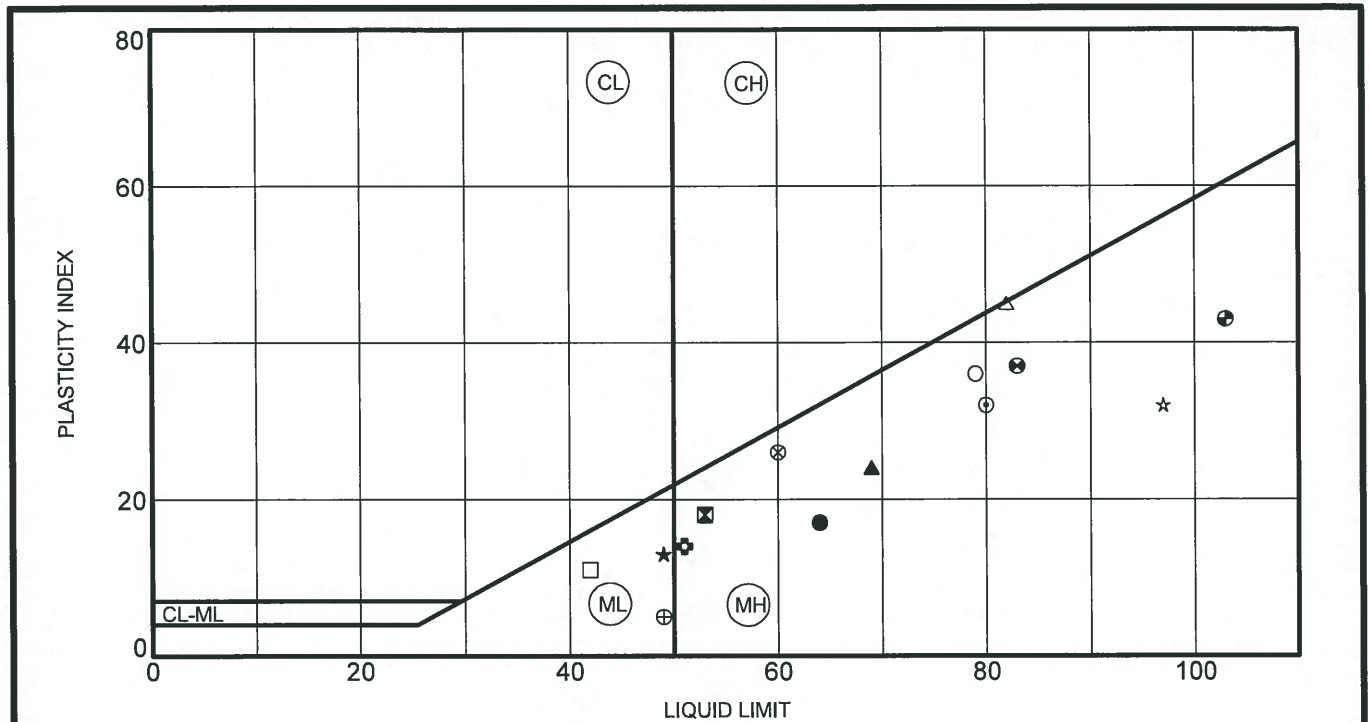
	Specimen	LL	PL	PI	Fines	Testing Lab	Description	
●	B-05	7.0 ft	40	25	15	65	RICH	SANDY LEAN CLAY (CL), light brown and gray
⊠	B-08	4.0 ft	67	26	41	87	RICH	FAT CLAY (CH), orangish brown and gray
▲	B-10	4.0 ft	71	33	38	86	RICH	FAT CLAY (CH), trace sand, orangish brown and gray
★	B-11	2.0 ft	51	23	28	71	RICH	FAT CLAY WITH SAND (CH), contains rock fragments, orangish brown and gray
⊙	B-11	9.0 ft	54	32	22	43	RICH	SILTY SAND WITH GRAVEL (SM), fine to coarse grained sand, contains rock fragments, light brown and gray
⊕	B-12	1.0 ft	41	23	18	76	RICH	LEAN CLAY WITH SAND (CL, A-7-6), light brown
○	B-14	2.0 ft	84	50	34	96	RICH	ELASTIC SILT (MH), reddish brown
△	B-18	2.0 ft	38	23	15	62	RICH	SANDY LEAN CLAY WITH GRAVEL (CL), contains rock fragments, brown
⊗	B-27	4.0 ft	63	39	24	88	RICH	ELASTIC SILT(MH), reddish brown
⊕	B-28	2.0 ft	66	39	27	43	RICH	SILTY SAND WITH GRAVEL (SM), fine to coarse grained sand, contains rock fragments, reddish brown
□	B-39	2.0 ft	67	34	33	64	RICH	SANDY ELASTIC SILT (MH), contains rock fragments, light brown
⊕	B-43	2.0 ft	70	39	31	73	RICH	ELASTIC SILT WITH SAND (MH), contains rock fragments, reddish brown
⊕	B-47	4.0 ft	51	24	27	77	RICH	FAT CLAY WITH SAND (CH), light gray and brown
★	B-58	0.0 ft	28	20	8	61	RICH	SANDY LEAN CLAY (CL), contains gravel, brown
⊗	B-66	0.0 ft	35	22	13	61	RICH	SANDY LEAN CLAY (CL), contains gravel, brown and gray

ATTERBERG LIMITS 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008 04 22.GDT 2/8/18



ATTERBERG LIMITS

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, VA
Contract: 16C13175 Task 01



PLOTTED DATA REPRESENTS SOIL PASSING NO. 40 SIEVE

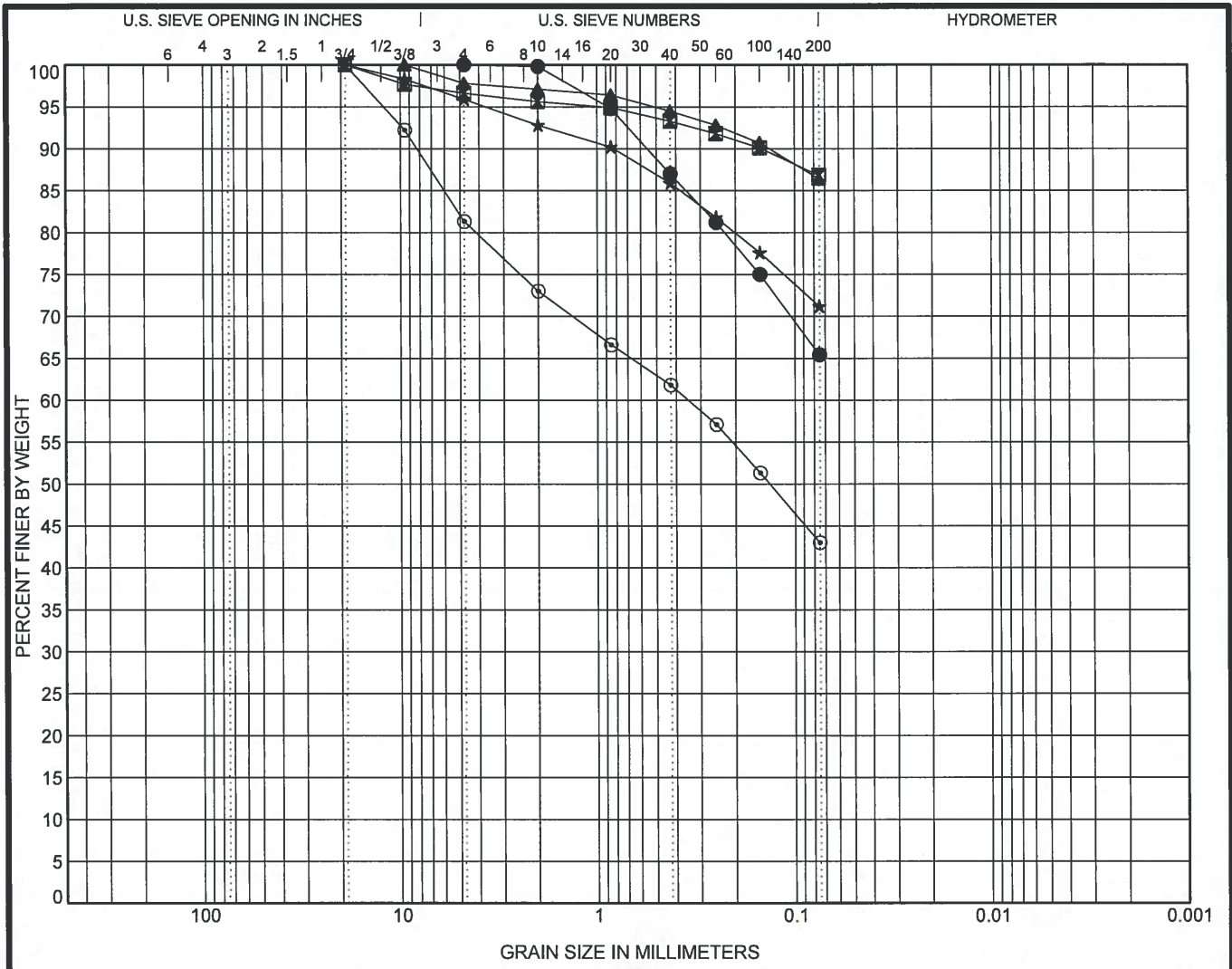
Specimen	LL	PL	PI	Fines	Testing Lab	Description
● B-68	4.0 ft	64	47	17	76	RICH ELASTIC SILT WITH SAND (MH), contains mica and rock fragments, reddish brown
⊠ B-75	2.0 ft	53	35	18	79	RICH ELASTIC SILT WITH SAND (MH, A-7-5), contains rock fragments, reddish brown
▲ B-77	4.0 ft	69	45	24	90	CVL ELASTIC SILT (MH), reddish brown
★ B-77	9.0 ft	49	36	13	85	CVL SILT WITH SAND (ML), reddish brown
⊙ B-78	2.0 ft	80	48	32	92	CVL ELASTIC SILT (MH), reddish brown
⊕ B-80	7.0 ft	51	37	14	80	RICH ELASTIC SILT WITH SAND (MH), contains mica and rock fragments, red, brown and gray
○ B-84	2.0 ft	79	43	36	96	RICH ELASTIC SILT (MH), reddish brown
△ B-88	2.0 ft	82	37	45	68	RICH SANDY ELASTIC SILT (MH), contains rock fragments, light orangish brown
⊗ B-89	4.0 ft	60	34	26	78	RICH ELASTIC SILT WITH SAND (MH), light gray and brown
⊕ B-89	14.0 ft	49	44	5	70	RICH SILT WITH SAND (ML), brown
□ B-90	4.0 ft	42	31	11	70	RICH SILT WITH SAND (ML), A-5, contains mica, light brown
⊙ B-93	4.0 ft	83	46	37	89	RICH ELASTIC SILT (MH), reddish brown
⊕ B-94	2.0 ft	103	60	43	83	RICH ELASTIC SILT WITH SAND (MH), contains fragments, reddish brown
★ B-95	2.0 ft	97	65	32	93	RICH ELASTIC SILT (MH), reddish brown

ATTERBERG LIMITS 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008 04 22.GDT 2/8/18



ATTERBERG LIMITS

Project: Zion Crossroads Water and Sewer System
 Route 250 and Route 15
 Fluvanna County, VA
Contract: 16C13175 Task 01



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SIEVE 5 SHEET 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2010_02_25.GDT 2/8/18

Specimen	Sample Description	LL	PL	PI	Cc	Cu
● B-05	7.0 ft SANDY LEAN CLAY (CL), light brown and gray	40	25	15	--	--
☒ B-08	4.0 ft FAT CLAY (CH), orangish brown and gray	67	26	41	--	--
▲ B-10	4.0 ft FAT CLAY (CH), trace sand, orangish brown and gray	71	33	38	--	--
★ B-11	2.0 ft FAT CLAY WITH SAND (CH), contains rock fragments, orangish brown and gray	51	23	28	--	--
◎ B-11	9.0 ft SILTY SAND WITH GRAVEL (SM), fine to coarse grained sand, contains rock fragments, light brown and gray	54	32	22	--	--

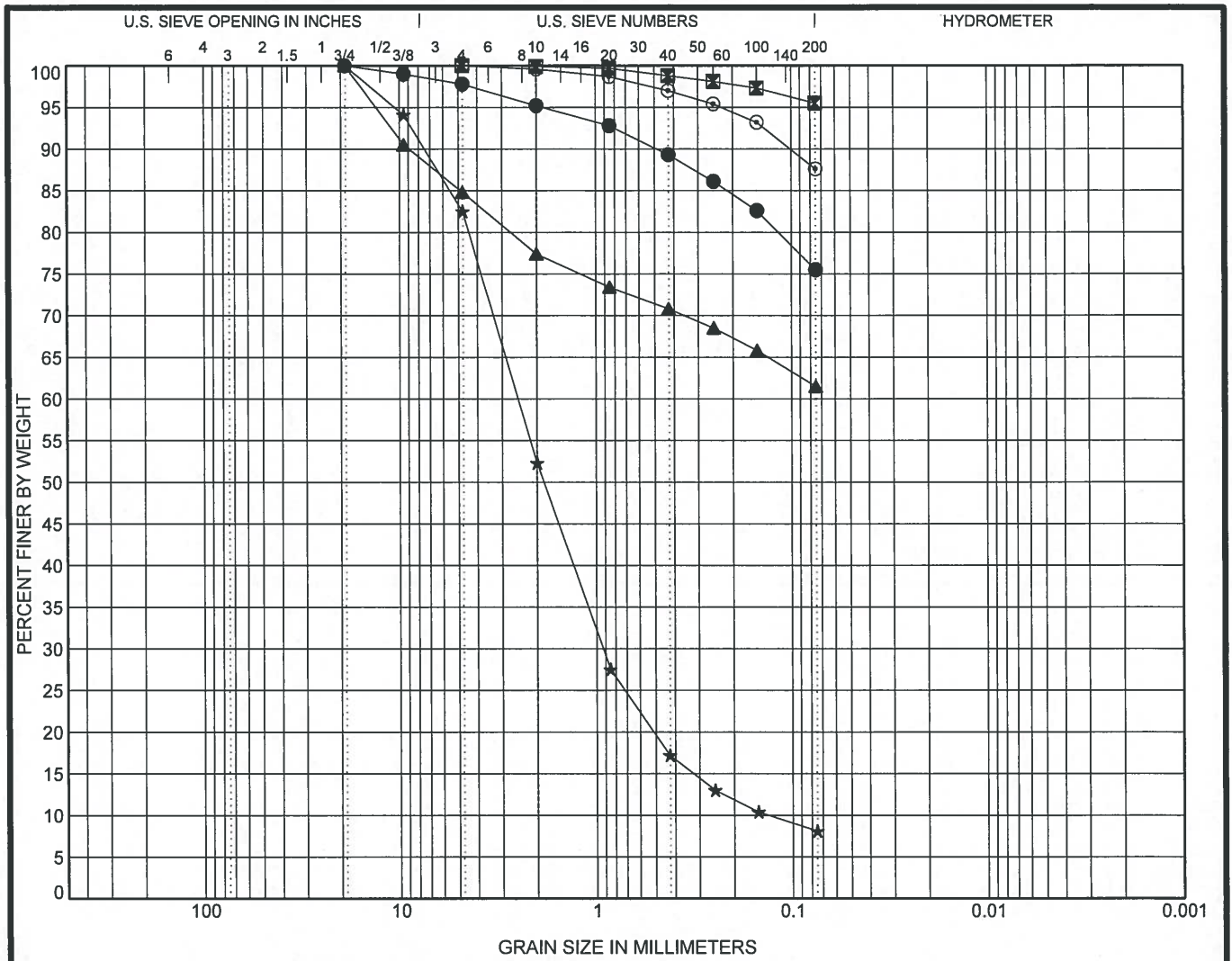
Specimen	Test Method	Testing Lab	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-05	7.0 ft ASTM D422	RICH	4.75	--	--	--	0.0	34.6	65.4	
☒ B-08	4.0 ft ASTM D422	RICH	19	--	--	--	3.4	9.8	86.8	
▲ B-10	4.0 ft ASTM D422	RICH	9.5	--	--	--	2.2	11.4	86.4	
★ B-11	2.0 ft ASTM D422	RICH	19	--	--	--	4.1	24.7	71.2	
◎ B-11	9.0 ft ASTM D422	RICH	19	0.35	--	--	18.7	38.3	43.0	



GRADATION CURVES

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, VA

Contract: 16C13175 Task 01



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SIEVE 5 SHEET, 16C13175 COMBINED LOGS.GPJ, SCHNABEL DATA TEMPLATE 2010_02_25.GDT 2/8/18

Specimen	Sample Description	LL	PL	PI	Cc	Cu
● B-12 1.0 ft	LEAN CLAY WITH SAND (CL, A-7-6), light brown	41	23	18	--	--
☒ B-14 2.0 ft	ELASTIC SILT (MH), reddish brown	84	50	34	--	--
▲ B-18 2.0 ft	SANDY LEAN CLAY WITH GRAVEL (CL), contains rock fragments, brown	38	23	15	--	--
★ B-23 7.0 ft	POORLY GRADED SAND WITH SILT (SP-SM), fine to coarse grained sand, reddish brown	NP	NP	NP	2.59	18.75
◎ B-27 4.0 ft	ELASTIC SILT (MH), reddish brown	63	39	24	--	--

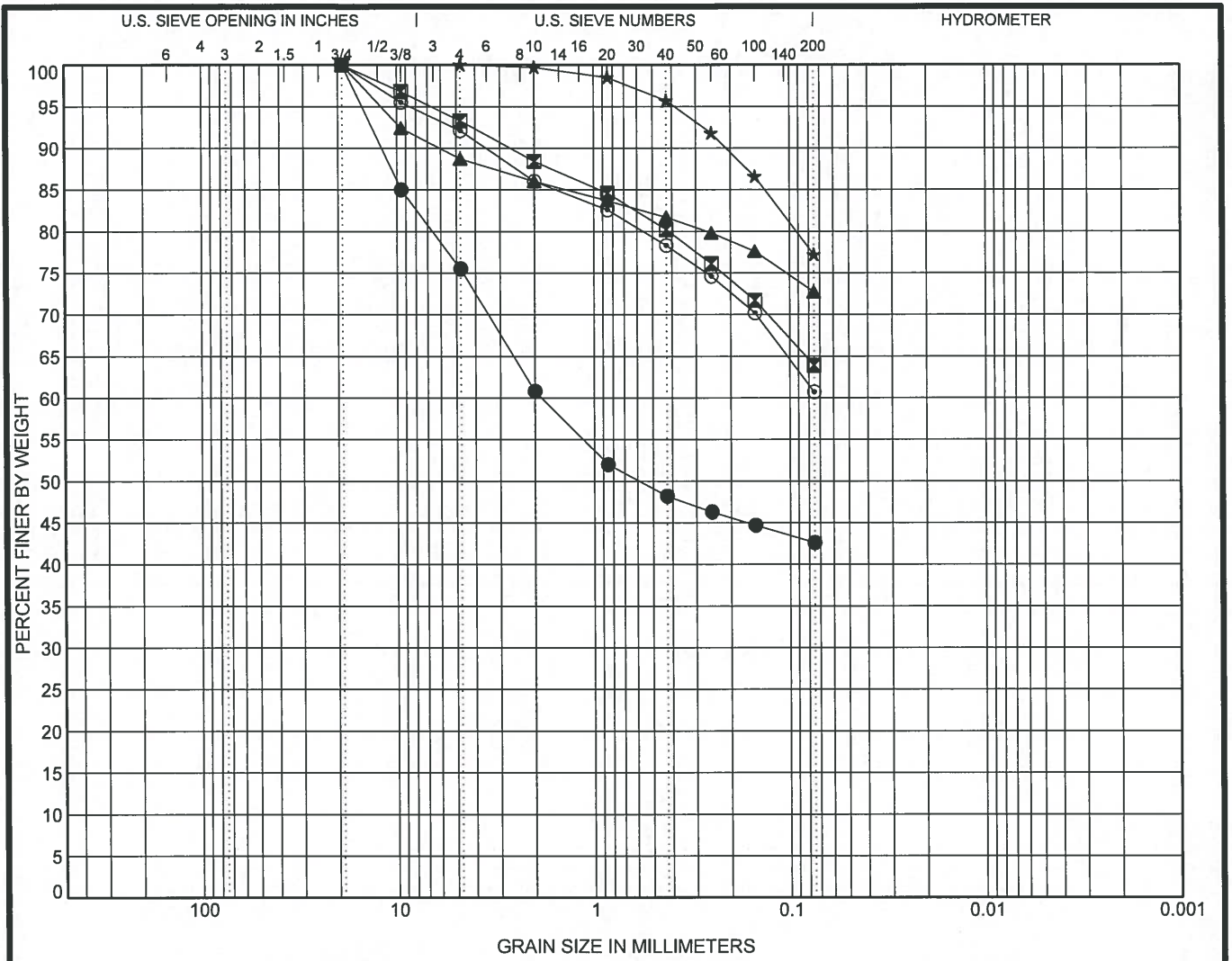
Specimen	Test Method	Testing Lab	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-12 1.0 ft	ASTM D422	RICH	19	--	--	--	2.2	22.3	75.5	
☒ B-14 2.0 ft	ASTM D422	RICH	4.75	--	--	--	0.0	4.5	95.5	
▲ B-18 2.0 ft	ASTM D422	RICH	19	--	--	--	15.2	23.3	61.5	
★ B-23 7.0 ft	ASTM D422	RICH	19	2.49	0.93	0.133	17.5	74.4	8.1	
◎ B-27 4.0 ft	ASTM D422	RICH	4.75	--	--	--	0.0	12.4	87.6	



GRADATION CURVES

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, VA

Contract: 16C13175 Task 01



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SIEVE 5 SHEET 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2010_02_25.GDT 2/8/18

Specimen	Sample Description	LL	PL	PI	Cc	Cu
● B-28	2.0 ft SILTY SAND WITH GRAVEL (SM), fine to coarse grained sand, contains rock fragments, reddish brown	66	39	27	--	--
⊠ B-39	2.0 ft SANDY ELASTIC SILT (MH), contains rock fragments, light brown	67	34	33	--	--
▲ B-43	2.0 ft ELASTIC SILT WITH SAND (MH), contains rock fragments, reddish brown	70	39	31	--	--
★ B-47	4.0 ft FAT CLAY WITH SAND (CH), light gray and brown	51	24	27	--	--
◎ B-58	0.0 ft SANDY LEAN CLAY (CL), contains gravel, brown	28	20	8	--	--

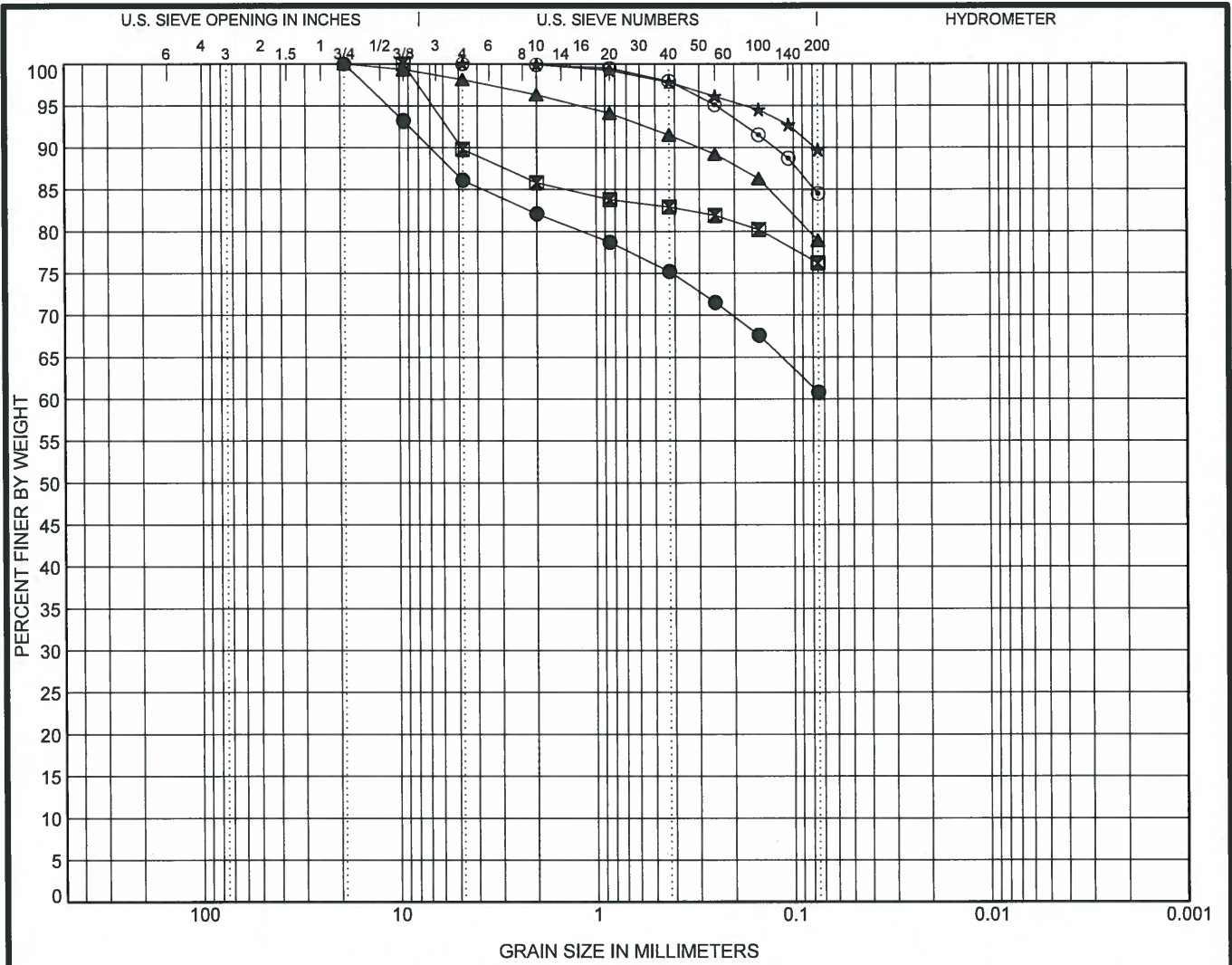
Specimen	Test Method	Testing Lab	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-28	ASTM D422	RICH	19	1.85	--	--	24.5	32.9	42.6	
⊠ B-39	ASTM D422	RICH	19	--	--	--	6.7	29.4	63.9	
▲ B-43	ASTM D422	RICH	19	--	--	--	11.3	16.0	72.7	
★ B-47	ASTM D422	RICH	4.75	--	--	--	0.0	22.8	77.2	
◎ B-58	ASTM D422	RICH	19	--	--	--	7.9	31.4	60.7	



GRADATION CURVES

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, VA

Contract: 16C13175 Task 01



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SIEVE 5 SHEET, 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2010_02_25.GDT 2/8/18

Specimen	Sample Description	LL	PL	PI
● B-66 0.0 ft	SANDY LEAN CLAY (CL), contains gravel, brown and gray	35	22	13
☒ B-68 4.0 ft	ELASTIC SILT WITH SAND (MH), contains mica and rock fragments, reddish brown	64	47	17
▲ B-75 2.0 ft	ELASTIC SILT WITH SAND (MH, A-7-5), contains rock fragments, reddish brown	53	35	18
★ B-77 4.0 ft	ELASTIC SILT (MH), reddish brown	69	45	24
◎ B-77 9.0 ft	SILT WITH SAND (ML), reddish brown	49	36	13

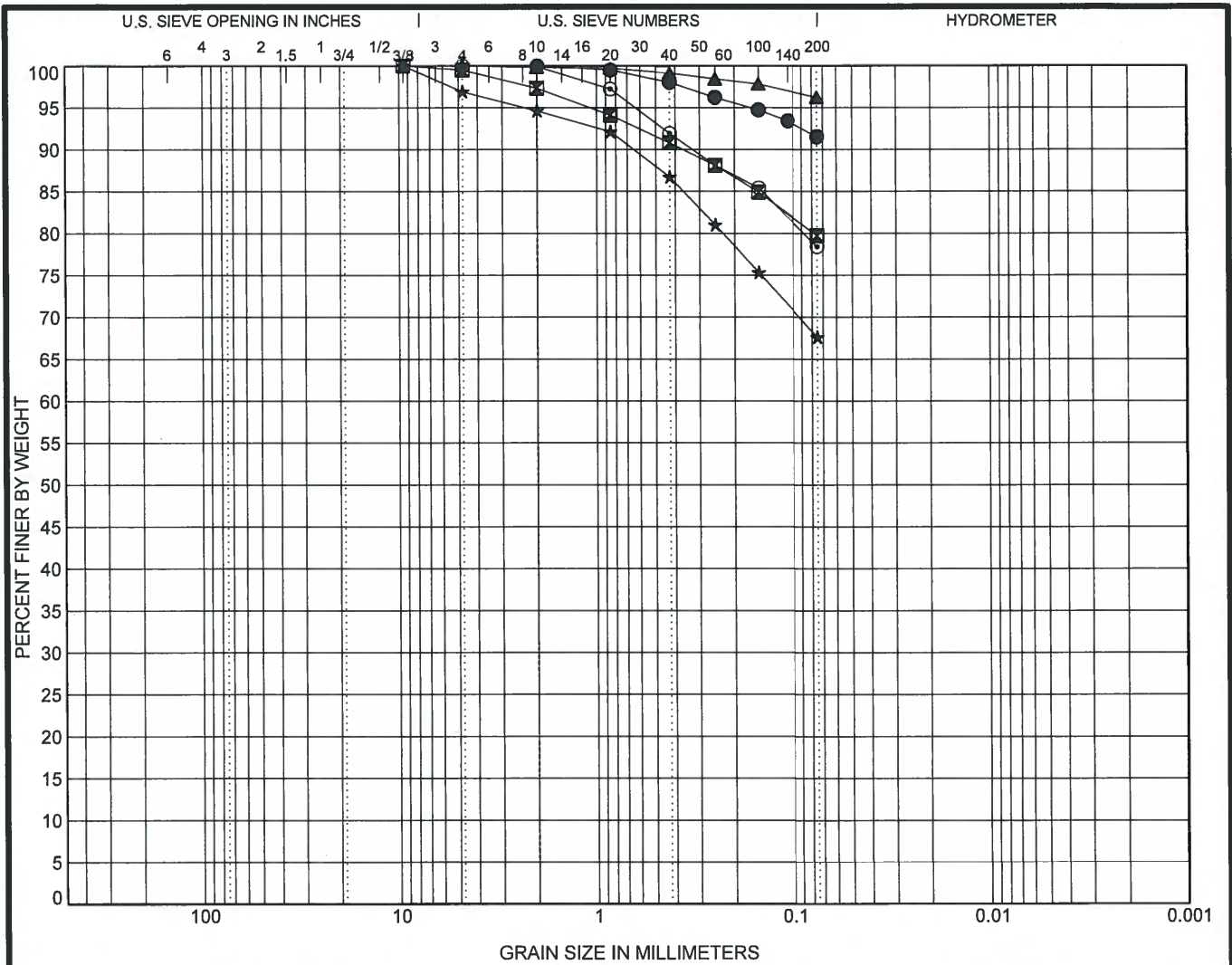
Specimen	Test Method	Testing Lab	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-66 0.0 ft	ASTM D422	RICH					13.9	25.3	60.8	
☒ B-68 4.0 ft	ASTM D422	RICH					10.2	13.6	76.2	
▲ B-75 2.0 ft	ASTM D422	RICH					1.9	19.2	78.9	
★ B-77 4.0 ft	ASTM D1140	CVL					0.0	10.3	89.7	
◎ B-77 9.0 ft	ASTM D1140	CVL					0.0	15.5	84.5	



GRADATION CURVES

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, VA

Contract: 16C13175 Task 01



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SIEVE 5 SHEET 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2010_02_25.GDT 2/6/18

Specimen	Sample Description	LL	PL	PI
● B-78 2.0 ft	ELASTIC SILT (MH), reddish brown	80	48	32
⊠ B-80 7.0 ft	ELASTIC SILT WITH SAND (MH), contains mica and rock fragments, red, brown and gray	51	37	14
▲ B-84 2.0 ft	ELASTIC SILT (MH), reddish brown	79	43	36
★ B-88 2.0 ft	SANDY ELASTIC SILT (MH), contains rock fragments, light orangish brown	82	37	45
⊙ B-89 4.0 ft	ELASTIC SILT WITH SAND (MH), light gray and brown	60	34	26

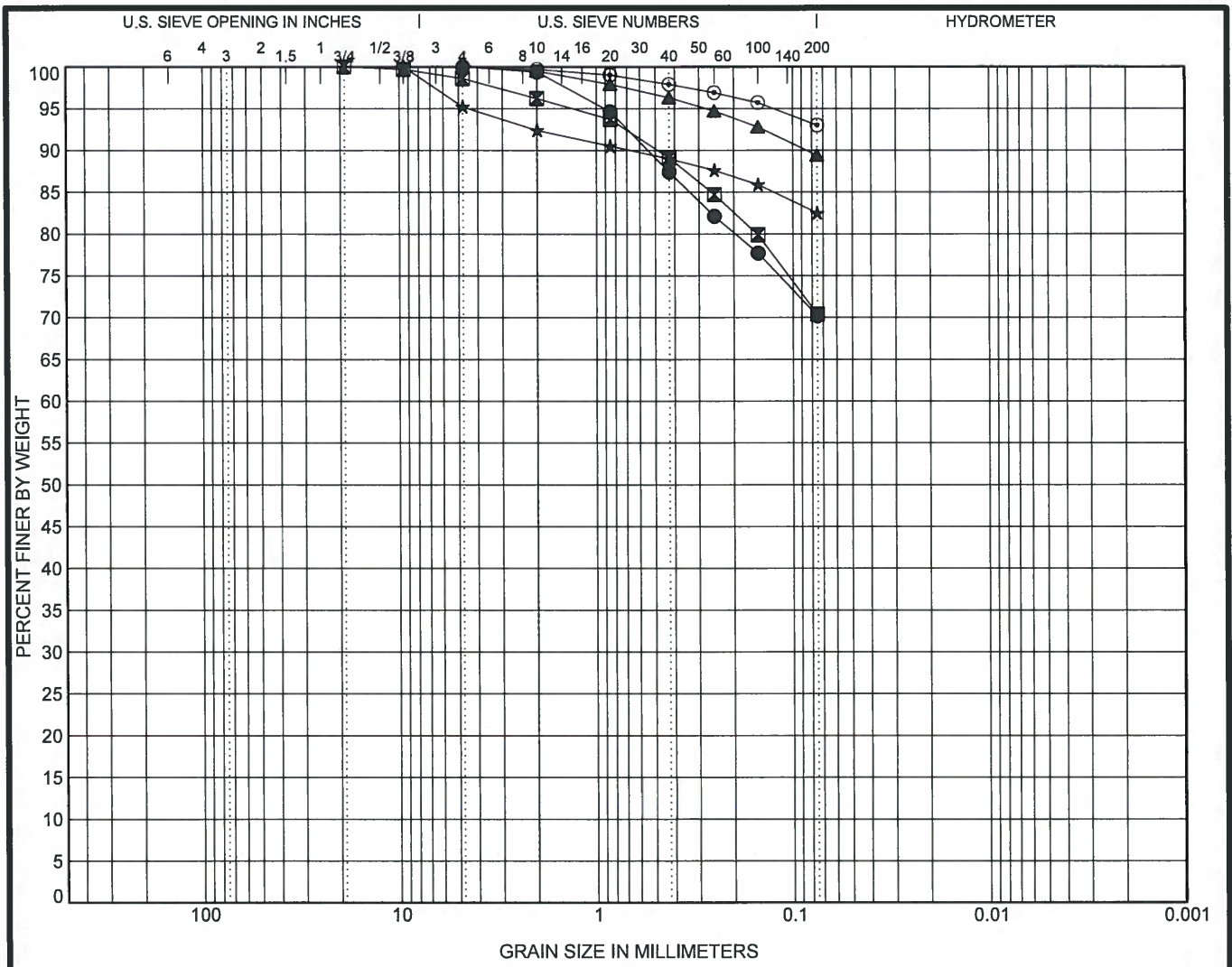
Specimen	Test Method	Testing Lab	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-78 2.0 ft	ASTM D1140	CVL	2	--	--	--	0.0	8.5	91.5	
⊠ B-80 7.0 ft	ASTM D422	RICH	9.5	--	--	--	0.5	19.8	79.7	
▲ B-84 2.0 ft	ASTM D422	RICH	4.75	--	--	--	0.0	3.8	96.2	
★ B-88 2.0 ft	ASTM D422	RICH	9.5	--	--	--	3.1	29.3	67.6	
⊙ B-89 4.0 ft	ASTM D422	RICH	4.75	--	--	--	0.0	21.6	78.4	



GRADATION CURVES

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, VA

Contract: 16C13175 Task 01



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SIEVE 5 SHEET - 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2010_02_25.GDT 2/8/18

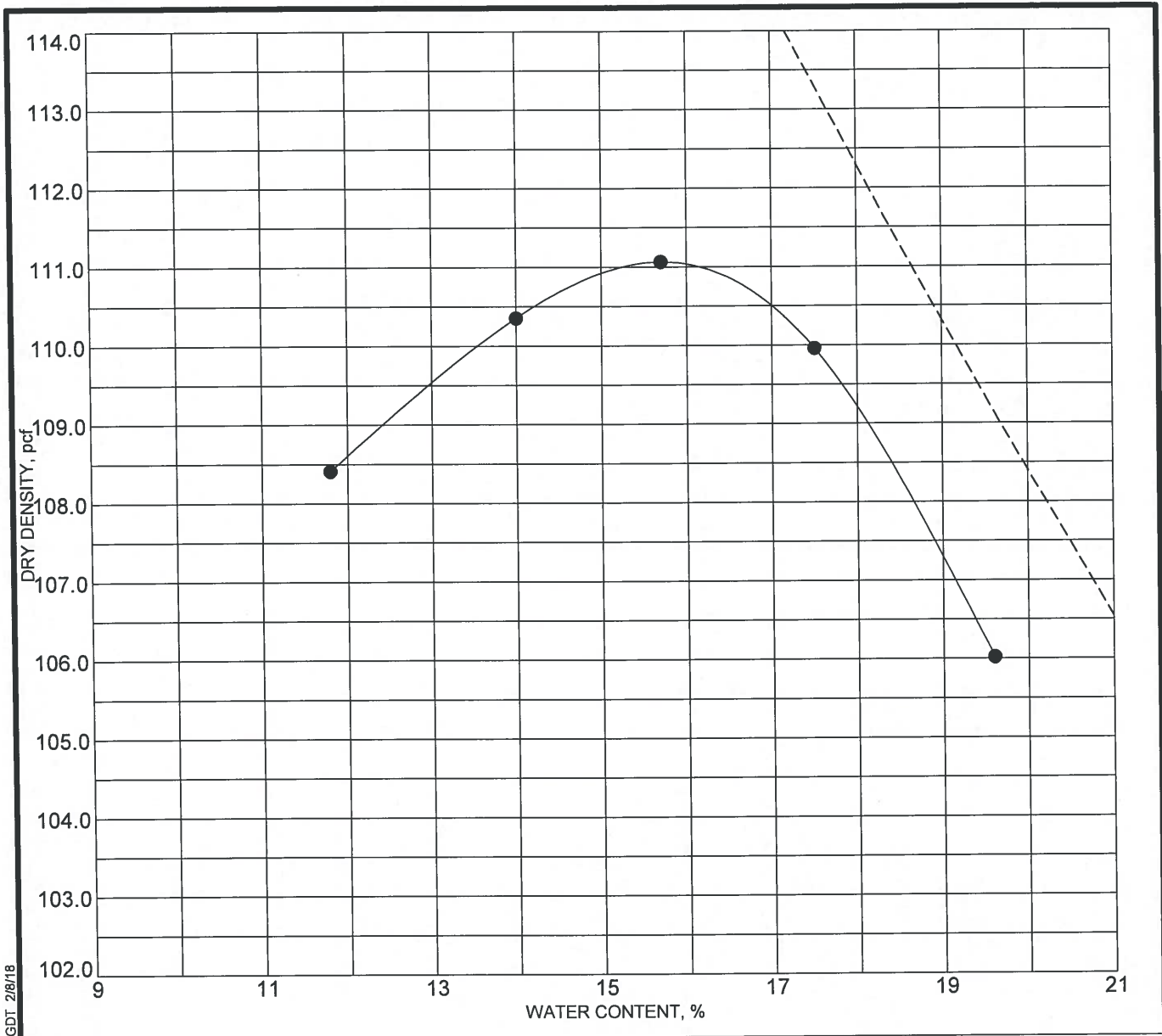
Specimen	Sample Description	LL	PL	PI	Cc	Cu
● B-89	14.0 ft SILT WITH SAND (ML), brown	49	44	5	--	--
☒ B-90	4.0 ft SILT WITH SAND (ML), A-5, contains mica, light brown	42	31	11	--	--
▲ B-93	4.0 ft ELASTIC SILT (MH), reddish brown	83	46	37	--	--
★ B-94	2.0 ft ELASTIC SILT WITH SAND (MH), contains fragments, reddish brown	103	60	43	--	--
◎ B-95	2.0 ft ELASTIC SILT (MH), reddish brown	97	65	32	--	--

Specimen	Test Method	Testing Lab	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-89	ASTM D422	RICH	4.75	--	--	--	0.0	29.8	70.2	
☒ B-90	ASTM D422	RICH	19	--	--	--	1.4	28.2	70.4	
▲ B-93	ASTM D422	RICH	4.75	--	--	--	0.0	10.6	89.4	
★ B-94	ASTM D422	RICH	9.5	--	--	--	4.8	12.7	82.5	
◎ B-95	ASTM D422	RICH	4.75	--	--	--	0.0	7.0	93.0	



GRADATION CURVES

Project: Zion Crossroads Water and Sewer System
 Route 250 and Route 15
 Fluvanna County, VA
Contract: 16C13175 Task 01



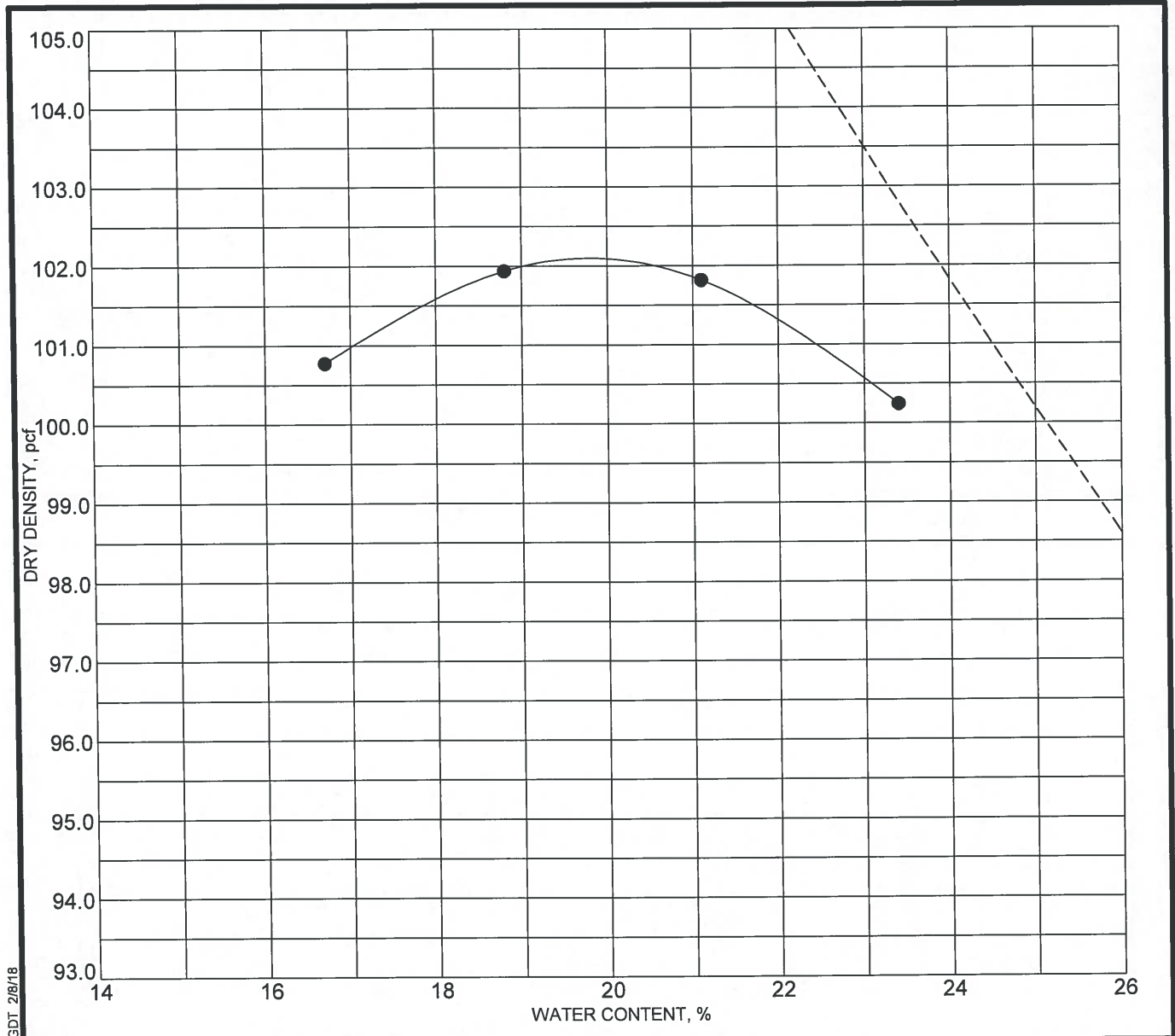
COMPACTION 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008 04 22.GDT 2/6/18

Sample Description: LEAN CLAY WITH SAND (CL, A-7-6), light brown Sample Source: B-12, 1.0 ft Test Methods: VTM1	Assumed Specific Gravity: 2.66 Max. Dry Density (pcf): 111.1 Opt. Moisture (%): 15.6
--	---

Liquid Limit (LL): 41 Plasticity Index (PI): 18 % Retained #4 Sieve: 2.2 % Passing # 200 Sieve: 75.5	Comments: Bulk sample obtained from auger cuttings over the depth interval 0 to 5.0 feet Date: 2-20-17 Reviewed By: DS
---	---



MOISTURE DENSITY RELATIONSHIP
Project: Zion Crossroads Water and Sewer System
 Route 250 and Route 15
 Fluvanna County, VA
Contract: 16C13175 Task 01 **Testing Lab:** RICH



COMPACTION 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008 04 22.GDT 2/8/18

<p>Sample Description: ELASTIC SILT WITH SAND (MH, A-7-5), contains rock fragments, reddish brown</p> <p>Sample Source: B-75, 2.0 ft</p> <p>Test Methods: ASTM D698 Method B</p>	<p>Assumed Specific Gravity: 2.68</p> <p>Max. Dry Density (pcf): 102.1</p> <p>Opt. Moisture (%): 19.7</p>
---	--

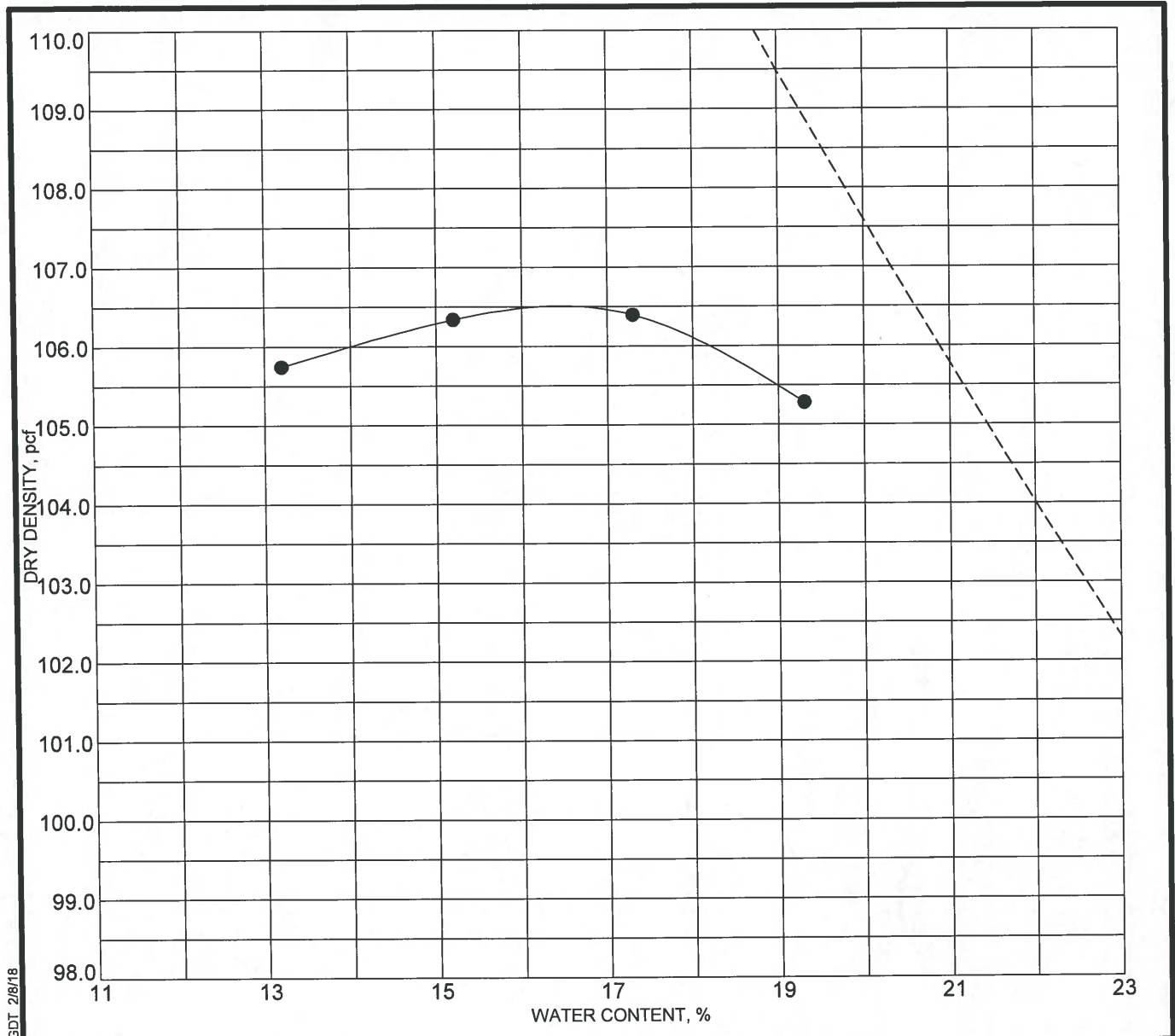
<p>Liquid Limit (LL): 53</p> <p>Plasticity Index (PI): 18</p> <p>% Retained #4 Sieve: 1.9</p> <p>% Passing # 200 Sieve: 78.9</p>	<p>Comments: Bulk sample obtained from auger cuttings over the depth interval 2.0 to 5.5 feet</p> <p>Date: 2-8-17 Reviewed By: DS</p>
--	---



MOISTURE DENSITY RELATIONSHIP

Project: Zion Crossroads Water and Sewer System
Route 250 and Route 15
Fluvanna County, VA

Contract: 16C13175 Task 01 **Testing Lab:** RICH



COMPACTION 16C13175 COMBINED LOGS.GPJ SCHNABEL DATA TEMPLATE 2008 04 22.GDT 2/8/18

Sample Description: SILT WITH SAND (ML), A-5), contains mica, light brown Sample Source: B-90, 4.0 ft Test Methods: VTM1	Assumed Specific Gravity: 2.63 Max. Dry Density (pcf): 106.5 Opt. Moisture (%): 16.4
---	---

Liquid Limit (LL): 42 Plasticity Index (PI): 11 % Retained #4 Sieve: 1.4 % Passing # 200 Sieve: 70.4	Comments: Borrow Source: Bulk sample obtained from auger cuttings over the depth interval 4.0 to 9.0 feet Date: 3-21-17 Reviewed By: DS
---	---



MOISTURE DENSITY RELATIONSHIP

Project: Zion Crossroads Water and Sewer System
 Route 250 and Route 15
 Fluvanna County, VA

Contract: 16C13175 Task 01 **Testing Lab:** RICH

Exhibit I

Drawings



SCALE: 1" = 20' DATE: 05/18/2018

Table with columns: No., DATE, BY, DESCRIPTION, REVISIONS

APPROVED BY: JEH CHECKED BY: DWY DATE: MAY 2018

TITLE: EROSION AND SEDIMENT CONTROL NOTES

PROJECT NO.: 50073867

16-090-532/768 C1.0

EROSION & SEDIMENT CONTROL NOTES

- ES-1: UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED THROUGHOUT THE LIFE OF THE PROJECT...

MINIMUM STANDARDS

- MS-1: PERMANENT OR TEMPORARY SOIL STABILIZATION SHALL BE APPLIED TO DENUDED AREAS WITHIN SEVEN DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE...

EROSION & SEDIMENT CONTROL SEQUENCE

- 1. ALL EROSION CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE LATEST EDITION OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH)...

EROSION & SEDIMENT CONTROL MAINTENANCE

- 1. THE PROJECT AREA SHALL BE CHECKED AFTER RAINFALL EVENT OR WEEKLY, WHICHEVER IS MORE FREQUENT, TO DETERMINE THE NEEDED MAINTENANCE...

EROSION & SEDIMENT CONTROL SEQUENCE

- 1. ALL EROSION CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE LATEST EDITION OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH)...

EROSION & SEDIMENT CONTROL NARRATIVE

THE ZION CROSSROADS WATER AND SEWER SYSTEM PROJECT CONSISTS OF THE INSTALLATION OF APPROXIMATELY 1.2 MILES OF 15" DRAINAGE PIPES, 1.2 MILES OF 12" DRAINAGE PIPES, AND 1.2 MILES OF 10" DRAINAGE PIPES...

EROSION & SEDIMENT CONTROL NARRATIVE

Table with columns: ID, SOIL TYPE, EROSION HAZARD FACTOR, SUPPLES

EROSION & SEDIMENT CONTROL NARRATIVE

UNDER CHANGING SOIL SURVEY BY THE NATURAL RESOURCES CONSERVATION SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE SOILS MAP 100, THE PROJECT AREA SOILS ARE CONSIDERED "HIGH EROSION"...

EROSION & SEDIMENT CONTROL NARRATIVE

TO REDUCE THE AMOUNT OF SOIL OR MUD BEING TRANSPORTED ONTO PUBLIC ROADS, A STONE PAD ENRICHMENT SHALL BE A MINIMUM OF 12 FEET WIDE BY 70 FEET LENGTH, A FILTER FABRIC LINER SHALL BE INSTALLED BENEATH THE PLACEMENT OF THE CONSTRUCTION ENRICHMENT AS SPECIFIED IN STATE MANUAL STANDARD...

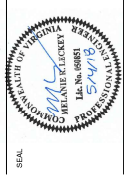
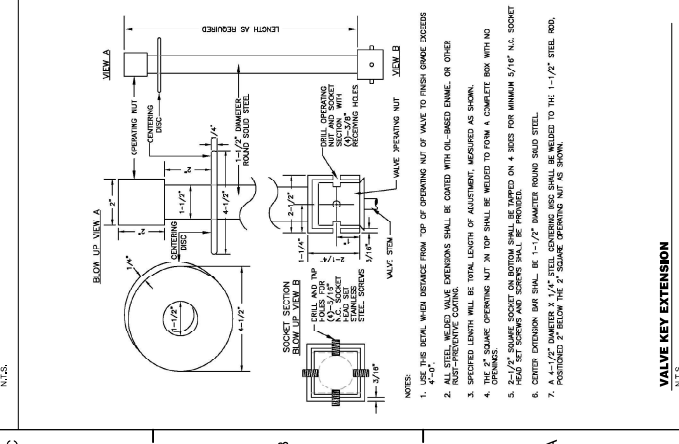
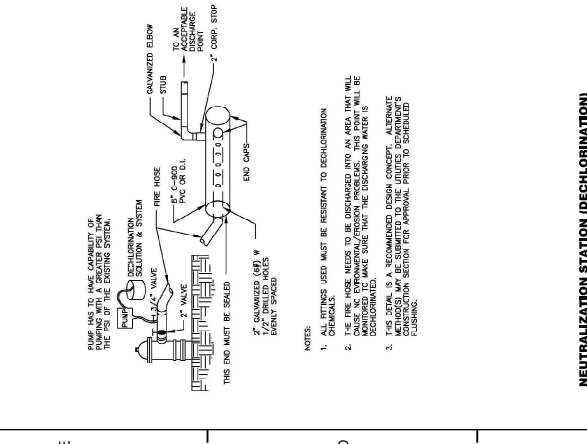
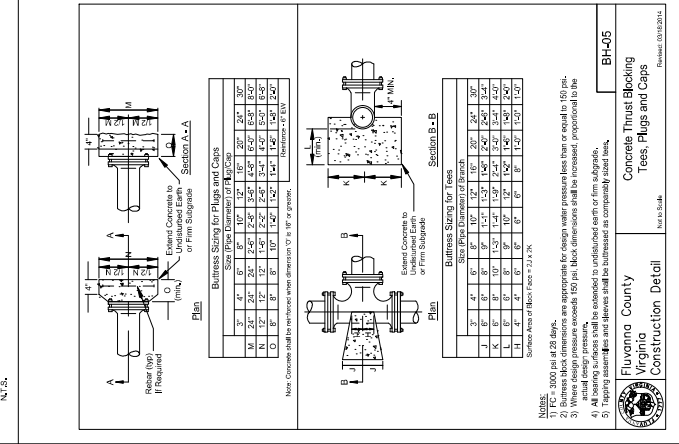
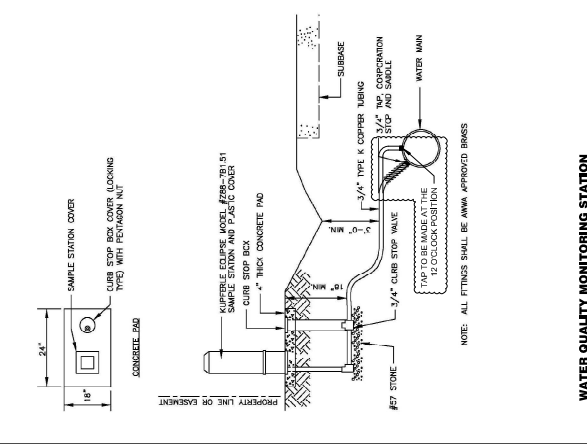
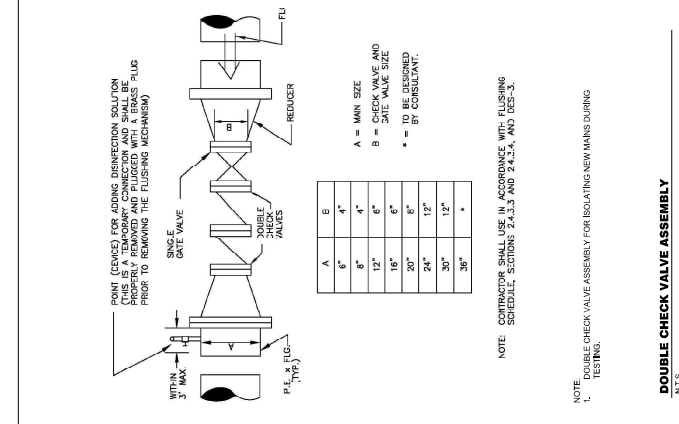
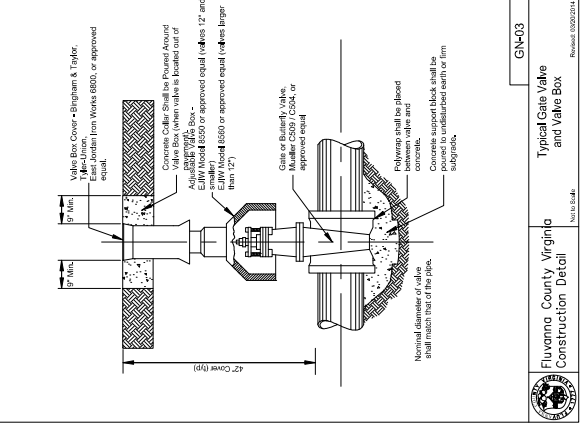
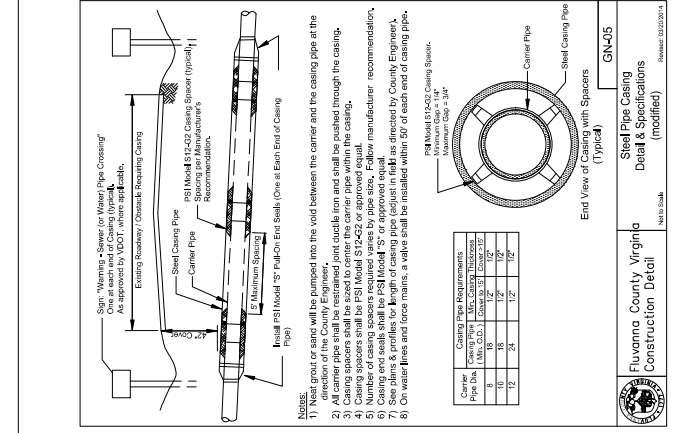
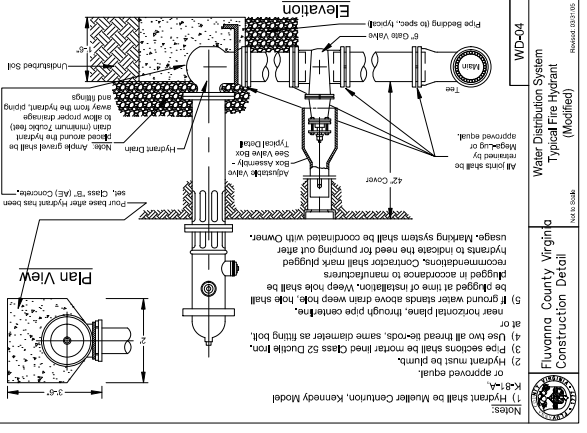


Table with 3 columns: No., DATE, BY, Description. Includes rows for REVISIONS, DRAWN BY, APPROVED BY, CHECKED BY, DATE.



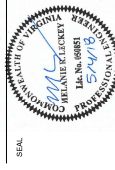
Notes for various details including: 1) Next grout or sand will be pumped into the void between the carrier and the casing pipe at the location of the Empty Embedment joint... 2) All carrier pipe shall be sized to enter the carrier pipe within the casing... 3) Casing spacers shall be sized to enter the carrier pipe within the casing... 4) Casing spacers shall be PSI Model S12-02 or approved equal... 5) Casing end seals shall be PSI Model 'S' or approved equal... 6) Casing end seals shall be PSI Model 'S' or approved equal... 7) Step plates & profiles for length of casing pipe (not in final) as directed by County Engineer... 8) On water lines and force mains, a valve shall be installed within 50' of each end of casing pipe... PSI Model S12-02 Casing Spacer... Maximum Size = 3/4"

Notes for Double Check Valve Assembly: 1. DOUBLE CHECK VALVE ASSEMBLY FOR ISOLATING NEW MAINS DURING TESTING.

Notes for Water Quality Monitoring Station: NOTE: ALL FITTINGS SHALL BE ANMA APPROVED BRASS.

Notes for Valve Key Extension: 1. USE THIS DETAIL WHEN REMOVING FROM TOP OF OPENING NUT OF VALVE TO FINISH GROUND EXCEEDS... 2. ALL STEEL WELDED VALVE EXTENSIONS SHALL BE COATED WITH OIL-BASED ENAMEL OR OTHER RUST-PREVENTIVE COATING... 3. SPOILED LENGTH WILL BE TOTAL LENGTH OF ADJUSTMENT, MEASURED AS SHOWN... 4. 2" DIA. SQUARE OPENING NUT IN TOP SHALL BE WELDED TO FORM A COMPLETE BOX WITH NO OPENINGS... 5. 2-1/2" SQUARE SPOCKET ON BOTTOM SHALL BE TAPPED ON 4 SIDES FOR MINIMUM 3/16" N.E. SOCKET HEAD SET SCREWS AND SCREWS SHALL BE PROVIDED... 6. CENTER OPENING OR SHA. BE 1-1/2" DIAMETER ROUND SOLID STEEL... 7. A 1-1/2" DIA. 3" X 1/2" STEEL CONDUIT END SHALL BE WELDED TO THE 1-1/2" STEEL ROD... 8. OPENINGS 2" BELOW THE 2" SQUARE OPENING NUT BE SHOWN.

Notes for Concrete Thrust Blocking: 1) FC - 3000 psi at 28 days... 2) When design pressure exceeds 150 psi, block dimensions shall be increased proportionally to the actual design pressure... 3) Where design pressure exceeds 150 psi, block dimensions shall be increased proportionally to the actual design pressure... 4) Tapping assemblies and sleeves shall be buttressed as comparably sized bars.

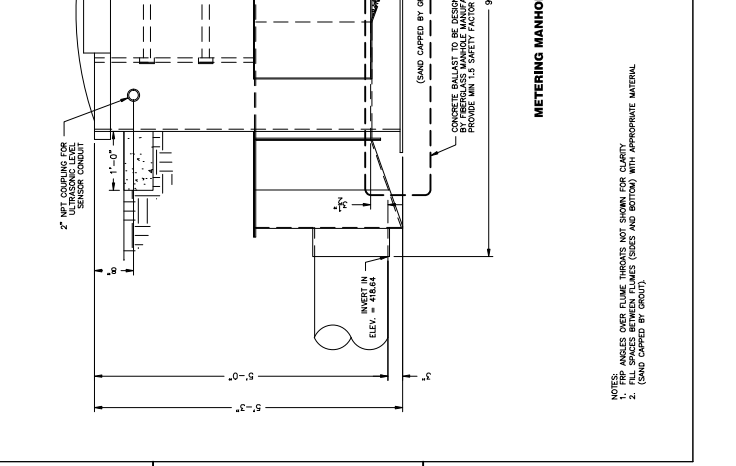
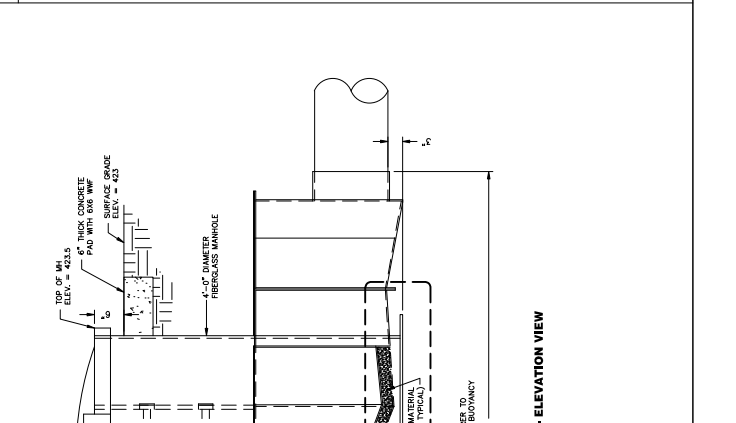
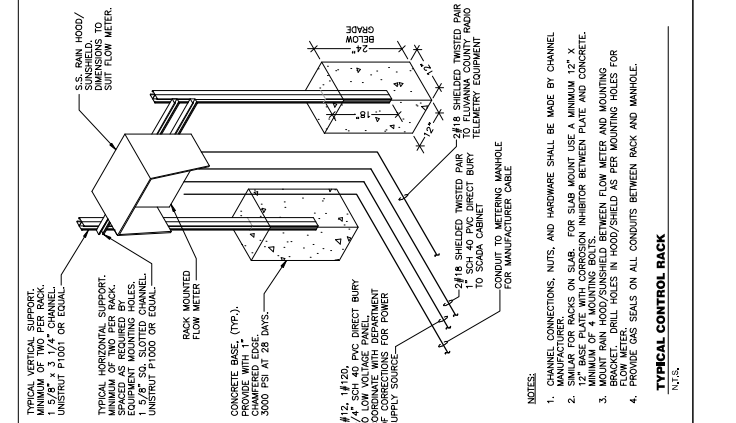
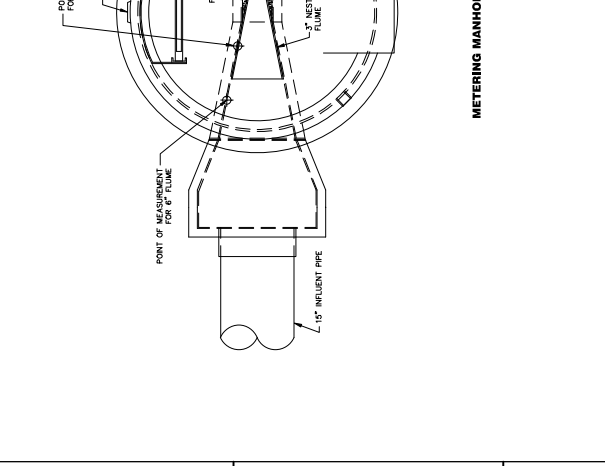
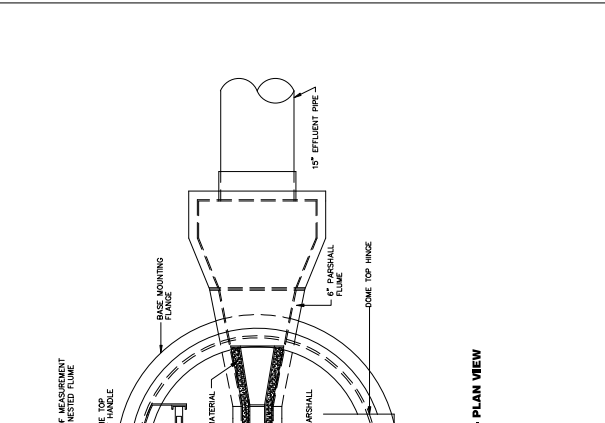
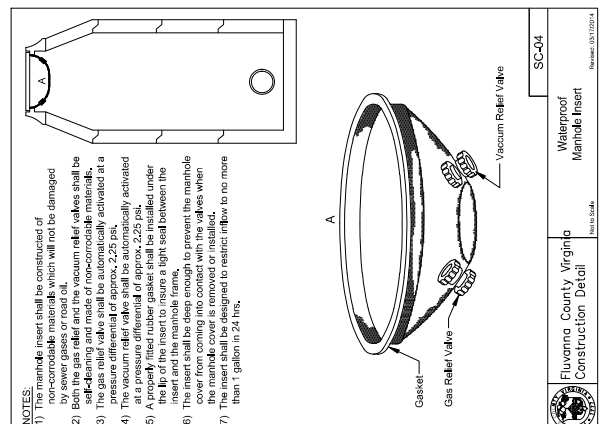
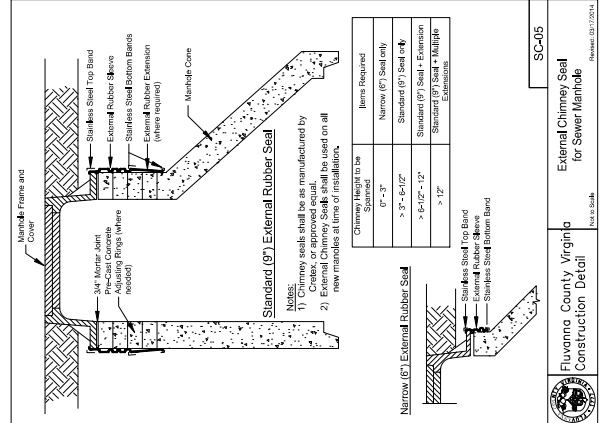


SEAL: _____

SCALE: _____

No.	DATE	BY	Description

DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018
 TITLE: DETAILS



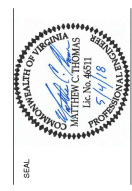
NOTES:
 1. PER ANGLES OVER FLUME THROATS (SIZES NOT SHOWN FOR CLARITY)
 2. FILL SPACES BETWEEN FLUMES (SIZES AND BOTTOM) WITH APPROPRIATE MATERIAL.
 (SAND CAPTED BY GROUP)



Dewberry Engineers Inc.
 6000 Old Dominion Drive, Suite 200
 Glen Allen, Virginia 22042
 Phone: 703.441.2000
 Fax: 703.441.2002
 www.dewberry.com

ZION CROSSROADS
 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN

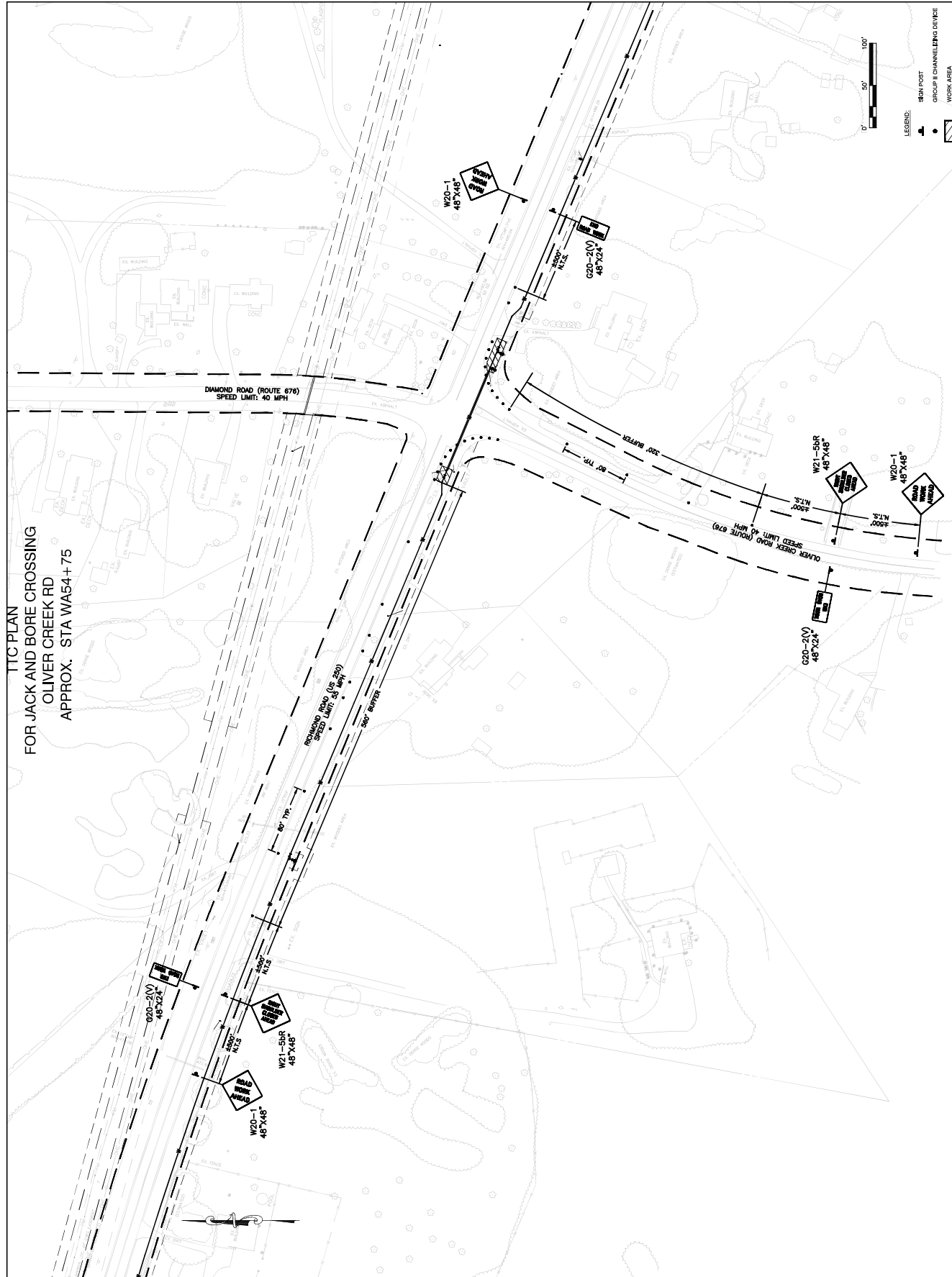


SCALE

NO.	DATE	BY	DESCRIPTION

REVISIONS
 DRAWN BY: JMS
 APPROVED BY: MCT
 CHECKED BY: DWY
 DATE: MAY 2018

TITLE: TEMPORARY TRAFFIC CONTROL ROUTE 2502 AT OLIVER CREEK RD
 PROJECT NO.: 5001061
 SHEET NO.: C3.2
 542/768



LEGEND:
 SEN POST
 GROUP II CHANNELING DEVICE
 WORK AREA

E D C B A



Dewberry Engineers Inc.
 6000 Lakeside Drive, Suite 300
 Glen Allen, Virginia 22042
 Phone: 703.750.7000
 Fax: 703.750.7002
 www.dewberry.com

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 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



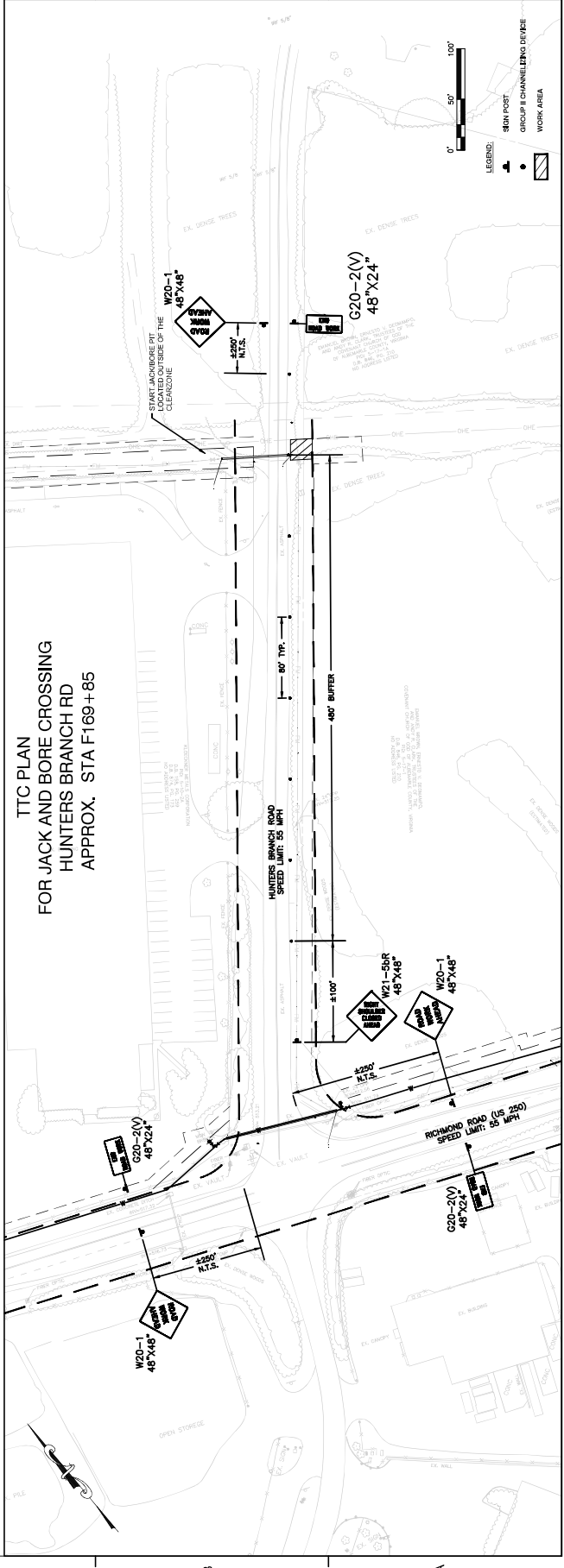
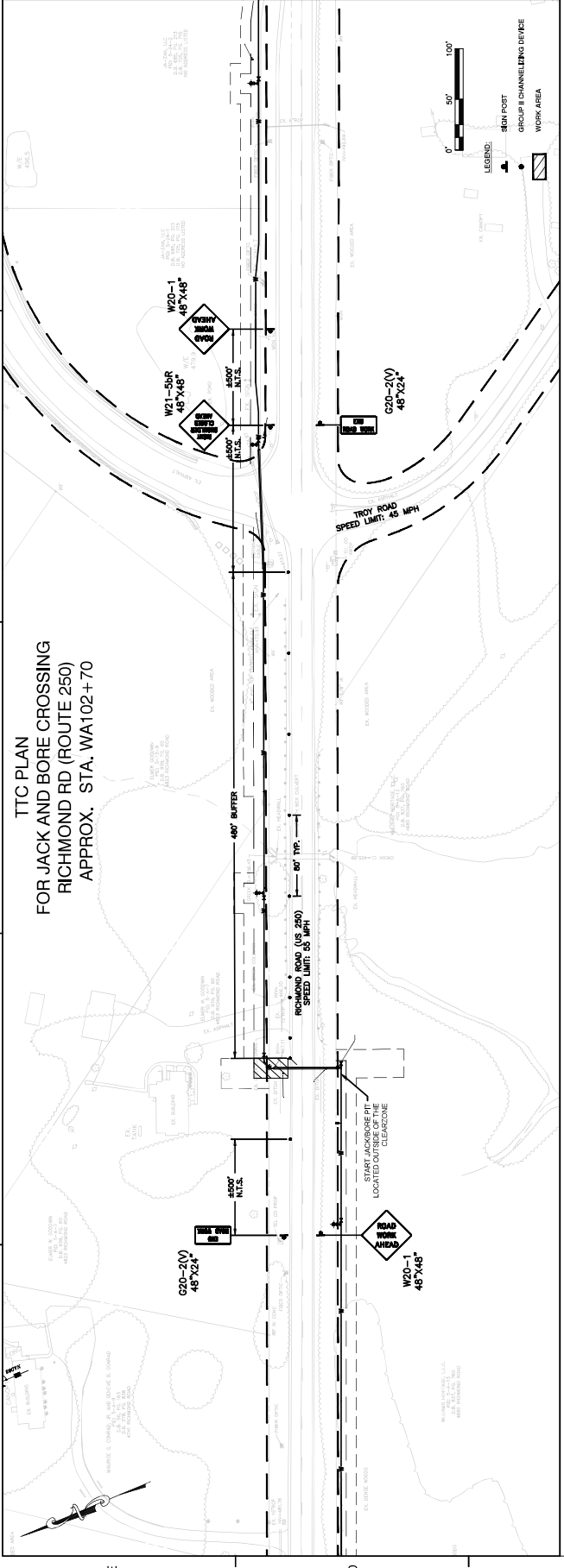
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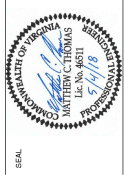
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REVISIONS
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 APPROVED BY: MCT
 CHECKED BY: DWY
 DATE: MAY 2018

TITLE: **B**
TEMPORARY TRAFFIC CONTROL
ROUTE 250
HUNTERS BRANCH RD
 PROJECT NO.: 5007-06-3
C3.3
 SHEET NO.

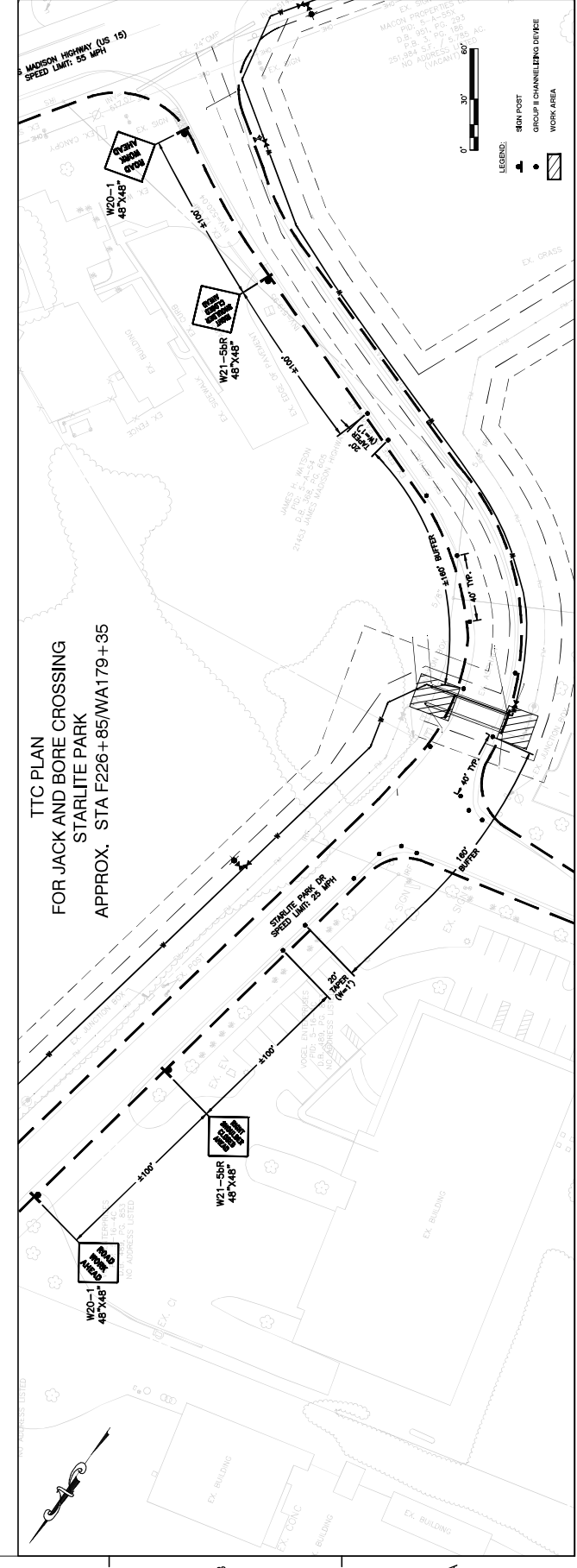
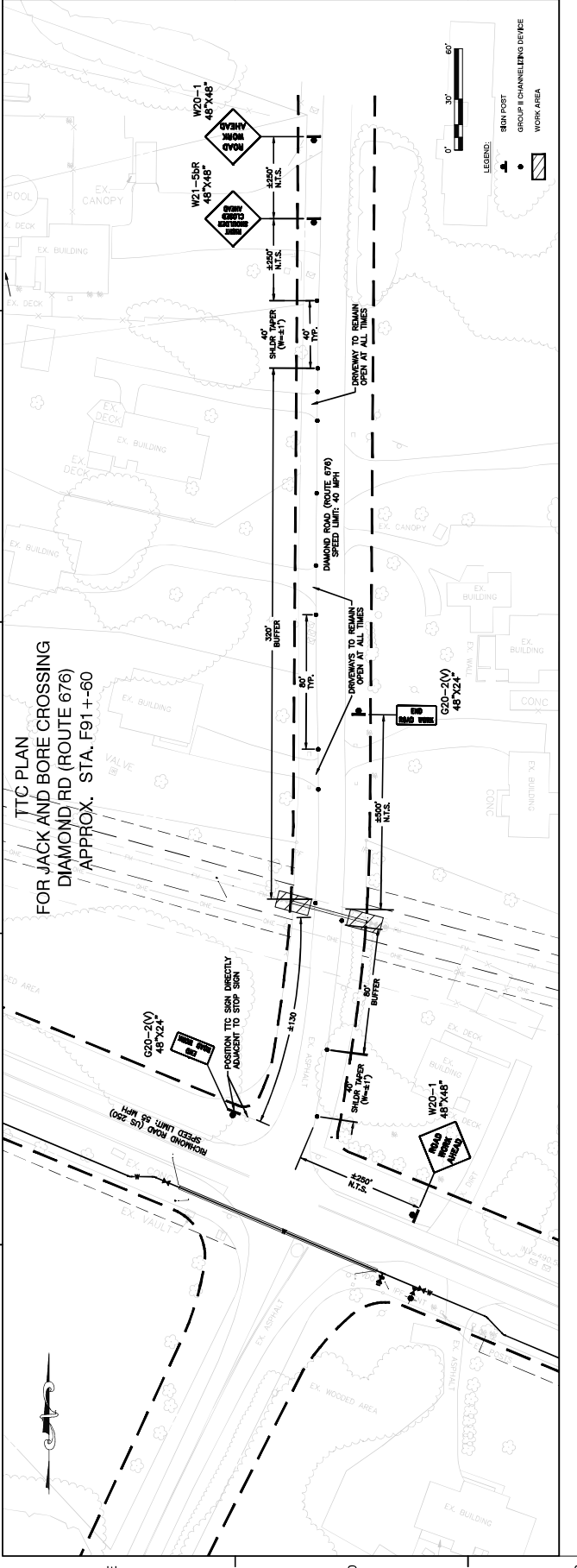
543/768





NO.	DATE	BY	DESCRIPTION

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 PROJECT NO.: 5007-06-02
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C3.4 544/768
 SHEET NO.

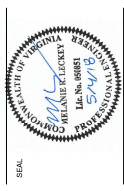




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 www.dewberry.com

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 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



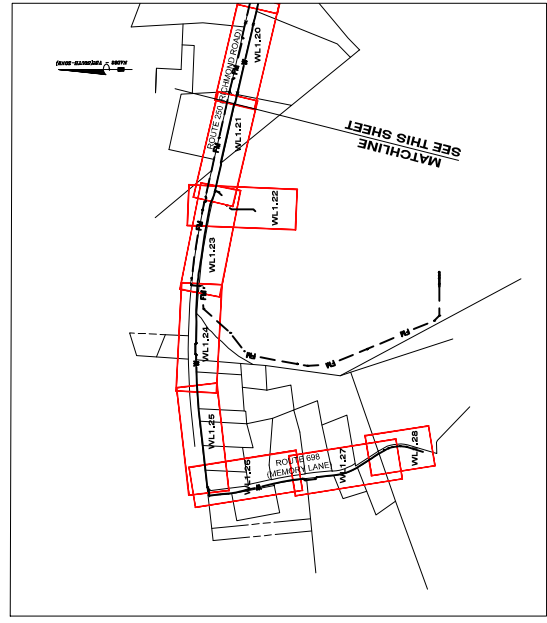
SCALE
 0' 500' 1000'
 HORIZONTAL 1"=500'

No.	DATE	BY	Description

REVISIONS
 No. DATE BY Description

DRAWN BY: JPH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

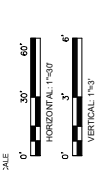
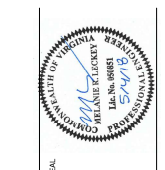
TITLE: **WATERLINE ALIGNMENT KEY PLAN**
 PROJECT NO.: 500000661
 19-000-06-1545/768
WLO:1



NADS - YSC(SOUTH-ZONE)

1 2 3 4 5

E D C B A



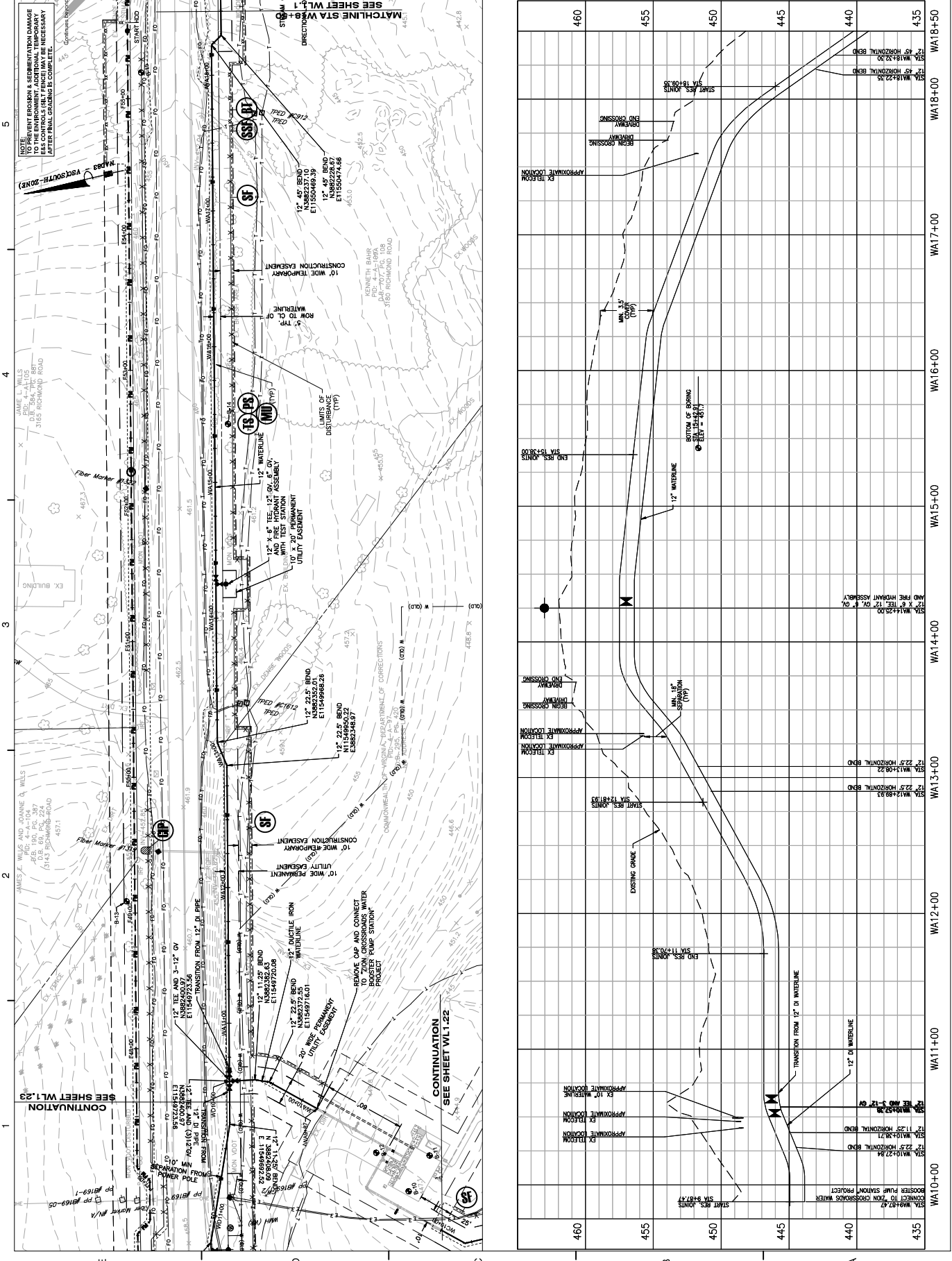
No.	DATE	BY	DESCRIPTION

DRAWN BY: JKH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

TITLE: **WATERLINE
 PLAN AND
 PROFILES**

PROJECT NO.: 50030661

WL1.0



CONTINUATION SEE SHEET WL1.22

NOTE: THIS DRAWING IS SUBJECT TO ANY CHANGE TO THE EXISTING CONDITIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE ACCURACY OF ALL DATA AND CONDITIONS SHOWN HEREON. ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER.



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ZION CROSSROADS
 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



SCALE
 0" = 30'
 0" = 60'
 HORIZONTAL 1" = 50'
 0" = 3'
 0" = 6"
 VERTICAL 1" = 3'

No.	DATE	BY	DESCRIPTION

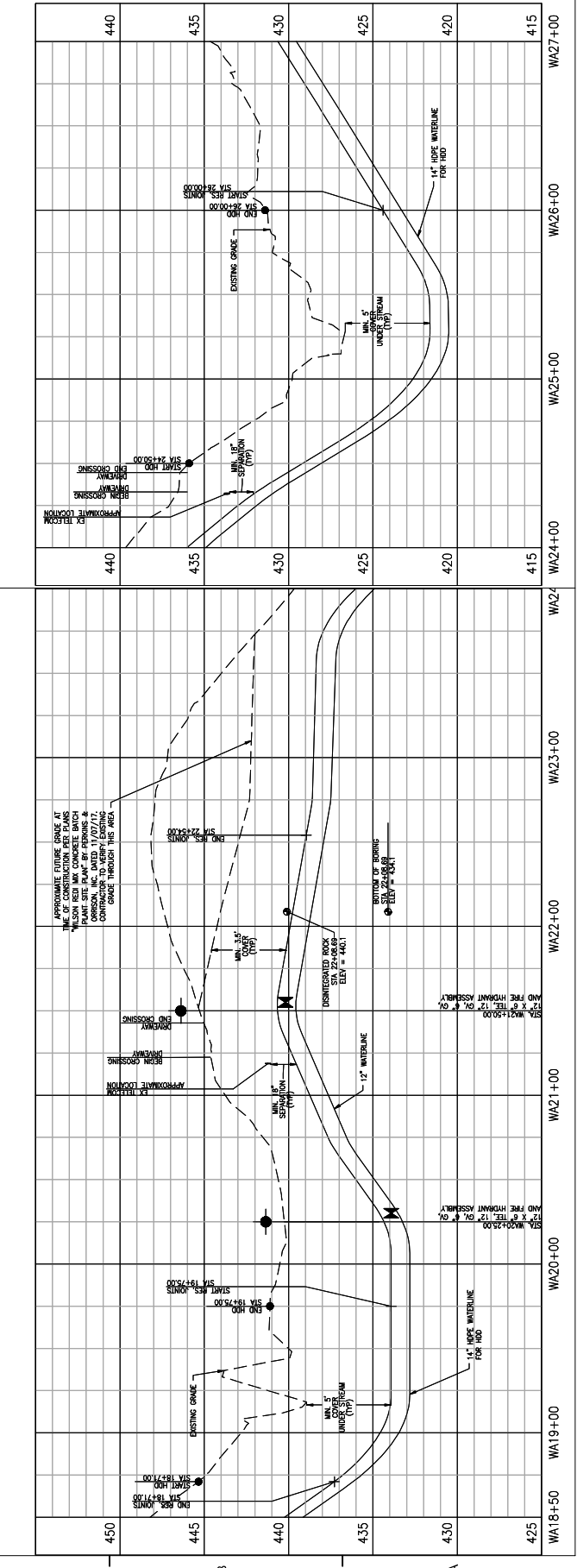
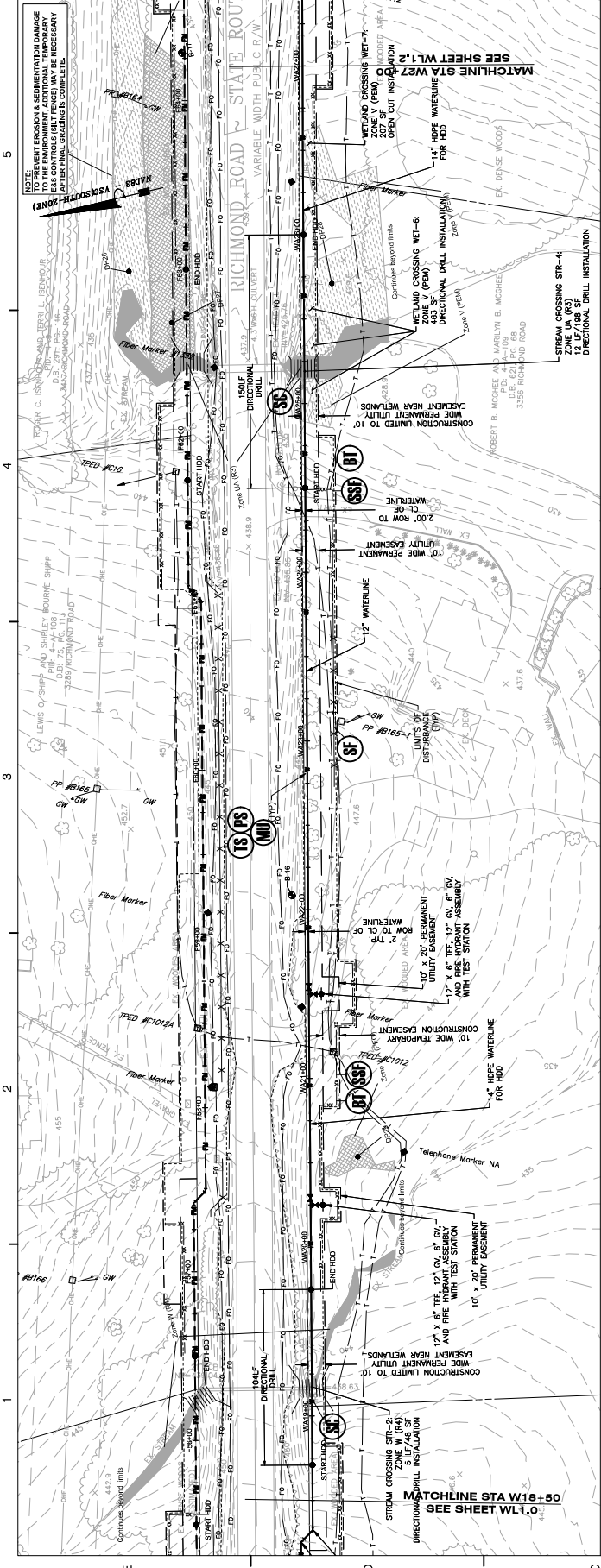
REVISIONS
 DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

WATERLINE
 PLAN AND
 PROFILES 16-0-01

PROJECT NO. 5007861

WL11

16-0-01-547878

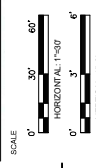




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 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



No.	DATE	BY	Description

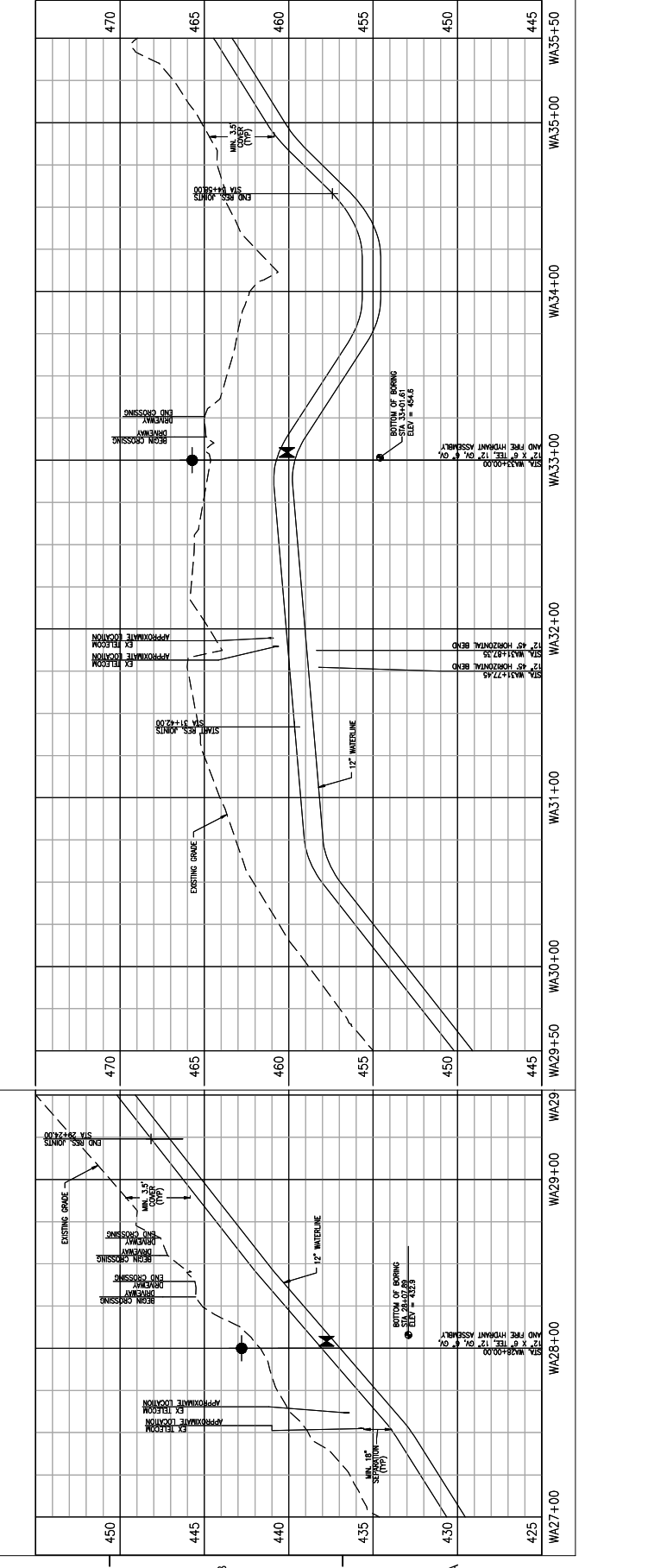
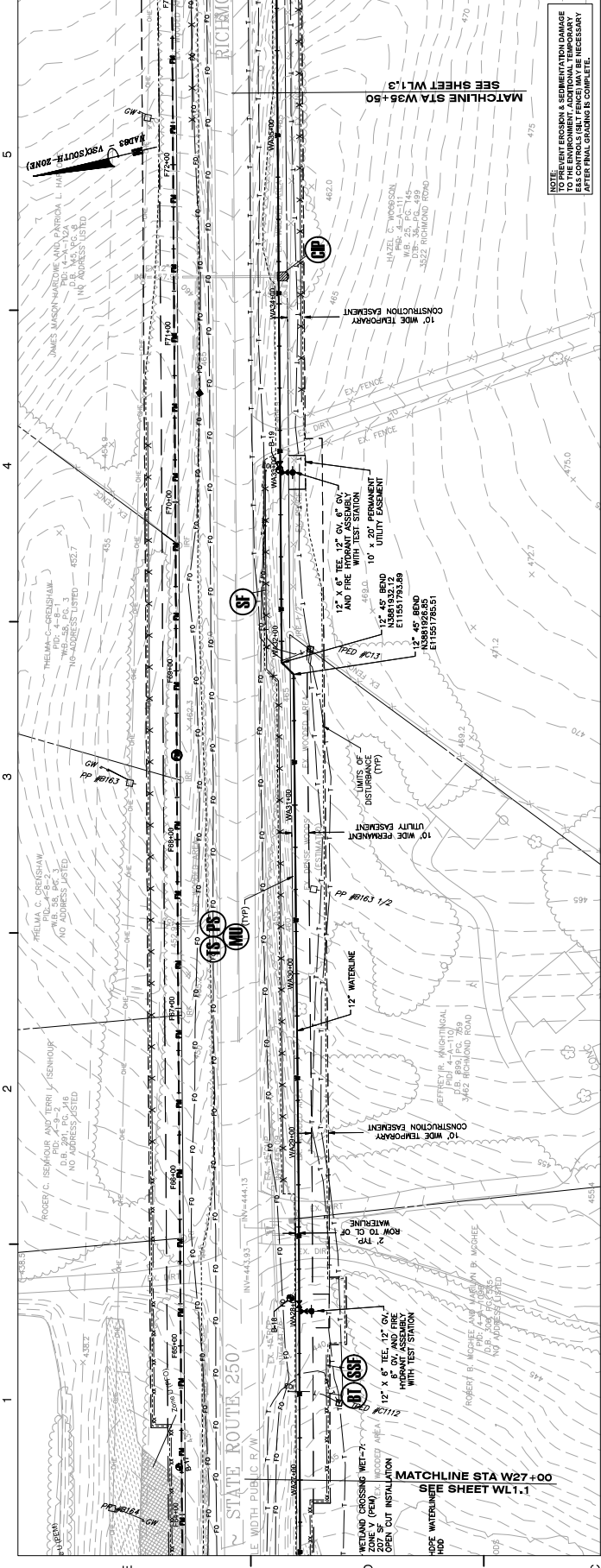
REVISIONS

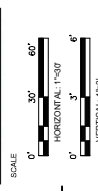
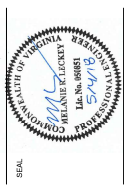
DRAWN BY: JKH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

TITLE
**WATERLINE
 PLAN AND
 PROFILES**
 PROJECT NO.: 50033861

WL1.2
 19-09-2018

891/48/94



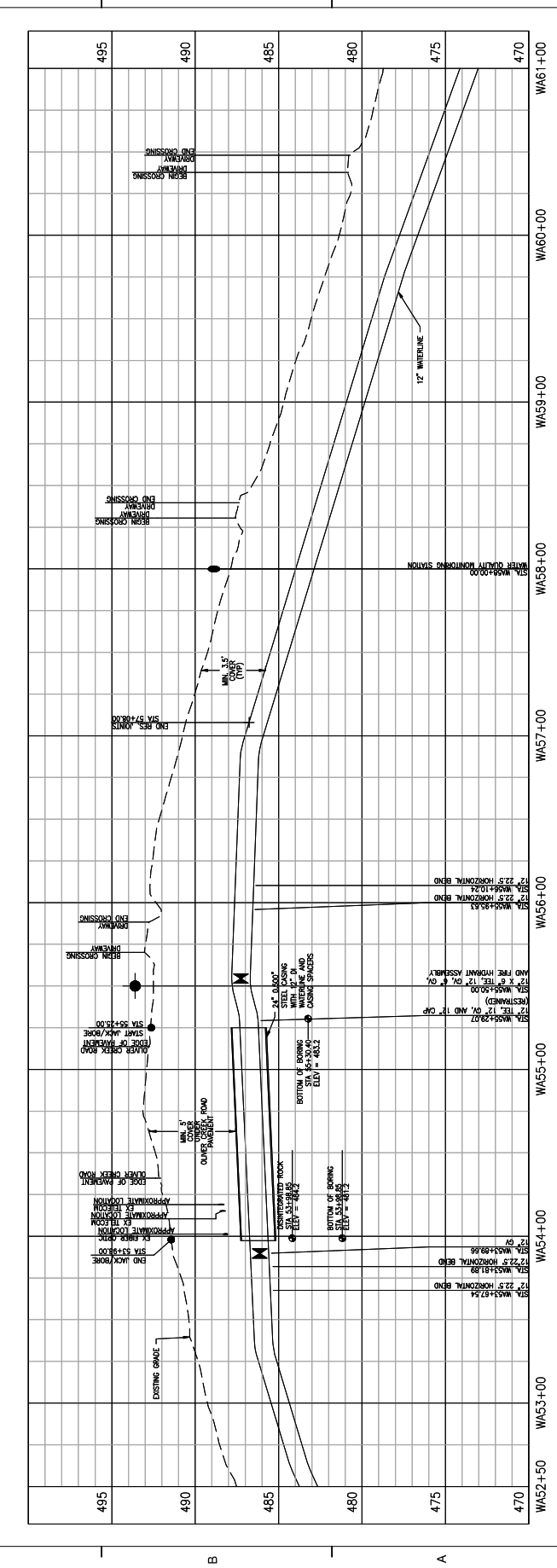
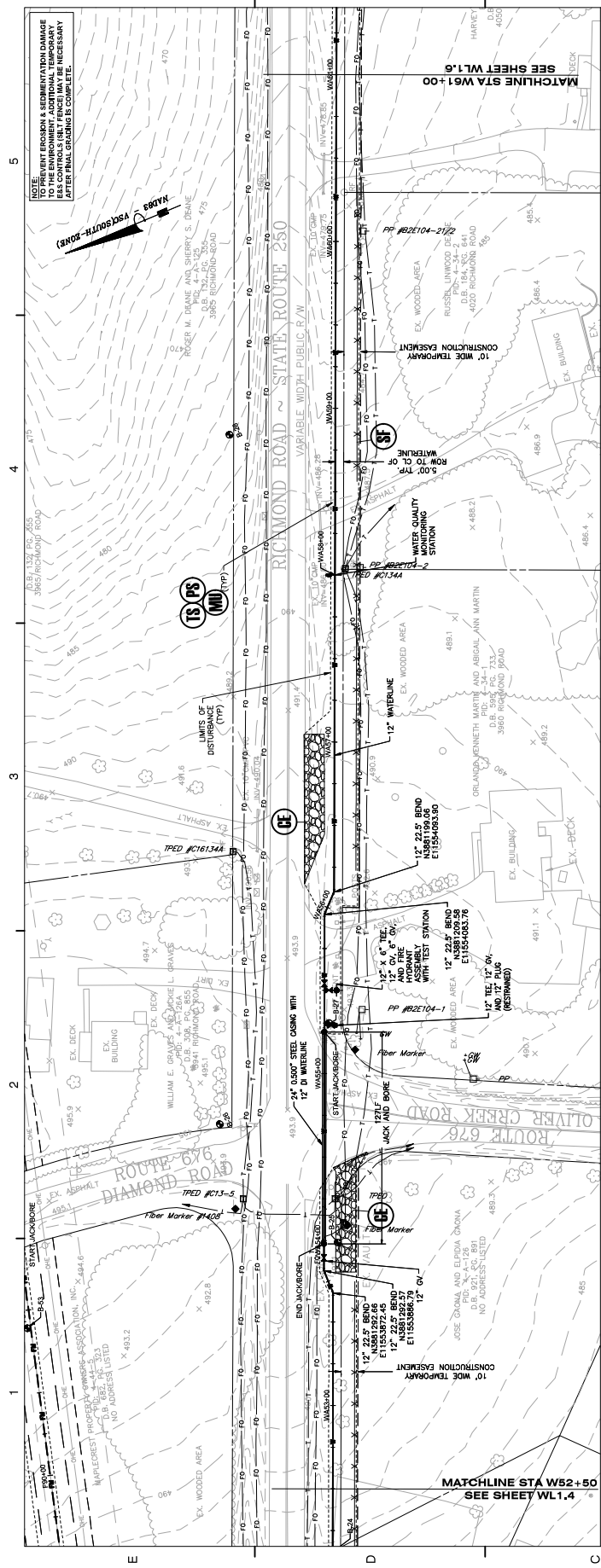


No.	DATE	BY	Description

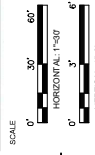
REVISIONS
 DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

TITLE: WATERLINE PLAN AND PROFILES
 PROJECT NO.: 5001861

WL15



NOTE: THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE ENVIRONMENTAL AGENCY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE ENVIRONMENTAL AGENCY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE ENVIRONMENTAL AGENCY.

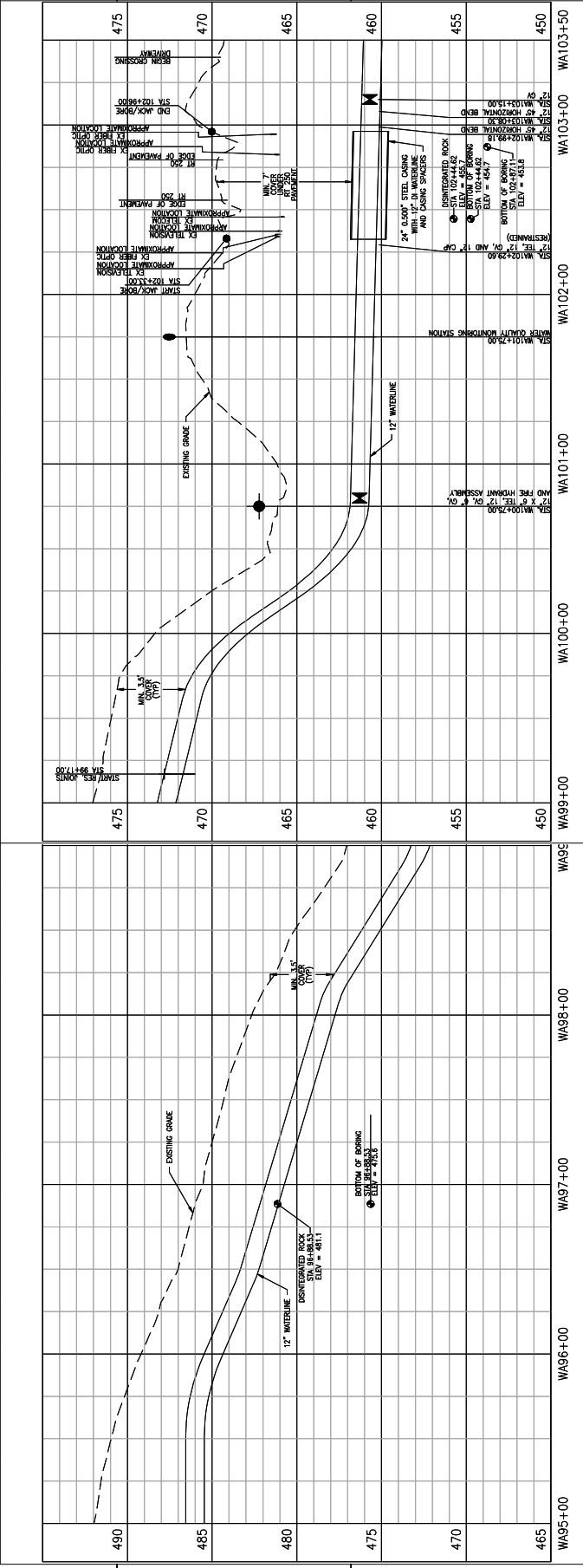
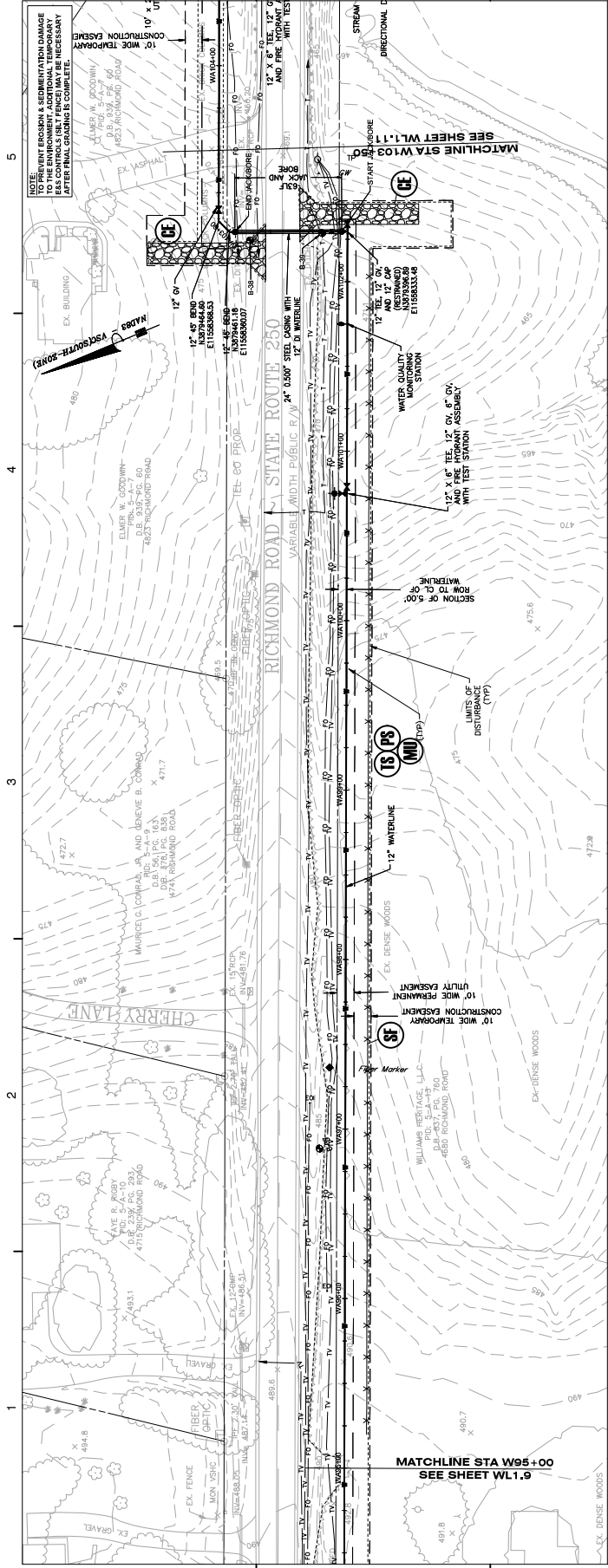


No.	DATE	BY	Description

DATE: MAY 2018
DRAWN BY: JEH
APPROVED BY: MRL
CHECKED BY: DAW

WATERLINE
PLAN AND
PROFILES 18-00-00-000

PROJECT NO.: 50033661



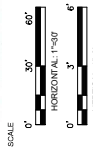
E D C B A



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 600 West Peachtree Street, Suite 2000
 Atlanta, Georgia 30308
 Phone: 404.521.8600
 Fax: 404.521.8606
 www.dewberry.com

ZION CROSSROADS
 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

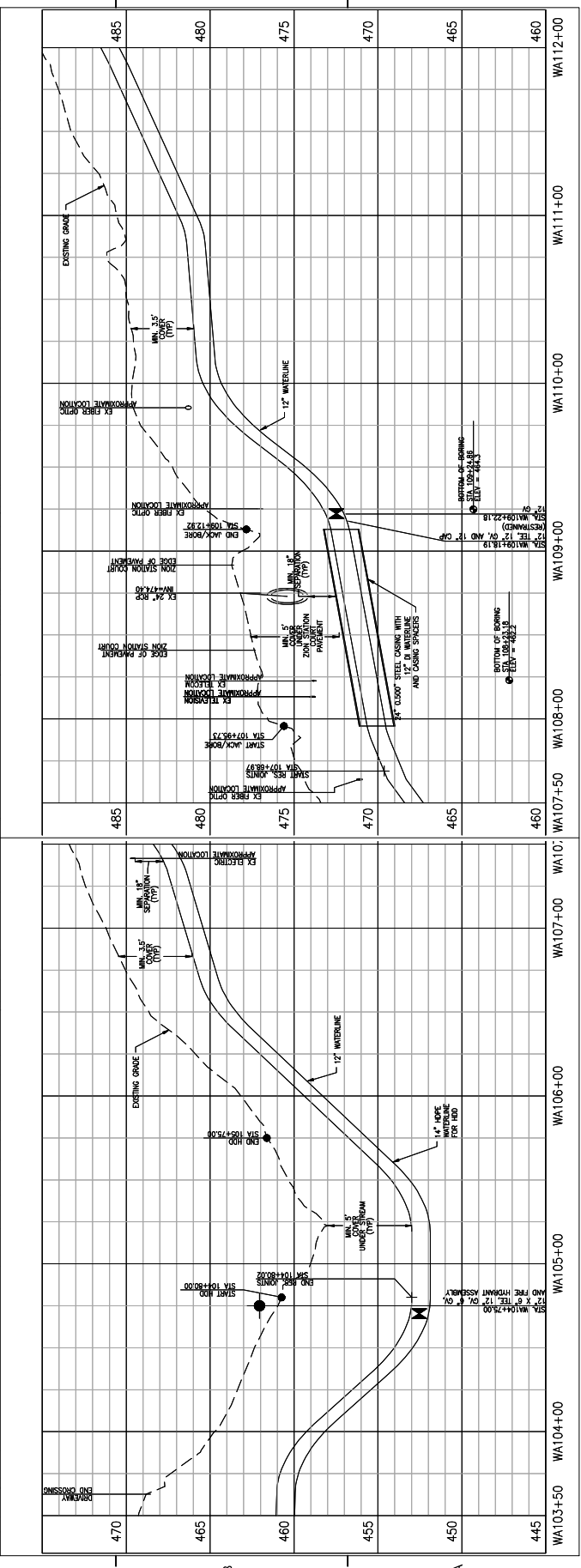
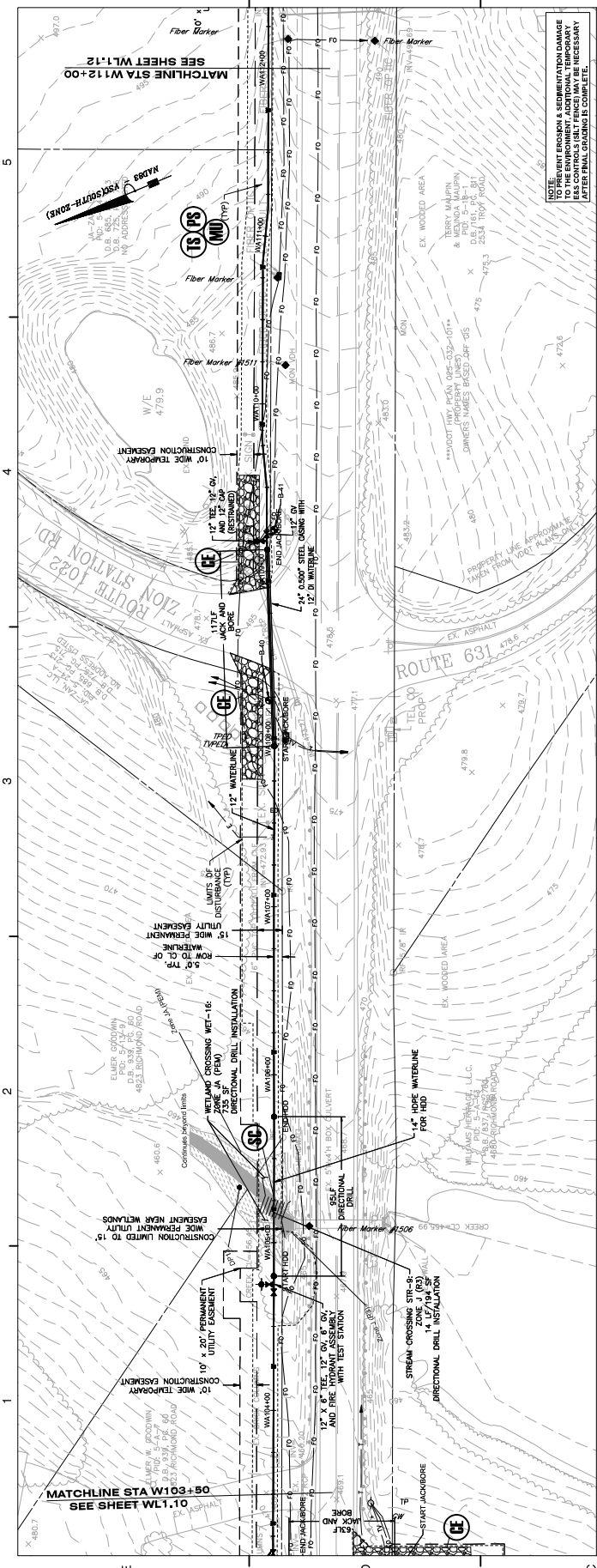
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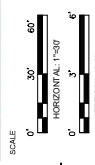
No.	DATE	BY	DESCRIPTION

TITLE
**WATERLINE
 PLAN AND
 PROFILES**
 PROJECT NO. 50033661
 19-00-011-001-001
 19-00-011-001-001

DATE
 MAY 2018
 DRAWN BY
 MRL
 CHECKED BY
 DAW
 DATE
 MAY 2018
 DESIGNED BY
 JEH



WA103+50 WA104+00 WA105+00 WA106+00 WA107+00 WA107+50 WA108+00 WA109+00 WA110+00 WA111+00 WA112+00



No.	DATE	BY	DESCRIPTION

REVISIONS

NO. DATE BY DESCRIPTION

DRAWN BY JEH

APPROVED BY MRL

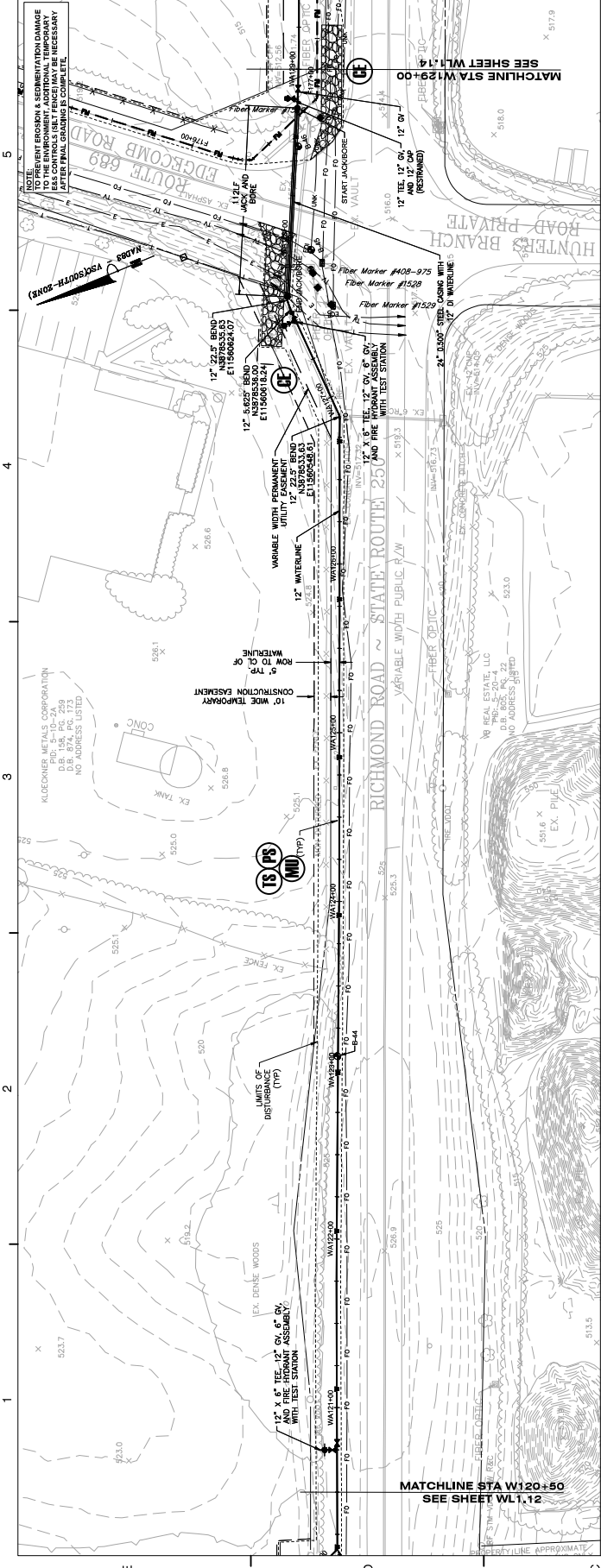
CHECKED BY DJW

DATE MAY 2018

TITLE
**WATERLINE
 PLAN AND
 PROFILES**

PROJECT NO. 5003061

WL1.13





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 4500 Hillsborough Blvd., Suite 200
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 Fax: 919.876.2909
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 WATER AND SEWER SYSTEM**

FLUVANNA COUNTY, VA

KEY PLAN

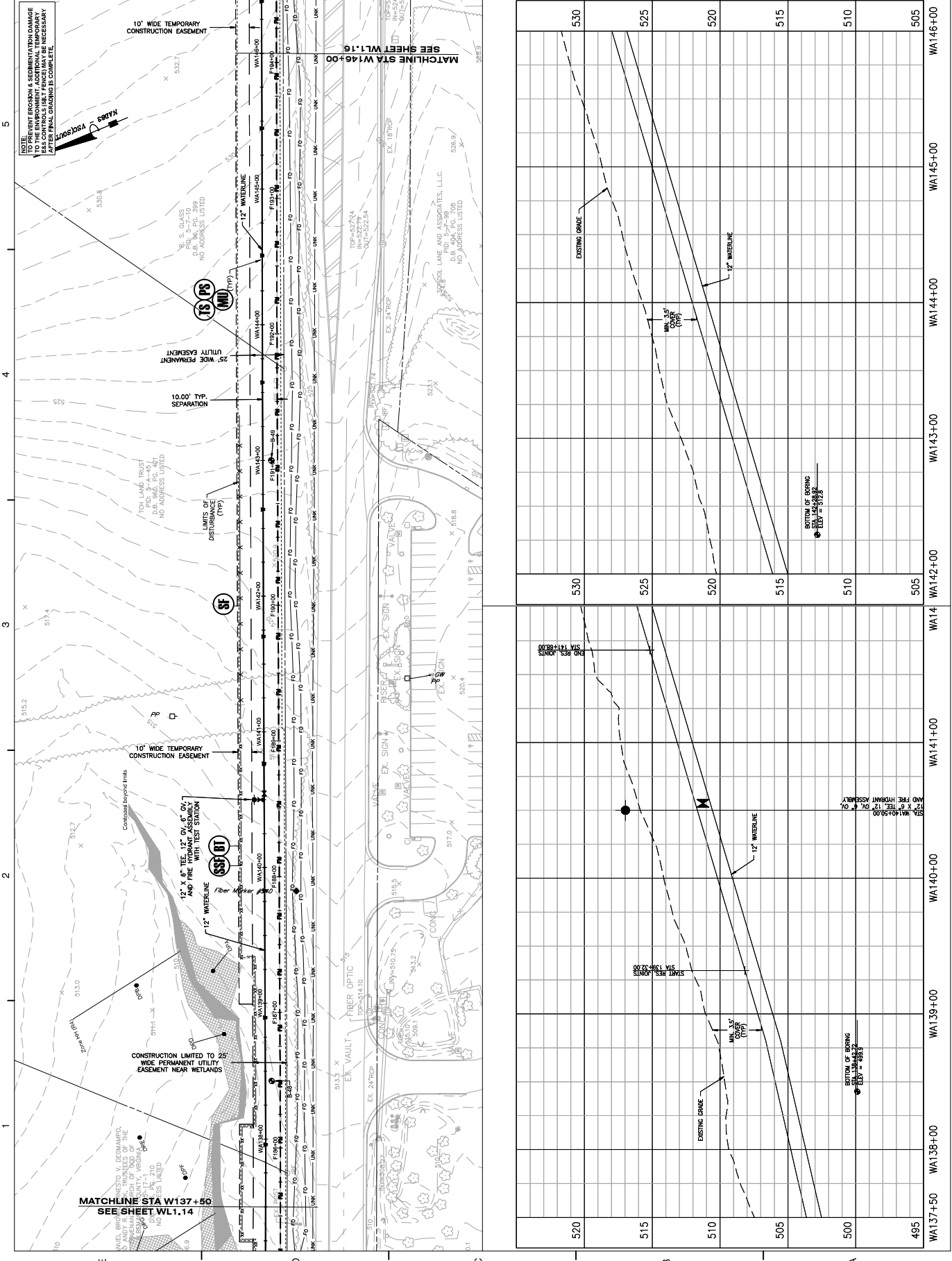


No.	DATE	BY	DESCRIPTION

REVISIONS
 DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

TITLE
**WATERLINE
 PLAN AND
 PROFILES**
 PROJECT NO.: 50003061

WL1.15
 16-06-19-00-561/768





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 4000 Westpark Drive, Suite 200
 Raleigh, North Carolina 27606
 Phone: 919.487.2000
 Fax: 919.487.2001
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ZION CROSSROADS
 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



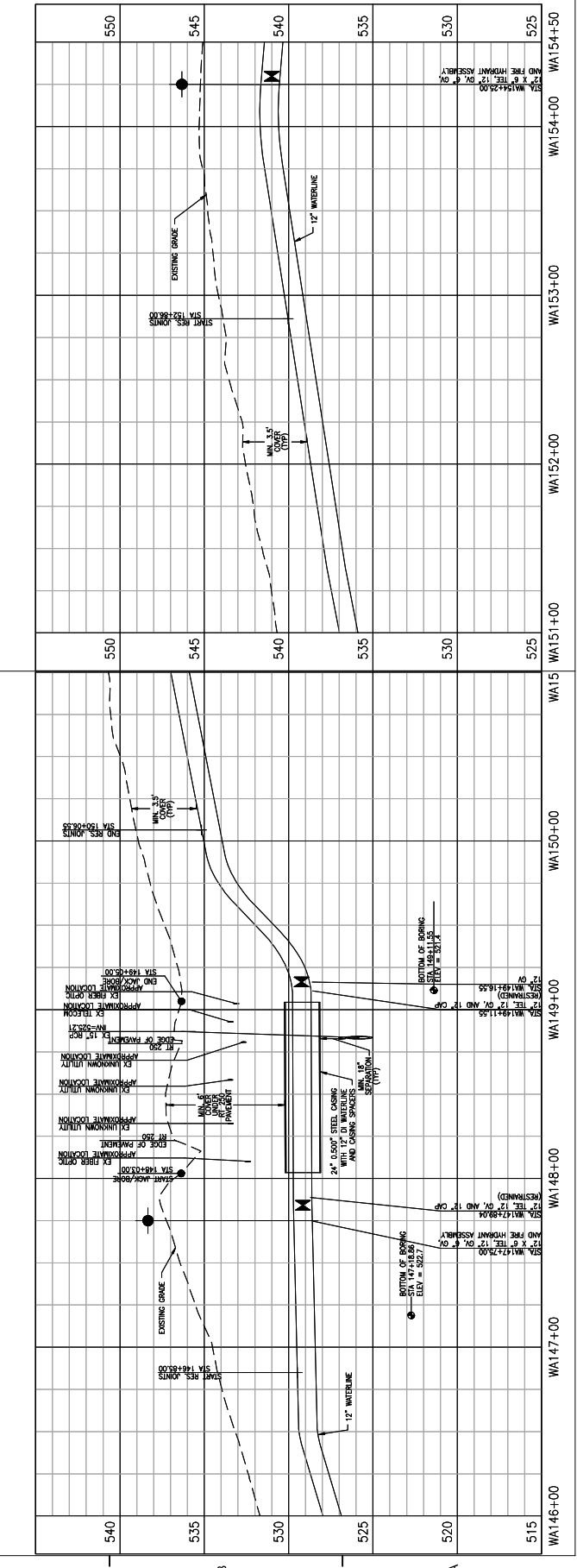
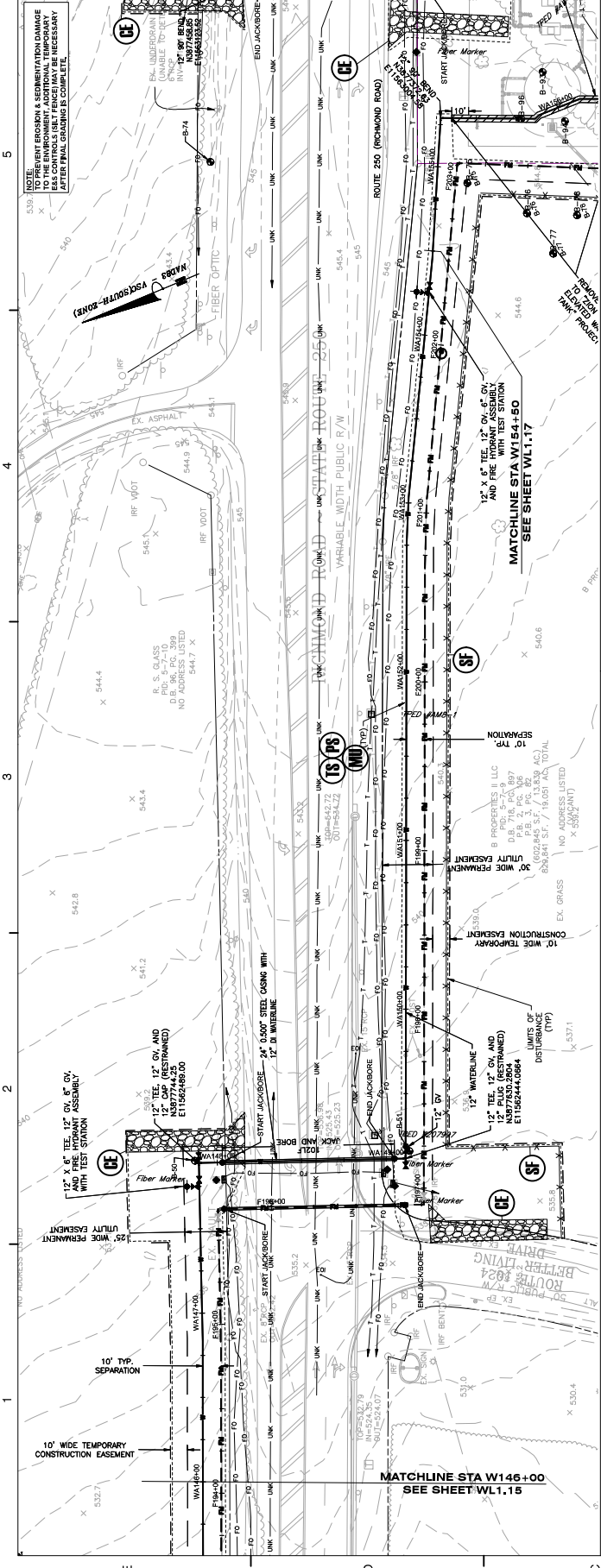
No.	DATE	BY	DESCRIPTION

DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

WATERLINE
 PLAN AND
 PROFILES 16-0-00-060-062/768

PROJECT NO.: 5003861

WL1.16



Station	Profile Description
550	EXISTING GROUND
545	EXISTING GROUND
540	EXISTING GROUND
535	EXISTING GROUND
530	EXISTING GROUND
525	EXISTING GROUND
520	EXISTING GROUND



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ZION CROSSROADS
 WATER AND SEWER SYSTEM
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 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



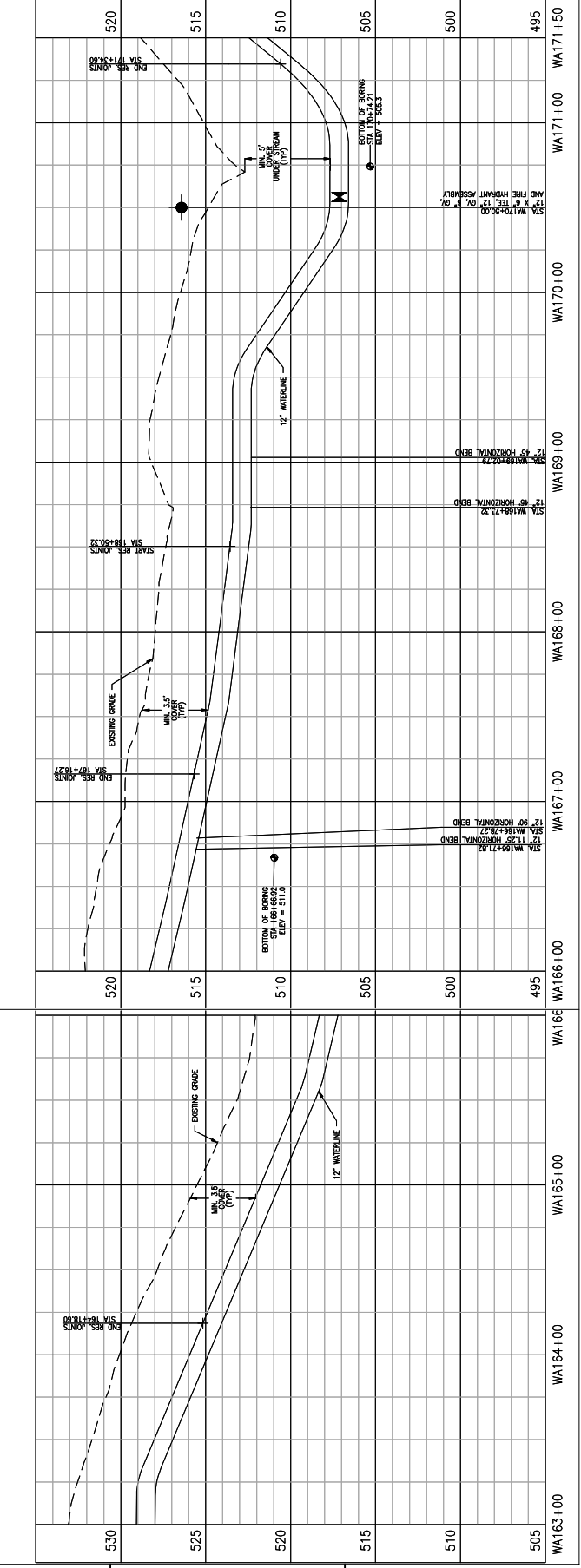
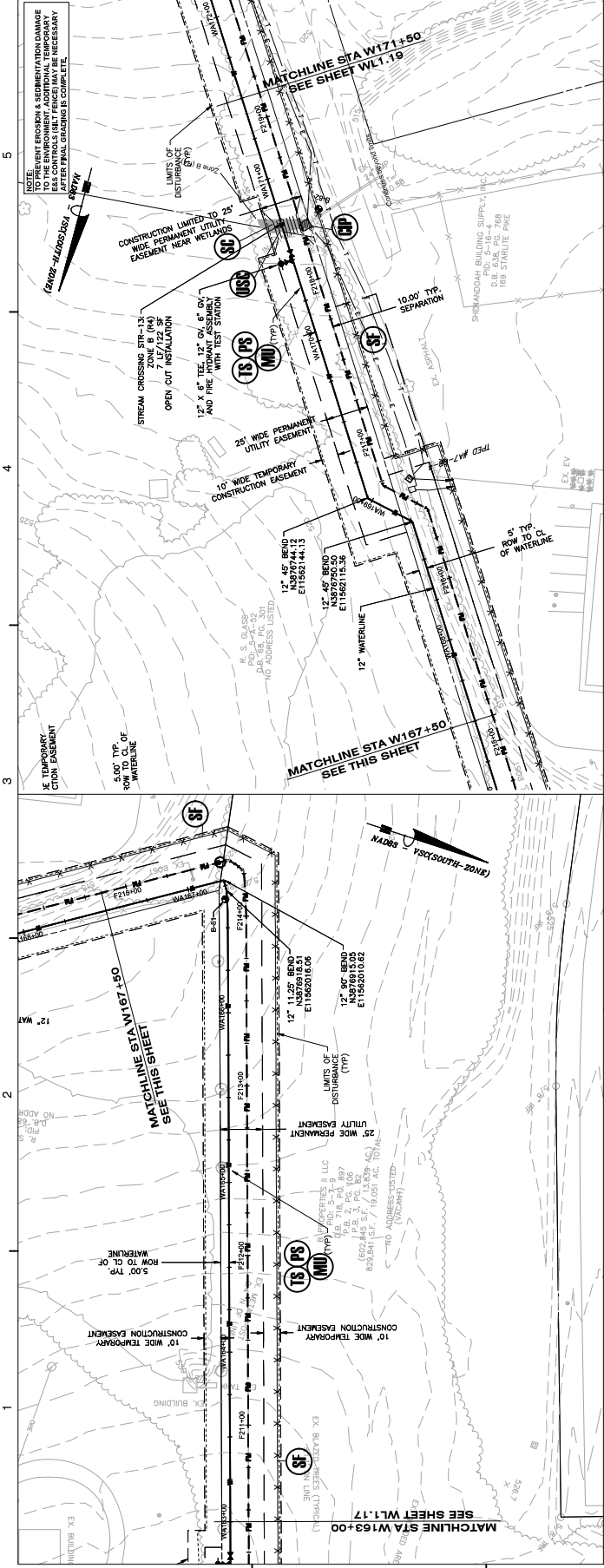
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 HORIZONTAL 1"=50'
 0' 5' 10'
 VERTICAL 1"=3'

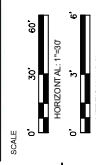
No.	DATE	BY	DESCRIPTION

REVISIONS
 DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

TITLE
**WATERLINE
 PLAN AND
 PROFILES**
 PROJECT NO.: 5003861

WL1.18
 19-00-00-564/768





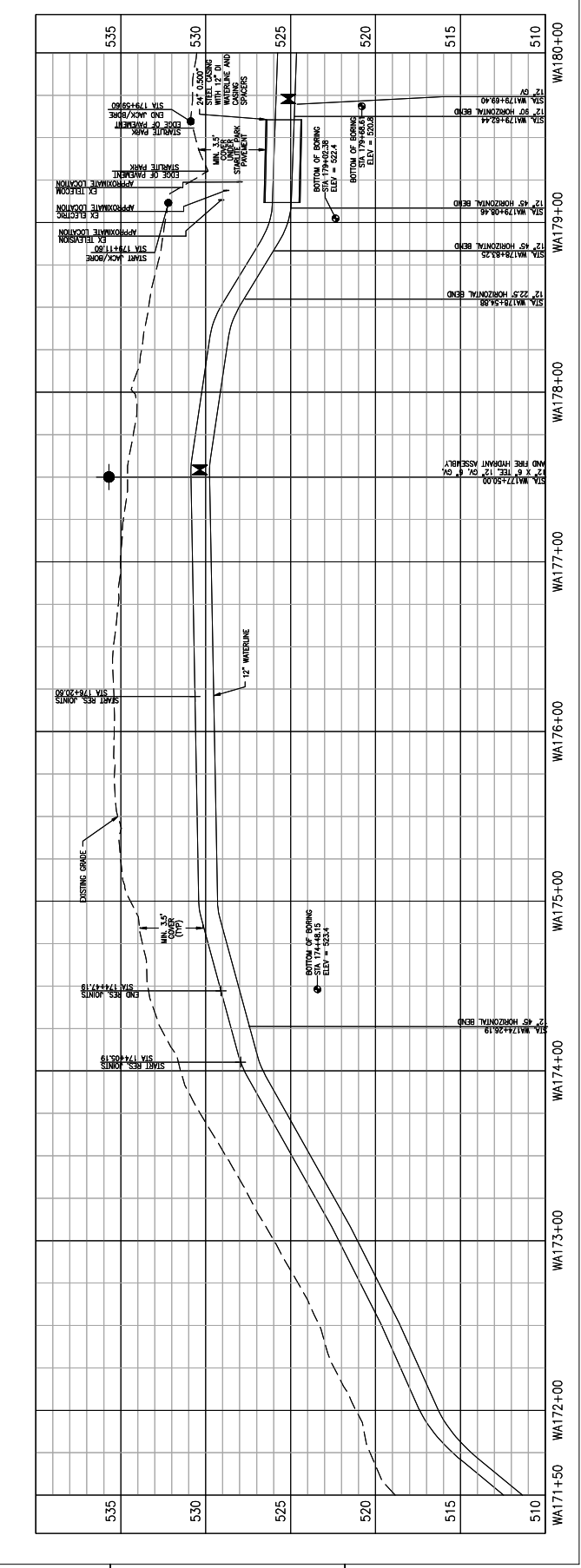
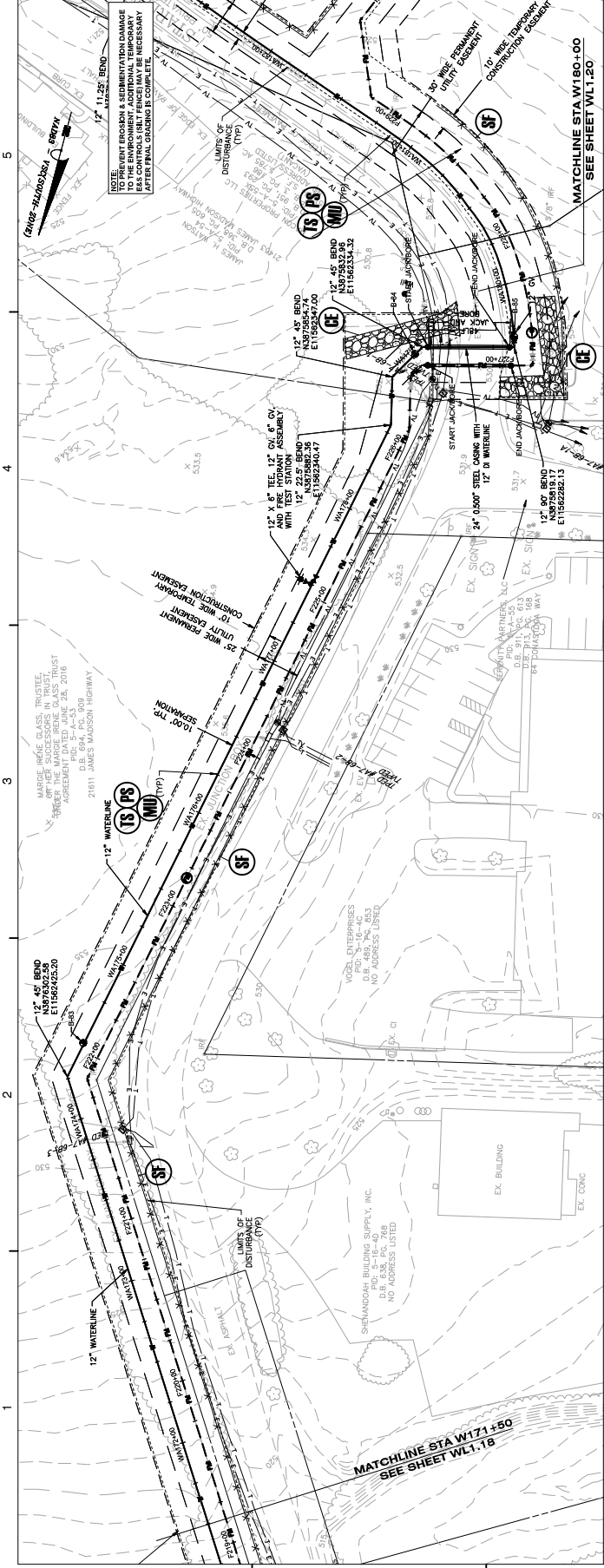
No.	DATE	BY	Description

DESIGNED BY: JEH
 DRAWN BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2016

**WATERLINE
 PLAN AND
 PROFILES**

PROJECT NO.: 50073861

WL1.19

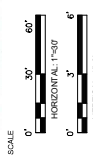




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 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



No.	DATE	BY	Description

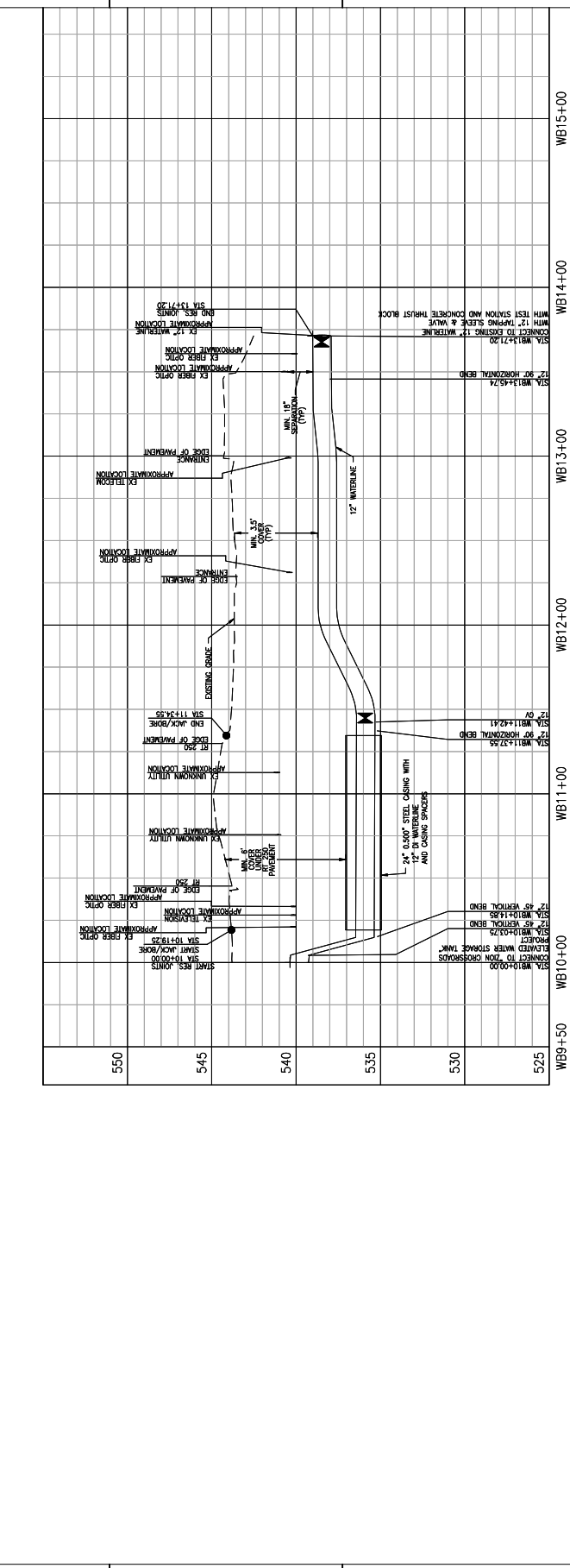
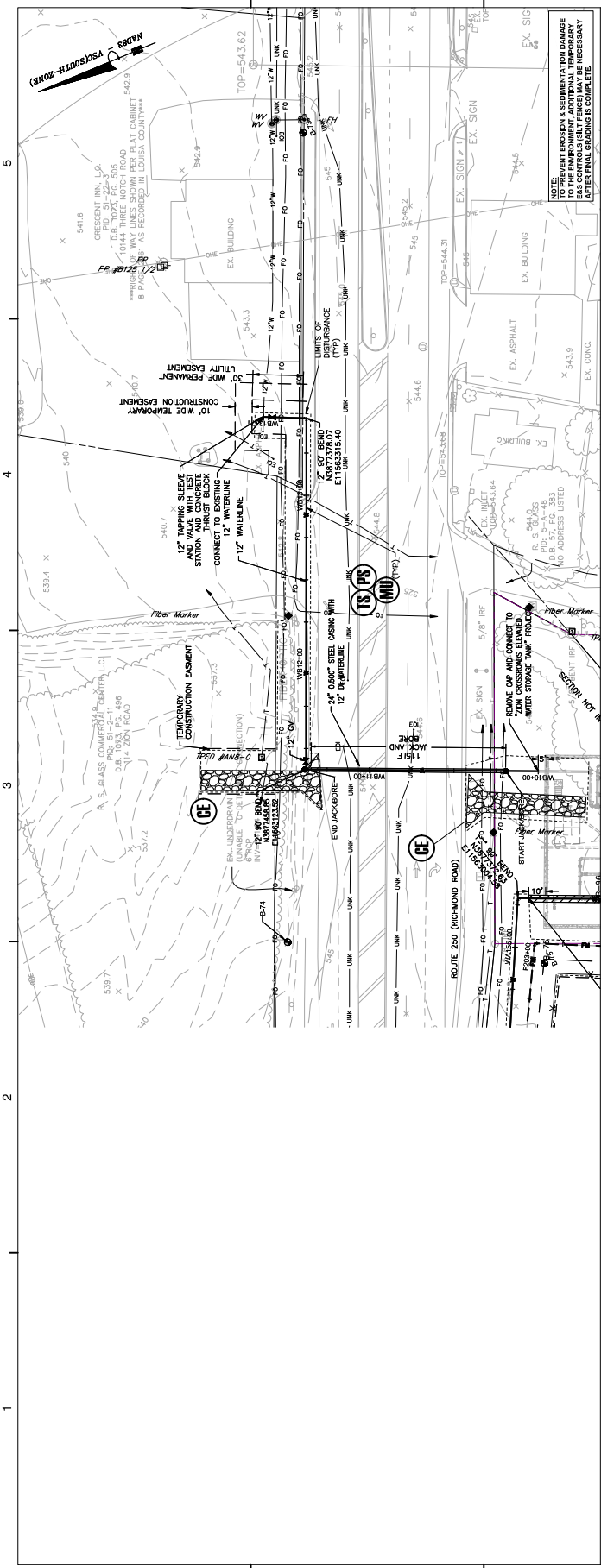
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TITLE
**WATERLINE
 PLAN AND
 PROFILES**

PROJECT NO. 50000061

WL1.01

19-06-09-0567/798

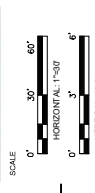
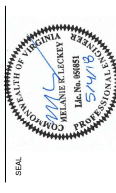




Dewberry Engineers Inc.
 4000 Westpark Drive, Suite 200
 Fairfax, VA 22031
 PHONE: 703.641.2000
 FAX: 703.641.2001
 www.dewberry.com

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 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN

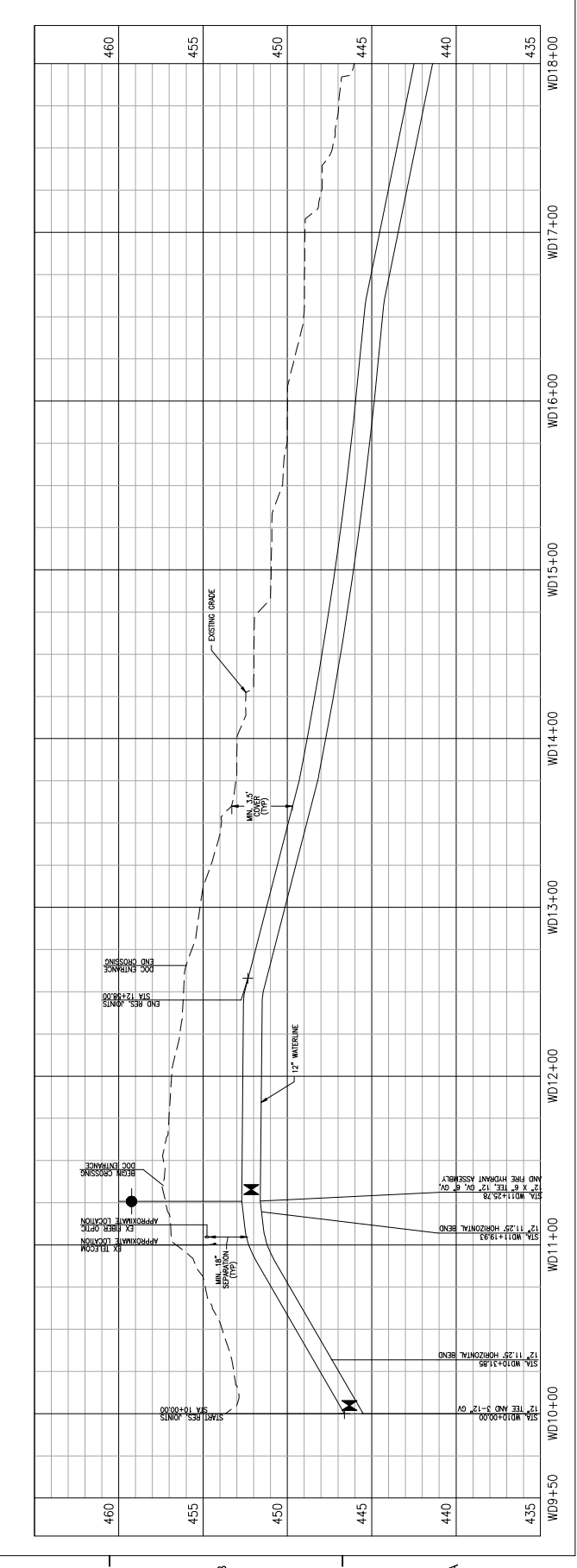
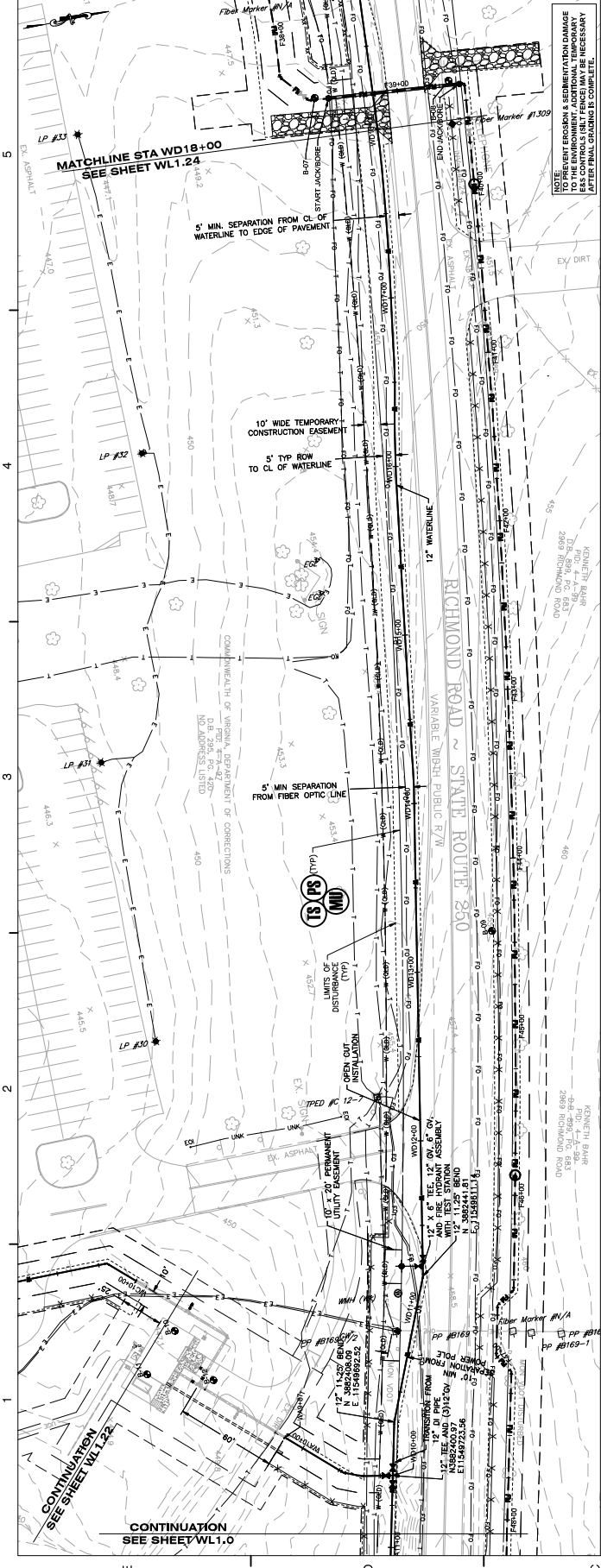


No.	DATE	BY	Description

REVISIONS
 DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

TITLE: WATERLINE PLAN AND PROFILES
 PROJECT NO.: 5003861

WL1.23
 19-00-06-569/768



CONTINUATION
 SEE SHEET WL1.1

CONTINUATION
 SEE SHEET WL1.2

WD9+50 WD10+00 WD11+00 WD12+00 WD13+00 WD14+00 WD15+00 WD16+00 WD17+00 WD18+00



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 6701 Lee's Ferry Road, Suite 200
 Glen Allen, Virginia 22060
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 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



SCALE
 0' 30' 60'
 HORIZONTAL 1"=50'
 0' 3' 6'
 VERTICAL 1"=3'

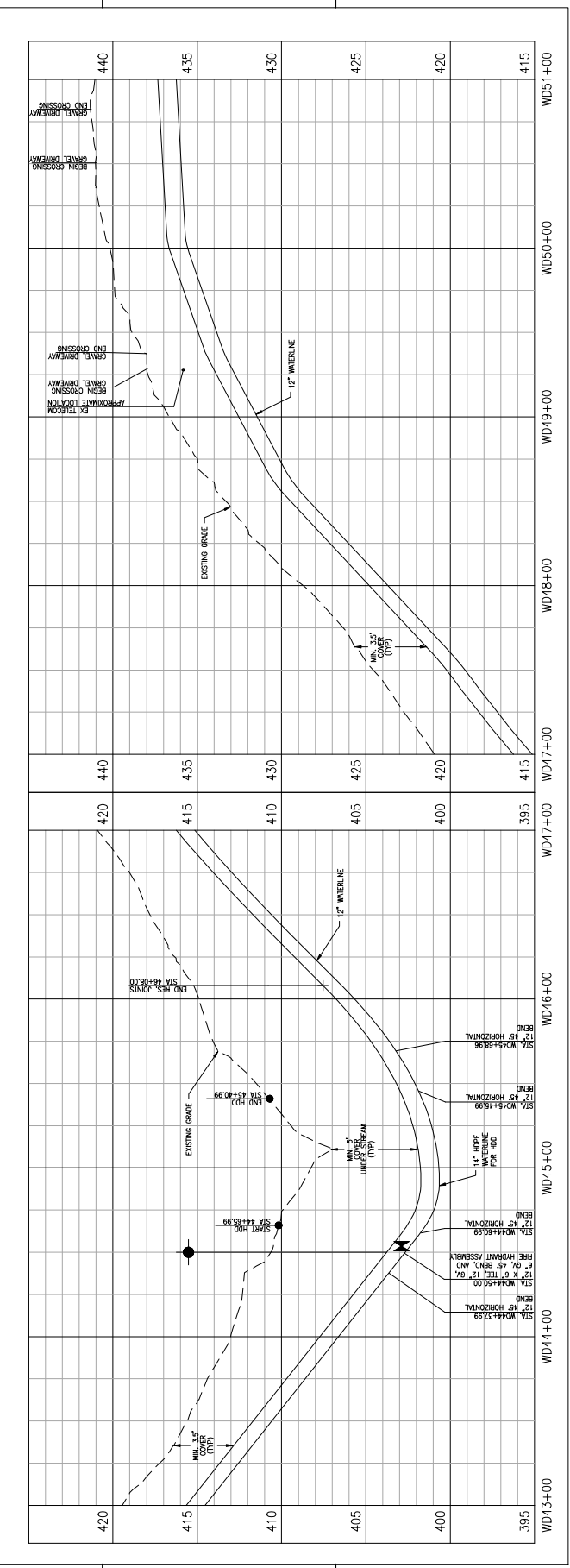
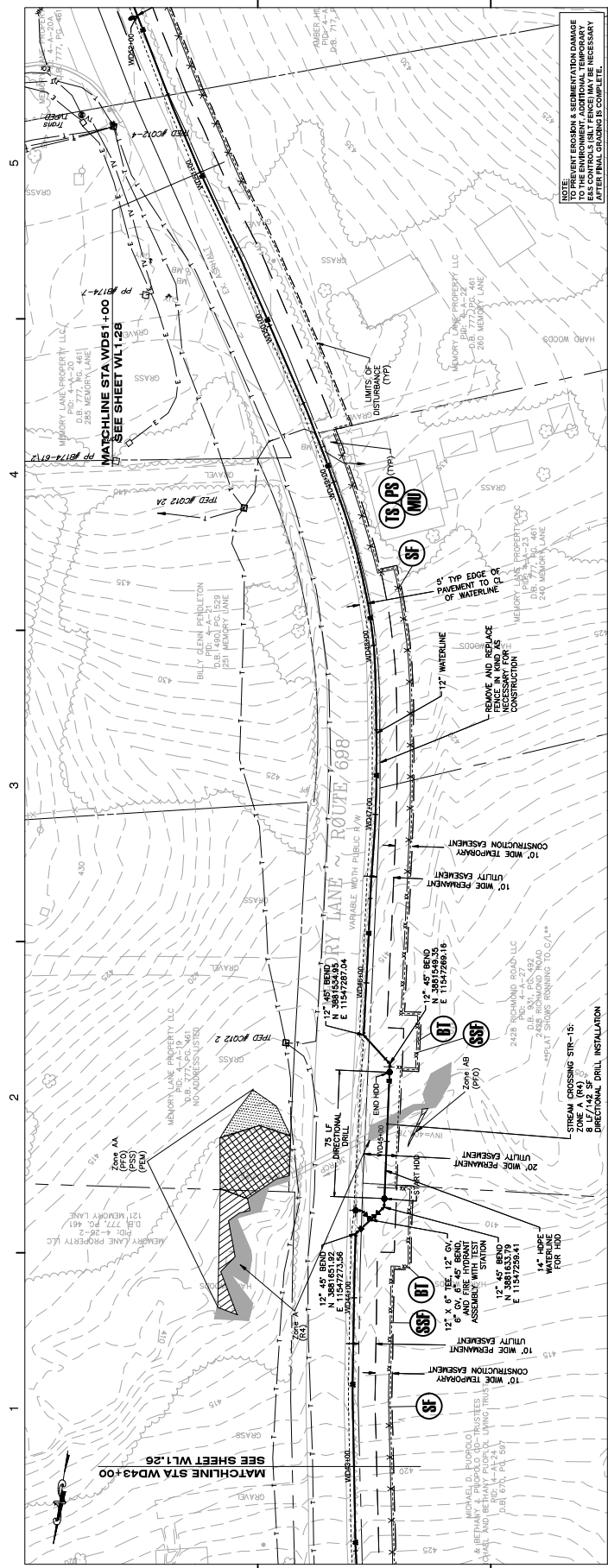
No.	DATE	BY	Description

REVISIONS
 DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

TITLE: WATERLINE PLAN AND PROFILES
 19-0690-061
 PROJECT NO.: 5003861

WL1.27

19-0690-061/573/768



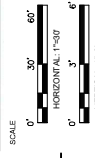
Zone 1A (PSS) (PEM)
 Zone 1B (PSS) (PEM)
 Zone 1C (PSS) (PEM)
 Zone 1D (PSS) (PEM)



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 10000 Lakeside Drive, Suite 200
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 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



No.	DATE	BY	Description

DESIGNED BY: JEH
 DRAWN BY: MRL
 APPROVED BY: DAW
 CHECKED BY: DAW
 DATE: MAY 2018

TITLE: WATERLINE
 PLAN AND
 PROFILES

PROJECT NO.: 50000061

WL1.28

19-06-00-00-574/768

NOTE: PERMIT REVIEW & SUBMITTAL RANGE TO THE ENVIRONMENTAL DEPARTMENT (E&S) CONTROLS (SET FENCE) MAY BE NECESSARY AFTER FINAL GRADING IS COMPLETE.

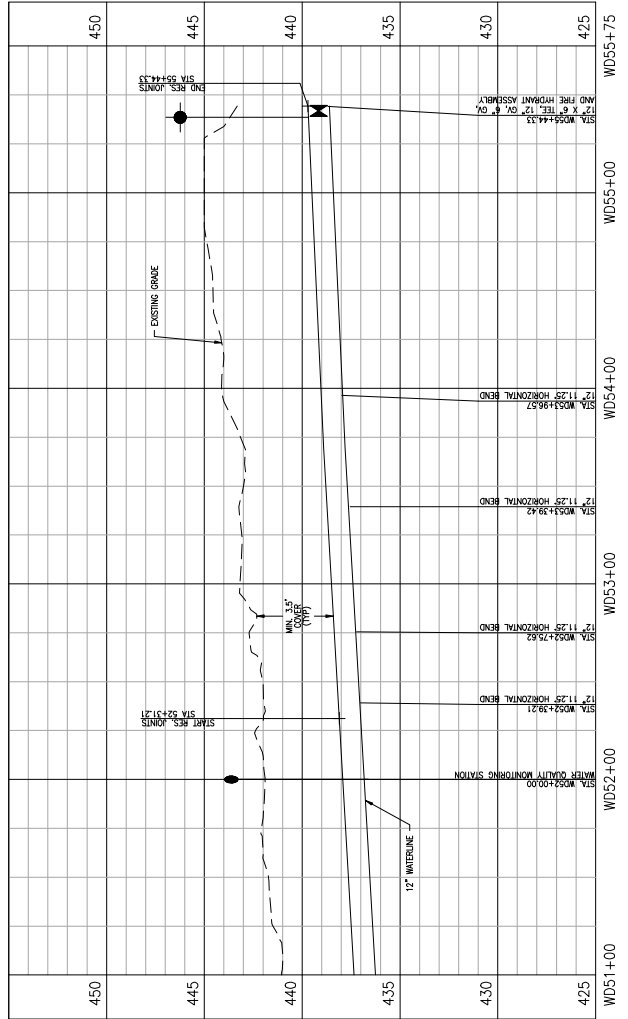
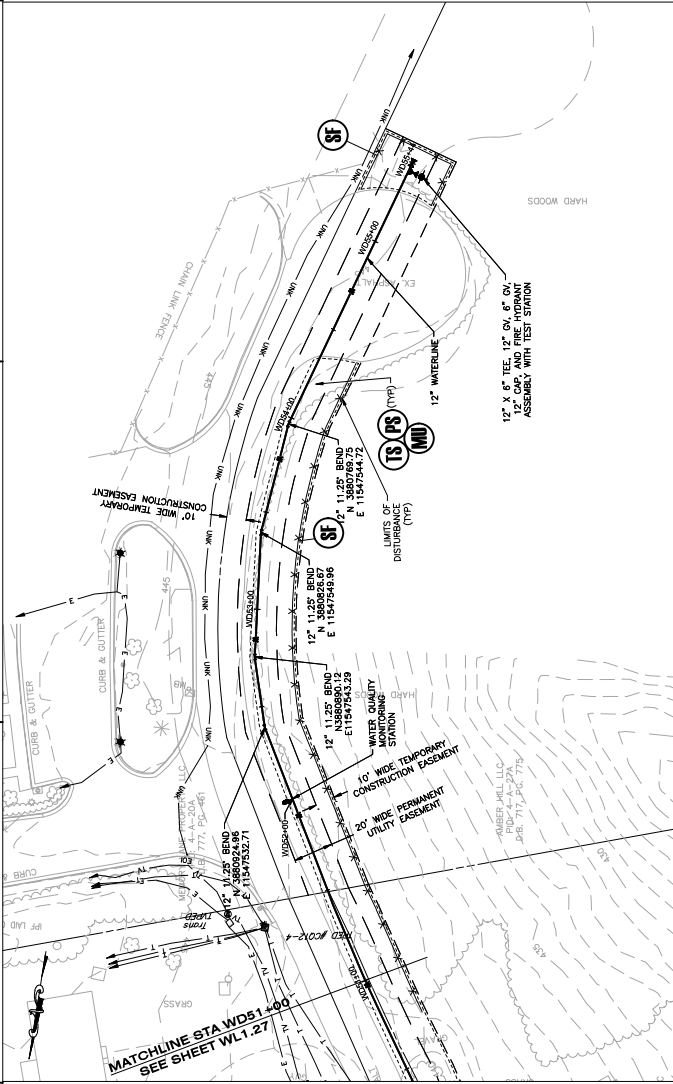
5

4

3

2

1



E D C B A



Dewberry Engineers Inc.
 1400 N. 10th St., Suite 1000
 Cary, NC 27513, USA
 Tel: 919.241.7000
 Fax: 919.241.7001
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 WATER AND SEWER SYSTEM
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 FLUVANNA COUNTY, VA

KEY PLAN



SCALE
 0' = 500' 1000'
 HORIZONTAL 1" = 500'

No.	DATE	BY	Description

REVISIONS

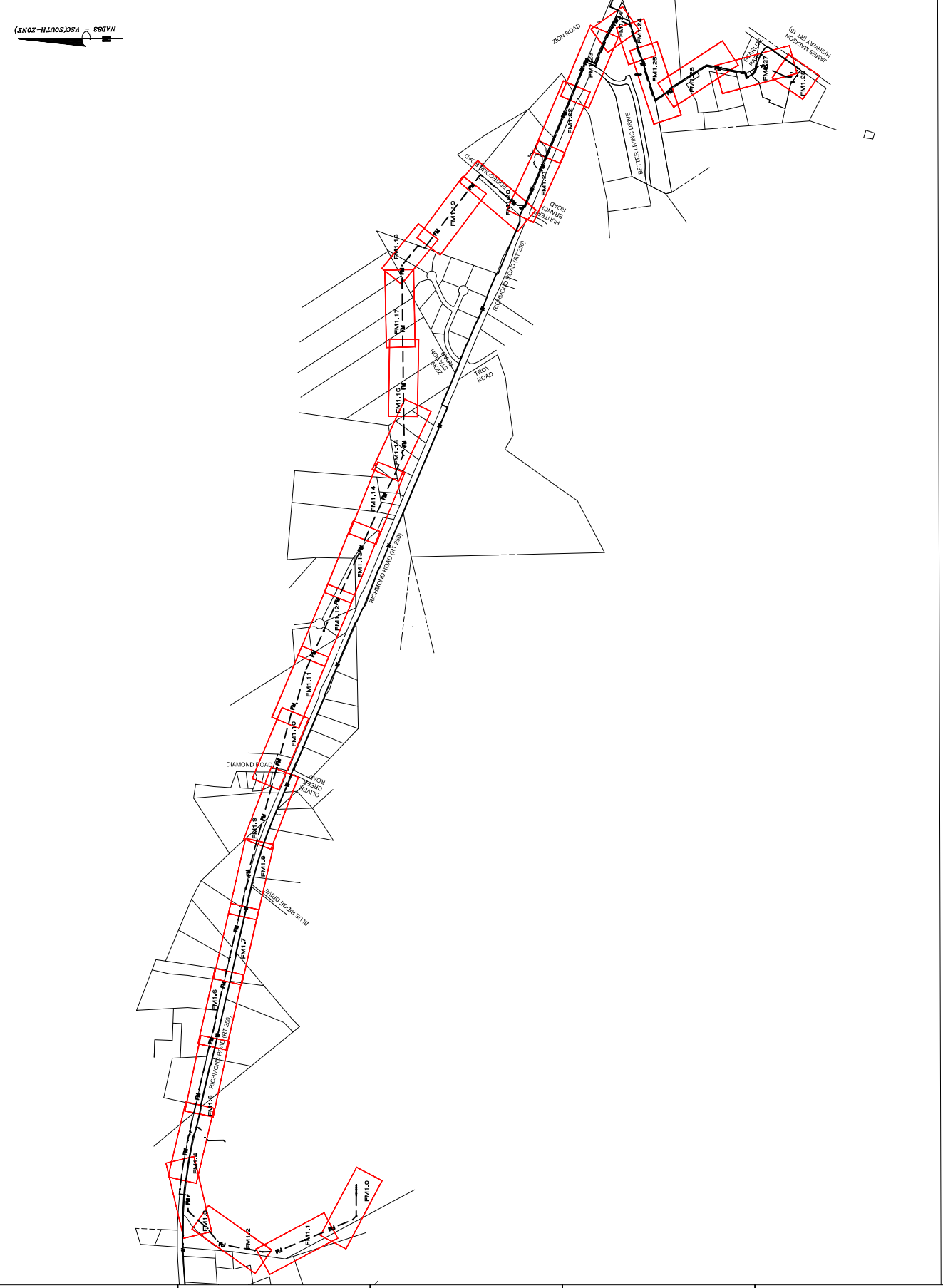
DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

TITLE
**FORCE MAIN
 ALIGNMENT
 KEY PLAN**

PROJECT NO. 50073061

FMO-1

19-00-06-575/768



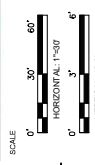
NADS
 VSQ(SOUTH)-ZONES



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 Fax: 804.276.7502
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 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



No.	DATE	BY	Description

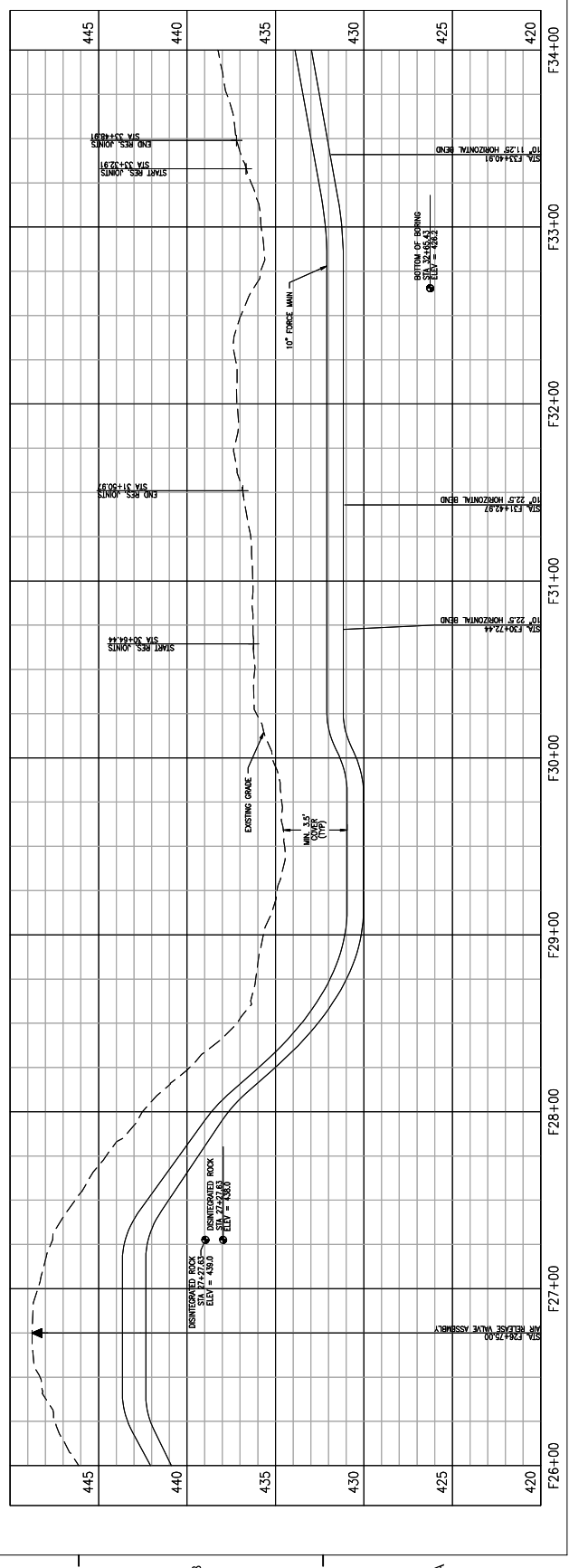
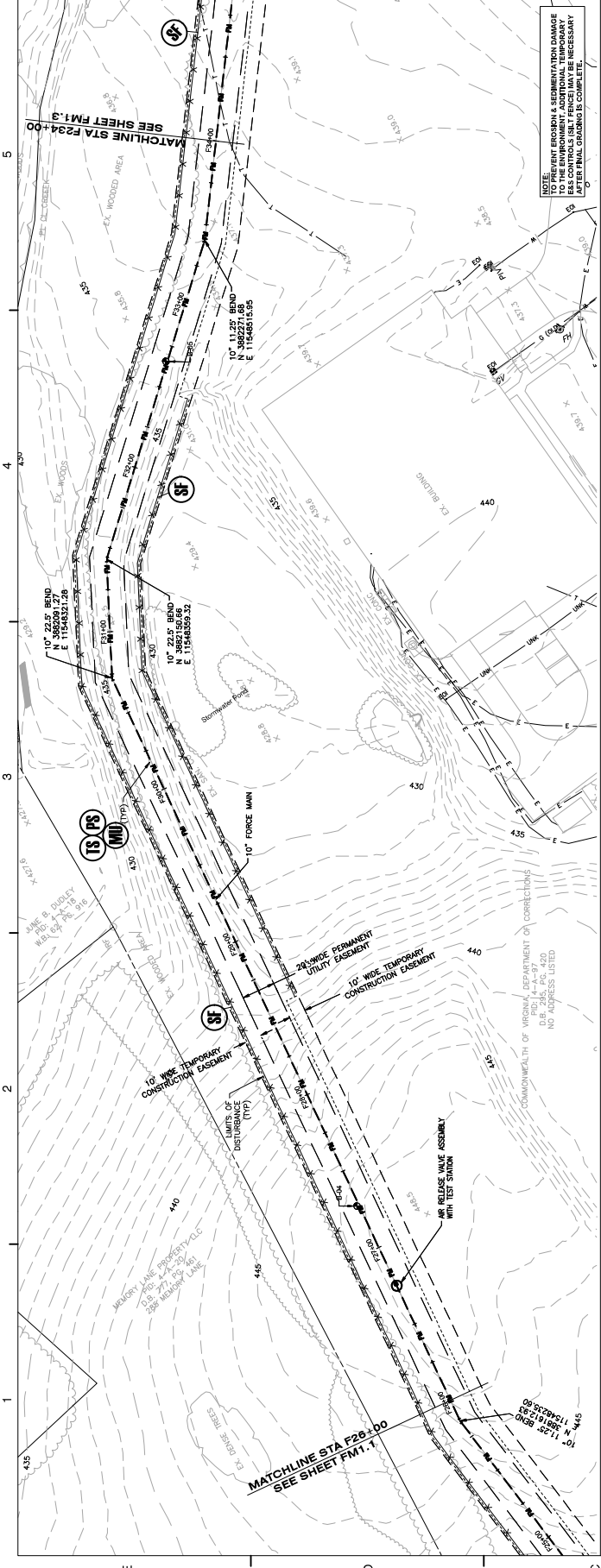
REVISIONS
 DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

TITLE
**FORCE MAIN
 PLAN AND
 PROFILES**

PROJECT NO.: 50033661

FM1.2

19-06-001
 5/18/2018

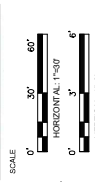




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 Los Angeles, CA 90048
 Phone: 310.551.2000
 Fax: 310.551.2007
 www.dewberry.com

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 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

REF PLAN



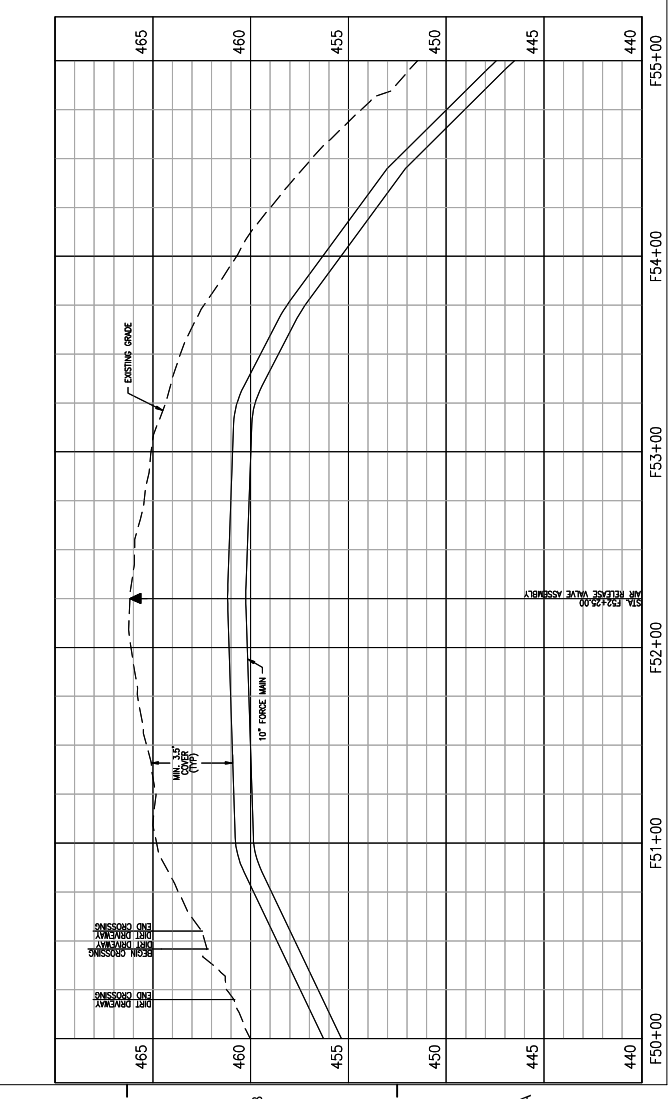
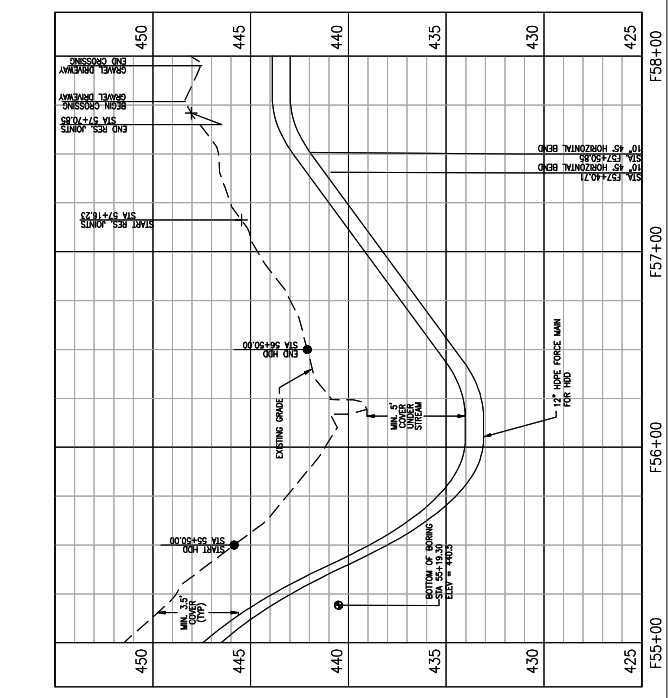
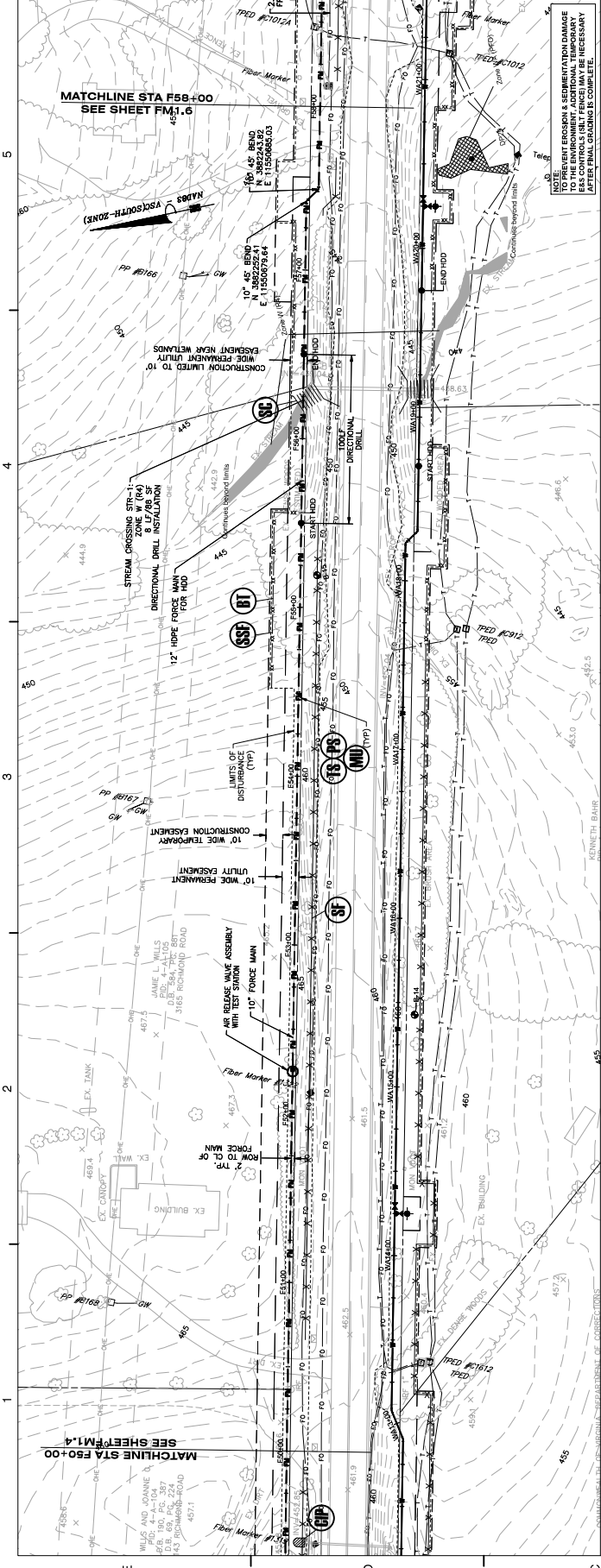
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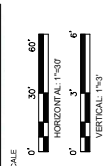
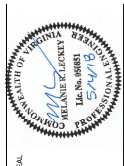
DESIGNED BY: JEH
 DRAWN BY: MRL
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018
 PROJECT NO.: 50032861

FORCE MAIN
 PLAN AND
 PROFILES

FM15

19-0-00-1581/798





No.	DATE	BY	Description

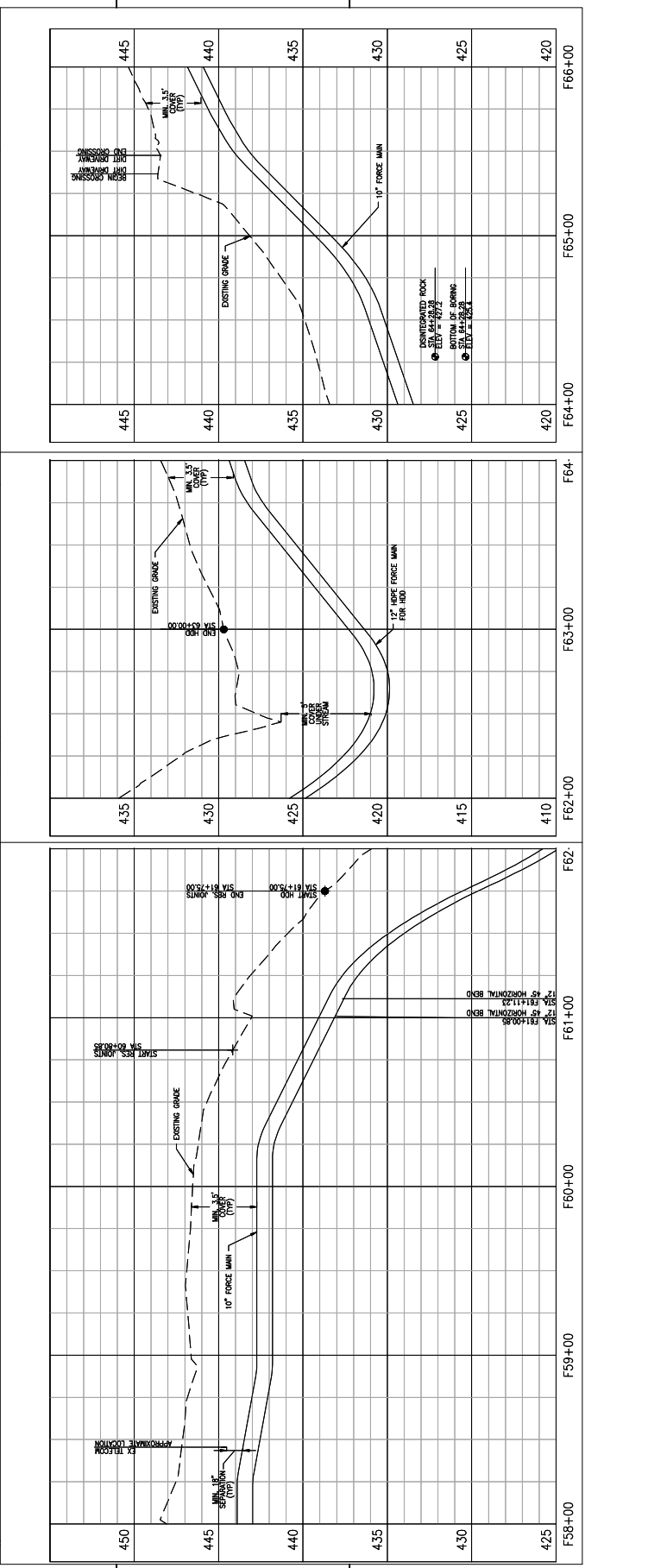
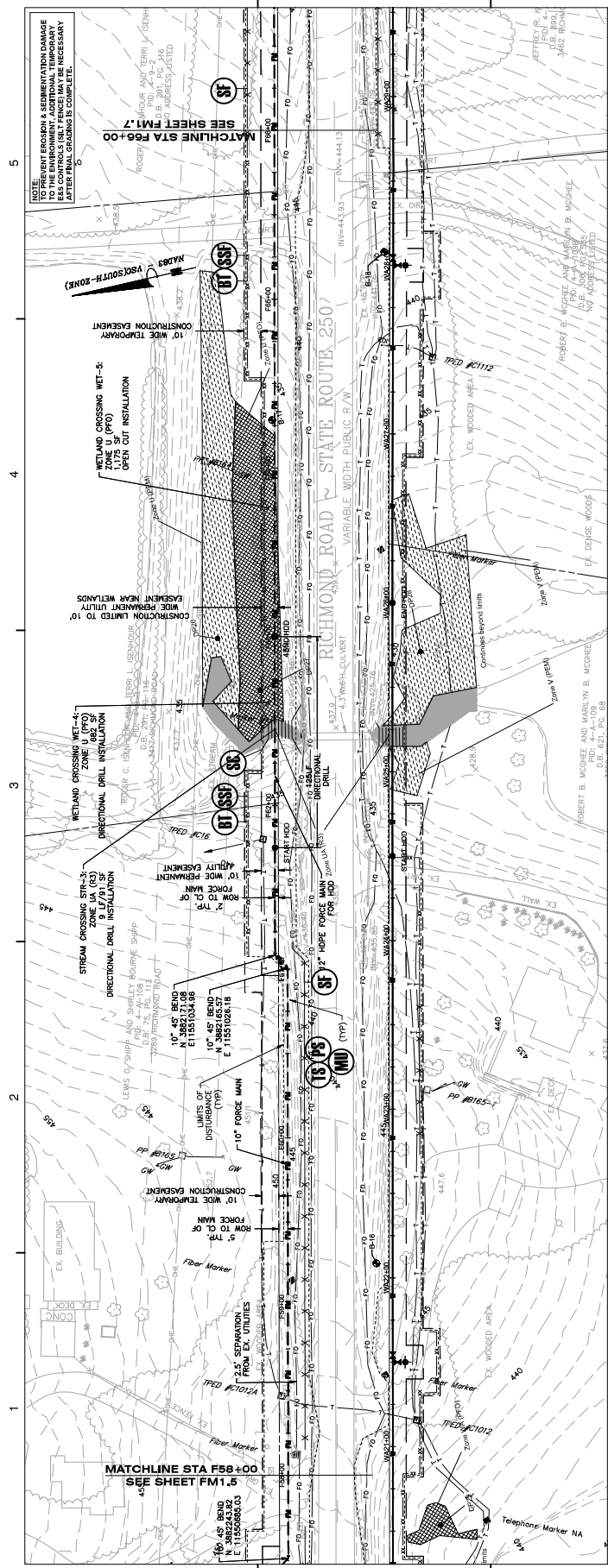
REVISIONS
 DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

TITLE
**FORCE MAIN
 PLAN AND
 PROFILES**

PROJECT NO.: 5007861

FM1.6

16-0-90-582/768



1 2 3 4 5
 F58+00 F59+00 F60+00 F61+00 F62+00 F63+00 F64+00 F65+00 F66+00



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 4601 Bldg. 1, 10700 S. 26th St.
 Suite 200
 Phoenix, AZ 85048
 Phone: 602.498.4000
 Fax: 602.498.7000
 www.dewberry.com

ZION CROSSROADS
 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



SEAL
 SCALE
 0' 30' 60'
 HORIZONTAL: 1" = 50'
 0' 5' 10'
 VERTICAL: 1" = 5'

No.	DATE	BY	Description

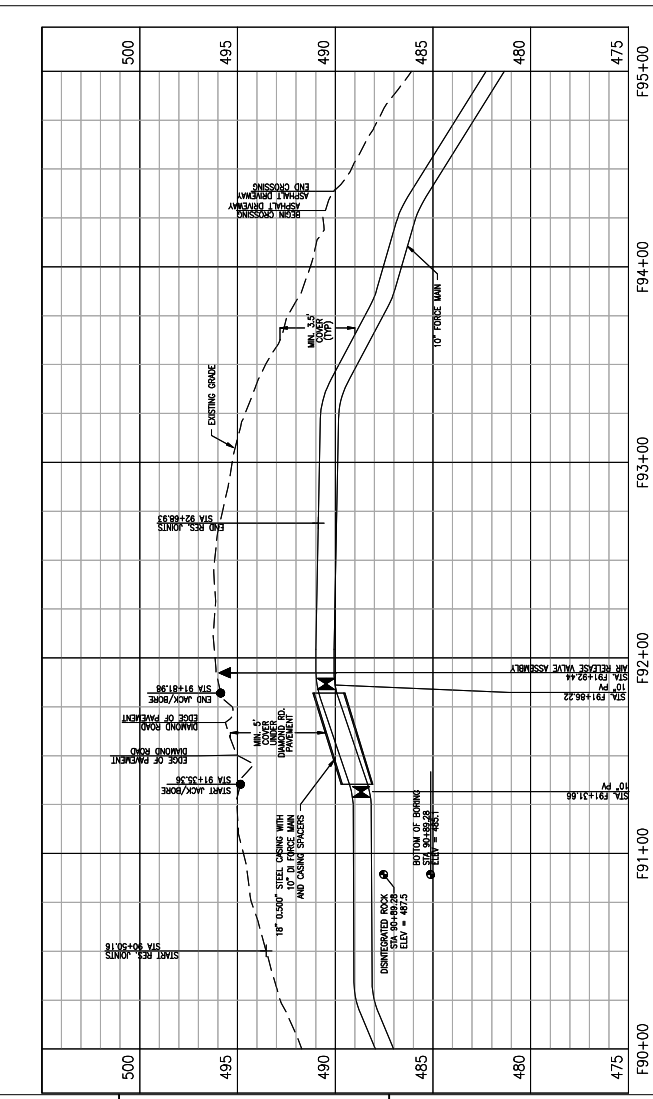
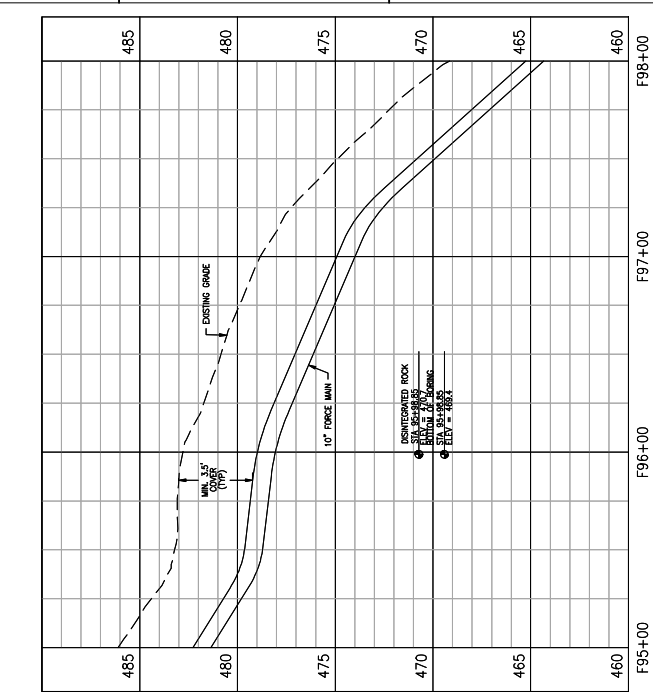
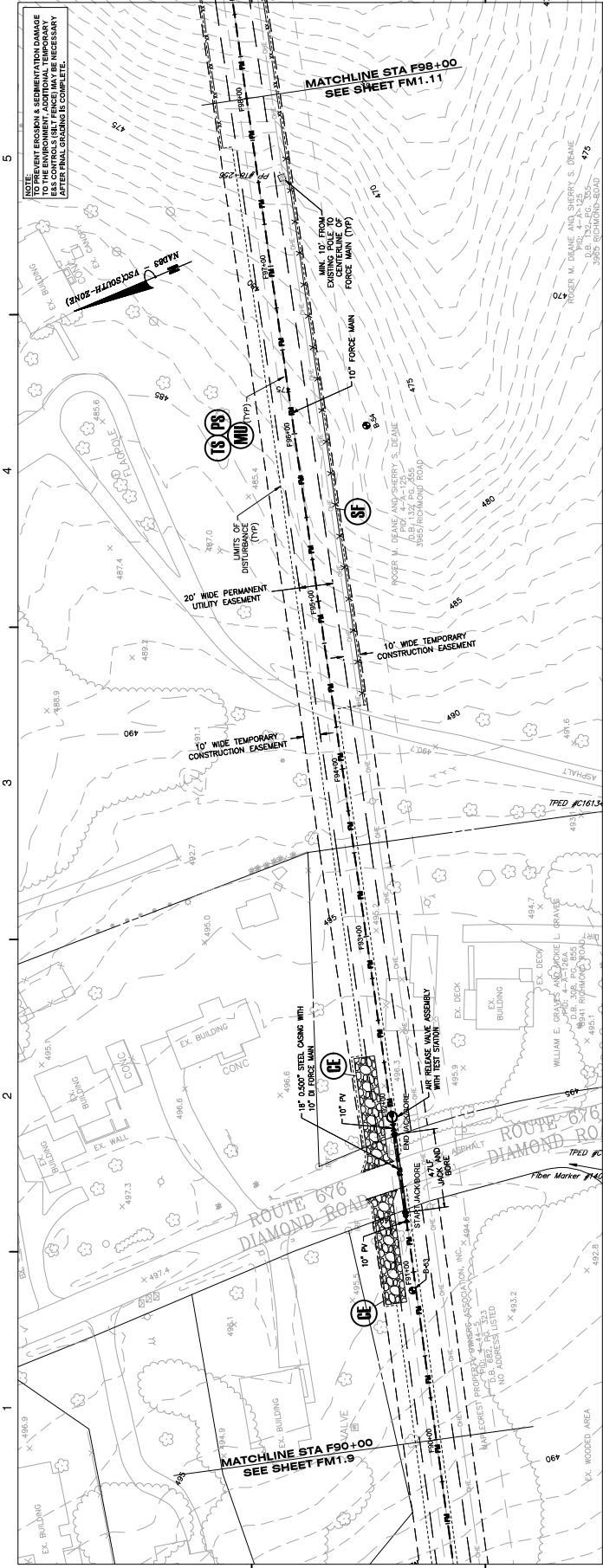
APPROVED BY: JKH
 DRAWN BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2016

FORCE MAIN
 PLAN AND
 PROFILES

PROJECT NO. 50010361

FM1.10

19-0-069-586/768

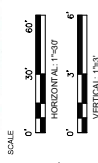




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ZION CROSSROADS
 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



No.	DATE	BY	DESCRIPTION

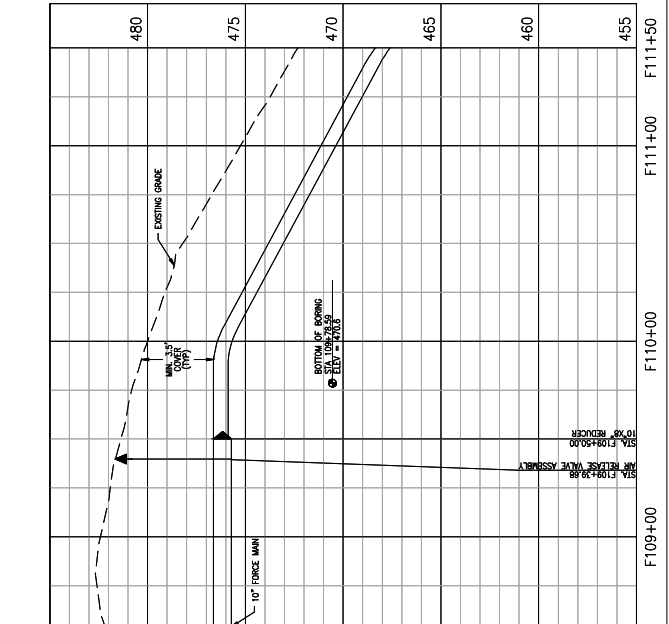
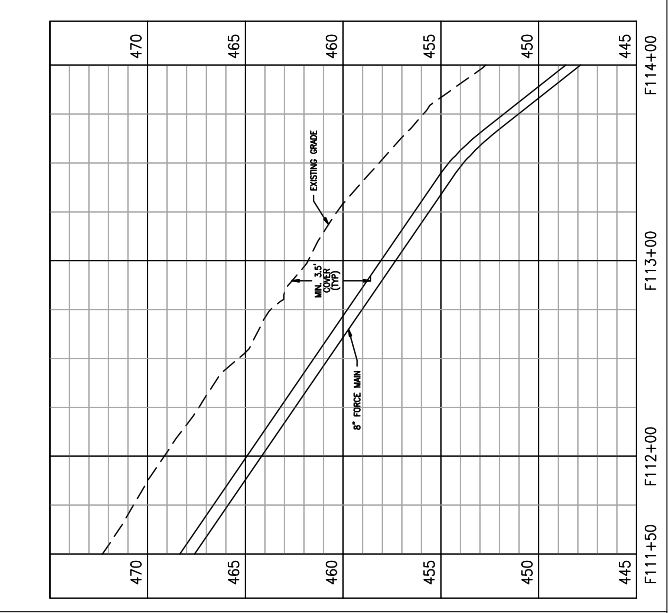
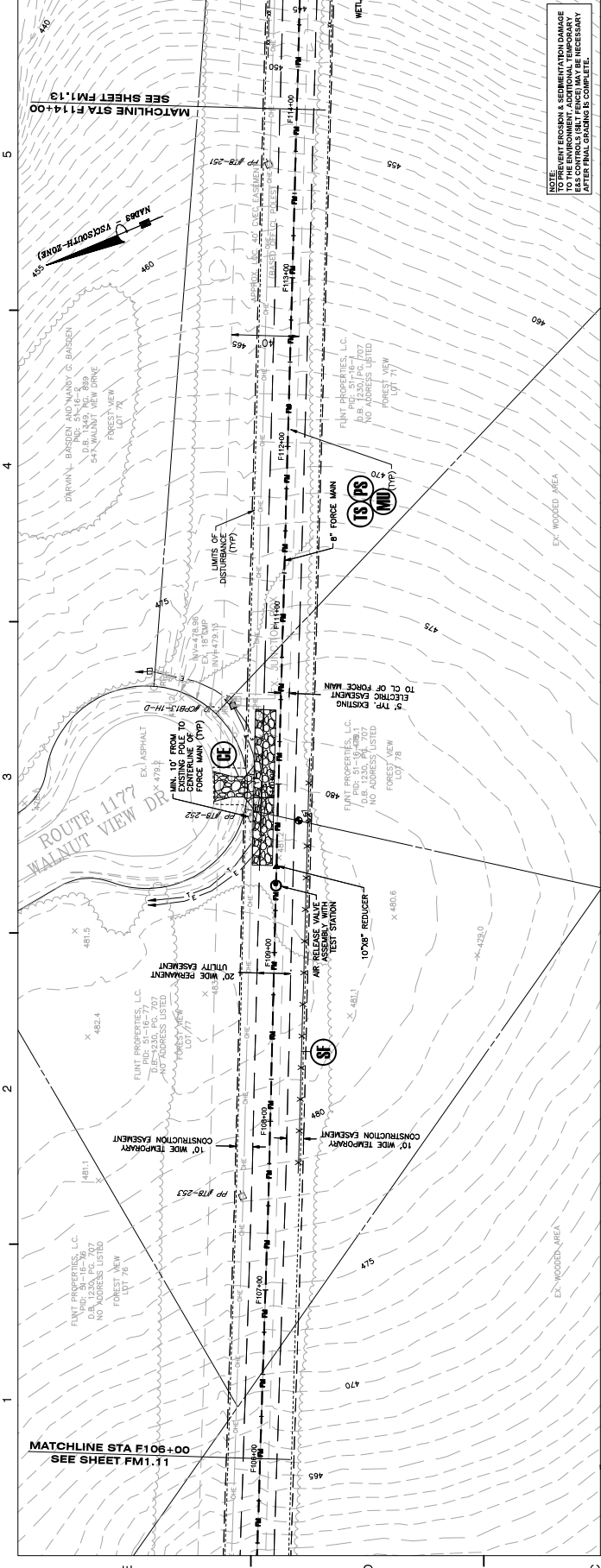
DESIGNED BY: JKH
 DRAWN BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

FORCE MAIN
 PLAN AND
 PROFILES

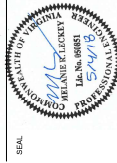
PROJECT NO.: 5003361

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19-06-19 1588/768



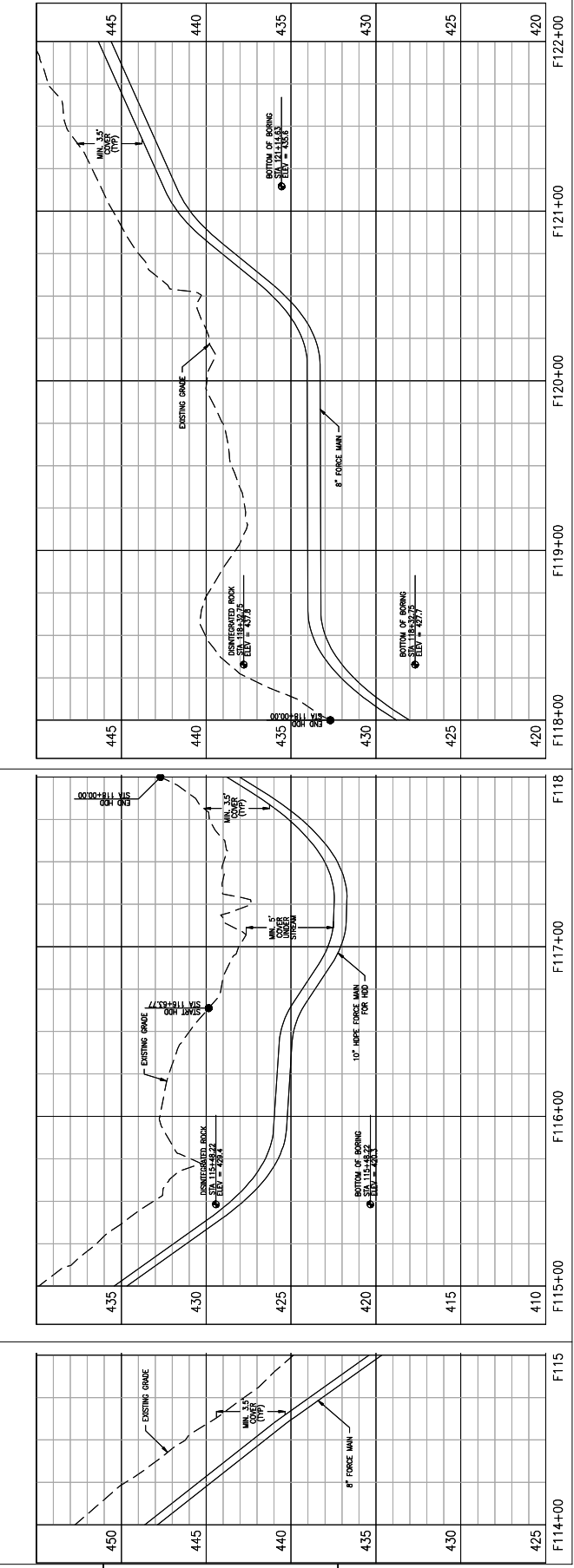
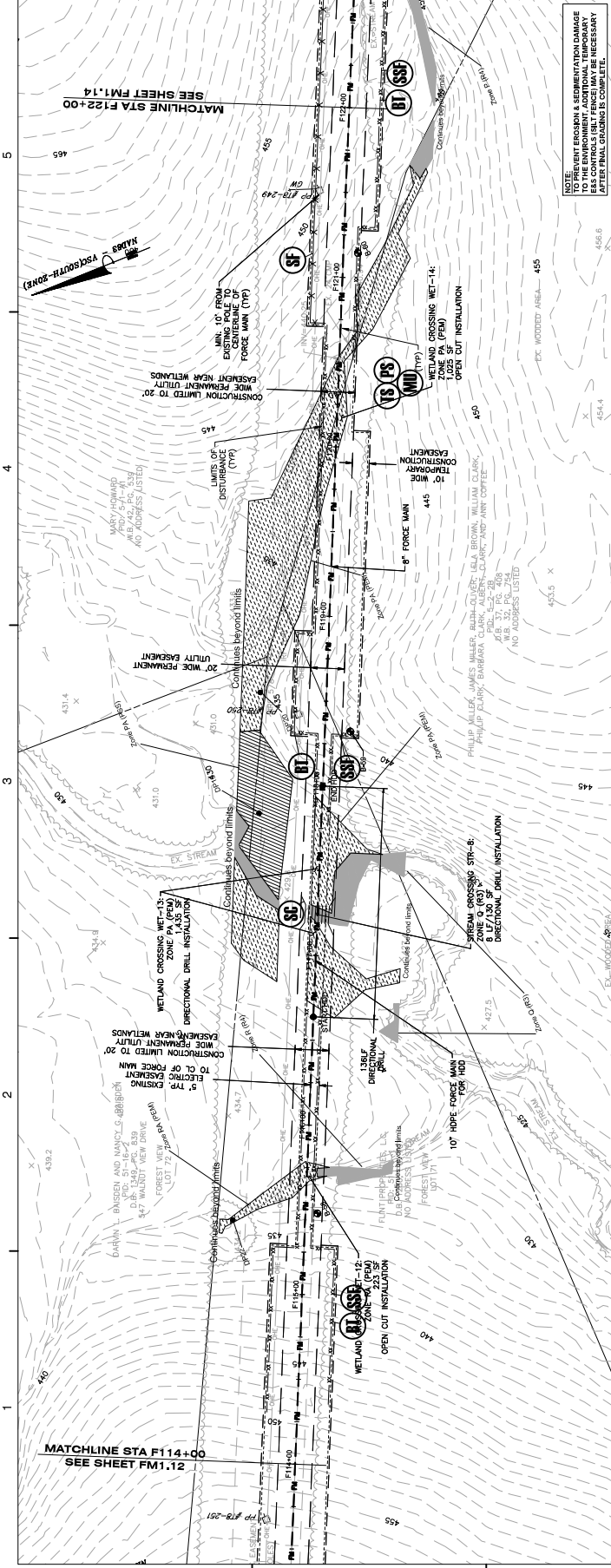
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No.	DATE	BY	Description

REVISIONS
 DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: DAW
 DATE: MAY 2018

TITLE
**FORCE MAIN
 PLAN AND
 PROFILES**
 PROJECT NO. 5003361





Dewberry Engineers Inc.
 4000 Westpark Drive, Suite 200
 Westpark, Virginia 22090
 Phone: 703.441.2000
 Fax: 703.441.2001
 www.dewberry.com

ZION CROSSROADS
 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



SCALE
 0' 30' 60'
 HORIZONTAL 1"=50'
 0' 3' 6'
 VERTICAL 1"=3'

No.	DATE	BY	Description

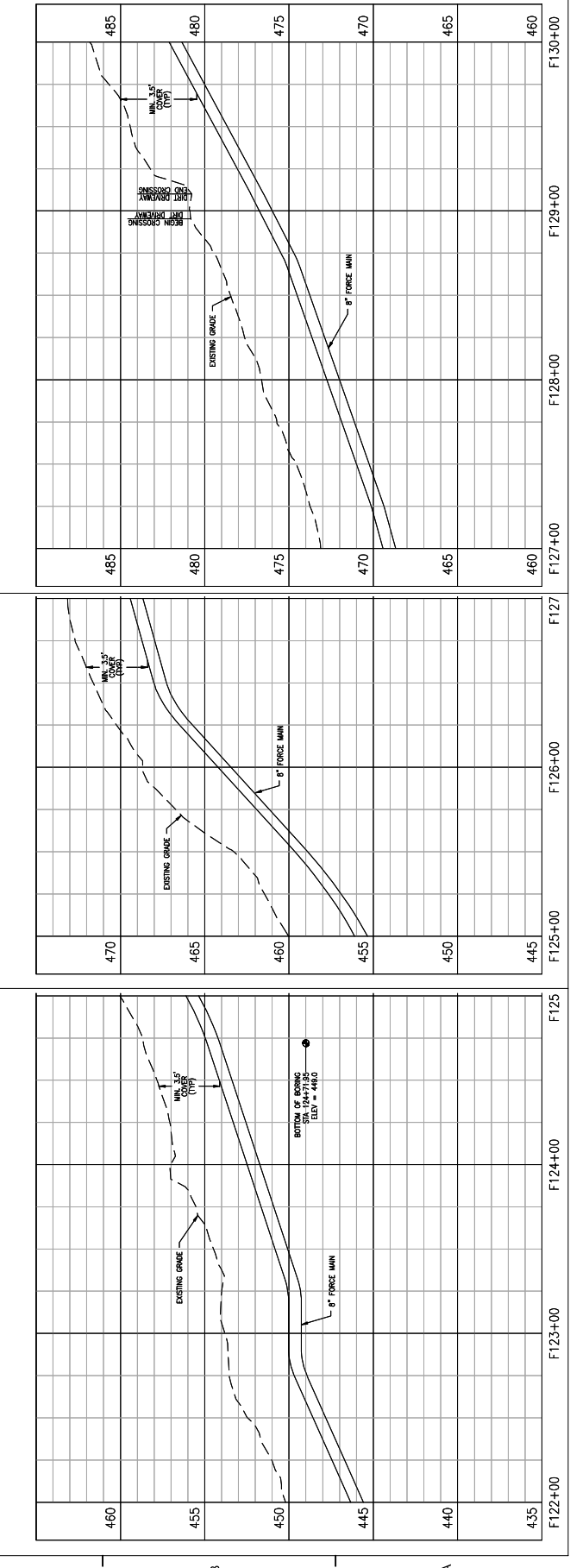
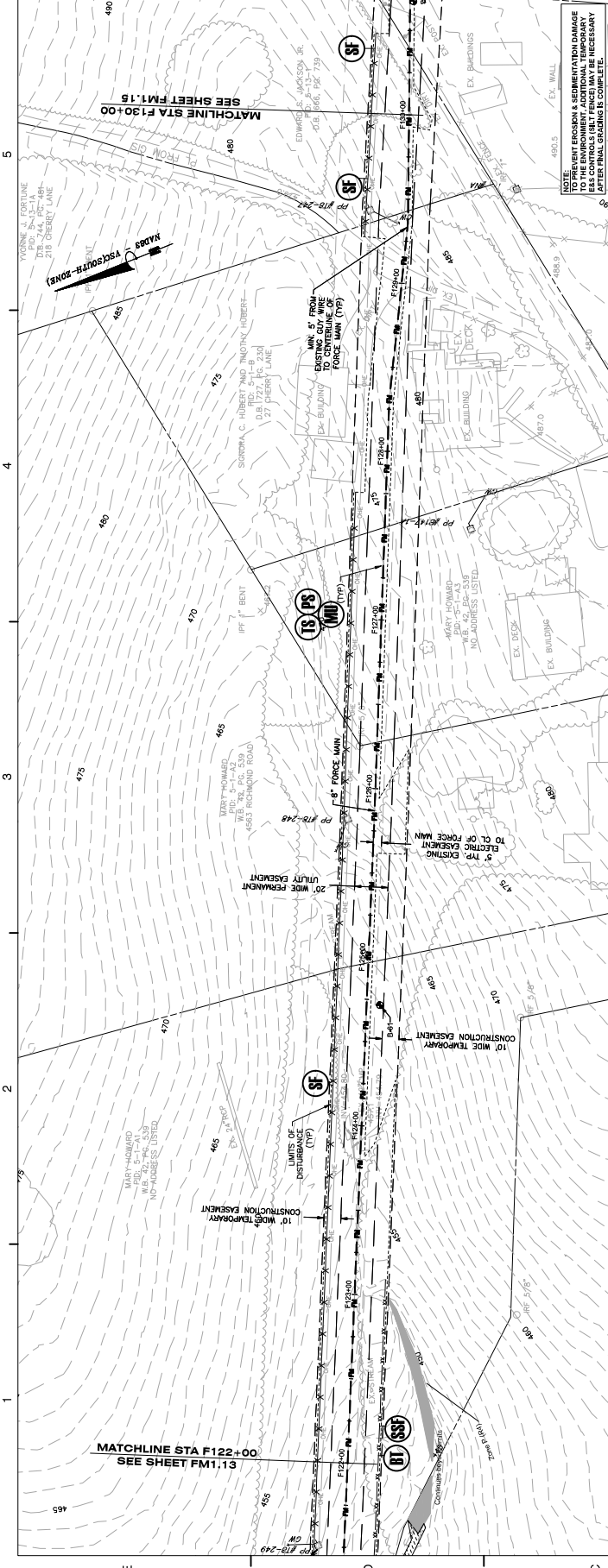
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 CHECKED BY: DAW
 DATE: MAY 2018

TITLE
**FORCE MAIN
 PLAN AND
 PROFILES**

PROJECT NO.: 50000061
 DATE: 19-06-2018

FM1.14

19-06-2018 590/768





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ZION CROSSROADS
 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



SCALE
 0" = 30'
 0" = 60'
 HORIZONTAL 1" = 50'
 0" = 3'
 0" = 6"
 VERTICAL 1" = 3'

No.	DATE	BY	Description

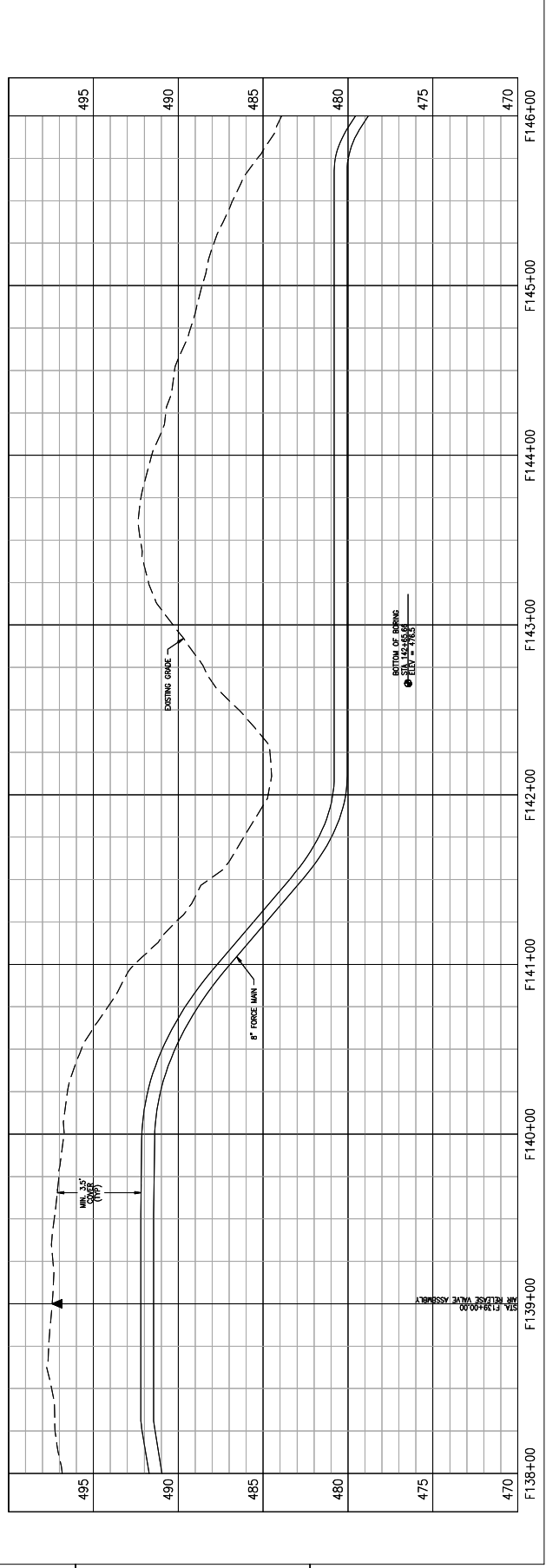
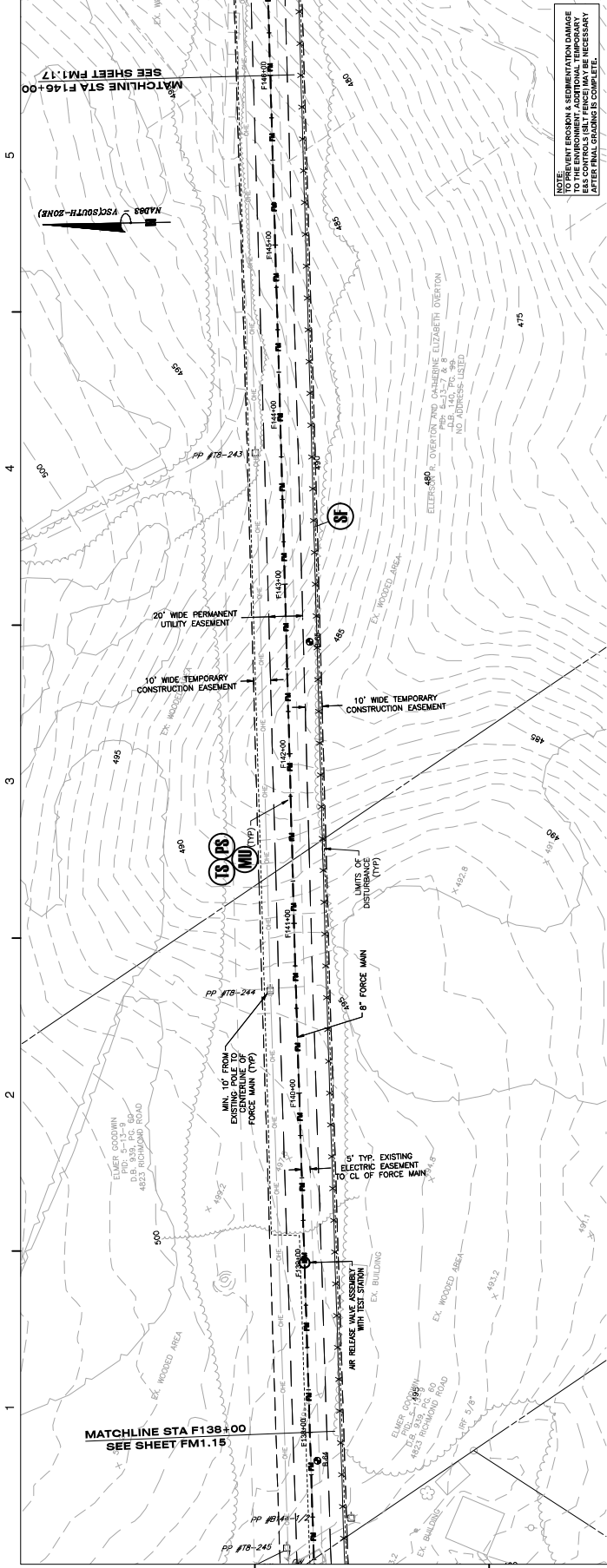
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 DATE: MAY 2018

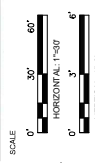
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**FORCE MAIN
 PLAN AND
 PROFILES**

PROJECT NO. 50003861

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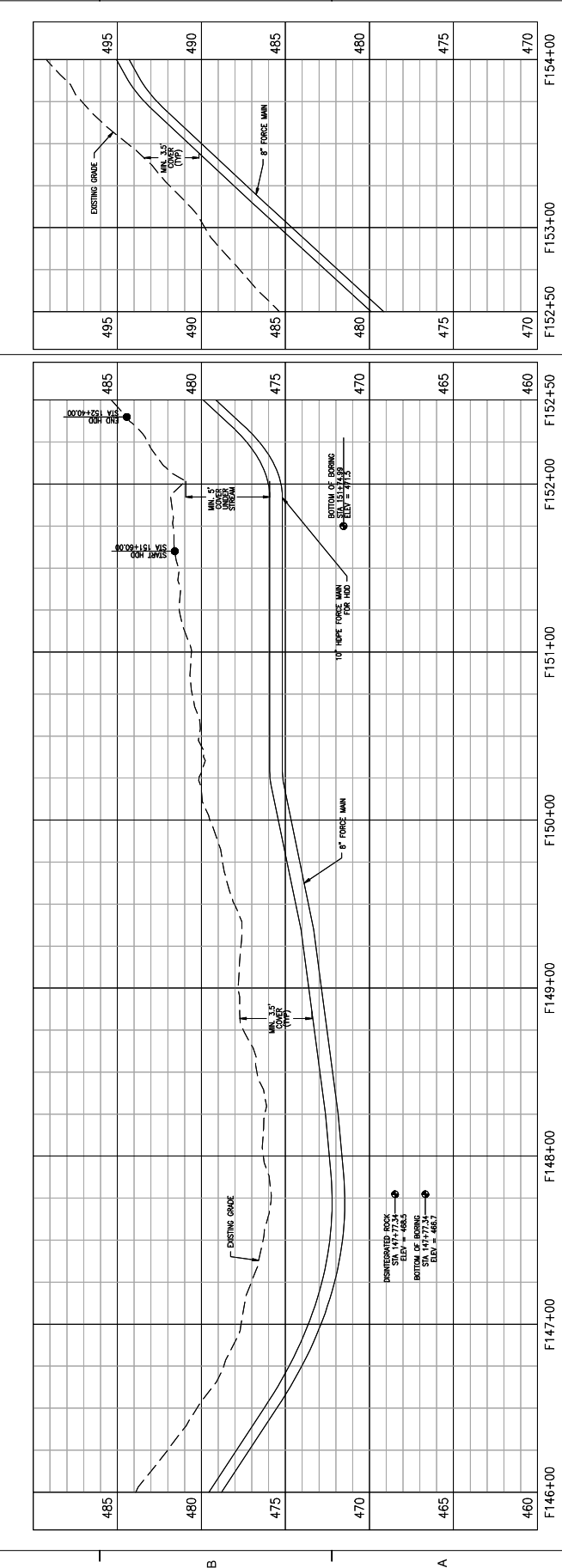
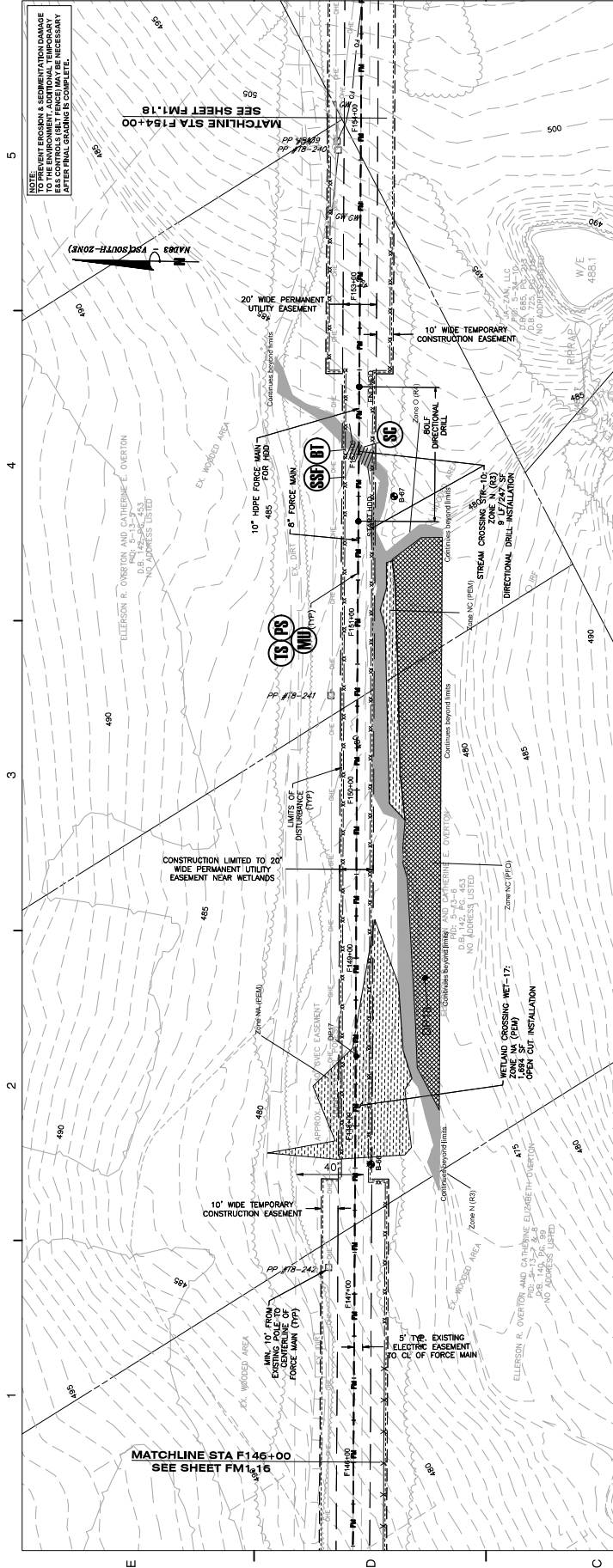


No.	DATE	BY	Description

DESIGNED BY: JEH
 DRAWN BY: MRL
 APPROVED BY: JAW
 CHECKED BY: JAW
 DATE: MAY 2018

TITLE: FORCE MAIN PLAN AND PROFILES
 PROJECT NO.: 50000061

FM1.17

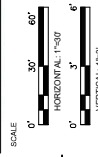




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ZION CROSSROADS
 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



No.	DATE	BY	Description

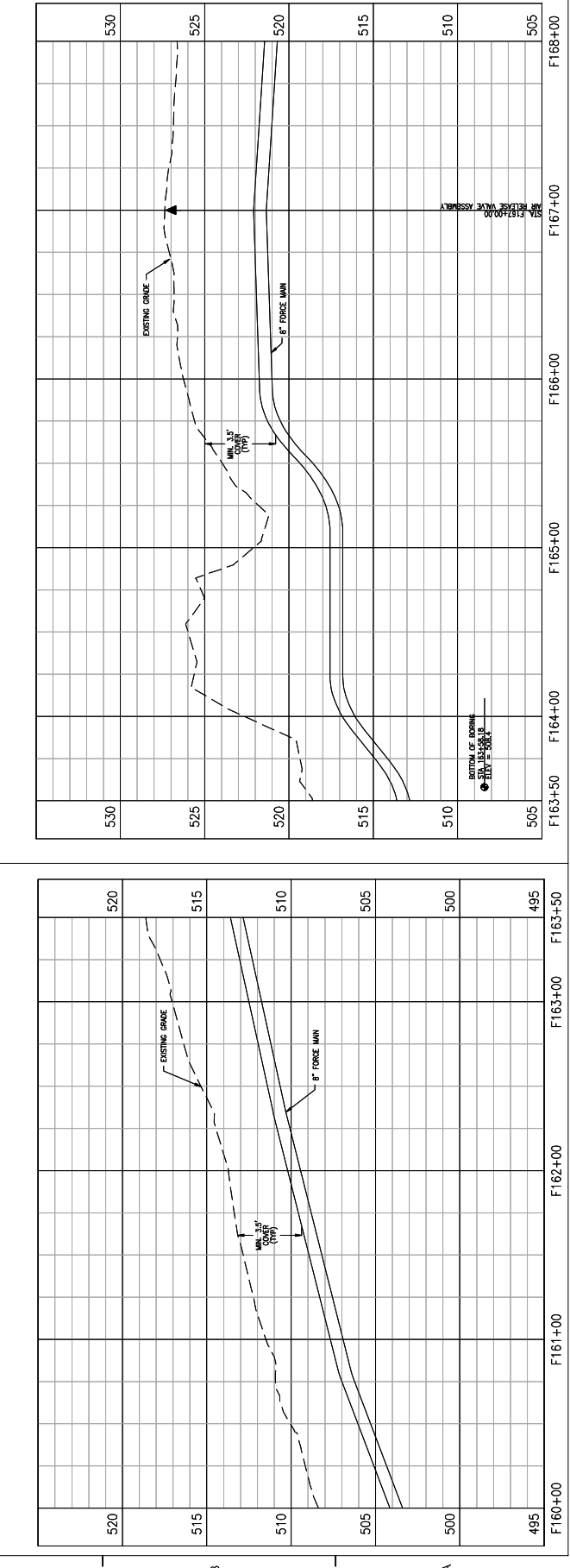
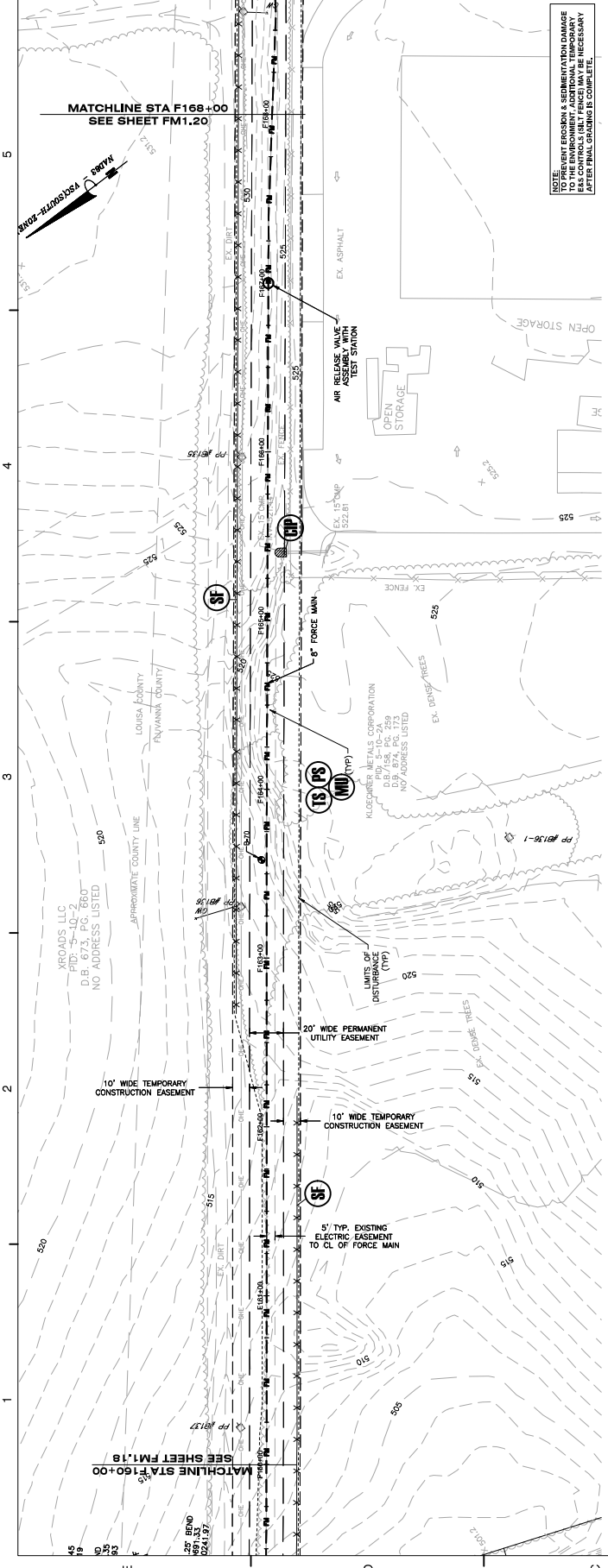
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 CHECKED BY: DJW
 DATE: MAY 2018

FORCE MAIN
 PLAN AND
 PROFILES

PROJECT NO. 50030861
 DATE 19-06-2018

FM1.19

19-06-2018 595/768





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ZION CROSSROADS
 WATER AND SEWER SYSTEM
 FLUVANNA COUNTY
 DEPARTMENT OF PUBLIC WORKS
 FLUVANNA COUNTY, VA

KEY PLAN



SCALE
 0" = 30'
 0" = 60'
 HORIZONTAL 1" = 50'
 0" = 3'
 0" = 6'
 VERTICAL 1" = 3'

No.	DATE	BY	DESCRIPTION

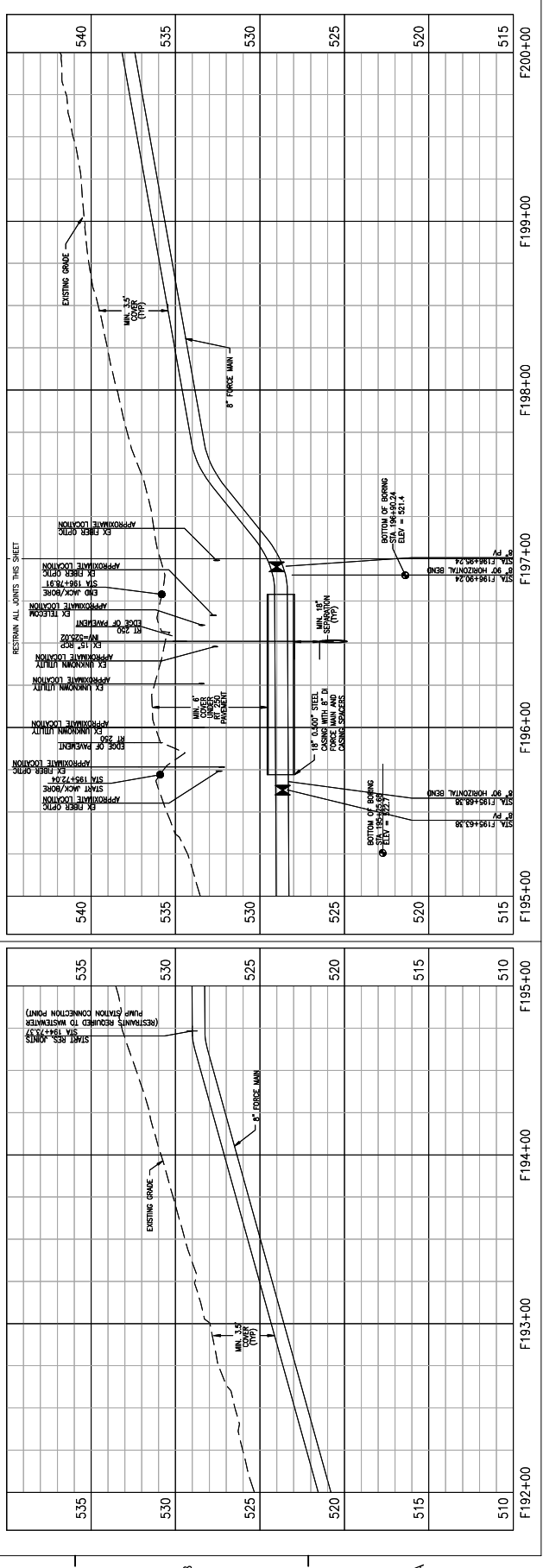
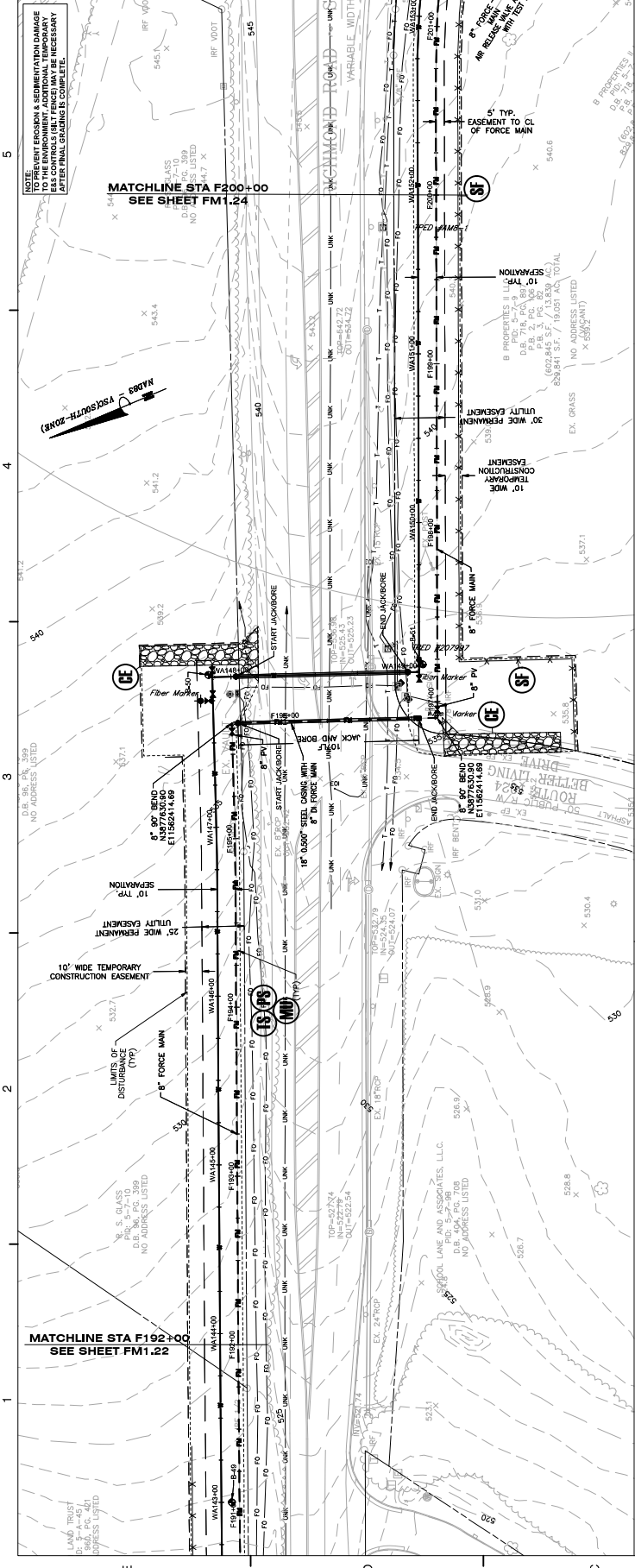
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 CHECKED BY: DAW
 DATE: MAY 2018

TITLE
**FORCE MAIN
 PLAN AND
 PROFILES**

PROJECT NO. 50032861

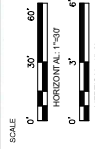
FM1.23

18-00-069-599/768



Stationing: F192+00, F193+00, F194+00, F195+00, F196+00, F197+00, F198+00, F199+00, F200+00

Elevation: 510, 515, 520, 525, 530, 535, 540



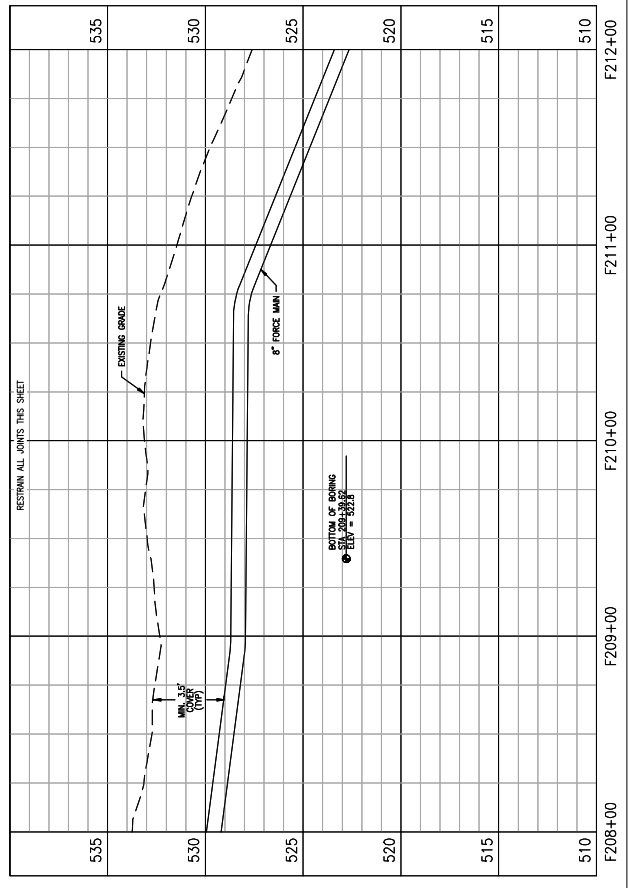
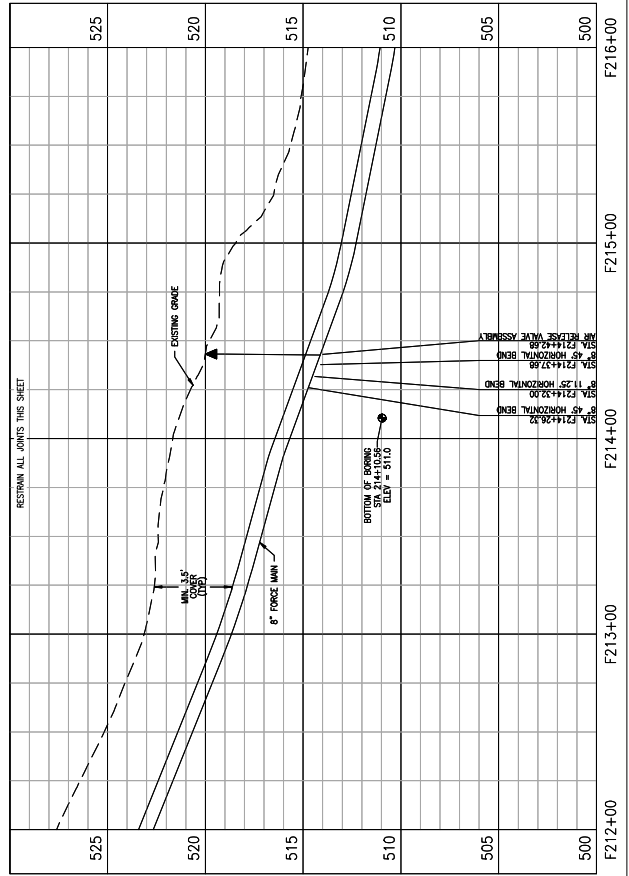
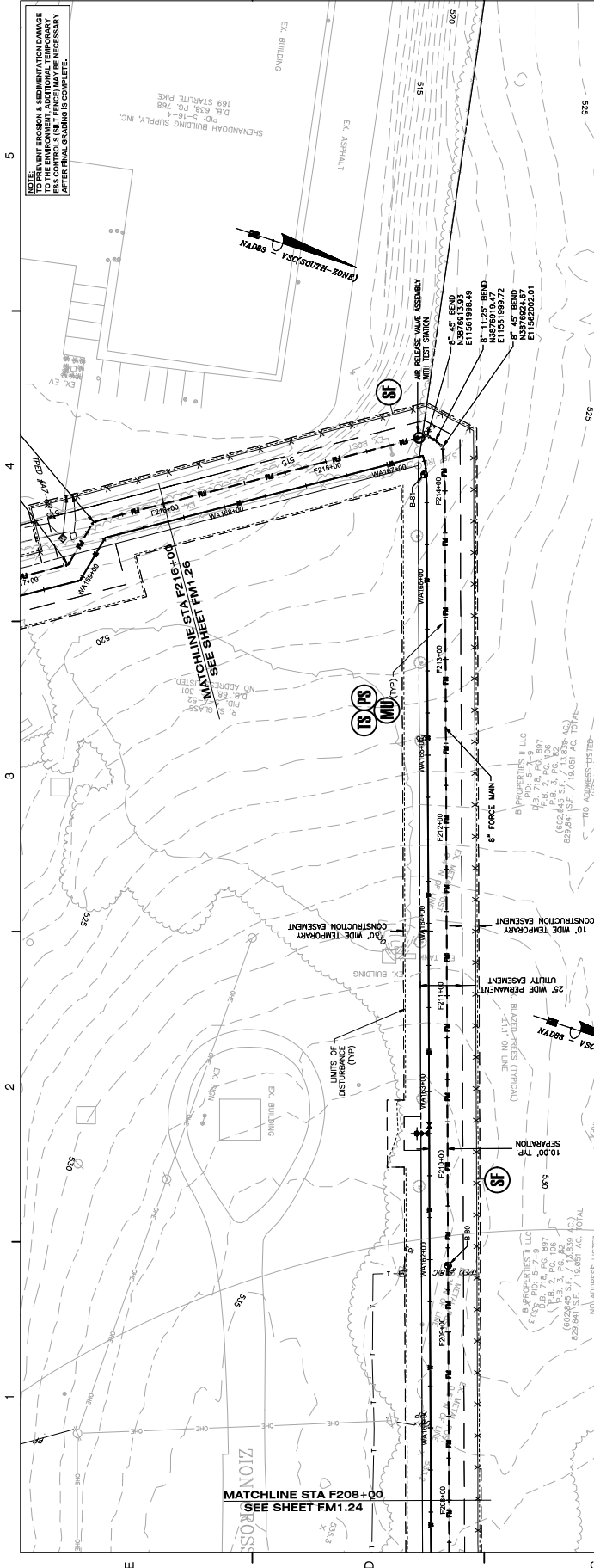
No.	DATE	BY	Description

DESIGNED BY: JEH
DRAWN BY: MRL
CHECKED BY: DW
DATE: MAY 2018

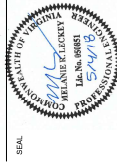
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PROJECT NO.: 50070861

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KEY PLAN



No.	DATE	BY	Description

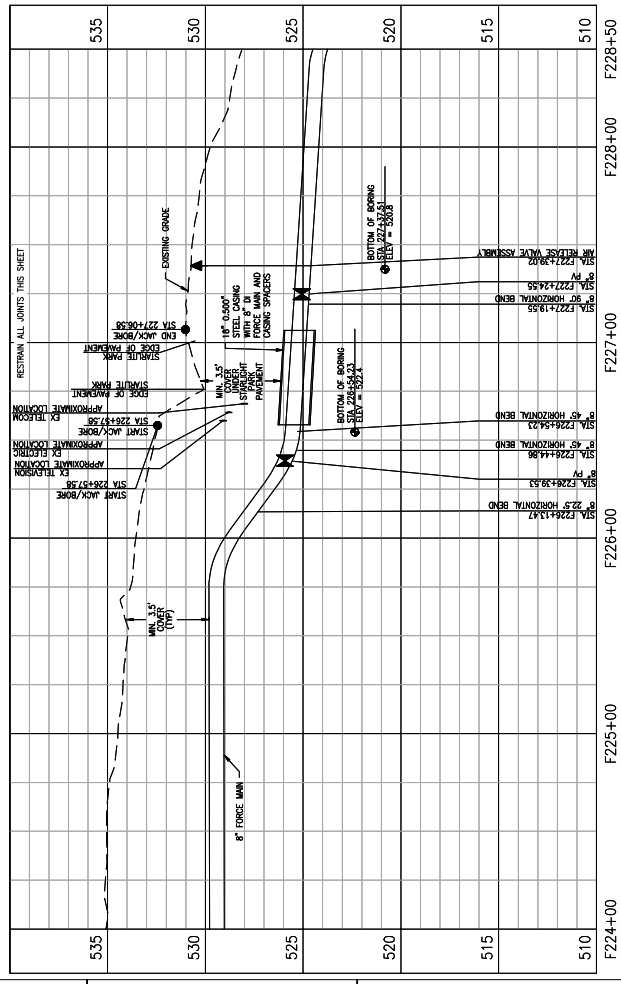
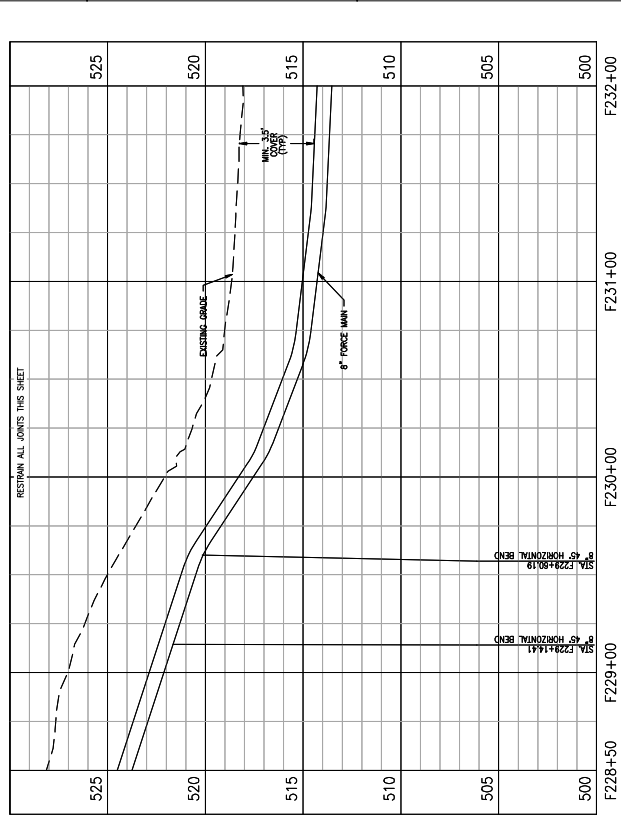
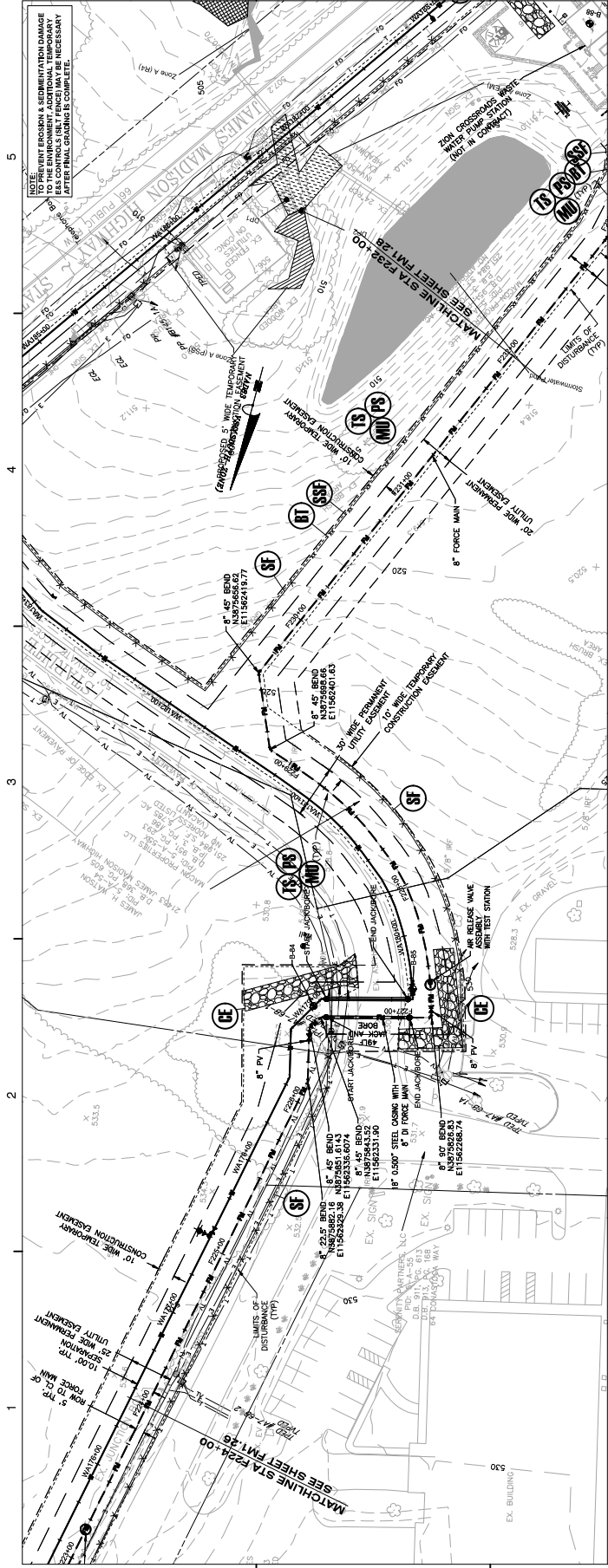
REVISIONS
 DRAWN BY: JEH
 APPROVED BY: MRL
 CHECKED BY: JAW
 DATE: MAY 2018

TITLE
**FORCE MAIN
 PLAN AND
 PROFILES**

PROJECT NO.: 50030661

FM1.27

19-0-00-090-0303/798



**FLUVANNA COUNTY BOARD OF SUPERVISORS
AGENDA ITEM STAFF REPORT**

TAB C

MEETING DATE:	Feb 6, 2019				
AGENDA TITLE:	Shelter for Help in Emergency FY20 Budget Presentation				
MOTION(s):	N/A				
STRATEGIC INITIATIVE?	Yes	No	If yes, list initiative(s):		
		X			
AGENDA CATEGORY:	Public Hearing	Action Matter	Presentation	Consent Agenda	Other
			XX		
STAFF CONTACT(S):	Eric Pollitt, Management Analyst				
PRESENTER(S):	Shaniece Bradford, Shelter for Help in Emergency				
RECOMMENDATION:					
TIMING:					
DISCUSSION:					
FISCAL IMPACT:					
POLICY IMPACT:					
LEGISLATIVE HISTORY:					
ENCLOSURES:					
REVIEWS COMPLETED:	Legal	Finance	Purchasing	HR	Other

**FLUVANNA COUNTY BOARD OF SUPERVISORS
AGENDA ITEM STAFF REPORT**

TAB D

MEETING DATE:	Feb 6, 2019				
AGENDA TITLE:	Adoption of the Fluvanna County Board of Supervisors Dec 19, 2018 Meeting Minutes.				
MOTION(s):	I move the meeting minutes of the Fluvanna County Board of Supervisors Regular Meeting on Wednesday, January 23, 2019, be adopted.				
STRATEGIC INITIATIVE?	Yes	No	If yes, list initiative(s):		
		X			
AGENDA CATEGORY:	Public Hearing	Action Matter	Presentation	Consent Agenda	Other
				XX	
STAFF CONTACT(S):	Kelly Belanger Harris, Clerk to the Board				
PRESENTER(S):	Steven M. Nichols, County Administrator				
RECOMMENDATION:	Approve				
TIMING:	Routine				
DISCUSSION:	None.				
FISCAL IMPACT:	N/A				
POLICY IMPACT:	N/A				
LEGISLATIVE HISTORY:	None				
ENCLOSURES:	Draft Minutes for January 23, 2019				
REVIEWS COMPLETED:	Legal	Finance	Purchasing	HR	Other

FLUVANNA COUNTY BOARD OF SUPERVISORS
REGULAR MEETING MINUTES
Circuit Court Room
January 23, 2019
Work Session 4:00pm
Regular Meeting 7:00pm

MEMBERS PRESENT: John M. (Mike) Sheridan, Columbia District, Chair
Mozell Booker, Fork Union District, Vice Chair
Patricia Eager, Palmyra District
Tony O’Brien, Rivanna District (*arrived at 5:27pm*)
Donald W. Weaver, Cunningham District

ABSENT: None.

ALSO PRESENT: Steven M. Nichols, County Administrator
Fred Payne, County Attorney
Kelly Belanger Harris, Clerk for the Board of Supervisors

WORK SESSION – CALL TO ORDER

At 4:01pm Chair Sheridan called to order the Budget Work Session of January 23, 2019. After the recitation of the Pledge of Allegiance, a moment of silence was observed.

NON-PROFIT ORGANIZATION PRESENTATIONS

- Piedmont Housing Alliance – Virginia Leary
- Central Virginia Small Business Development Center - Betty Hoge
- Fluvanna County Chamber of Commerce - Rudy Garcia
- Hospice of the Piedmont—Adam Wagner
- Jefferson Area Board of Aging (JABA) - Donna Baker
- Jefferson Area CHiP - Jon Nafziger
- Monticello Area Community Action Agency (MACAA) - Peter Hawes
- Piedmont Virginia Community College (PVCC)—Mr. Kim McManus
- Region Ten – Aisha Williams-Cusano
- Rivanna Conservation Alliance - Lisa Wittenborn
- Sexual Assault Resource Agency (SARA) – Sheri Owen
- SERCAP – Lauren Mason
- Thomas Jefferson Soil & Water Conservation District - Anne Coates
- OAR - Jefferson Area Community Corrections - Ross Carew

RECESS FOR DINNER AND CLOSED SESSION

MOTION TO ENTER INTO A CLOSED MEETING

At 6:03pm, Mr. O’Brien moved the Fluvanna County Board of Supervisors enter into a closed meeting, pursuant to the provisions of Section 2.2-3711 A.1, A.5, A.6, A.7, & A.8 of the Code of Virginia, 1950, as amended, for the purpose of discussing Personnel, Prospective Industry, Investment of Funds, Litigation, & Legal Matters. Mr. Weaver seconded. The motion carried, with a vote of 5-0. AYE: Sheridan, Booker, Eager, O’Brien, and Weaver. NAY: None. ABSENT: None.

MOTION TO EXIT A CLOSED MEETING & RECONVENE IN OPEN SESSION

At 7:00pm, Mr. O’Brien moved that the Closed Meeting be adjourned and the Fluvanna County Board of Supervisors convene again in open session and “BE IT RESOLVED, the Board of Supervisors does hereby certify to the best of each member’s knowledge (i) only public business matters lawfully exempted from open meeting requirements under Section 2.2-3711-A of the Code of Virginia, 1950, as amended, and (ii) only such public business matters as were identified in the motion by which the closed meeting was convened were heard, discussed, or considered in the meeting.” Mrs. Booker seconded. The motion carried, with a roll call vote, of 5-0. AYES: Sheridan, Booker, Eager, O’Brien, and Weaver. NAYS: None. ABSENT: None.

1 – RECONVENE, CALL TO ORDER, & PLEDGE OF ALLEGIANCE

At 7:01pm Chair Sheridan called to order the Regular Meeting of January 23, 2019. After the recitation of the Pledge of Allegiance, a moment of silence was observed.

3 - ADOPTION OF AGENDA

MOTION

Mr. Weaver moved to accept the Agenda, for the January 23, 2019 Regular Meeting of the Board of Supervisors. Mrs. Booker seconded and the Agenda was adopted by a vote of 5-0. AYES: Sheridan, Booker, Eager, O’Brien, and Weaver. NAYS: None. ABSENT: None.

4 - COUNTY ADMINISTRATOR’S REPORT

Mr. Nichols reported on the following topics:

- Community and County Staff Recognitions
 - DSS Christmas Program - Matched 170 children and 30 seniors with sponsors this year who provided Christmas presents. A big thanks goes out to Program Coordinator Jane Wilson. And thank you to the businesses, churches, and individuals who sponsored a child/senior this year.
- Announcements and Updates
 - Fluvanna County is sponsoring “Landlord/Tenant Rights and Responsibilities and Fair Housing Workshops.” Presentations by Central Virginia Legal Aid Society - Marty Wegbreit and Robin Leiter-White

Day	Date	Time	Location	Notes
Saturday	February 9	9:00 am – 11:00 am	Library	Continental Breakfast
Thursday	March 14	6:00 pm – 8:00 pm	Fluvanna Community Center	Snacks

- Upcoming Meetings

Day	Date	Time	Purpose	Location
Wed	Feb 6	4:00 PM 7:00 PM	Regular Meeting County Administrator’s FY 20 Budget Proposal	Courtroom
Wed	Feb 13	7:00 PM	Budget Work Session – Constitutional Officers	Morris Room
Wed	Feb 20	4:00 PM 7:00 PM	FCPS FY20 Adopted Budget Work Session Regular Meeting	Courtroom
Wed	Feb 27	7:00 PM	Budget Work Session – Agency Briefs Set Maximum RE Tax Rate for Advertising	Morris Room

5 - PUBLIC COMMENTS #1

At 7:06pm Chair Sheridan opened the first round of Public Comments.

With no one wishing to speak, Chair Sheridan closed the first round of Public Comments at 7:07pm.

6 - PUBLIC HEARING

None.

7 - ACTION MATTERS

None.

7A – BOARDS AND COMMISSIONS

None.

8 - PRESENTATIONS

None.

9 - CONSENT AGENDA

The following items were discussed before approval:

Accounts Payable Report – December 2018—Eric Dahl, Deputy County Administrator/Finance Director

The following items were approved under the Consent Agenda for January 23, 2019:

Minutes of December 19, 2018—Kelly Belanger Harris, Clerk to the Board

Minutes of January 9, 2019—Kelly Belanger Harris, Clerk to the Board

Accounts Payable Report – December 2018—Eric Dahl, Deputy County Administrator/Finance Director

Economic Development Coordinator Position Description Reclassification – Jessica Rice, HR Manager

Sheriff's Office Vehicle Insurance Claim – Eric Pollitt & Sheriff Eric Hess

FCPS Supplemental Appropriation – Brenda Gilliam

FY19 Fork Union Light Pole Insurance Claim – Eric Pollitt & Cyndi Toller

ZXR Project Agreement #12 – Dewberry—Eric Dahl, Deputy County Administrator/Finance Director

ZXR Project Agreement #13 - Dewberry—Eric Dahl, Deputy County Administrator/Finance Director

ZXR Project Agreement #14 – Dewberry—Eric Dahl, Deputy County Administrator/Finance Director

ZXR Project Agreement #15 - Dewberry—Eric Dahl, Deputy County Administrator/Finance Director

ZXR Project Agreement #16 - Dewberry—Eric Dahl, Deputy County Administrator/Finance Director

MOTION

Mr. Weaver moved to approved the Consent Agenda, for the January 23, 2019 Board of Supervisors meeting, and to ratify Accounts Payable and Payroll for December 2018, in the amount of \$1,873,921.20.

Mrs. Booker seconded and the motion passed 5-0. AYE: Sheridan, Booker, Eager, O'Brien, & Weaver.

NAY: None. ABSENT: None.

10 - UNFINISHED BUSINESS

Mrs. Booker requested an update on the Strategic Initiatives; Mr. Nichols indicated that an update will be made in the near future, at an upcoming Board meeting.

11 - NEW BUSINESS

Mrs. Eager requested reconsideration of AirBnB policy with regards to potential revenue from a transient occupancy tax. With three supervisors indicating agreement to research, Mr. Nichols noted that Staff would proceed and return with findings at a future meeting.

12 - PUBLIC COMMENTS #2

At 7:18pm Chair Sheridan opened the second round of Public Comments.

With no one else wishing to speak, Chair Sheridan closed the second round of Public Comments at 7:19pm.

13 - CLOSED MEETING

MOTION TO ENTER INTO A CLOSED MEETING

At 7:19pm, Mr. O'Brien moved the Fluvanna County Board of Supervisors enter into a closed meeting, pursuant to the provisions of Section 2.2-3711 A.1, A.5, A.6, A.7, & A.8 of the Code of Virginia, 1950, as amended, for the purpose of discussing Personnel, Prospective Industry, Investment of Funds, Litigation, and Legal Matters. Mrs. Booker seconded. The motion carried, with a vote of 5-0. AYE: Sheridan, Booker, Eager, O'Brien, and Weaver. NAY: None. ABSENT: None.

MOTION TO EXIT A CLOSED MEETING & RECONVENE IN OPEN SESSION

At 8:15pm, Mr. O'Brien moved that the Closed Meeting be adjourned and the Fluvanna County Board of Supervisors convene again in open session and "BE IT RESOLVED, the Board of Supervisors does hereby certify to the best of each member's knowledge (i) only public business matters lawfully exempted from open meeting requirements under Section 2.2-3711-A of the Code of Virginia, 1950, as amended, and (ii) only such public business matters as were identified in the motion by which the closed meeting was convened were heard, discussed, or considered in the meeting." Mr. Weaver seconded. The motion carried, with a roll call vote, of 5-0. AYES: Sheridan, Booker, Eager, O'Brien, and Weaver. NAYS: None. ABSENT: None.

14 - ADJOURN

MOTION:

At 8:15pm Mrs. Booker moved to adjourn the regular meeting of Wednesday, January 23, 2019. Mr. Weaver seconded and the motion carried with a vote of 5-0. AYES: Sheridan, Booker, Eager, O'Brien, & Weaver. NAYS: None. ABSENT: None.

ATTEST:

FLUVANNA COUNTY BOARD OF SUPERVISORS

Kelly Belanger Harris
Clerk to the Board

John M. Sheridan
Chair

**FLUVANNA COUNTY BOARD OF SUPERVISORS
AGENDA ITEM STAFF REPORT**

TAB E

MEETING DATE:	February 6, 2019				
AGENDA TITLE:	First Amendment to Water Tower Lease Agreement with USCOC of Virginia				
MOTION(s):	I move the Board of Supervisors approve the “First Amendment to Water Tower Lease Agreement” of County property, with USCOC of Virginia for the purposes of allowing the modifications described in the amendment, and further authorize the County Administrator to execute the agreement subject to approval as to form by the County Attorney.				
TIED TO STRATEGIC INITIATIVES?	Yes	No	If yes, list initiative(s):		
		X			
AGENDA CATEGORY:	Public Hearing	Action Matter	Presentation	Consent Agenda	Other
				XX	
STAFF CONTACT(S):	Cyndi Toler, Purchasing Officer				
PRESENTER(S):	Cyndi Toler, Purchasing Officer				
RECOMMENDATION:	Approval.				
TIMING:	Current.				
DISCUSSION:	The First amendment allows for the Tenant to make certain replacements and modifications to their equipment on the county owned water tower. All other terms of the original lease will stay the same.				
FISCAL IMPACT:	none				
POLICY IMPACT:	N/A				
LEGISLATIVE HISTORY:	N/A				
ENCLOSURES:	Second Amendment to Structure Lease Agreement				
REVIEWS COMPLETED:	Legal	Finance	Purchasing	HR	Other
	XX	XX			

FIRST AMENDMENT TO WATER TOWER LEASE AGREEMENT

THIS FIRST AMENDMENT (the "Amendment"), made the _____ day of _____ 2018, modifies that certain Water Tower Lease Agreement dated 3rd day of August, 2011, (the "Lease") between **Board of Supervisors of Fluvanna County**, Virginia, a political subdivision of the Commonwealth of Virginia, having an address of 132 Main Street, Palmyra, Virginia 22963 ("LESSOR") and **USCOC of Virginia RSA #3, Inc.**, a Virginia corporation, having an address of Attention: Real Estate Lease Administration, 8410 West Bryn Mawr Avenue, Chicago, Illinois, 60631 ("LESSEE").

WHEREAS, pursuant to the Lease, LESSOR has leased to LESSEE certain Tower Space on the Tower on the Property including and Land Space for LESSEE'S cellular common carrier mobile radio station operations located at 2984 James Madison Highway, Bremono Bluff, Virginia 23022;

WHEREAS, LESSEE has requested to make certain replacements and modifications as more specifically described in the USCOC Requested Modifications, as defined below in Section 1;

WHEREAS, the LESSOR has approved such USCOC Requested Modifications subject to certain conditions identified in its Conditional Approval Parties, as defined in Section 1;

WHEREAS, LESSOR and LESSEE, in their mutual interest, wish to amend the Lease as set forth below accordingly.

NOW, THEREFORE, in consideration of the terms of this Amendment and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, LESSOR and LESSEE agree as follows:

1. **Exhibits, Definitions and Recitations:** The foregoing recitations are incorporated into this Amendment. All defined terms in the Lease shall have the same defined meaning when used in this Amendment unless the context requires otherwise. The following exhibits are attached hereto and made a material part hereof:

- a. **Exhibit 1** – Conditional Approval Letter dated May 15, 2018 from Senior Planner, Department of Planning & Community Development, Fluvanna County to Todd Berlinski, Faulk & Foster for US Cellular (the "Approval") with #ZUP 18:04 Technical Review by Atlantic Technology Consultants, Inc. dated May 7, 2018 (the "Technical Requirements") attached thereto and made a part thereof; and
- b. **Exhibit 2** – Antenna Attachment, Co-location, and Modification Application and Checklist (the "Application"), with Letter of Authorization dated December 4, 2017 (the "Authorization"), Copy of Structural Analysis Report of Tower Engineering Professionals dated March 26, 2018 "Analysis"), and the

Construction Drawings entitled "VoLTE-WAVE 3 DRAWINGS FORK UNION USF 768333 2984 JAMES MADISON HWY. FORK UNION, VA 23022 (FLUVANNA COUNTY)" dated March 26, 2018 (the "Plans") attached thereto and made a part thereof.

Collectively Exhibit 1 comprised of the Approval and Technical Requirements is referred to herein as the "**Conditional Approval**".

Collectively Exhibit 2 comprised of the Application, Authorization, Analysis and Plans is referred to as the "**USCOC Requested Modifications**".

In the event of a direct conflict between this Amendment and attachment, or part thereof, the following shall be the order of preference to resolve said conflict: (i) this Amendment; (ii) the Conditional Approval; (iii) the Technical Review; (iv) the Structural Analysis; (iv) the Plans; (v) the Application; and (vi) the Authorization.

2. **Scope of Work:** LESSEE may at its sole cost and expense modify, upgrade and/or replace its equipment at the Tower only as specified in the USCOC Requested Modifications subject to any limitations and all required modifications, conditions and provisions of the Conditional Approval (the "Approved Modifications"). LESSEE Approved Modifications must be completed: (i) in a good and workmanlike manner consistent with all applicable industry standards and so as to pass without exception in the industry; (ii) so as to not interrupt any existing operations including those of the County or any other tenant and further so as to provide continuous uninterrupted service to any customers or users of other tenants or the County; (iii) in accordance with this Amendment and all provisions hereof; (iv) free of liens; and (v) in compliance with all applicable laws, rules, ordinances, and regulations, federal, state, local or otherwise; and (vi) with prudence and due diligence. In addition, the Approved Modifications shall be: (i) performed and installed only by qualified persons(s) or firms appropriately licensed and insured; and (ii) made in accordance with all applicable provisions of the Lease and shall hereafter be subject to all applicable provisions of the Lease including specifically and without limitation Sections 13, 14, 15, 16, 31, 36, 38, and 39 thereof. Notwithstanding the foregoing, nothing herein shall modify the definition of "Tower Space", "Tower", "Property", "Land Space", "Right of Way", "Furth Rights of Way" or the "Premises" as such are defined in the Lease; and in no event may the LESSEE make any modifications to the frequencies of its equipment or increase the loading or similar burden on the Tower. LESSEE shall be solely responsible for removal and proper disposal at its sole cost and expense of any and all debris or other trash caused by or related to the LESSEE Improvements. LESSEE will commence construction of the LESSEE Improvements upon receipt of all government approvals necessary for the construction of the LESSEE Improvements and compliance with all other applicable laws, rules and regulations. LESSEE Improvements must be completed and fully operational on or

before the 30th day of June, 2019, time being of the essence. LESSEE shall provide written notification to LESSOR when the LESSEE Improvements are complete.

3. The LESSEE represents and warrants that all assumptions made in the Technical Requirements are true and correct and consistent with its Analysis and Plans.

4. **Lighting:** Notwithstanding any provision of the Lease, in the event that the Approved Modifications cause or necessitate any modification, improvements or work to be done to the painting or lighting system on the Tower so as to be in compliance with applicable law, including without limitation any provisions of the Federal Communication Act of 1934, as amended from time to time, such modification, improvements or work on the lighting or painting of the Tower shall be the responsibility of the Lessee and shall be completed by the Lessee as part of the Approved Modifications at Tenant's sole cost and expense.

5. **Other Terms and Conditions Remain.** Except as expressly set forth in this Amendment, the Lease otherwise is unmodified and remains in full force and effect. Each reference in the Lease to itself shall be deemed also to refer to this Amendment.

IN WITNESS WHEREOF, the parties have caused their properly authorized representatives to execute and seal this First Amendment on the dates set forth below.

Site Name: Fork Union

Site Number: 768333

Signature Page

IN WITNESS WHEREOF, the parties hereto bind themselves to this Amendment as of the date of full execution.

LESSOR:
Board of Supervisors of Fluvanna County

LESSEE:
USCOC of Virginia RSA #3, Inc.

By: _____
Steven M. Nichols, County Administrator
Date: _____

By: *[Signature]*
Print Name: Narothum Saxena
Print Title: Vice President
Date: JAN 14 2019

STATE OF VIRGINIA

CITY/COUNTY OF _____, to-wit:

The foregoing instrument was acknowledged before me this ____ day of _____, 2018, by Steven M. Nichols, County Administrator, on behalf of the Board of Supervisors of Fluvanna County, a political subdivision of the Commonwealth of Virginia.

Notary Public SEAL

My commission expires:
Notary registration number:

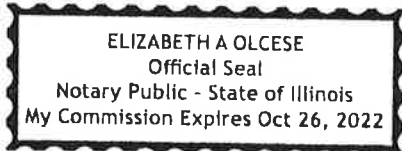
STATE OF Illinois

CITY/COUNTY OF Cook, to-wit:

I, the undersigned, a notary public and for the State and County aforesaid, do hereby certify that Narothum Saxena, the Vice President, of USCOC of Virginia RSA #3, Inc., on behalf of the corporation, known to me to be the same person whose name is subscribed to the foregoing First Amendment to Water Tower Lease Agreement, appeared before me this day in person and acknowledged that, pursuant to his authority, he signed this First Amendment as his free and voluntary act.

[Signature]
Notary Public SEAL

My commission expires: OCT 26 2022
Notary registration number: 884516



Approved as to Form
By: [Signature]
Fluvanna County attorney
By: Kristina M. Hofmann,
Assistant County attorney



COUNTY OF FLUVANNA

"Responsive & Responsible Government"

BOS 2019-02-06 - p.619/768
132 Main Street
P.O. Box 540
Palmyra, VA 22963
(434) 591-1910
Fax (434) 591-1911
www.fluvannacounty.org

May 15, 2018

Todd Berlinski
Faulk & Foster for US Cellular
678 Front Avenue NW, Suite 215
Grand Rapids, MI 49504

Delivered via email

**REF: Re: ZUP 18:04 – Antenna replacement/modification on existing tower at
2984 James Madison Highway, Fork Union, VA 23055
Tax Map 51-A-78**

Dear Mr. Berlinski:

Please be advised the above referenced application submitted to our office on April 30, 2018 to replace antennas on the existing telecommunications facility on Tax Map 51, Section A, Parcel 78 is **approved**, based on satisfaction of the conditions stated in the attached letter from Atlantic Technology Consultants, Inc. dated May 7, 2018.

If you have any questions or comments, feel free to contact me at (434) 591-1910 or at brobinson@fluvannacounty.org.

Sincerely,

Brad Robison
Senior Planner
Dept. of Planning & Community Development

Copy: File



#ZUP 18:04

TECHNICAL REVIEW
TELECOMMUNICATIONS EQUIPMENT CO-LOCATION

US Cellular

Site: Fork Union Water Tank

2984 James Madison Highway
Fork Union, VA 23022

Submitted by:

ATLANTIC TECHNOLOGY CONSULTANTS, INC.

A Member of The Atlantic Group of Companies

ATC PROJECT #: 1151-15

May 7, 2018



EXECUTIVE SUMMARY

Evaluation Criteria:

Fluvanna County:

Planning and Zoning Ordinance:

Article 27: Regulations of Telecommunications Facilities

Section 22-27-9.2 : Antenna Element Replacements:

Applicant:

US Cellular dba "US Cell" has made application to the County of Fluvanna for Administrative Review by the Zoning Department of plans for co-location of telecommunications equipment at an existing 115-ft AGL Water Tank. The water tank is owned by Fluvanna County Board of Supervisors, but the land is leased from Francis and Frank White, Deed Book 51-A-78 and is located at 2984 James Madison Highway Fork Union, VA 23022

US Cell is an FCC licensed wireless telecommunications provider authorized to provide services (Voice and Data) in the Charlottesville BTA areas. The County of Fluvanna geographically lays in the Charlottesville BTA.

This applicant, US Cell, currently has six (6) antennas with electronics and cables located on the water tank. Three (3) antennas will remain. All six (6) existing coax cables will be removed along with jumpers and electronics. In addition, three (3) LTE antennas and one (1) 1.25" hybrid cable will be installed. US Cell requests approval to add three (3) Raycap, six (6) Remote Radio Heads and six (6) combiners at the 115-ft AGL position. In addition US Cell will be installing electronic radio equipment in the 12' x 20' concrete equipment shelter.

No changes to the height of the water tank are proposed and no modifications to any of the ground equipment or electrical upgrades are proposed.

This report outlines the specific areas of evaluation with respect to this proposal regarding the site plans as presented.

It is the opinion of this consultant that the Applicant's plans conform to the requirements of Fluvanna County and the FCC.

The Consultant recommends: Approval.

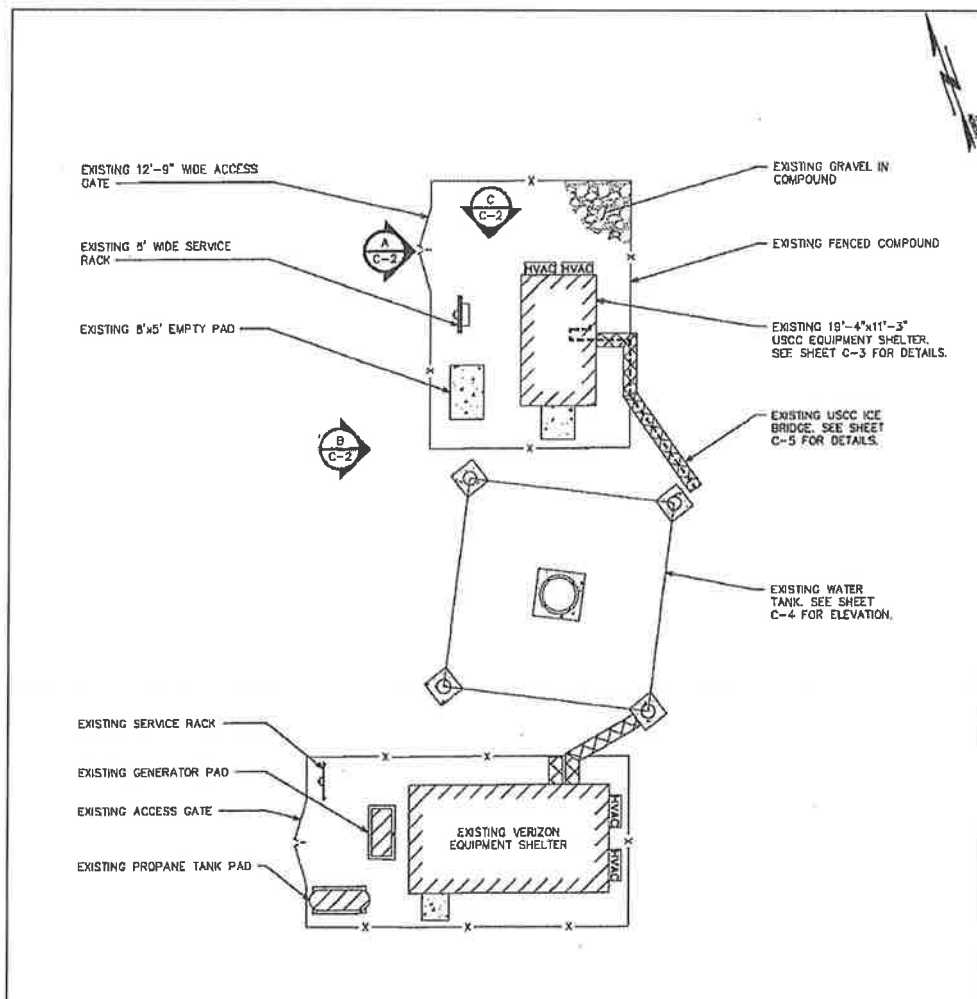


George N. Condyles, IV, CPM
President & COO
Atlantic Technology Consultants, Inc.

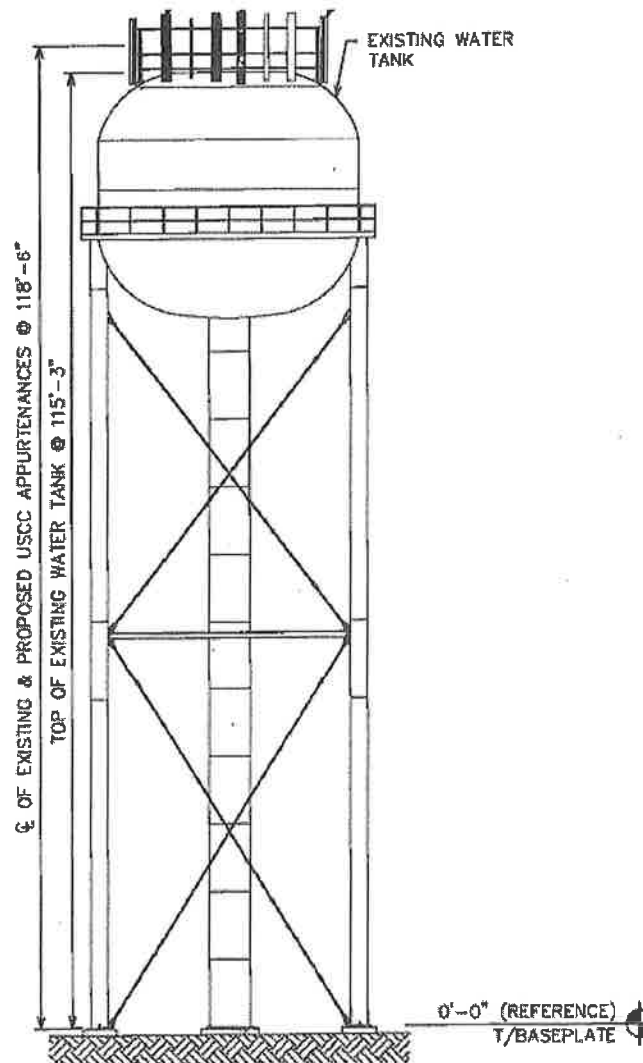
1.0 TECHNICAL

1.1 Siting

The water tank site is located on a 100' x 100' square area of land leased by Fluvanna County. The existing fenced compound provides sufficient ground space for location of telecommunications transceiver equipment cabinets, and encloses the foundation of the existing 115-ft four legged Water Tank. The site's physical location is approximately 500 feet north of James Madison Highway with an adjoining entrance road. The physical address is 2984 James Madison Highway, Fork Union, VA. The water centroid is at 37-45-03.24 N, 78-17-11.17 W (NAD 83 Datum) Ground Elevation of 478-ft. The property is Zoned (A-1) Agricultural.



A review by the Zoning Administrator of plans to co-locate equipment at this site is required in accordance with County zoning ordinance. This site is well maintained and in excellent condition.



This applicant, US Cell, currently has six (6) antennas with electronics and cables located on the water tank. Three (3) antennas will remain. All six (6) existing coax cables will be removed along with jumpers and electronics. In addition, three (3) LTE antennas and one (1) 1.25" hybrid cable will be installed. US Cell requests approval to add three (3) Raycap, six (6) Remote Radio Heads and six (6) combiners at the 115-ft AGL position. In addition US Cell will be installing electronic radio equipment in the 12' x 20' concrete equipment shelter.

No changes to the height of the water tank are proposed and no modifications to any of the ground equipment or electrical upgrades are proposed. The Applicant provided the specific technical data model's

nomenclature for each component. The components conform to reasonable specifications.

Co-location at this site is preferable to construction of a new site, with such co-location minimizing visual impact of telecommunications equipment on the surrounding area in accordance with County's ordinance.

1.2 Structural

The existing water tank was designed with the ability to support multiple appurtenances. Currently, two (2) carriers, US Cell and Verizon, are located on the water tank. With consideration of all existing and proposed appurtenances, this water tank is near its maximum loading.

A full structural analysis has been submitted by US Cell. The engineering firm Tower Engineering Professionals, Inc represented by Jordan W. Shelley PE in a Structural Analysis dated March 26, 2018 has rated this structure with the intended additions to be at 103.5% of loading.

This water tank has "Sufficient Capacity" to provide adequate loading for this scope of work.

1.3 RF Exposure

FCC bulletin OET-65 provides guidance for a licensee proposing to construct a telecommunications support structure in calculation of RF exposure limitations, including analysis of the cumulative effect of all transmitters on the structure. Appropriate steps, including warning signage at the site, must be taken to protect both the general public and site workers from unsafe RF exposure in accordance with federal guidelines.

This site is compliant will all FCC requirements and regulations.

1.4 Grounding

Grounding of all structures and equipment at an RF site is critically important to the safety of both personnel and equipment at the site. Even a single component not meeting this standard places all other site components at risk for substantial damage. All structures and equipment at the site should maintain a ground potential difference of less than 5 ohms.

The existing water tank, shelters, and equipment are adequately grounded as per all Codes.

1.5 General Safety

This site compound is Compliant to all Safety requirements by:

1. It is surrounded by suitable security fencing and is locked.
2. The water tank has OSHA approved Fall-Safe equipment.
3. All components are grounded and are in good working order.

1.6 Interference

The consultant sees no evidence of interference by or with this site after a general evaluation of the surrounding transmitter sites.

Should any interference issues be posed with respect to this site, mitigation would nevertheless remain the responsibility of the applicant and affected carrier(s), and would be regulated by the Federal Communication Commission, having no effect or burden on the County.

2.0 PROCEDURAL

2.1 FAA Study

Due to height and location, this site does not require lighting set forth by the FAA.

2.2 FCC Antenna Site Registration

This site does not require registration with the FCC as an elevated antenna support structure.

2.3 Environmental Impacts

This application proposes co-location at an existing site, not a new site construction; therefore, a full environmental impact study is neither required nor practically advisable.

2.4 Historic Impacts

This evaluation is not required for co-location applications, and practically speaking, this consultant has no evidence indicating that the addition of the appurtenances as proposed would have any significant change in impact on historic site preservation or appreciation. Additionally, no sites of historic preservation interest are known to exist proximal to this site.

3.0 RECOMMENDATIONS

This request for approval to co-locate telecommunications equipment as proposed represents an appreciable intent on the part of the Applicant to conform to all applicable federal, state, and local regulations, accepted industry practices, and specific County ordinances regarding telecommunications towers and co-location of equipment.

After review, the Consultant recommends Approval.

In closing, this consultant remains available to address any comments or questions which may arise following review of this report. Any interested party with such comments or questions may feel free to contact this firm, which remains committed to delivering independent, objective, unbiased, and thorough consulting services.

Respectfully submitted,

A handwritten signature in cursive script that reads "George N. Condyles, IV".

George N. Condyles, IV, CPM
President & COO



Commonwealth of Virginia

Fluvanna County



Antenna Attachment, Co-location, and Modification Application and Checklist

Fees: \$550 Site Plan Review fee and \$900 consultant fee. Payable in one check, or cash.

The Following MUST be included with your application:

1. A statement from a qualified individual on applicant letter head that the applicant will comply with all FCC Rules regarding human exposure to RF energy, along with the Individuals qualifications.
2. A statement from the applicant stating that the applicant will comply will all applicable FCC Rules regarding radio-frequency interference.
3. Complete Plans of the proposed facility addressing the items outlined in Page 3 of this application, and which also meet County Building Code requirements.

Additional Information may be requested.

Commercial Wireless Provider US Cellular

Applicant's Name

Phone 616-647-3720 x107 Fax NA Email elizabeth.ploughman@faulkandfoster.com

Address Faulk and Foster for US Cellular- 678 Front Ave NW, Ste 215, Grand Rapids, MI 49504

WCF'S Owner Name (if different from applicant)

Phone _____ Fax _____ Email _____

Address USCOC of Virginia RSA #3 Inc., a Virginia corporation, • 8410 W. Bryn Mawr Ave., Chicago, ILL 60631

Property Owners Name

Phone 434-591-1910 Fax _____ Email _____

Address Fluvanna County, 132 Main St Palmyra, VA 22963

For Co-location or attachment on County Property lessor/licensor legal/attorney contact information

Phone 434-591-1910 Fax _____ Email _____

Address Fluvanna County, 132 Main St Palmyra, VA 22963

11/1/2018
12:00 PM
COW 017

- Antenna element replacement Yes No
- Co-location on existing tower Yes No
- Co-location on existing utility distribution pole Yes No
- Concealed antenna attachment on water tank Yes No
- Concealed antenna attachment on building Yes No
- Non-concealed co-location/antennae attachment Yes No
- Modification/replacement of existing antennae's Yes No

Facility Information

Site Address 2984 James Madison Highway

Site Tax Parcel Identification Number 51-A-78

Property Zoning _____

Current Use of Property water tank

Latitude (NAD 83) N37°45'3.24" Longitude (NAD 83) W78°17'11.17"

Ground Elevation (AMSL) (Ft.) 478

Total Height of Structure (AGL) (Ft.) 115.3

RAD Center (Ft.) 118.6

FCC Antenna Structure Registration Number (ASR) (if applicable) NA

- All Applications are subject to standards set in Fluvanna County Zoning Ordinance, Article 27 'Regulation of Telecommunication Facilities'
- The table on page 3 lists what is required for each specific type of application
- Development Standards in the table on page 3 are abbreviated in description. See Fluvanna County Zoning Ordinance, Article 27 'Regulation of Telecommunication Facilities' for a complete description of what is required for submittal.

Development Standards X = Required	Antenna Element Replacement	Concealed colocation or attachment on TASF	Non-concealed colocation or combined on existing TASF	Modification to existing colocation antenna array	Non-concealed colocation or attachment on existing utility pole
Contact Planning for submittal requirements/fee/process/dates		X	X	X	X
Affidavit by RF engineer indicating compliance with siting alternative hierarchy		X	X	X	X
Two sets of signed & sealed site plans	X	X	X	X	X
Identification card or tax bill showing ownership of property	X	X	X	X	X
Proof of applicants authorization	X	X	X	X	X
Color map of designated search ring		X	X	X	X
Site plan/survey		X	X	X	X
Structural analysis by VA PE		X	X	X	X
Written statement giving reason for antenna replacement	X				
Description of proposed antenna replacement including antenna element design, type and manufactures model number of the existing and proposed antenna				X	
Site plan/survey shall include:					
Location of added antenna	X	X	X	X	X
Size, number, location of feed lines		X	X	X	X
Ground equipment identified by owner, type and size		X	X	X	X
Description of method of attaching equipment		X	X	X	X
Dimensions of antenna on tower		X	X	X	X
Setbacks of all equipment		X	X	X	X
Method of concealment techniques for antenna		X			
If required, photo-simulated post construction renderings of proposed concealed equipment on existing concealed structure; or on existing building or water tank		X			
Method of concealment techniques for antenna, feed lines, ground equipment		X			
Fencing type and location		X	X	X	X
Landscape/buffer plan		X	X	X	X
Date received: 4-30-18 ZUP 18 :04 Fee: 1450.00 Date Sent to Consultant:					
Election District: Fork Union		Planning Area: Fork Union CPA		Date of Approval/Denial:	



Faulk & Foster

4-25-18

Fluvanna County Planning Department
132 Main Street
Palmyra VA, 22963

**RE: US Cellular Antenna Modification
USC 76833 Fork Union
Address: 2984 James Madison Hwy**

Greetings,

I have enclosed an updated application on the new form for antenna modification for the above mentioned project.

Also enclosed is a new check in the amount of \$1450.

The construction drawings and FCC compliance statement were previously submitted and received in your office per email confirmation from Brad Robinson.

Please return original check in the amount of \$900 to the following address:
Faulk and Foster Attn: Jessica Hale, 1811 Auburn Ave, Monroe, LA 71201

Please let me know if anything further is needed prior to obtaining approval for this project.

Please send all invoices as well as a copy of the permit to my email:
Elizabeth.ploughman@faulkandfoster.com.

The hard copy can be sent to my attention at:
Faulk and Foster, 678 Front Ave NW, Suite 215, Faulk and Foster, Grand Rapids, MI 49504

Please contact me with any questions.

Thank you,

Liz Ploughman
Project Coordinator
Faulk and Foster
Direct (616) 647-3720 x107
elizabeth.ploughman@faulkandfoster.com



April 12, 2018

Fluvanna County
Brad Robinson
132 Main Street
Palmyra VA, 22963

RE: Colo Modification Application Review Fee: US Cellular Site – 768333 Fork Union

Hi Brad,

Enclosed are the remaining documents needed for the Colo Modification Application Review associated with the US Cellular project on the County water tower located 2984 JAMES MADISON HWY. By now you should have received the check for the Application Fee of \$900 and the RF letter. Enclosed are the following documents:

- USCC Authorization Letter
- Copy of the Passing Structural Analysis Report
- Copy of the 11X17 Construction Drawings

Sincerely,

Todd Berlinski

Regional Project Manager
***Faulk & Foster* Real Estate, Inc.**
637 Virginia Avenue
East Lansing, MI 48823
(517) 974-2425



LETTER OF AUTHORIZATION

December 4th, 2017

RE: Confirmation for Faulk & Foster as Approved Vendor for US Cellular

To Whom it May Concern,

US Cellular authorizes Faulk & Foster, its agents and employees to perform leasing, zoning and permitting services associated with US Cellular's equipment modification project.

A handwritten signature in cursive script, appearing to read "David Sharp".

12/4/17

David Sharp, PMP

Senior Project Manager

U.S. Cellular

10 Corporate Dr., Suite 210

Bedford, NH, 03110

Phone (603) 582-5315

Fax (603) 533-2277

E-mail: David.sharp@uscellular.com

March 26, 2018

Ken Hardin
 U.S. Cellular
 800 Cornerstone Drive
 Knoxville, TN 37932
 (865) 777-8054



Tower Engineering Professionals
 326 Tryon Road
 Raleigh, NC 27603
 (919) 661-6351
Structures@tepgroup.net

Subject: Structural Analysis Report

Carrier Designation: U.S. Cellular VoLTE Reconfiguration
Site Number: 768333
Site Name: Fork Union_USF

Engineering Firm Designation: TEP Project Number: 52861.152764

Site Data: 2984 James Madison Hwy,
 Fork Union, Fluvanna County, VA 23022
 Latitude 37° 45' 03.24", Longitude -78° 17' 11.17"
 115.3 Foot - 200,000 Gallon - 4-Column Elevated Water Tank

Dear Ken Hardin,

Tower Engineering Professionals is pleased to submit this "Structural Analysis Report" to determine the structural integrity of the above mentioned water tank.

The purpose of the analysis is to determine acceptability of the water tank stress level, including the lateral-resistance system. Based on our analysis we have determined the water tank stress level for the structure under the following load case, to be:

LC1: Existing + Proposed + Future Equipment
 Note: See Table 1 for the existing, proposed, and future loading

Sufficient Capacity

Structure Capacity	Controlling Component	Notes
103.5%	Sway Rods	Lateral-Resistance System

The analysis has been performed in accordance with the ASCE 7-10 Minimum Design Loads for Buildings and Other Structures and the 2012 Virginia Construction Code based upon a wind speed of 120 mph 3-second gust and exposure category B.

All modifications and equipment proposed in this report shall be installed in accordance with the appurtenances listed in Table 1 for the determined available structural capacity to be effective.

We at Tower Engineering Professionals appreciate the opportunity of providing our continuing professional services to you and U.S. Cellular. If you have any questions or need further assistance on this or any other projects please give us a call.

Structural analysis prepared by: Ryan N. Morofsky, E.I.

Respectfully submitted by:

Jordan W. Shelley, P.E.



03/26/2018

TABLE OF CONTENTS

1) INTRODUCTION

2) ANALYSIS CRITERIA

Table 1 - Existing, Proposed, and Future Antenna and Cable Information

3) ANALYSIS PROCEDURE

Table 2 - Documents Provided

3.1) Analysis Method

3.2) Assumptions

4) ANALYSIS RESULTS

Table 3 - Water Tank Component Capacity

Table 4 - Foundation Comparison Results

4.1) Recommendations

5) APPENDIX A

Analysis Calculations

1) INTRODUCTION

The water tank is a 115.3-ft, 200,000-gallon, 4-column elevated water tank designed by Phoenix Fabricators and Erectors, Inc. in 2005. TEP visited the site in April of 2017 to collect existing steel and appurtenance information. All information provided to TEP was assumed to be accurate and complete.

2) ANALYSIS CRITERIA

The analysis has been performed in accordance with the ASCE 7-10 Minimum Design Loads for Buildings and Other Structures and the 2012 Virginia Construction Code using a 3-second gust wind speed of 120 mph with the following design criteria. Seismic loading was not considered in this analysis. The structure may remain unaltered with respect to the seismic loading per Section 3403.4 of the 2012 IBC because the additional loading does not increase the seismic forces in any structural element by more than 10% cumulative since the original construction.

- 1) **Classification of Structure: Class III**
Definition: Structures that due to height, use, or location represent a substantial hazard to human life and/or damage to property in the event of failure and/or used primarily for essential communications.
- 2) **Exposure Category: Exposure B**
Definition: Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.
- 3) **Topographic Category: Category 1**
Definition: No abrupt changes in general topography, e.g. flat or rolling terrain, no wind speed-up consideration shall be required.

Table 1 - Existing, Proposed, and Future Antenna and Cable Information

Existing/ Proposed	Elevation (ft)	Qty	Antenna Model	Mount Type	Qty Coax	Coax Size	Coax Location	Owner/ Tenant
<i>Proposed</i>	118.5	3	<i>KMW AM-X-CD-17-65-00T-RET</i>	(24) Post Corral Mount	3	1 1/4 <i>Hybrid</i>	<i>A-Leg</i>	<i>USCC</i>
		6	<i>Kaelus B12/B5 Combiner</i>					
		3	<i>Nokia FRBG B12 RRH</i>					
		3	<i>Nokia FXCB/A B5 RRH</i>					
		3	<i>Raycap RUSDC-6267-PF-48</i>					
Existing	118.5	6	Antel WPA 80063/8CF		6	1 5/8	A-Leg	USCC
<i>To Be Removed</i>	118.5	3	<i>KMW AM-X-CW-18-65-00T-RET</i>	-	6	1 5/8	<i>A-Leg</i>	<i>USCC</i>
Existing	118.5	6	Antel LPA 80090-8CF	(24) Post Corral Mount	18	1 5/8	B-Leg	Verizon
		3	Antel BXA 185085-12CF					
		3	Antel BXA 70063/8CF					

3) ANALYSIS PROCEDURE**Table 2 - Documents Provided**

Document	Remarks	Reference	Source
Steel and Appurtenance Mapping	Tower Engineering Professionals, Inc., dated September 4, 2014	52861_15529	TEP
Mount Mapping Report	Tower Engineering Professionals, Inc., dated May 26, 2017	52861.120867	TEP
Previous Structural Analysis	Tower Engineering Professionals, Inc., dated July 25, 2017	52861_120864	TEP
Correspondence	Correspondence from U.S. Cellular in reference to the existing, proposed, and reserved loading.	-	USCC

3.1) Analysis Method

RISA-3D (version 16.0.1), a commercially available analysis software package, was used to create a three-dimensional model of the water tank structure and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

- 1) The water tank, tank components, and foundation were built in accordance with the manufacturer's specifications.
- 2) The water tank, tank components, and foundation have been maintained in accordance with the manufacturer's specification.
- 3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Table 1.
- 4) All water tank components are in sufficient condition to carry their full design capacity.
- 5) Serviceability with respect to antenna twist, tilt, roll, or lateral translation, is not checked and is left to the carrier or tank owner to ensure conformance.
- 6) All antenna mounts and mounting hardware are structurally sufficient to carry the full design capacity requirements of appurtenance wind area and weight as provided by the original manufacturer specifications. It is the carrier's responsibility to ensure compliance to the structural limitations of the existing and/or proposed antenna mounts. TEP did not perform a site visit to verify the size, condition or capacity of the antenna mounts and did not analyze antennas supporting mounts as part of this structural analysis report.
- 7) The member stresses in the catwalk handrail and corral mounts were not considered as part of this analysis.
- 8) All member connections are assumed to have a greater capacity than the supporting member.
- 9) The following material grades were assumed:
 - a) All steel members: ASTM A36
 - b) Anchor bolts: ASTM A36
- 10) This report is not a construction document.

This analysis may be affected if any assumptions are not valid or have been made in error. Tower Engineering Professionals should be notified to determine the effect on the structural integrity of the water tank.

4) ANALYSIS RESULTS**Table 3 - Water Tank Component Capacity**

Notes	Component	% Capacity	Pass / Fail
1	Columns	92.3	Pass
1	Riser	51.0	Pass
1,2	Sway Rods	103.5	Pass
1	Struts	43.1	Pass
1	Hub Rods	15.7	Pass
1	Anchor Bolts	80.6	Pass

Table 4 - Foundation Comparison Results

Component	Analysis without Antennas (kips)	Analysis with Antennas (kips)	Ratio	Notes
Column Download	460.3	506.2	1.10	Maximum Water
Column Uplift	-.3	-.3	-.3	Minimum Water
Column Shear	27.3	38.2	1.40	-
Riser Download	751.7	751.7	1.00	-
Riser Shear	3.2	3.0	0.94	-

Structure Rating (max from all components) =	103.5%
---	---------------

Notes:

- 1) See additional documentation in "Appendix A - Analysis Calculations" for calculations supporting the % capacity listed.
- 2) A structure rating of 105% or less is within engineering tolerances and considered acceptable per the 2012 IEBC Section 1007.1 Exception #1.
- 3) Uplift in columns is considered negligible compared to the other base reactions.

4.1) Recommendations

- 1) The tank and tank components has sufficient capacity to carry the existing and proposed loads. No modifications are required at this time.
- 2) This analysis assumes the structural integrity of the tank and tank components has not been compromised. TEP recommends inspection and maintenance be performed at regular intervals as prescribed by AWWA M42 (every three years).
- 3) If the load differs from that described in Table 1 of this report or the provisions of this analysis are found to be invalid, another structural analysis should be performed.
- 4) TEP did not have sufficient information to perform a foundation analysis. Provide TEP with foundation drawings and a geotechnical report for this site in order to determine the substructure capacity. If this information is not available, TEP recommends a foundation mapping and geotechnical investigation.

APPENDIX A
ANALYSIS CALCULATIONS



Fork Union_USF

TEP #: 52861.152764
 Analysis: RNM 3/26/2018
 Check: WBA 3/26/2018

Water Tank Analysis_v0.6 - Inputs

Water Tank Type:	Multi Column	Exposure:	B
Code:	ASCE 7-10	Topo:	1
Wind Speed:	120 mph	Crest Ht.:	0

Column Quantity	Bays	Column Radius Bot. (ft)	Column Radius Top (ft)	Tank Radius (ft)
4	2	21.92	18.00	18.00

Riser Shape:	Pipe
Riser Size:	P60x0.304
Riser Height:	82.5 ft
BCL (estimated):	85.3 ft

Hub Rods @ top of Riser?

	Height (ft)	Column Type	Column Size	Sway Rod Type	Sway Rod Size	Sway Rod Stagger (0,1,2)	Strut Type	Strut Size	Hub Rod Type	Hub Rod Size
Bay 1:	46.38	Pipe	P24x0.301	SR	SR 1-1/2	0	WF	W8x31	SR	SR 1
Hub Rods:	81.00	Pipe	P24x0.301	SR	SR 1-1/2	0			SR	SR 1
B/Catwalk:	93.29									

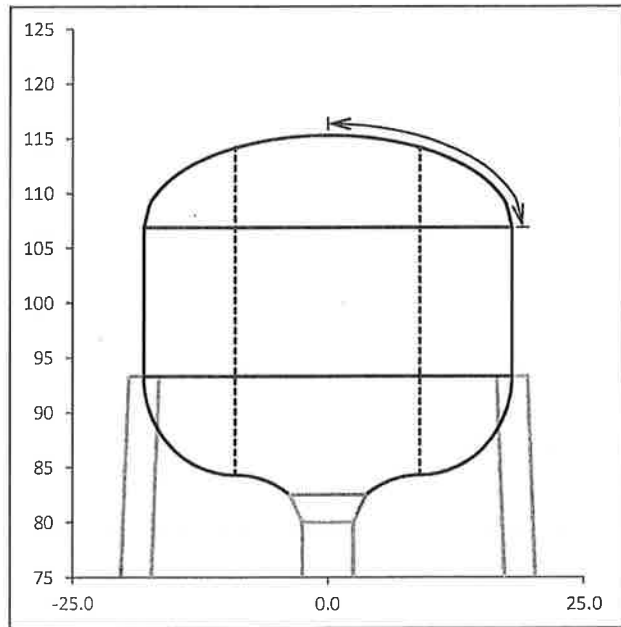
Tank Shape
Torus Bottom
Torus Radius
Assumed

	Height (ft)	t _{AVG} (in)
Top:	8.42	0.2500
Middle:	13.58	0.3125
Bottom:	10.79	0.3750

Arc Length: 21.436 ft
 Volume: 26,861 ft³
 Volume: 200,931 gal
 Assumed Rated Tank Volume: 200,000 gal
 Water Weight: 1668.33 kip
 Weight to Riser: 520.69 kip

Dry Riser?

S _{Area,top} :	1,368.7	ft ²	A _{Proj,top} :	238.0	ft ²
S _{Area,mid} :	1,536.2	ft ²	A _{Proj,mid} :	489.0	ft ²
S _{Area,bot} :	1,520.5	ft ²	A _{Proj,bot} :	305.1	ft ²
Total:	4,425.5	ft²	Total:	1,032.1	ft²
W _{t,top} :	13.97	kip	Wind _{top} :	3.51	kip
W _{t,mid} :	19.60	kip	Wind _{mid} :	7.22	kip
W _{t,bot} :	23.28	kip	Wind _{bot} :	4.50	kip
Total:	56.86	kip	Total:	15.23	kip



BASE REACTIONS			
Member	Download (k)	Uplift (k)	Shear (k)
Columns	506.2	113.1	38.2
Riser	751.7	0.0	3.0

COLUMN ANCHOR RODS			
Total Area (in ²)	φTn (kips)	φVn (kips)	Capacity
4.81	140.30	94.17	80.6%

Fork Union_USF

TEP #: 52861.152764
 Analysis: RNM 3/26/2018
 Check: WBA 3/26/2018

Water Tank Analysis_v0.0 - Joint Reactions and Anchor Bolt Capacities

BASE REACTIONS			
Member	Download (k)	Uplift (k)	Shear (k)
Columns	506.21	113.10	38.24
Riser	751.67	0.00	3.00

Anchor Bolt Diameter: 1.750 in
 Anchor Bolt Quantity: 2
 Fy: 36 ksi
 Fu: 58 ksi

Ab = 2.405 in²
 Qty*Ab = 4.811 in²

Tension

ft = 23.511 ksi
 Fnt = 43.50 ksi
 F'nt = 38.89 ksi
 F'nt = 38.89 ksi
 Tu = 113.10 kips
 φTn = 140.30 kips

Shear

fv = 7.948 ksi
 Fnv = 26.10 ksi
 F'nv = 26.10 ksi
 F'nv = 26.10 ksi
 Vu = 38.24 kips
 φVn = 94.17 kips

Tension Capacity = 80.6%
 Shear Capacity = 40.6%
 Max Capacity = 80.6%

Handrail Wind and Weight Calculations

Catwalk Radius

20.00

 ft
 Number of Posts

32

Elevation of Appurtenances:

95.00

 ft

Horizontal Properties

Height Perpendicular to Wind of Horizontals
 Upper

2.00

 in
 Middle

1.50

 in
 Lower

8.00

 in

Shape	Area	Cf	CfA
F	13.33	2.00	26.67
F	10.00	2.00	20.00
F	53.33	2.00	106.67

Weight of Horizontals

Upper

2.44

 plf
 Middle

1.28

 plf
 Other 1

13.61

 plf
 Other 2

25.52

 plf

Weights
306.62
160.85
1710.28
3206.94

Post Properties

Post Width

1.75

 in
 Post Length

3.50

 ft
 Post Weight

2.11

 plf

Shape	Area	Cf	CfA	Weight
F	16.33	1.97	32.12	236.32

Total Weight (kips) = 5.621

Total CfA = 185.5 sf
 Pw = 28.99 psf
 Ka = 0.75

Wind Force = 4.032 kips

BLC 6: HANDRAIL DL (WEIGHT)

N21	L	Y	-5.621
-----	---	---	--------

BLC 7: HANDRAIL LL (WIND)

N21	L	X	-4.032
-----	---	---	--------

Inner Corral Wind and Weight Calculations

Inner Corral Radius 10.19 ft
 Number of Posts 16

Elevation of Appurtenances: 118.50 ft

Horizontal Properties

Height Perpendicular to Wind of Horizontals

Upper 2.00 in
 Middle 1.50 in
 Lower 4.00 in

Shape	Area	Cf	CfA
F	6.79	2.00	13.59
F	5.10	2.00	10.19
F	13.59	2.00	27.17

Weight of Horizontals

Upper 2.44 plf
 Middle 1.28 plf
 Lower 3.40 plf

Weights

156.22
 81.95
 217.69

Post Properties

Post Width 1.75 in
 Post Length 3.75 ft
 Post Weight 2.11 plf

F	8.75	2.00	17.50	126.60
---	------	------	-------	--------

Total Weight (kips) = 0.582

Total CfA = 68.5 sf
 Pw = 30.88 psf
 Ka = 1.00

Wind Force = 2.114 kips

BLC 8: CORRAL DL (WEIGHT)

N22	L	Y	-0.582
-----	---	---	--------

BLC 9: CORRAL LL (WIND)

N22	L	X	-2.114
-----	---	---	--------

Top of Tank Wind and Weight Calculations

Corral Radius	15.00	ft
Number of Posts	24	

Elevation of Appurtenances: 118.50 ft

Horizontal Properties

Height Perpendicular to Wind of Horizontals

Upper	2.00	in
Middle	2.00	in
Lower	1.50	in
Toe Plate	4.00	in

Shape	Area	Cf	CfA
F	10.00	2.00	20.00
F	10.00	2.00	20.00
F	7.50	2.00	15.00
F	20.00	2.00	40.00

Weight of Horizontals

Upper	2.44	plf
Middle	2.44	plf
Lower	1.79	plf
Toe Plate	3.40	plf

Weights

229.96
229.96
168.70
320.44

Post Properties

Post Width	5.00	in
Post Length	6.50	ft
Post Weight	8.20	plf

F	65.00	1.69	109.63	1279.20
---	-------	------	--------	---------

Kicker 1 Properties

Kicker Width	2.00	in
Kicker Length	6.59	ft
Kicker Weight	2.44	plf

F	13.18	2.00	26.36	192.96
---	-------	------	-------	--------

Diagonal Properties

Diagonal Width	1.50	in
Diagonal Length	5.00	ft
Diagonal Weight	1.79	plf

F	15.00	2.00	30.00	214.80
---	-------	------	-------	--------

Appurtenance Properties

Proposed- (6) Kaelus B12/B5 Combiner (USCC)

App. Height	8.00	in
App. Width (Wind)	6.20	in
App. Depth	3.70	in
App. Weight	6.60	lbs
Number of App.	6	

F	2.07	1.30	2.70	39.60
---	------	------	------	-------

Appurtenance Properties	Proposed - (3) Nokia FRBG B12 RRH (USCC)						
App. Height	15.70	in	F	5.14	1.30	6.68	178.50
App. Width (Wind)	15.70	in					
App. Depth	5.90	in					
App. Weight	59.50	lbs					
Number of App.	3						

Appurtenance Properties	Proposed - (3) Nokia FXCB/A B5 RRH (USCC)						
App. Height	22.10	in	F	8.93	1.30	11.63	165.30
App. Width (Wind)	19.40	in					
App. Depth	5.20	in					
App. Weight	55.10	lbs					
Number of App.	3						

Appurtenance Properties	Proposed - (3) Raycap RUSDC-6267-PF-48 (USCC)						
App. Height	20.52	in	F	8.08	1.30	10.52	75.00
App. Width (Wind)	18.90	in					
App. Depth	7.02	in					
App. Weight	25.00	lbs					
Number of App.	3						

Appurtenance Properties	Existing - (6) Antel WPA 80063/8CF (USCC)						
App. Height	94.60	in	F	44.15	1.45	63.93	114.00
App. Width (Wind)	11.20	in					
App. Depth	5.10	in					
App. Weight	19.00	lbs					
Number of App.	6						

Appurtenance Properties	Proposed - (3) KMW AM-X-CD-17-65-00T-RET (USCC)						
App. Height	96.00	in	F	23.60	1.44	33.93	178.50
App. Width (Wind)	11.80	in					
App. Depth	6.00	in					
App. Weight	59.50	lbs					
Number of App.	3						

Appurtenance Properties	Existing - (6) Antel LPA 80090-8CF (Verizon)						
App. Height	94.60	in	F	22.47	1.72	38.64	138.00
App. Width (Wind)	5.70	in					
App. Depth	9.40	in					
App. Weight	23.00	lbs					
Number of App.	6						

Appurtenance Properties	Existing - (3) Antel BXA 185085-12CF (Verizon)						
App. Height	72.00	in	F	9.15	1.56	14.28	39.00
App. Width (Wind)	6.10	in					
App. Depth	4.10	in					
App. Weight	13.00	lbs					
Number of App.	3						

Appurtenance Properties	Existing - (3) Antel BXA 70063/8CF (Verizon)						
App. Height	94.70	in	F	22.10	1.45	32.01	72.00
App. Width (Wind)	11.20	in					
App. Depth	5.20	in					
App. Weight	24.00	lbs					
Number of App.	3						

Appurtenance Properties	(9) 2.5SCH40 x 8'						
App. Height	96.00	in	R	17.40	1.20	20.88	417.60
App. Width (Wind)	2.90	in					
App. Depth	2.90	in					
App. Weight	46.40	lbs					
Number of App.	9						

Appurtenance Properties

(12) 2SCH40 x 7'

App. Height	84.00	in	R	16.80	1.20	20.16	307.44
App. Width (Wind)	2.40	in					
App. Depth	2.40	in					
App. Weight	25.62	lbs					
Number of App.	12						

Appurtenance Properties

(3) 2.5SCH40 x 7'-9"

App. Height	93.00	in	R	5.62	1.20	6.74	134.85
App. Width (Wind)	2.90	in					
App. Depth	2.90	in					
App. Weight	44.95	lbs					
Number of App.	3						

Total Weight (kips) = 4.496

Total CfA = 523.1 sf
 Pw = 30.88 psf
 Ka = 1.00

Wind Force = 16.152 kips

BLC 8: CORRAL DL (WEIGHT)

N22	L	Y	-4.496
-----	---	---	--------

BLC 9: CORRAL LL (WIND)

N22	L	X	-16.152
-----	---	---	---------

Feed Line Wind and Weight Calculations

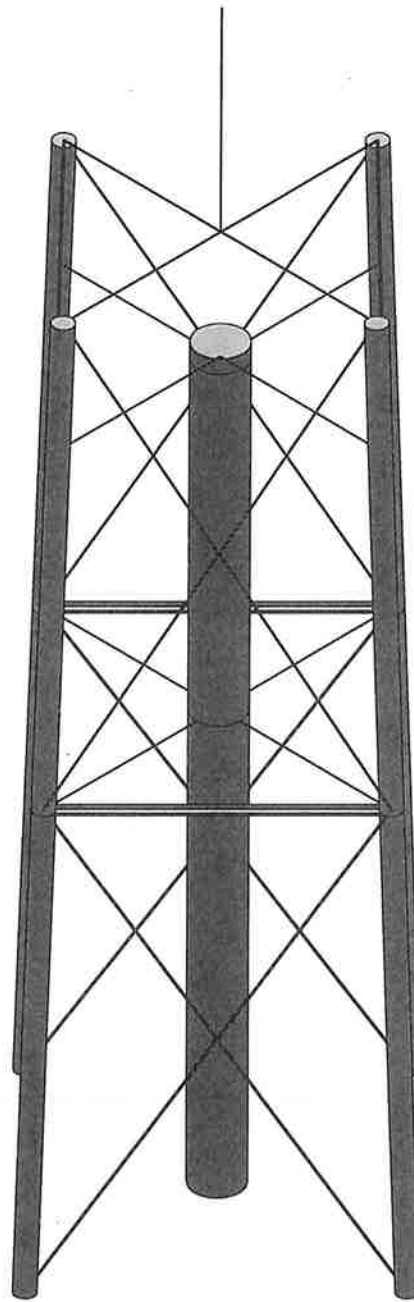
Leg	Description of Lines	Weight (plf)	R Width (in)	R Width (ft)	F Width (in)	F Width (ft)
A	USCC Coax	15.85	10.32	0.860	0.00	0.000
B	Verizon Coax	15.02	3.96	0.330	0.00	0.000
C	Ladder, Safety	8.87	2.36	0.197	2.00	0.167
D	Empty	0.00	0.00	0.000	0.00	0.000
Riser	Empty	0.00	0.00	0.000	0.00	0.000

BLC 6: HANDRAIL DL (WEIGHT)

COL_1	Y	-15.847	0	%100
COL_2	Y	-15.015	0	%100
COL_3	Y	-8.867	0	%100
COL_4	Y	0.000	0	%100
COL_5	Y	-15.847	0	%100
COL_6	Y	-15.015	0	%100
COL_7	Y	-8.867	0	%100
COL_8	Y	0.000	0	%100

BLC 7: HANDRAIL LL (WIND)

COL_1	X	-21.522	0	%100
COL_2	X	-8.259	0	%100
COL_3	X	-11.873	0	%100
COL_4	X	0.000	0	%100
COL_5	X	-27.399	0	%100
COL_6	X	-10.514	0	%100
COL_7	X	-15.115	0	%100
COL_8	X	0.000	0	%100

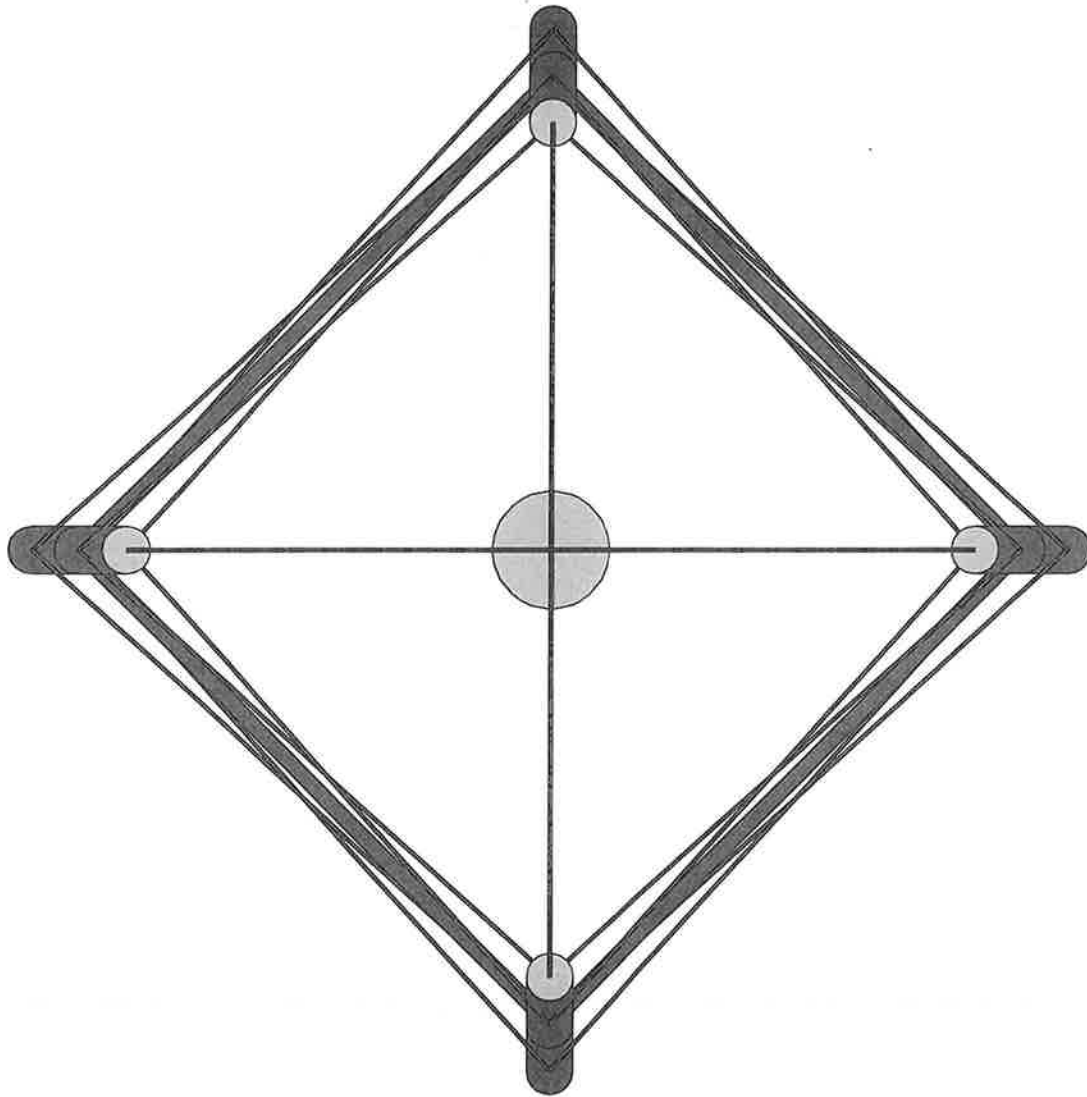


Shanghai City Building

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768333 - Fork Union_USF(LC_1)

SK - 1
Mar 26, 2018 at 4:10 PM
Fork Union_USF_LC1.r3d



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768333 - Fork Union_USF(LC_1)

SK - 2

Mar 26, 2018 at 4:11 PM

Fork Union_USF_LC1.r3d



Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 52861-152764
 Model Name : Fork Union_USF(LC_1)

Mar 26, 2018
 4:12 PM
 Checked By: WBA

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warning?	Yes
Trans Load Elavn Intersecting Wood Wall?	Yes
Area Load Mesh (1/r^2)	1.44
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	No
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigenvalue Convergence Tol. (1/E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 141(360-10): LRFD
Adjust Stiffness?	No
RISAC Connection Code	AISC 131(360-09): ASD
Code Formed Steel Code	Name
Wood Code	AF&PA NDS-91/97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM-1-05: ASD - Building
	AISC 141(360-10): ASD

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCALoad Contour
Paralle Beta Factor (P/CA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR SET ASTM A615
Min % Steel for Column	1
Max % Steel for Column	8



Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 52861-152764
 Model Name : Fork Union_USF(LC_1)

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(Global) Model Settings, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Cl X	.035
Cl Z	.035
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	8.5
R Z	8.5
Ca	.36
Cv	.34
NV	1
Occupancy Category	4
Seismic Zone	3
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Label	E (ksi)	G (ksi)	Nu	Therm (1/E)	Density(k/ft ³)	Yield(ksi)	Ry	Fu(ksi)	Rt
1 A36 Gr. 36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2 A572 Gr. 50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3 A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4 A500 Gr. 42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5 A500 Gr. 46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6 33 ksi	29000	11154	.3	.65	.49	33	1.5	58	1.2

Hot Rolled Steel Properties

Label	Shape	Type	Design List	Material	Design Rules	A (in ²)	Iy (in ⁴)	Iz (in ⁴)	J (in ⁸)
1 HRTA	WT10x33	Beam	None	A36 Gr. 36	Typical	9.71	36.6	171	.593

Hot Rolled Steel Section Sets

Label	X (in)	Y (in)	Z (in)	Temp. (F)	Detach From Diap.
1 N1	21.92	0	0	0	
2 N2	0	0	21.92	0	
3 N3	-21.92	0	0	0	
4 N4	0	0	-21.92	0	
5 N5	19.97136	0	0	0	
6 N6	0	0	19.97136	0	
7 N7	-19.97136	0	0	0	
8 N8	0	0	-19.97136	0	
9 N9	18.51642	0	0	0	
10 N10	0	0	18.51642	0	
11 N11	-18.51642	0	0	0	
12 N12	0	0	-18.51642	0	
13 N13	18	0	0	0	
14 N14	0	0	18	0	

Joint Coordinates and Temperatures

Joint Coordinates and Temperatures (Continued)

Label	X (ft)	Y (ft)	Z (ft)	Temp (F)	Detach From Data
15	N15	-18	93.29	0	
16	N16	-0	93.29	0	
17	N17	0	0	0	
18	N18	0	46.38	0	
19	N19	0	81	0	
20	N20	0	82.5	0	
21	N21	0	93.29	0	
22	N22	0	119.333	0	

Joint Boundary Conditions

Joint Label	X Rct. (ft)	Y Rct. (ft)	Z Rct. (ft)	X Rot. (k/ft-rad)	Y Rot. (k/ft-rad)	Z Rot. (k/ft-rad)
1	N1	Reaction	Reaction	Reaction		
2	N2	Reaction	Reaction	Reaction		
3	N3	Reaction	Reaction	Reaction		
4	N4	Reaction	Reaction	Reaction		
5	N17	Reaction	Reaction	Reaction		

Member Primary Data

Label	U-Defl	J-Defl	K-Defl	Relate(Defl)	Section/Shape	Type	Design List	Material	Design Rules
1	COL 1	N1	N5		P24x0.301	None	None	A36 Gr.36	Typical
2	COL 2	N2	N6		P24x0.301	None	None	A36 Gr.36	Typical
3	COL 3	N3	N7		P24x0.301	None	None	A36 Gr.36	Typical
4	COL 4	N4	N8		P24x0.301	None	None	A36 Gr.36	Typical
5	COL 5	N5	N13		P24x0.301	None	None	A36 Gr.36	Typical
6	COL 6	N6	N14		P24x0.301	None	None	A36 Gr.36	Typical
7	COL 7	N7	N15		P24x0.301	None	None	A36 Gr.36	Typical
8	COL 8	N8	N16		P24x0.301	None	None	A36 Gr.36	Typical
9	SW_RD 1	N1	N6		SR 1-1/2	None	None	A36 Gr.36	Typical
10	SW_RD 2	N2	N7		SR 1-1/2	None	None	A36 Gr.36	Typical
11	SW_RD 3	N3	N8		SR 1-1/2	None	None	A36 Gr.36	Typical
12	SW_RD 4	N4	N5		SR 1-1/2	None	None	A36 Gr.36	Typical
13	SW_RD 5	N5	N14		SR 1-1/2	None	None	A36 Gr.36	Typical
14	SW_RD 6	N6	N15		SR 1-1/2	None	None	A36 Gr.36	Typical
15	SW_RD 7	N7	N16		SR 1-1/2	None	None	A36 Gr.36	Typical
16	SW_RD 8	N8	N13		SR 1-1/2	None	None	A36 Gr.36	Typical
17	SW_RD 9	N5	N2		SR 1-1/2	None	None	A36 Gr.36	Typical
18	SW_RD 10	N6	N3		SR 1-1/2	None	None	A36 Gr.36	Typical
19	SW_RD 11	N7	N4		SR 1-1/2	None	None	A36 Gr.36	Typical
20	SW_RD 12	N8	N1		SR 1-1/2	None	None	A36 Gr.36	Typical
21	SW_RD 13	N13	N6		SR 1-1/2	None	None	A36 Gr.36	Typical
22	SW_RD 14	N14	N7		SR 1-1/2	None	None	A36 Gr.36	Typical
23	SW_RD 15	N15	N8		SR 1-1/2	None	None	A36 Gr.36	Typical
24	SW_RD 16	N16	N5		SR 1-1/2	None	None	A36 Gr.36	Typical
25	HB_RD 1	N5	N18		SR 1	None	None	A36 Gr.36	Typical
26	HB_RD 2	N6	N18		SR 1	None	None	A36 Gr.36	Typical
27	HB_RD 3	N7	N18		SR 1	None	None	A36 Gr.36	Typical
28	HB_RD 4	N8	N18		SR 1	None	None	A36 Gr.36	Typical
29	HB_RD 5	N9	N19		SR 1	None	None	A36 Gr.36	Typical
30	HB_RD 6	N10	N19		SR 1	None	None	A36 Gr.36	Typical

Member Primary Data (Continued)

Label	U-Defl	J-Defl	K-Defl	Relate(Defl)	Section/Shape	Type	Design List	Material	Design Rules
31	HB_RD 7	N11	N19		SR 1	None	None	A36 Gr.36	Typical
32	HB_RD 8	N12	N19		SR 1	None	None	A36 Gr.36	Typical
33	RISER 1	N17	N18		P60x0.304	None	None	A36 Gr.36	Typical
34	RISER 2	N18	N19		P60x0.304	None	None	A36 Gr.36	Typical
35	RISER 3	N19	N20		P60x0.304	None	None	A36 Gr.36	Typical
36	STRUT 1	N5	N6		WBx31	None	None	A36 Gr.36	Typical
37	STRUT 2	N6	N7		WBx31	None	None	A36 Gr.36	Typical
38	STRUT 3	N7	N8		WBx31	None	None	A36 Gr.36	Typical
39	STRUT 4	N8	N5		WBx31	None	None	A36 Gr.36	Typical
40	RIGID1	N13	N21		RIGID	None	None	RIGID	Typical
41	RIGID2	N14	N21		RIGID	None	None	RIGID	Typical
42	RIGID3	N15	N21		RIGID	None	None	RIGID	Typical
43	RIGID4	N16	N21		RIGID	None	None	RIGID	Typical
44	RIGID5	N21	N22		RIGID	None	None	RIGID	Typical

Member Advanced Data

Label	I-Release	J-Release	K-Release	J Offsets	J Offsets	T/C Only	Physical Analysis	Inactive	Seismic Design
1	COL 1						Yes		None
2	COL 2						Yes		None
3	COL 3						Yes		None
4	COL 4						Yes		None
5	COL 5						Yes		None
6	COL 6						Yes		None
7	COL 7						Yes		None
8	COL 8						Yes		None
9	SW_RD 1						Tension O..		None
10	SW_RD 2						Tension O..		None
11	SW_RD 3						Tension O..		None
12	SW_RD 4						Tension O..		None
13	SW_RD 5						Tension O..		None
14	SW_RD 6						Tension O..		None
15	SW_RD 7						Tension O..		None
16	SW_RD 8						Tension O..		None
17	SW_RD 9						Tension O..		None
18	SW_RD 10						Tension O..		None
19	SW_RD 11						Tension O..		None
20	SW_RD 12						Tension O..		None
21	SW_RD 13						Tension O..		None
22	SW_RD 14						Tension O..		None
23	SW_RD 15						Tension O..		None
24	SW_RD 16						Tension O..		None
25	HB_RD 1						Tension O..		None
26	HB_RD 2						Tension O..		None
27	HB_RD 3						Tension O..		None
28	HB_RD 4						Tension O..		None
29	HB_RD 5						Tension O..		None
30	HB_RD 6						Tension O..		None
31	HB_RD 7						Tension O..		None
32	HB_RD 8						Tension O..		None
33	RISER 1						Yes		None



Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 52861.132764
 Model Name : 768333 - Fork Union_USF(L.C.1)

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Member Advanced Data (Continued)

Label	J Release	J Offset	J Offset	T/C Only	Physical Analysis	Inactive	Section Design
34	RISER 2				Yes		None
35	RISER 3				Yes		None
36	STRUT 1	BenPin	BenPin		Yes		None
37	STRUT 2	BenPin	BenPin		Yes		None
38	STRUT 3	BenPin	BenPin		Yes		None
39	STRUT 4	BenPin	BenPin		Yes		None
40	RIGID1				Yes		None
41	RIGID2				Yes		None
42	RIGID3				Yes		None
43	RIGID4				Yes		None
44	RIGID5				Yes		None

Hot Rolled Steel Design Parameters

Label	Shape	Length(ft)	Height	Width	Lcomp top(ft)	Lcomp bot(ft)	L-torq	Kyy	Kzz	Cp	Function
1	COL 1	P24X0.301	46.421					1	1	1	Lateral
2	COL 2	P24X0.301	46.421					1	1	1	Lateral
3	COL 3	P24X0.301	46.421					1	1	1	Lateral
4	COL 4	P24X0.301	46.421					1	1	1	Lateral
5	COL 5	P24X0.301	46.951					1	1	1	Lateral
6	COL 6	P24X0.301	46.951					1	1	1	Lateral
7	COL 7	P24X0.301	46.951					1	1	1	Lateral
8	COL 8	P24X0.301	46.951					1	1	1	Lateral
9	SW RD 1	SR 1-1/2	55.049					1	1	1	Lateral
10	SW RD 2	SR 1-1/2	55.049					1	1	1	Lateral
11	SW RD 3	SR 1-1/2	55.049					1	1	1	Lateral
12	SW RD 4	SR 1-1/2	55.049					1	1	1	Lateral
13	SW RD 5	SR 1-1/2	54.068					1	1	1	Lateral
14	SW RD 6	SR 1-1/2	54.068					1	1	1	Lateral
15	SW RD 7	SR 1-1/2	54.068					1	1	1	Lateral
16	SW RD 8	SR 1-1/2	54.068					1	1	1	Lateral
17	SW RD 9	SR 1-1/2	55.049					1	1	1	Lateral
18	SW RD 10	SR 1-1/2	55.049					1	1	1	Lateral
19	SW RD 11	SR 1-1/2	55.049					1	1	1	Lateral
20	SW RD 12	SR 1-1/2	55.049					1	1	1	Lateral
21	SW RD 13	SR 1-1/2	54.068					1	1	1	Lateral
22	SW RD 14	SR 1-1/2	54.068					1	1	1	Lateral
23	SW RD 15	SR 1-1/2	54.068					1	1	1	Lateral
24	SW RD 16	SR 1-1/2	54.068					1	1	1	Lateral
25	HB RD 1	SR 1	19.971					1	1	1	Lateral
26	HB RD 2	SR 1	19.971					1	1	1	Lateral
27	HB RD 3	SR 1	19.971					1	1	1	Lateral
28	HB RD 4	SR 1	19.971					1	1	1	Lateral
29	HB RD 5	SR 1	18.516					1	1	1	Lateral
30	HB RD 6	SR 1	18.516					1	1	1	Lateral
31	HB RD 7	SR 1	18.516					1	1	1	Lateral
32	HB RD 8	SR 1	18.516					1	1	1	Lateral
33	RISER 1	PE6X0.304	46.38					1	1	1	Lateral
34	RISER 2	PE6X0.304	34.62					1	1	1	Lateral
35	RISER 3	PE6X0.304	1.5					1	1	1	Lateral
36	STRUT 1	WBX31	28.243					1	1	1	Lateral



Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 52861.132764
 Model Name : 768333 - Fork Union_USF(L.C.1)

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Hot Rolled Steel Design Parameters (Continued)

Label	Shape	Length(ft)	Height	Width	Lcomp top(ft)	Lcomp bot(ft)	L-torq	Kyy	Kzz	Cp	Function
37	STRUT 2	WBX31	28.243					1	1	1	Lateral
38	STRUT 3	WBX31	28.243					1	1	1	Lateral
39	STRUT 4	WBX31	28.243					1	1	1	Lateral

Joint Loads and Enforced Displacements (BLC 3 : TANK DL (WATER))

Joint Label	L/D M	Direction	Magnitude (k,k-ft), (ft,rad), (k-in/2ft), (k-in/2-in)
1	N20	Y	-520.694
2	N13	Y	-288.91
3	N14	Y	-288.91
4	N15	Y	-288.91
5	N16	Y	-288.91

Joint Loads and Enforced Displacements (BLC 4 : TANK DL (STEEL))

Joint Label	L/D M	Direction	Magnitude (k,k-ft), (ft,rad), (k-in/2ft), (k-in/2-in)
1	N13	Y	-14.215
2	N14	Y	-14.215
3	N15	Y	-14.215
4	N16	Y	-14.215

Joint Loads and Enforced Displacements (BLC 5 : TANK LL (WIND))

Joint Label	L/D M	Direction	Magnitude (k,k-ft), (ft,rad), (k-in/2ft), (k-in/2-in)
1	N13	X	-3.808
2	N14	X	-3.808
3	N15	X	-3.808
4	N16	X	-3.808

Joint Loads and Enforced Displacements (BLC 6 : HANDRAIL DL (WEIGHT))

Joint Label	L/D M	Direction	Magnitude (k,k-ft), (ft,rad), (k-in/2ft), (k-in/2-in)
1	N21	Y	-5.612

Joint Loads and Enforced Displacements (BLC 7 : HANDRAIL LL (WIND))

Joint Label	L/D M	Direction	Magnitude (k,k-ft), (ft,rad), (k-in/2ft), (k-in/2-in)
1	N21	X	-4.032

Joint Loads and Enforced Displacements (BLC 8 : CORRAL DL (WEIGHT))

Joint Label	L/D M	Direction	Magnitude (k,k-ft), (ft,rad), (k-in/2ft), (k-in/2-in)
1	N22	Y	-.892
2	N22	Y	-4.496

Joint Loads and Enforced Displacements (BLC 9 : CORRAL LL (WIND))

Joint Label	L/D M	Direction	Magnitude (k,k-ft), (ft,rad), (k-in/2ft), (k-in/2-in)
1	N22	X	-2.114
2	N22	X	-16.152



Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 52861.162764
 Model Name : 768333 - Fork Union_USF(LC_1)

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Member Point Loads

Member Label	Direction	No Data to Print ...	Member Label	Location 1, %
--------------	-----------	----------------------	--------------	---------------

Member Distributed Loads (BLC 2: MEMBER WIND FORCES)

Member Label	Direction	Start Magnitude (lb./F. Ksf)	End Magnitude (lb./F. Ksf)	Start Location 1, %	End Location 1, %
1	COL 1	X	-50.008	0	%100
2	COL 2	X	-50.052	0	%100
3	COL 3	X	-50.008	0	%100
4	COL 4	X	-50.052	0	%100
5	COL 5	X	-63.662	0	%100
6	COL 6	X	-63.718	0	%100
7	COL 7	X	-63.662	0	%100
8	COL 8	X	-63.718	0	%100
9	SW RD 1	X	-2.87	0	%100
10	SW RD 2	X	-2.87	0	%100
11	SW RD 3	X	-2.915	0	%100
12	SW RD 4	X	-2.915	0	%100
13	SW RD 5	X	-3.701	0	%100
14	SW RD 6	X	-3.755	0	%100
15	SW RD 7	X	-3.701	0	%100
16	SW RD 8	X	-3.755	0	%100
17	SW RD 9	X	-2.915	0	%100
18	SW RD 10	X	-2.87	0	%100
19	SW RD 11	X	-2.87	0	%100
20	SW RD 12	X	-2.87	0	%100
21	SW RD 13	X	-3.755	0	%100
22	SW RD 14	X	-3.701	0	%100
23	SW RD 15	X	-3.755	0	%100
24	SW RD 16	X	-3.701	0	%100
25	HB RD 1	X	0	0	%100
26	HB RD 2	X	-2.362	0	%100
27	HB RD 3	X	0	0	%100
28	HB RD 4	X	-2.362	0	%100
29	HB RD 5	X	0	0	%100
30	HB RD 6	X	-2.77	0	%100
31	HB RD 7	X	0	0	%100
32	HB RD 8	X	-2.77	0	%100
33	RISER 1	X	-105.433	0	%100
34	RISER 2	X	-130.735	0	%100
35	RISER 3	X	-140.401	0	%100
36	STRUT 1	X	-22.269	0	%100
37	STRUT 2	X	-22.269	0	%100
38	STRUT 3	X	-22.269	0	%100
39	STRUT 4	X	-22.269	0	%100

Member Distributed Loads (BLC 8: CORRAL DL (WEIGHT))

Member Label	Direction	Start Magnitude (lb./F. Ksf)	End Magnitude (lb./F. Ksf)	Start Location 1, %	End Location 1, %
1	COL 1	Y	-15.847	0	%100
2	COL 2	Y	-15.015	0	%100
3	COL 3	Y	-8.867	0	%100



Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 52861.162764
 Model Name : 768333 - Fork Union_USF(LC_1)

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Member Distributed Loads (BLC 8: CORRAL DL (WEIGHT)) (Continued)

Member Label	Direction	Start Magnitude (lb./F. Ksf)	End Magnitude (lb./F. Ksf)	Start Location 1, %	End Location 1, %
4	COL 4	Y	-15.847	0	%100
5	COL 5	Y	-15.015	0	%100
6	COL 6	Y	-15.015	0	%100
7	COL 7	Y	-8.867	0	%100
8	COL 8	Y	0	0	%100

Member Distributed Loads (BLC 9: CORRAL LL (WIND))

Member Label	Direction	Start Magnitude (lb./F. Ksf)	End Magnitude (lb./F. Ksf)	Start Location 1, %	End Location 1, %
1	COL 1	X	-21.522	0	%100
2	COL 2	X	-8.259	0	%100
3	COL 3	X	-11.873	0	%100
4	COL 4	X	0	0	%100
5	COL 5	X	-27.399	0	%100
6	COL 6	X	-10.514	0	%100
7	COL 7	X	-15.115	0	%100
8	COL 8	X	0	0	%100

Basic Load Cases

BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed Area (sq. ft.)	Surface Area (sq. ft.)
1	GRAVITY	None	-1					
2	MEMBER WIND FORCES	None					39	
3	TANK DL (WATER)	None					4	
4	TANK DL (STEEL)	None					4	
5	TANK LL (WIND)	None					1	
6	HANDRAIL DL (WEIGHT)	None					1	
7	HANDRAIL LL (WIND)	None					2	
8	CORRAL DL (WEIGHT)	None					8	
9	CORRAL LL (WIND)	None					2	

Envelope Joint Reactions

Joint	X (k)	Y (k)	Z (k)	MX (k-ft)	MY (k-ft)	MZ (k-ft)		
1	max 38.236	3	440.294	1	0.005	3	0	1
2	min -18.459	1	-113.102	1	-302	3	0	1
3	max 15.119	2	440.455	1	12.809	3	0	1
4	min 0.003	1	29.109	3	-18.464	1	0	1
5	max 22.221	2	508.21	2	0.005	1	0	1
6	min 7.535	3	153.867	3	0.004	3	0	1
7	max 14.625	2	438.668	1	18.414	1	0	1
8	min 0.003	1	27.96	3	-12.511	3	0	1
9	max 3.002	3	751.667	1	0.4	1	0	1
10	min 0.016	1	14.59	3	0	3	0	1
11	Totals: max 78.43	2	2510.548	1	0	1	0	1
12	min 0	1	112.423	3	0	2	1	1



Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 52851.152764
 Model Name : 76533 - Fork Union_US(FLC_1)

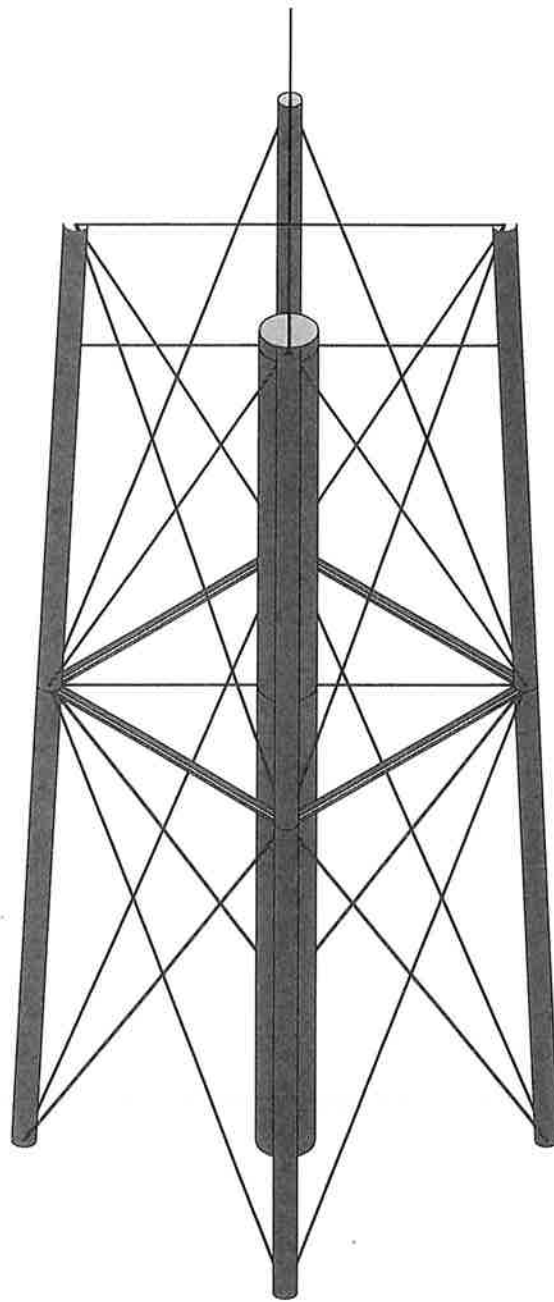
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Load Combinations

Description	Sel.	PL	SR	BLC	Fact.	BLC	Fact.	BLC	Fact.	BLC	Fact.	BLC	Fact.	BLC	Fact.	
1	1AD	Yes		1	1.4	2	1	3	1.4	4	1.4	5	1	4	1.4	5
2	1.2D + 1W	Yes		1	1.2	2	1	3	1.2	4	1.2	5	1	4	1.2	5
3	0.9D + 1W	Yes		1	0.9	2	1	3	0.9	4	0.9	5	1	4	0.9	5
4	ADD DL			6	1	8	1									
5	ADD WL			7	1	9	1									

Envelope AISC 14th(360-10): LRFD Steel Code Checks

Member	Shape	Code Check	Lo	LC	Stn.	Lo	Stn.	phiPn	phiPt	phiMn	Vy	phiV	phiE
1	COL 3IP240.3	923	46	2	0.09	46	2	2.673	726	0.92	429	171	429.1
2	COL 7IP240.3	877	46	2	0.17	0	2.672	308	726	0.92	429	171	429.1
3	COL 8IP240.3	802	46	2	0.19	0	2.672	308	726	0.92	429	171	429.1
4	COL 8IP240.3	799	45	2	0.20	0	2.672	308	726	0.92	429	171	429.1
5	SW R...SR 1-1/2	793	55	2	0.07	55	2	1.29	57	2.56	1.431	1.431	1.431
6	SW R...SR 1-1/2	779	0	2	0.07	0	2	1.29	57	2.56	1.431	1.431	1.431
7	COL 2IP240.3	769	0	1	0.10	46	2	2.673	726	0.92	429	171	429.1
8	COL 1IP240.3	759	0	1	0.12	46	2	2.673	726	0.92	429	171	429.1
9	COL 4IP240.3	766	0	1	0.09	46	2	2.673	726	0.92	429	171	429.1
10	COL 5IP240.3	755	0	1	0.20	0	2.672	308	726	0.92	429	171	429.1
11	SW R...SR 1-1/2	684	55	2	0.07	55	2	1.29	57	2.56	1.431	1.431	1.431
12	SW R...SR 1-1/2	668	0	2	0.07	0	2	1.29	57	2.56	1.431	1.431	1.431
13	SW R...SR 1-1/2	522	54	3	0.08	0	2	1.33	57	2.56	1.431	1.431	1.431
14	SW R...SR 1-1/2	517	0	3	0.08	54	2	1.33	57	2.56	1.431	1.431	1.431
15	RISER 1P800.3	510	0	1	0.08	0	3	1.472	1.847	1.99	2.461	6.31	2.481
16	SW R...SR 1-1/2	504	54	3	0.08	0	2	1.33	57	2.56	1.431	1.431	1.431
17	SW R...SR 1-1/2	498	0	3	0.08	54	2	1.33	57	2.56	1.431	1.431	1.431
18	RISER 2P800.3	496	0	1	0.05	34	1.92	1.847	1.99	2.461	6.31	2.481	1.431
19	RISER 3P800.3	481	0	1	0.00	0	3	1.517	1.847	1.99	2.461	6.31	2.481
20	STRUT...WBX31	380	14	2	0.12	28	1	1.72	965	2.95	812	3.8	0.7
21	STRUT...WBX31	378	13	2	0.12	0	1	1.72	965	2.95	812	3.8	0.7
22	STRUT...WBX31	327	14	2	0.12	28	1	1.72	965	2.95	812	3.8	0.7
23	STRUT...WBX31	319	13	2	0.12	28	1	1.72	965	2.95	812	3.8	0.7
24	HB RD...SR 1	157	0	2	0.03	18	1	1.93	25	4.47	4.24	4.24	4.24
25	HB RD...SR 1	129	0	3	0.03	0	1	2.25	25	4.47	4.24	4.24	4.24
26	HB RD...SR 1	099	0	2	0.04	19	2	1.93	25	4.47	4.24	4.24	4.24
27	HB RD...SR 1	009	0	2	0.04	19	2	1.93	25	4.47	4.24	4.24	4.24
28	HB RD...SR 1	002	0	1	0.03	0	1	2.25	25	4.47	4.24	4.24	4.24
29	HB RD...SR 1	002	0	1	0.03	18	1	1.93	25	4.47	4.24	4.24	4.24
30	SW R...SR 1-1/2	000	0	1	0.00	0	1	1.29	57	2.56	1.431	1.431	1.431
31	SW R...SR 1-1/2	000	0	1	0.00	0	1	1.29	57	2.56	1.431	1.431	1.431
32	SW R...SR 1-1/2	000	0	1	0.00	0	1	1.33	57	2.56	1.431	1.431	1.431
33	SW R...SR 1-1/2	000	0	1	0.00	0	1	1.33	57	2.56	1.431	1.431	1.431
34	SW R...SR 1-1/2	000	0	1	0.00	0	1	1.29	57	2.56	1.431	1.431	1.431
35	SW R...SR 1-1/2	000	0	1	0.00	0	1	1.29	57	2.56	1.431	1.431	1.431
36	SW R...SR 1-1/2	000	0	1	0.00	0	1	1.33	57	2.56	1.431	1.431	1.431
37	SW R...SR 1-1/2	000	0	1	0.00	0	1	1.33	57	2.56	1.431	1.431	1.431
38	HB RD...SR 1	000	0	1	0.00	0	1	2.25	25	4.47	4.24	4.24	4.24
39	HB RD...SR 1	000	0	1	0.00	0	1	2.25	25	4.47	4.24	4.24	4.24



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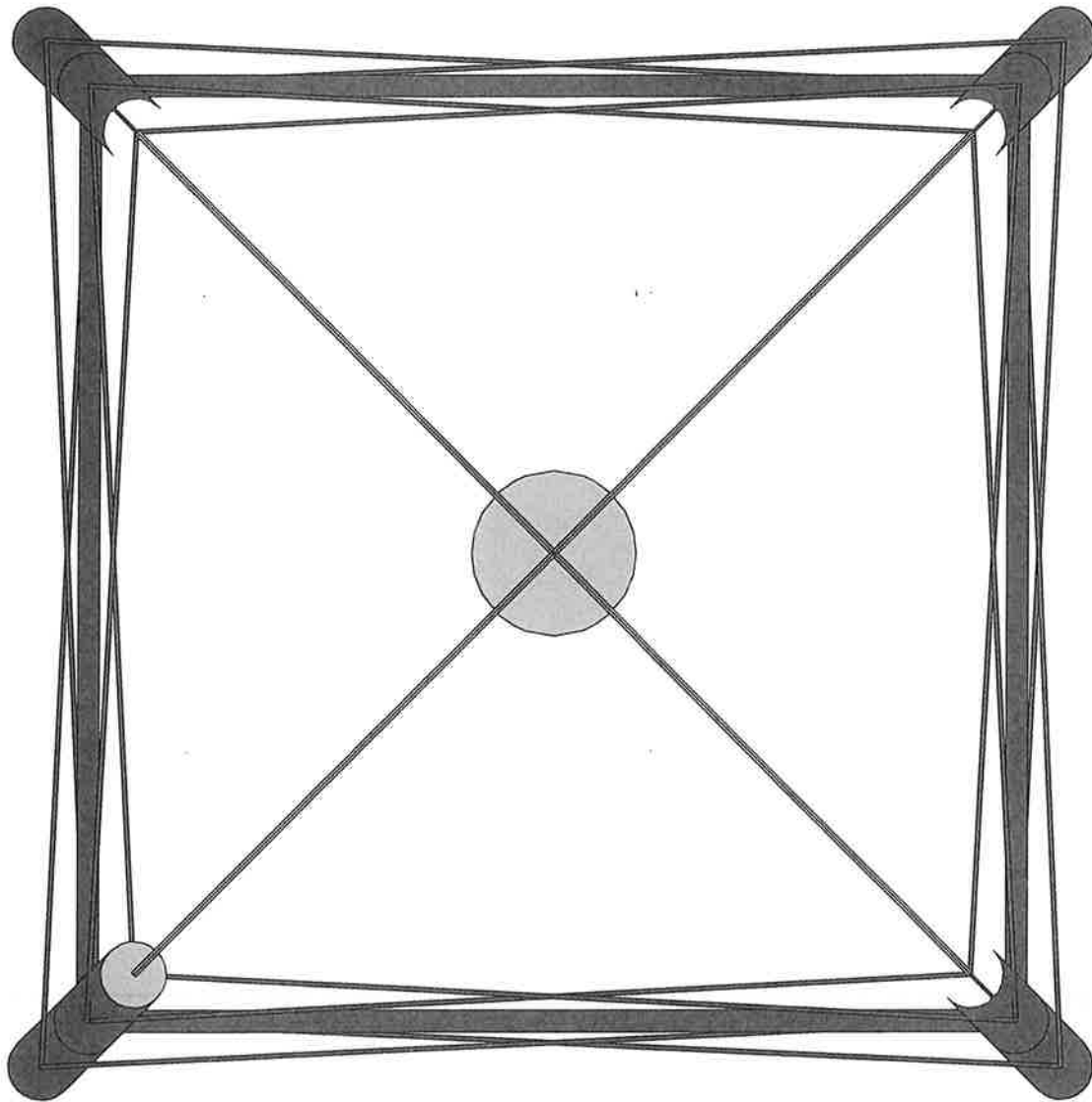
768333 - Fork Union_USF(LC_2)

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Company : Tower Engineering Professionals, Inc.
 Designer : RVM
 Job Number : 52861-142764
 Model Name : 768333 - Fork Union_USF(LC_2)

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(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Bwn Intersecting Wood Wall?	Yes
Area Load Mesh (in ²)	144
Merge Tolerance (in)	1.2
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	No
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec ²)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 141H360-10: LRFD
Adjust Stiffness?	No
RISAConnection Code	AISC 131H360-09: ASD
Cold Formed Steel Code	N/A
Wood Code	AF&PA NDS-91/97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 300-05: ASD
Aluminum Code	AA ADM-1-05: ASD - Building
	AISC 141H360-10: ASD

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Paralle Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR SET ASTM A615
Min % Steel for Column	1
Max % Steel for Column	8



Company : Tower Engineering Professionals, Inc.
 Designer : RVM
 Job Number : 52861-142764
 Model Name : 768333 - Fork Union_USF(LC_2)

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(Global) Model Settings, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Cl X	.035
Cl Z	.035
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	8.5
R Z	8.5
Ca	.36
Cv	.54
NV	1
Occupancy Category	4
Seismic Zone	3
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Hot Rolled Steel Properties

Label	E (ksi)	G (ksi)	Nu	Therm. (VE)	Density (k/cf)	Yield (ksi)	Ry	Furk (ksi)	Rt
1 A36 Gr. 36	29000	11154	.3	65	49	36	1.5	58	1.2
2 A572 Gr. 50	29000	11154	.3	65	49	50	1.1	58	1.2
3 A992	29000	11154	.3	65	49	50	1.1	58	1.2
4 A500 Gr. 42	29000	11154	.3	65	49	42	1.3	58	1.1
5 A500 Gr. 48	29000	11154	.3	65	49	48	1.2	58	1.1
6 33 ksi	29000	11154	.3	65	49	33	1.5	58	1.2

Hot Rolled Steel Section Sets

Label	Shape	Type	Design List	Material	Design Rules	A (in ²)	Iy (in ⁴)	Izz (in ⁴)	J (in ⁶)
1 HRTA	WT0x33	Beam	None	A36 Gr. 36	Typical	9.71	36.6	1.71	.583

Joint Coordinates and Temperatures

Label	X (ft)	Y (ft)	Z (ft)	Temp (F)	Detach From Diap...
1 N1	15.499781	0	-15.499781	0	
2 N2	15.499781	0	15.499781	0	
3 N3	-15.499781	0	-15.499781	0	
4 N4	-15.499781	0	15.499781	0	
5 N5	14.121726	0	-14.121726	0	
6 N6	14.121726	0	14.121726	0	
7 N7	-14.121726	0	-14.121726	0	
8 N8	-14.121726	0	14.121726	0	
9 N9	13.093086	0	-13.093086	0	
10 N10	13.093086	0	13.093086	0	
11 N11	-13.093086	0	-13.093086	0	
12 N12	-13.093086	0	13.093086	0	
13 N13	12.727922	0	-12.727922	0	
14 N14	12.727922	0	12.727922	0	



Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 698814,62764
 Model Name : 768333 - Fork Union_USF(LC_2)

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Joint Coordinates and Temperatures (Continued)

Label	J Label	X Joint	Y Joint	Z Joint	Temp (F)	Detach From Dab.
15	N15	-12.727922	93.29	12.727922	0	
16	N16	-12.727922	93.29	-12.727922	0	
17	N17	0	0	0	0	
18	N18	0	46.36	0	0	
19	N19	0	81	0	0	
20	N20	0	82.5	0	0	
21	N21	0	93.29	0	0	
22	N22	0	145.333	0	0	

Joint Boundary Conditions

Joint Label	X Joint	Y Joint	Z Joint	X Rest. (k-in/ft)	Y Rest. (k-in/ft)	Z Rest. (k-in/ft)
1	N1	Reaction	Reaction	Reaction		
2	N2	Reaction	Reaction	Reaction		
3	N3	Reaction	Reaction	Reaction		
4	N4	Reaction	Reaction	Reaction		
5	N17	Reaction	Reaction	Reaction		

Member Primary Data

Label	J Label	K Joint	Release(s)	Section/Shape	Type	Design List	Material	Design Rules
1	COL 1	N1	N5		P24K0.301	None	A36 Gr.36	Typical
2	COL 2	N2	N6		P24K0.301	None	A36 Gr.36	Typical
3	COL 3	N3	N7		P24K0.301	None	A36 Gr.36	Typical
4	COL 4	N4	N8		P24K0.301	None	A36 Gr.36	Typical
5	COL 5	N5	N13		P24K0.301	None	A36 Gr.36	Typical
6	COL 6	N6	N14		P24K0.301	None	A36 Gr.36	Typical
7	COL 7	N7	N15		P24K0.301	None	A36 Gr.36	Typical
8	COL 8	N8	N16		P24K0.301	None	A36 Gr.36	Typical
9	SW RD 1	N1	N6		SR 1-1/2	None	A36 Gr.36	Typical
10	SW RD 2	N2	N7		SR 1-1/2	None	A36 Gr.36	Typical
11	SW RD 3	N3	N8		SR 1-1/2	None	A36 Gr.36	Typical
12	SW RD 4	N4	N5		SR 1-1/2	None	A36 Gr.36	Typical
13	SW RD 5	N5	N14		SR 1-1/2	None	A36 Gr.36	Typical
14	SW RD 6	N6	N15		SR 1-1/2	None	A36 Gr.36	Typical
15	SW RD 7	N7	N16		SR 1-1/2	None	A36 Gr.36	Typical
16	SW RD 8	N8	N13		SR 1-1/2	None	A36 Gr.36	Typical
17	SW RD 9	N6	N2		SR 1-1/2	None	A36 Gr.36	Typical
18	SW RD 10	N5	N3		SR 1-1/2	None	A36 Gr.36	Typical
19	SW RD 11	N7	N4		SR 1-1/2	None	A36 Gr.36	Typical
20	SW RD 12	N8	N1		SR 1-1/2	None	A36 Gr.36	Typical
21	SW RD 13	N13	N6		SR 1-1/2	None	A36 Gr.36	Typical
22	SW RD 14	N14	N7		SR 1-1/2	None	A36 Gr.36	Typical
23	SW RD 15	N15	N8		SR 1-1/2	None	A36 Gr.36	Typical
24	SW RD 16	N16	N5		SR 1-1/2	None	A36 Gr.36	Typical
25	HB RD 1	N5	N18		SR 1	None	A36 Gr.36	Typical
26	HB RD 2	N6	N18		SR 1	None	A36 Gr.36	Typical
27	HB RD 3	N7	N18		SR 1	None	A36 Gr.36	Typical
28	HB RD 4	N8	N18		SR 1	None	A36 Gr.36	Typical
29	HB RD 5	N9	N19		SR 1	None	A36 Gr.36	Typical
30	HB RD 6	N10	N19		SR 1	None	A36 Gr.36	Typical

IRISA-3D Version 16.0.1 [D:\A\A\A\A\IRISATank\Fork Union_USF_LC2.r3d]



Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 698814,62764
 Model Name : 768333 - Fork Union_USF(LC_2)

Mar 26, 2018
 4:07 PM
 Checked By: WBA

Member Primary Data (Continued)

Label	J Label	K Joint	Release(s)	Section/Shape	Type	Design List	Material	Design Rules
31	HB RD 7	N11	N19	SR 1	None	A36 Gr.36	Typical	
32	HB RD 8	N12	N19	SR 1	None	A36 Gr.36	Typical	
33	RISER 1	N17	N18	P60X0.304	None	A36 Gr.36	Typical	
34	RISER 2	N18	N20	P60X0.304	None	A36 Gr.36	Typical	
35	RISER 3	N19	N20	P60X0.304	None	A36 Gr.36	Typical	
36	STRUT 1	N5	N5	WBX31	None	A36 Gr.36	Typical	
37	STRUT 2	N6	N7	WBX31	None	A36 Gr.36	Typical	
38	STRUT 3	N7	N8	WBX31	None	A36 Gr.36	Typical	
39	STRUT 4	N8	N5	WBX31	None	A36 Gr.36	Typical	
40	RIGID 1	N13	N21	RIGID	None	RIGID	Typical	
41	RIGID 2	N14	N21	RIGID	None	RIGID	Typical	
42	RIGID 3	N15	N21	RIGID	None	RIGID	Typical	
43	RIGID 4	N16	N21	RIGID	None	RIGID	Typical	
44	RIGID 5	N21	N22	RIGID	None	RIGID	Typical	

Member Advanced Data

Label	J Release	K Release	J Offset (ft)	J Offset (ft)	T/C Only	Physical Analysis	Inactive	Stress Design
1	COL 1					Yes		None
2	COL 2					Yes		None
3	COL 3					Yes		None
4	COL 4					Yes		None
5	COL 5					Yes		None
6	COL 6					Yes		None
7	COL 7					Yes		None
8	COL 8					Yes		None
9	SW RD 1					Yes		None
10	SW RD 2					Yes		None
11	SW RD 3					Yes		None
12	SW RD 4					Yes		None
13	SW RD 5					Yes		None
14	SW RD 6					Yes		None
15	SW RD 7					Yes		None
16	SW RD 8					Yes		None
17	SW RD 9					Yes		None
18	SW RD 10					Yes		None
19	SW RD 11					Yes		None
20	SW RD 12					Yes		None
21	SW RD 13					Yes		None
22	SW RD 14					Yes		None
23	SW RD 15					Yes		None
24	SW RD 16					Yes		None
25	HB RD 1					Yes		None
26	HB RD 2					Yes		None
27	HB RD 3					Yes		None
28	HB RD 4					Yes		None
29	HB RD 5					Yes		None
30	HB RD 6					Yes		None
31	HB RD 7					Yes		None
32	HB RD 8					Yes		None
33	RISER 1					Yes		None

IRISA-3D Version 16.0.1 [D:\A\A\A\A\IRISATank\Fork Union_USF_LC2.r3d]

Member Point Loads

Member Label	Direction	Start Magnitude (lb-ft, k-ft)	End Magnitude (lb-ft, k-ft)	Location (ft, %)
No Data to Print ...				

Member Distributed Loads (BLC 2 : MEMBER WIND FORCES)

Member Label	Direction	Start Magnitude (lb-ft, F, k-ft)	End Magnitude (lb-ft, F, k-ft)	Start Location (ft, %)	End Location (ft, %)
1	COL 1	X	-50.008	0	%100
2	COL 2	X	-50.052	0	%100
3	COL 3	X	-50.008	0	%100
4	COL 4	X	-50.052	0	%100
5	COL 5	X	-63.662	0	%100
6	COL 6	X	-63.718	0	%100
7	COL 7	X	-63.662	0	%100
8	COL 8	X	-63.718	0	%100
9	SW RD 1	X	-2.87	0	%100
10	SW RD 2	X	-2.915	0	%100
11	SW RD 3	X	-2.87	0	%100
12	SW RD 4	X	-2.915	0	%100
13	SW RD 5	X	-3.701	0	%100
14	SW RD 6	X	-3.755	0	%100
15	SW RD 7	X	-3.701	0	%100
16	SW RD 8	X	-3.755	0	%100
17	SW RD 9	X	-2.915	0	%100
18	SW RD 10	X	-2.87	0	%100
19	SW RD 11	X	-2.915	0	%100
20	SW RD 12	X	-2.87	0	%100
21	SW RD 13	X	-3.755	0	%100
22	SW RD 14	X	-3.701	0	%100
23	SW RD 15	X	-3.755	0	%100
24	SW RD 16	X	-3.701	0	%100
25	HB RD 1	X	0	0	%100
26	HB RD 2	X	-2.362	0	%100
27	HB RD 3	X	0	0	%100
28	HB RD 4	X	-2.362	0	%100
29	HB RD 5	X	0	0	%100
30	HB RD 6	X	-2.77	0	%100
31	HB RD 7	X	0	0	%100
32	HB RD 8	X	-2.77	0	%100
33	RISER 1	X	-105.453	0	%100
34	RISER 2	X	-130.735	0	%100
35	RISER 3	X	-140.401	0	%100
36	STRUT 1	X	-22.269	0	%100
37	STRUT 2	X	-22.269	0	%100
38	STRUT 3	X	-22.269	0	%100
39	STRUT 4	X	-22.269	0	%100

Member Distributed Loads (BLC 8 : CORRAL DL (WEIGHT))

Member Label	Direction	Start Magnitude (lb-ft, F, k-ft)	End Magnitude (lb-ft, F, k-ft)	Start Location (ft, %)	End Location (ft, %)
1	COL 1	Y	-15.847	0	%100
2	COL 2	Y	-15.015	0	%100
3	COL 3	Y	-8.867	0	%100

Member Distributed Loads (BLC 8 : CORRAL DL (WEIGHT)) (Continued)

Member Label	Direction	Start Magnitude (lb-ft, F, k-ft)	End Magnitude (lb-ft, F, k-ft)	Start Location (ft, %)	End Location (ft, %)
4	COL 4	Y	-15.847	0	%100
5	COL 5	Y	-15.015	0	%100
6	COL 6	Y	-15.015	0	%100
7	COL 7	Y	-8.867	0	%100
8	COL 8	Y	0	0	%100

Member Distributed Loads (BLC 9 : CORRAL LL (WIND))

Member Label	Direction	Start Magnitude (lb-ft, F, k-ft)	End Magnitude (lb-ft, F, k-ft)	Start Location (ft, %)	End Location (ft, %)
1	COL 1	X	-21.522	0	%100
2	COL 2	X	-8.259	0	%100
3	COL 3	X	-11.873	0	%100
4	COL 4	X	0	0	%100
5	COL 5	X	-27.989	0	%100
6	COL 6	X	-10.514	0	%100
7	COL 7	X	-15.115	0	%100
8	COL 8	X	0	0	%100

Basic Load Cases

BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed Area (sq. ft)	Surface
1	GRAVITY	None	None	-1				
2	MEMBER WIND FORCES	None	None	None	5		39	
3	TANK DL (WATER)	None	None	None	4			
4	TANK DL (STEEL)	None	None	None	4			
5	TANK LL (WIND)	None	None	None	1			
6	HANDRAIL DL (WEIGHT)	None	None	None	1			
7	HANDRAIL LL (WIND)	None	None	None	2			
8	CORRAL DL (WEIGHT)	None	None	None	2		8	
9	CORRAL LL (WIND)	None	None	None	2		8	

Envelope Joint Reactions

Joint	X (k)	Y (k)	Z (k)	MX (k-ft)	MY (k-ft)	MZ (k-ft)			
1	max 33.438	3	440.294	1	13.056	3	0	1	1
2	min -13.049	1	-69.801	3	-2.635	3	0	1	1
3	max 33.102	3	440.455	1	2.644	3	0	1	1
4	min -13.054	1	-69.594	3	-13.058	1	0	1	0
5	max 15.014	2	471.184	2	-3.513	3	0	1	0
6	min 4.628	3	118.818	3	-13.975	2	0	1	1
7	max 14.797	2	470.553	2	13.976	2	0	1	0
8	min 4.412	3	118.41	3	3.508	3	0	1	0
9	max 2.85	3	751.667	1	.017	3	0	1	0
10	min .039	1	14.59	3	-.005	3	0	1	1
11	max 78.43	3	2510.548	1	0	2	0	1	1
12	min 0	1	112.423	3	0	1	1	1	1



Company: Tower Engineering Professionals, Inc.
 Designer: PNM
 Job Number: 52981-152764
 Model Name: 78533 - Fork Union_US(F.L.C. 2)

Mar 28, 2018
 4:07 PM
 Checked By: W/BA

Road Combinations

Description	Sel.	PD	SR	BLC Fmt.	BLC Fmt.	BLC Fmt.	BLC Fmt.	BLC Fmt.	BLC Fmt.	BLC Fmt.	BLC Fmt.	BLC Fmt.	BLC Fmt.
1 ADD	Yes			1	1	4	2	3	1	4	1	4	1
2 1.2D + TW	Yes			1	1	2	2	1	3	1	2	1	2
3 0.9D + TW	Yes			1	1	9	2	1	3	4	9	5	1
4 ADD DL				6	1	8	1						
5 ADD WL				7	1	9	1						

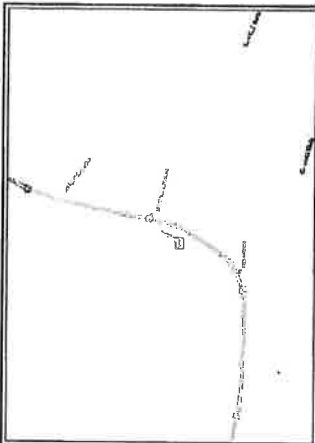
Envelope AISC 14th(360-10): LRFD Steel Code Checks

Member	Shape	Code Check	L _c	LC	S _{re}	S _{re}	phi _t P _n	phi _t P _n	phi _t M _n	phi _t M _n	E _{br}
1	SW R... SR 1-1/2	1.035	0	2	0.007	0	2	129	57.256	1.431	1.431
2	SW R... SR 1-1/2	1.031	55	2	0.007	55	2	129	57.256	1.431	1.431
3	COL 3 P24x0.3	858	46	2	0.008	46	2	575.378	726.082	429.171	429.1
4	COL 4 P24x0.3	892	46	2	0.008	46	2	575.378	726.082	429.171	429.1
5	COL 6 P24x0.3	926	46	2	0.017	0	2	572.308	726.082	429.171	429.1
6	COL 7 P24x0.3	821	43	2	0.018	0	2	572.308	726.082	429.171	429.1
7	COL 2 P24x0.3	769	0	1	0.010	46	2	575.378	726.082	429.171	429.1
8	COL 1 P24x0.3	789	0	1	0.012	46	2	575.378	726.082	429.171	429.1
9	COL 6 P24x0.3	756	0	1	0.019	0	2	572.308	726.082	429.171	429.1
10	COL 5 P24x0.3	755	0	1	0.021	0	2	572.308	726.082	429.171	429.1
11	SW R... SR 1-1/2	721	54	3	0.007	54	2	133	57.256	1.431	1.431
12	SW R... SR 1-1/2	720	54	3	0.007	0	1	133	57.256	1.431	1.431
13	RISER 1P60x0.3	510	0	1	0.005	0	3	1472.9	1847.199	2481.631	2481
14	RISER 2P60x0.3	496	0	1	0.005	54	3	1492.7	1847.199	2481.631	2481
15	RISER 3P60x0.3	481	0	1	0.000	0	3	1517.9	1847.199	2481.631	2481
16	STRUT W6x31	431	13	2	0.012	28	1	172.965	225.447	38.07	38.07
17	STRUT W6x31	421	14	2	0.012	28	1	172.965	225.447	38.07	38.07
18	STRUT W6x31	133	14	2	0.012	28	1	172.965	225.447	38.07	38.07
19	HB RD SR 1	119	0	2	0.003	19	1	193	25.447	424	424
20	HB RD SR 1	119	0	2	0.003	19	2	193	25.447	424	424
21	STRUT W6x31	117	14	2	0.012	0	1	172.965	225.447	38.07	38.07
22	HB RD SR 1	086	0	3	0.005	18	2	225	25.447	424	424
23	HB RD SR 1	086	0	3	0.004	0	2	225	25.447	424	424
24	SW R... SR 1-1/2	022	0	3	0.005	0	3	129	57.256	1.431	1.431
25	SW R... SR 1-1/2	022	55	3	0.005	55	3	129	57.256	1.431	1.431
26	HB RD SR 1	004	0	1	0.003	19	1	193	25.447	424	424
27	HB RD SR 1	002	0	1	0.003	19	1	193	25.447	424	424
28	SW R... SR 1-1/2	000	0	1	0.000	0	1	129	57.256	1.431	1.431
29	SW R... SR 1-1/2	000	0	1	0.000	0	1	129	57.256	1.431	1.431
30	SW R... SR 1-1/2	000	0	1	0.000	0	1	133	57.256	1.431	1.431
31	SW R... SR 1-1/2	000	0	1	0.000	0	1	133	57.256	1.431	1.431
32	SW R... SR 1-1/2	000	0	1	0.000	0	1	133	57.256	1.431	1.431
33	SW R... SR 1-1/2	000	0	1	0.000	0	1	129	57.256	1.431	1.431
34	SW R... SR 1-1/2	000	0	1	0.000	0	1	129	57.256	1.431	1.431
35	SW R... SR 1-1/2	000	0	1	0.000	0	1	133	57.256	1.431	1.431
36	SW R... SR 1-1/2	000	0	1	0.000	0	1	133	57.256	1.431	1.431
37	SW R... SR 1-1/2	000	0	1	0.000	0	1	133	57.256	1.431	1.431
38	HB RD SR 1	000	0	1	0.000	0	1	225	25.447	424	424
39	HB RD SR 1	000	0	1	0.000	0	1	225	25.447	424	424

STATE LOCATION



SITE LOCATION



PROJECT CONTACT:

NAME: U.S. CELLULAR CORPORATION
 ADDRESS: 8410 W. BRYN MAWR, SUITE 700
 CITY, STATE, ZIP: CHICAGO, IL 60631
 CONTACT: RANDY L. MATTSOHN
 PHONE: (262) 993-3178

SITE ACQUISITION:

NAME: FAULK & FOSTER
 ADDRESS: 1000 BURNING WOOD AVENUE
 CITY, STATE, ZIP: MONROE, LA 71201
 CONTACT: DAN HOOVER
 PHONE: (318) 325-4666 EXT. 239

TOWER OWNER:

NAME: FLUVANNA COUNTY
 ADDRESS: 132 MAIN STREET
 CITY, STATE, ZIP: PALMYRA, VA 22963
 CONTACT: CUSTOMER SERVICE
 PHONE: (434) 591-1910

CIVIL ENGINEER:

NAME: TOWER ENGINEERING PROFESSIONALS, INC.
 ADDRESS: 326 TRYON ROAD
 CITY, STATE, ZIP: RALEIGH, NC 27603-3530
 CONTACT: GRAHAM M. ANDRES, P.E.
 PHONE: (919) 561-6351

VOLTE-WAVE 3 DRAWINGS

FORK UNION USF

768333

SITE ADDRESS:

2984 JAMES MADISON HWY.
 FORK UNION, VA 23022
 (FLUVANNA COUNTY)

PROJECT INFORMATION

LATITUDE: N 37° 45' 03.24" +
 LONGITUDE: W 78° 17' 11.17" +
 GROUND ELEVATION: 478 ± (AMSL) **
 ** INFORMATION PROVIDED USCC
 ** INFORMATION FROM GOOGLE EARTH
 TOWER TYPE: 115.3' WATER TANK
 LOADING TYPE: 217R
 ACCESS ISSUES: CONTACT WILLIS THOMAS
 GATE COMBO: 872Z



Know what's Below.
 Call before you dig.

INDEX OF SHEETS

NO.	SHEET TITLE	REV
I-1	TITLE SHEET	2
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C-4	TANK ELEVATION	2
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STRUCTURAL NOTE

STRUCTURAL STATUS:
 * TOWER SA - PASSING (MARCH 26, 2019)

SCOPE OF WORK

TOWER SCOPE:

EXISTING EQUIPMENT TO REMAIN:
 (A) COAX PANEL ANTENNAS
 (B) FH-18 COAX COAX

PROPOSED EQUIPMENT:

- (1) 115.3' WATER TANK
- (2) RAYCAP RUSDC-6267-PR-48
- (3) 120VA FIBER/FIBER BRIDGE (DO NOT MIX MODELS)
- (4) 120VA FIBER/FIBER BRIDGE (DO NOT MIX MODELS)
- (5) FIBER COAXING

LITE JUMPERS:

- (1) FIBER JUMPERS FROM RAYCAP TO BAND 12 RRH
- (2) FIBER JUMPERS FROM RAYCAP TO BAND 5 RRH
- (3) POWER JUMPERS FROM RAYCAP TO BAND 12 RRH
- (4) POWER JUMPERS FROM RAYCAP TO BAND 5 RRH
- (5) PROPOSED 2" JUMPERS FROM BAND 12 RRH TO COMBINERS
- (6) PROPOSED 2" JUMPERS FROM BAND 5 RRH TO COMBINERS
- (7) PROPOSED 2" JUMPERS FROM COMBINERS TO ANTENNAS

TOP TOWER GROUND BAR:

CANNOT ACCOMMODATE ADDITIONAL GROUND LEADS. PROPOSED GROUND BAR REQUIRED.

BOTTOM TOWER GROUND BAR:

CAN ACCOMMODATE ADDITIONAL GROUND LEADS.

ICE BRIDGE:

CAN ACCOMMODATE ADDITION OF (3) HYBRID CABLES.

SHELTER COAX PORT:

CAN ACCOMMODATE ADDITION OF (3) HYBRID CABLES.

SHELTER EXTERIOR SCOPE:

CAN ACCOMMODATE ADDITIONAL GROUND LEADS.

PROPOSED EQUIPMENT:

- (1) PROPOSED RAYCAP RUSDC-6267-PR-48
- (2) PROPOSED RAYCAP RUSDC-6267-PR-48

EXISTING EQUIPMENT:

- (1) FIBER/FIBER BRIDGE SHALL BE HARVESTED AFTER INTEGRATION FOR ANOTHER SITE, UNLESS OTHERWISE DIRECTED BY USCC.

CABLE TRAYS:

PROPOSED HORIZONTAL AND VERTICAL CABLE TRAYS REQUIRED TO ACCOMMODATE PROPOSED (3) HYBRID CABLES.

SHELTER INTERNAL GROUND BAR:

CAN ACCOMMODATE ADDITIONAL GROUND LEADS.

SPECIAL REQUIREMENTS:

ANTENNA AZIMUTHS:
 EXISTING COAX PANEL ANTENNAS TO BE ROTATED TO DESIGN AZIMUTH AS SHOWN ON DRAWING. ALL ANTENNAS TO BE PRE-SCHEDULED WITH USCC FOR POTENTIAL EMI TESTING REQUIRED.

ANTENNA CONFIGURATION:

EXISTING COAX PANEL ANTENNAS TO REMAIN. PROPOSED LITE PANEL ANTENNAS TO BE PLACED WHERE EXISTING LITE PANEL EXIST.

DECOMMISSIONED EQUIPMENT REMOVAL:

- (1) LITE PANEL ANTENNAS
- (2) LITE PANEL ANTENNAS
- (3) FIBER/FIBER BRIDGE FROM INSIDE SHELTER
- (4) FIBER/FIBER BRIDGE FROM INSIDE SHELTER
- (5) COAXING WITH ADDITIONAL COAXING
- (6) COAXING WITH ADDITIONAL COAXING
- (7) COAXING WITH ADDITIONAL COAXING
- (8) COAXING WITH ADDITIONAL COAXING
- (9) COAXING WITH ADDITIONAL COAXING
- (10) COAXING WITH ADDITIONAL COAXING
- (11) COAXING WITH ADDITIONAL COAXING
- (12) COAXING WITH ADDITIONAL COAXING
- (13) COAXING WITH ADDITIONAL COAXING
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POST-INSTALLATION:

ANY EMPTY PLATES AND CHASSIS FROM RING REMOVAL

PLANS PREPARED FOR:

U.S. Cellular
 8410 W. BRYN MAWR, SUITE 700
 CHICAGO, IL 60631
 (773) 399-8900

PROJECT INFORMATION:

768333
 FORK UNION USF
 2984 JAMES MADISON HIGHWAY
 FORK UNION, VA 23022
 (FLUVANNA COUNTY)

PLANS PREPARED BY:

TOWER ENGINEERING PROFESSIONALS
 326 TRYON ROAD
 RALEIGH, NC 27603-3530
 PHONE: (919) 614-6351
 WWW.TOWERENGINEERING.COM

REVISIONS:

NO.	DATE	DESCRIPTION
1	04-12-16	CONSTRUCTION
2	03-25-16	PRELIMINARY
3	11-04-17	ISSUED FOR

DRAWN BY:

598 / CHECKED BY: LMM

TITLE SHEET

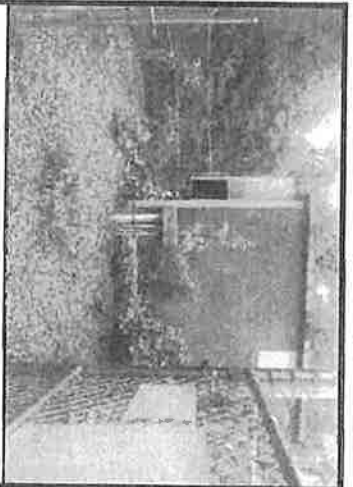
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T-1

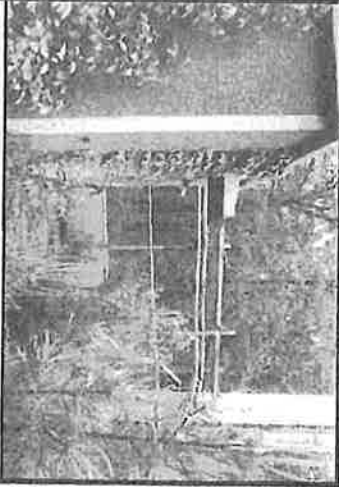
REVISION:

2

TEP # 52461 | 152902



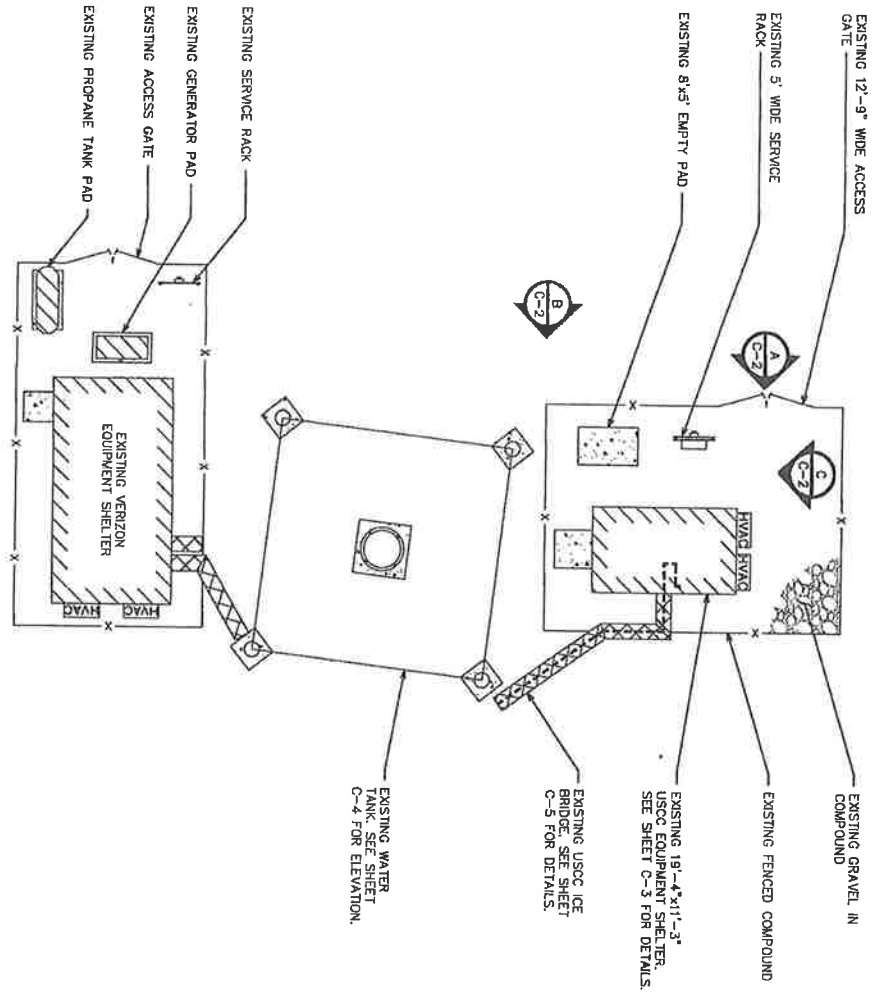
COMPOUND VIEW "A"



COMPOUND VIEW "B"



COMPOUND VIEW "C"



COMPOUND DETAIL

SCALE: 1/8" = 1'-0"



PLANS PREPARED FOR:

U.S. Cellular
 8410 W. BRYN MAWR, SUITE 700
 CHICAGO, IL 60651
 (773) 399-8900

PROJECT INFORMATION:

768333
FORK UNION USF
 2984 JAMES MADISON HIGHWAY
 FORK UNION, VA 23022
 (FLUYANNA COUNTY)

PLANS PREPARED BY:

TURNER ENGINEERING PROFESSIONALS
 326 TRYON ROAD
 RALEIGH, NC 27603-6380
 OFFICE (919) 871-6351
 www.turnerpe.com

SEAL

GRAHAM M. ANDRES
 Lic. No. 44739
 PROFESSIONAL ENGINEER
 State of Virginia
 expires 12/31/2024

NO.	DATE	ISSUED FOR:
2	04-12-19	CONSTRUCTION
1	03-26-18	PRELIMINARY
0	11-08-17	PRELIMINARY

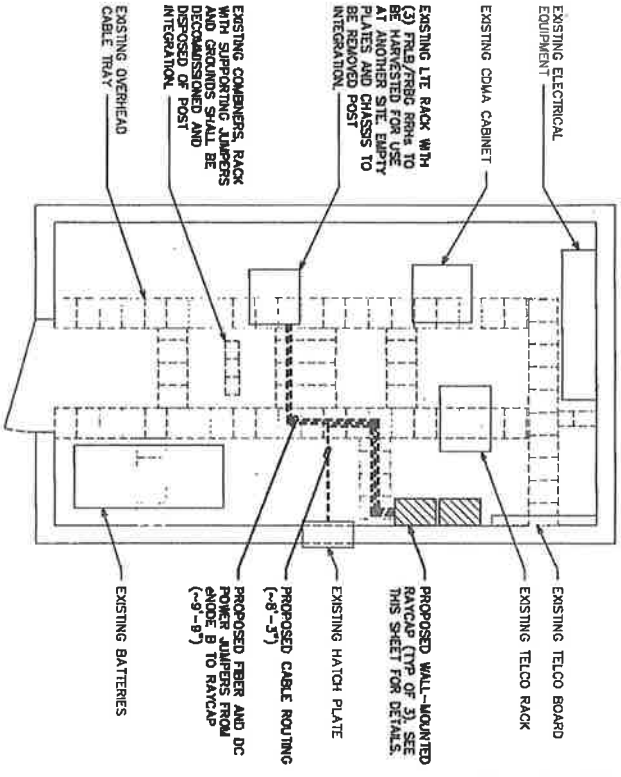
DRAWN BY: SSS | CHECKED BY: LWM

SHEET TITLE:
COMPOUND DETAIL

SHEET NUMBER:	REVISION:
C-2	2

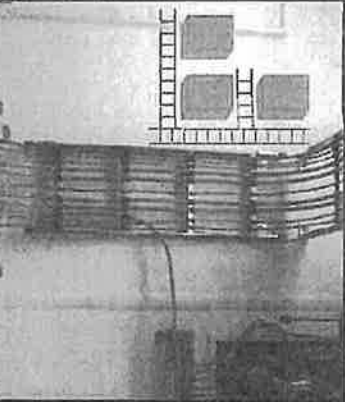
TSP #: 52861.159902

PROPOSED ESTIMATED CABLE TRAY LENGTHS		
BELOW EACH RAYCAP	VERTICAL ROUTE	FROM SHELTER WALL TO EXISTING CABLE TRAY
2'-0"	8'-0"	2'-10 1/2"



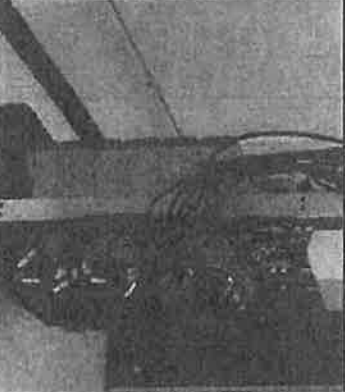
INTERIOR SHELTER LAYOUT

SCALE: N.T.S.



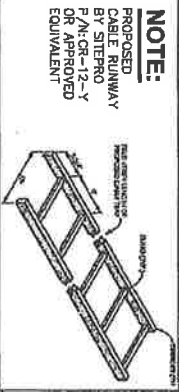
LOCATION OF PROP. RAYCAP

SCALE: N.T.S.



LOC. OF EX. ANODE B RACK

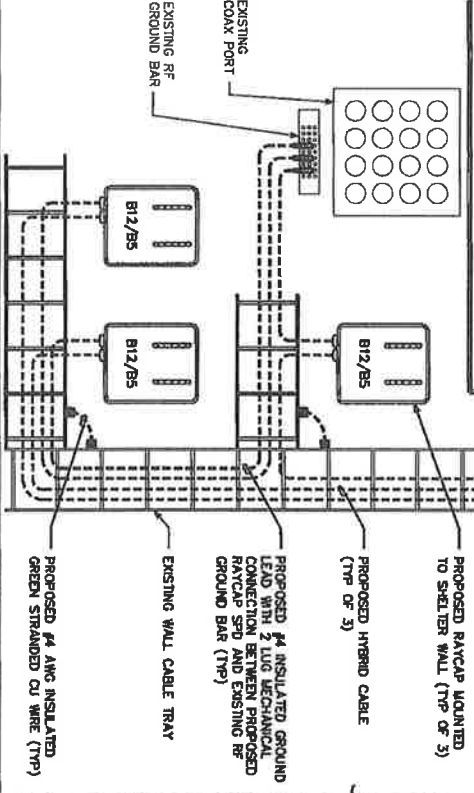
SCALE: N.T.S.



PROPOSED CABLE RUNWAY

SCALE: N.T.S.

NOTE:
PROPOSED CABLE RUNWAY BY SITEPRO P/N: OR-12-Y OR APPROVED EQUIVALENT



WALL CABLE TRAY DETAIL (TYP)

SCALE: N.T.S.

PLANS PREPARED FOR:
U.S. Cellular
 8410 W. BRYAN MAWR, SUITE 700
 CHICAGO, IL 60631
 (773) 399-8900

PROJECT INFORMATION:
768333
FORK UNION USF
 2954 JAMES MADSON HIGHWAY
 FORK UNION, VA 23022
 (FLUVANNA COUNTY)

PLANS PREPARED BY:

TINER ENGINEERING PROFESSIONALS
 326 TRYON ROAD
 RALEIGH, NC 27603-3530
 OFFICE (919) 81-6351
 www.tinengr.com

GRAHAM M. ANDRES
 Lic. No. 44739

Professional Engineer
 State of Virginia
 Exp. 12/31/2018

C-3

SHEET NUMBER: **2**

REVISION: **2**

TEP# 52861.152902

SHELTER DETAILS

REV	DATE	ISSUED FOR
2	04-12-18	CONSTRUCTION
1	03-29-18	PRELIMINARY
0	11-08-17	PRELIMINARY

DRAWN BY: SSI | CHECKED BY: LMM

EUPEN HYBRID CABLE LENGTH

PROPOSED RAYCAP QUANTITY IN SHELTER SPD:	3
EXISTING RAYCAP QUANTITY IN SHELTER SPD:	0
LENGTH FROM SHELTER RAYCAP SPD TO COAX PORT:	9-FT
ICE BRIDGE LENGTH:	31-FT
RAYCAP CENTERLINE + 20-FT BUFFER:	139-FT
TANK RAIL PERIMETER:	ALPHA: 79-FT BETA: 0-FT GAMMA: 0-FT
TOTAL EST. LENGTH OF HYBRID CABLE:	ALPHA: 208-FT BETA: 212-FT GAMMA: 179-FT
TOTAL EST. LENGTH OF HYBRID CABLE (ROUNDED UP):	ALPHA: 210-FT BETA: 215-FT GAMMA: 180-FT

JUMPER INFO

FIBER/POWER JUMPER LENGTH FROM RAYCAP TO RRH	BAND 12	BAND 5
ALPHA SECTOR:	10-FT	-
BETA SECTOR:	10-FT	10-FT
GAMMA SECTOR:	10-FT	-
LDX STRAIGHT JUMPER FROM B12 RRH TO COMBINER		
ALPHA SECTOR:	6-FT	
BETA SECTOR:	6-FT	
GAMMA SECTOR:	6-FT	
SUPERFLEX 90 JUMPER FROM B5 RRH TO COMBINER		
ALPHA SECTOR:	10-FT	
BETA SECTOR:	10-FT	
GAMMA SECTOR:	10-FT	
JUMPER FROM COMBINER TO ANTENNA		
ALPHA SECTOR:	6-FT	
BETA SECTOR:	6-FT	
GAMMA SECTOR:	6-FT	

RET JUMPER INFO

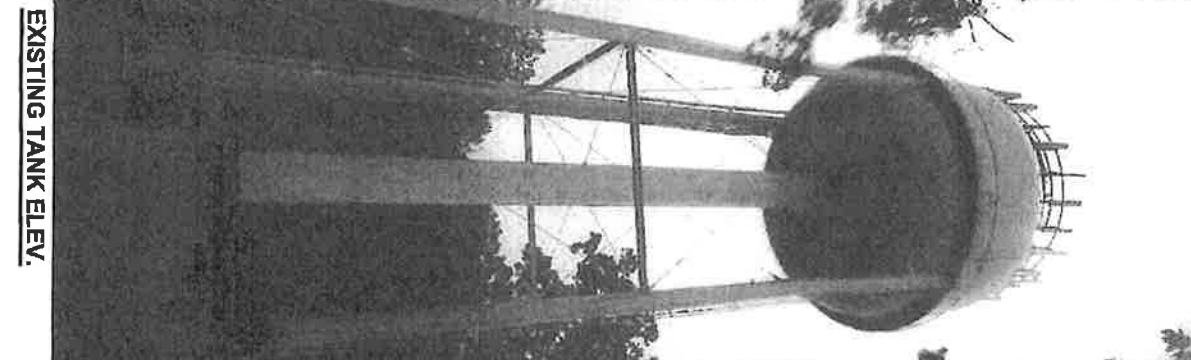
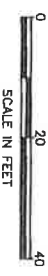
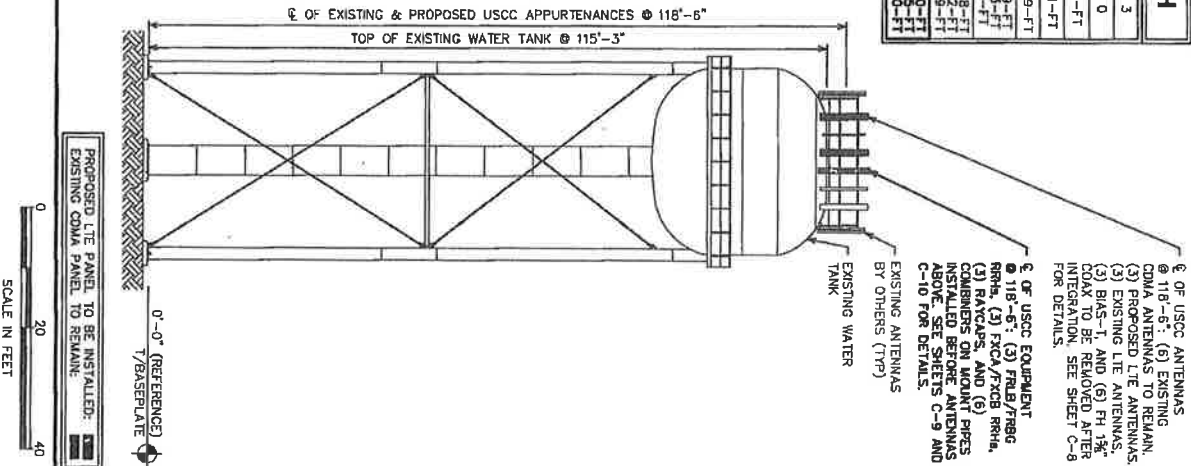
RRH TO ANTENNA	
ALPHA SECTOR:	10-M
BETA SECTOR:	10-M
GAMMA SECTOR:	10-M

NOTES:

1. VOLTAGE EQUIPMENT TO BE INSTALLED PRIOR TO LTE DECOMMISSION.
2. USCC CENTERLINE OVER 200-FT REQUIRES A MIDDLE GROUND BAR.

PROPOSED TANK ELEVATION

SCALE: 1" = 20'



PLANS PREPARED FOR:

 8410 W. BRYN MAWR, SUITE 700
 CHICAGO, IL 60631
 (773) 599-6900

PROJECT INFORMATION:
 768333
FORK UNION USF
 2964 JAMES MADISON HIGHWAY
 FORK UNION, VA 23022
 (FLUYANNA COUNTY)

PLANS PREPARED BY:

EXISTING USCC ANTENNAS

EXISTING WATER TANK

EXISTING ANTENNAS BY OTHERS (TP2)

EXISTING WATER TANK

EXISTING TANK ELEV.

CDMA ANTENNA TAG

LTE ANTENNA TAG

TOWER ENGINEERING PROFESSIONALS
 328 TRYON ROAD
 RALEIGH, NC 27603-3630
 OFFICE: (919) 891-8351
 WWW.TOWERENG.COM

SEAL:

GRAHAM M. ANDRES
 Lic. No. 44739

2	04-12-16	CONSTRUCTION
1	03-26-16	PRELIMINARY
0	11-08-17	ISSUED FOR:

DRAWN BY: SSS CHECKED BY: LMM

SHEET TITLE:
TANK ELEVATION

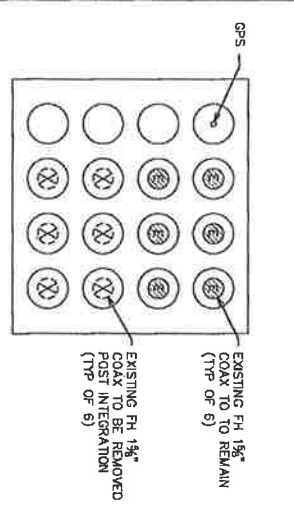
SHEET NUMBER: **C-4** REVISION: **2**

TEP #: 52067.1152902

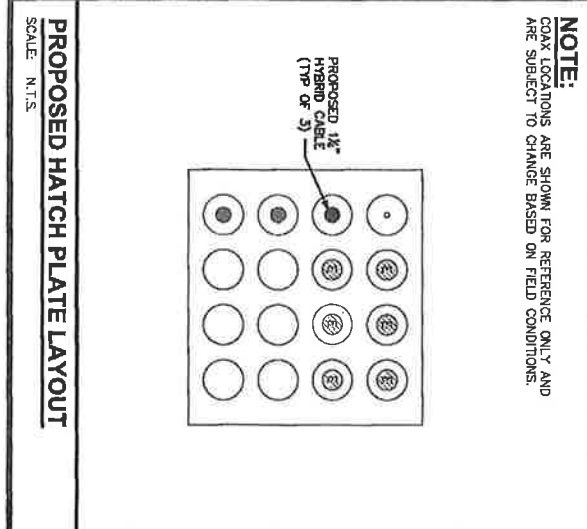
NOTES:

- ALL VIEWS ARE LOOKING FROM THE TOWER TOWARDS THE SHELTER.
- ANALOG COAX (IF APPLICABLE) TO BE REMOVED IS LABELED WITH GREEN TAPE.

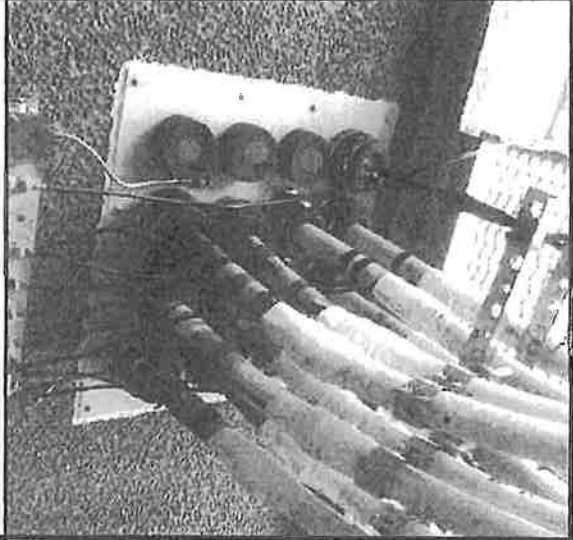
LEGEND	
	EMPTY PORT
	EXISTING COAX TO REMAIN
	EXISTING COAX TO BE REMOVED
	PROPOSED HYBRID
	EXISTING EW
	PROPOSED EW



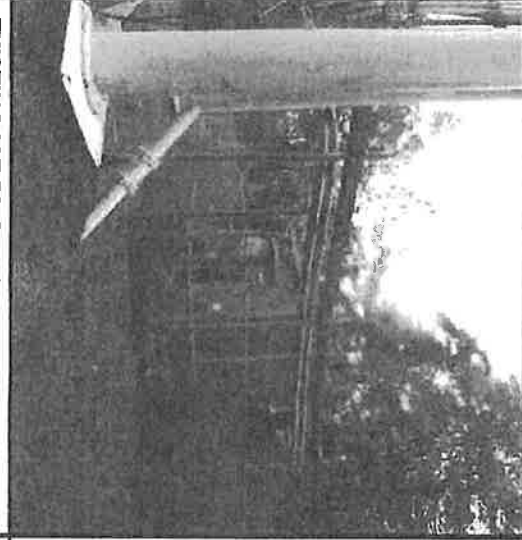
EXISTING HATCH PLATE LAYOUT
SCALE: N.T.S.



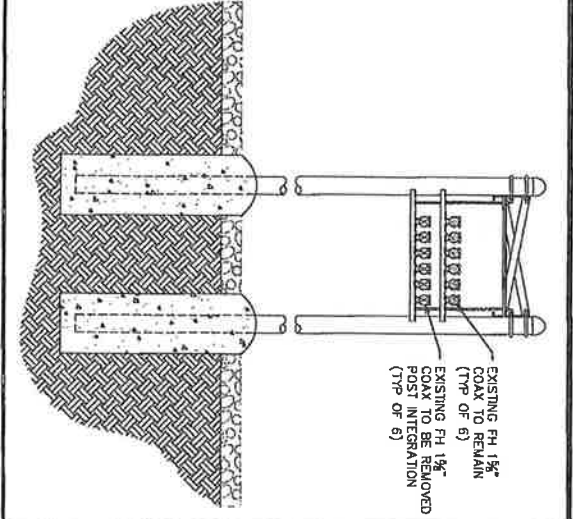
PROPOSED HATCH PLATE LAYOUT
SCALE: N.T.S.



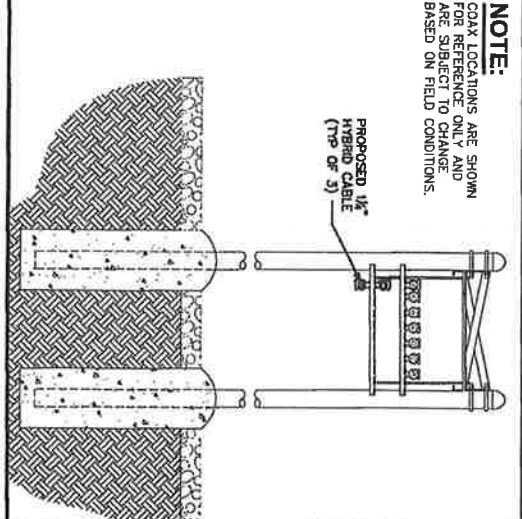
EXISTING HATCH PLATE



EXISTING ICE BRIDGE ELEVATION



EXISTING ICE BRIDGE CONFIGURATION



PROPOSED ICE BRIDGE CONFIGURATION
SCALE: N.T.S.

PLANS PREPARED FOR:

U.S. Cellular
8410 W. BRYN MAWR, SUITE 700
CHICAGO, IL 60651
(773) 399-8900

PROJECT INFORMATION:
768333
FORK UNION USE
2984 JAMES MADISON HIGHWAY
FORK UNION, VA 23022
(FLUYANNA COUNTY)

PLANS PREPARED BY:

TOWER ENGINEERING PROFESSIONALS
326 TRYON ROAD
PALM BEACH, FL 33450
OFFICE: (561) 681-8551
www.tep.com

SEAL:

GRAHAM M. ANDRES
Lic. No. 44739

PROFESSIONAL ENGINEER
January 12, 2012

REV	DATE	ISSUED FOR
2	04-12-19	CONSTRUCTION
1	03-26-18	PRELIMINARY
0	11-09-17	PRELIMINARY

DRAWN BY: 555 CHECKED BY: LMM

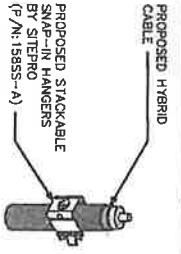
SHEET TITLE:
HATCH PLATE & ICE BRIDGE DETAILS

SHEET NUMBER: **C-5**

REVISION: **2**

TEP # 52061.152902

LEGEND	
	EXISTING COAX TO REMAIN
	EXISTING COAX TO BE REMOVED
	EXISTING COAX
	EXISTING EMC
	PROPOSED EMC

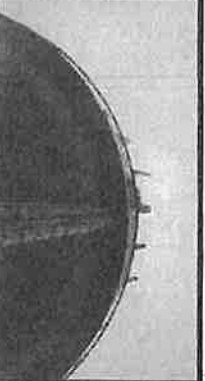


LEGEND
SCALE: N.T.S.

SNAPSTAK HANGER
SCALE: N.T.S.

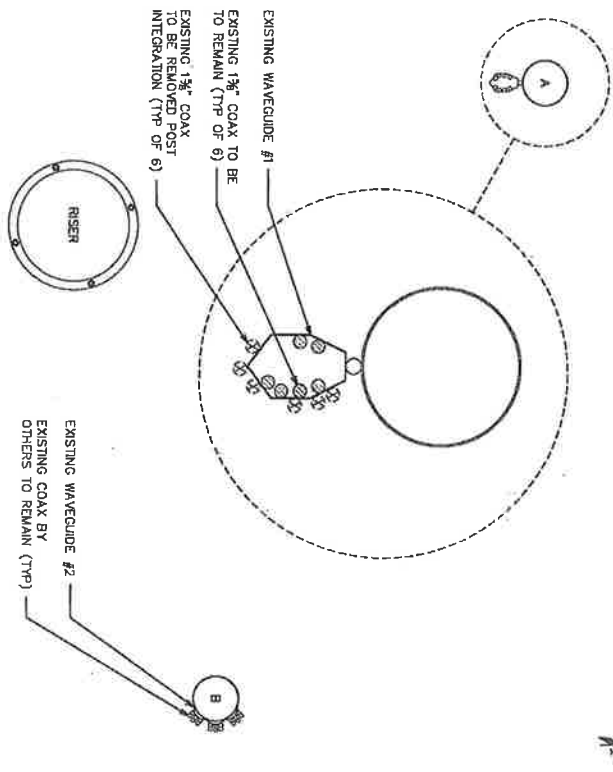


EXISTING USCC WAVEGUIDE

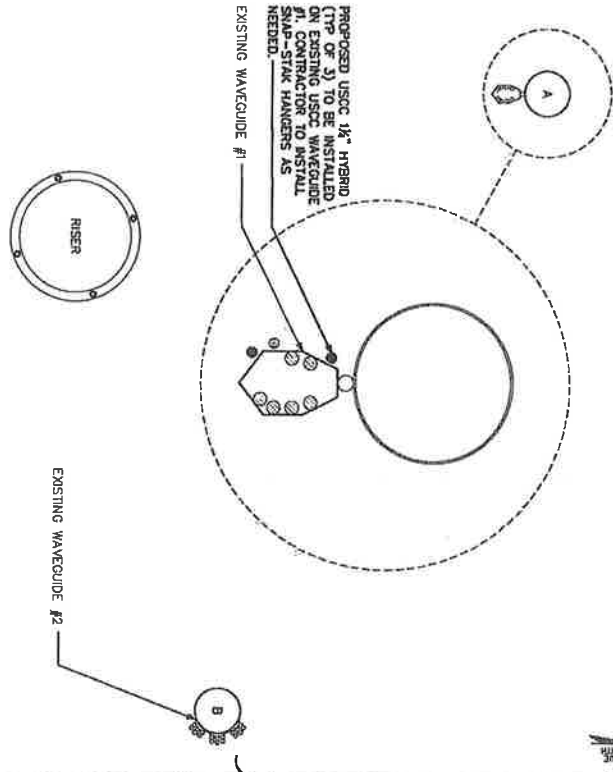


CATWALK COAX OPENING

NOTE:
COAX ROUTED THROUGH OPENING IN CATWALK AS PICTURED ABOVE. MAPPING CREW UNABLE TO OBTAIN DIMENSIONS OF OPENING. APPEARS TO HAVE SUFFICIENT SPACE FOR PROPOSED HYBRID CABLES. CONTRACTOR TO VERIFY.



EXISTING COAX LAYOUT
SCALE: 3/8" = 1'
0 4 8
SCALE IN FEET



PROPOSED COAX LAYOUT
SCALE: 3/8" = 1'
0 4 8
SCALE IN FEET

PLANS PREPARED FOR:

U.S. Cellular

8410 W. BRYAN MAWR, SUITE 700
CHICAGO, IL 60651
(773) 599-8900

PROJECT INFORMATION:

768333

FORK UNION USF

2964 JAMES MADISON HIGHWAY
FORK UNION, VA 23022
(FLUYANNA COUNTY)

PLANS PREPARED BY:

TOWER ENGINEERING PROFESSIONALS

326 JAYSON ROAD
RALEIGH, NC 27603-5530
OFFICE: (919) 861-6351
www.towereng.com

REGISTERED PROFESSIONAL ENGINEER

STATE OF VIRGINIA

GRAHAM M. ANDRES
Lic. No. 44739

APR 12 2014

REV	DATE	ISSUED FOR
2	04-12-18	CONSTRUCTION
1	03-26-18	PRELIMINARY
0	11-09-17	PRELIMINARY

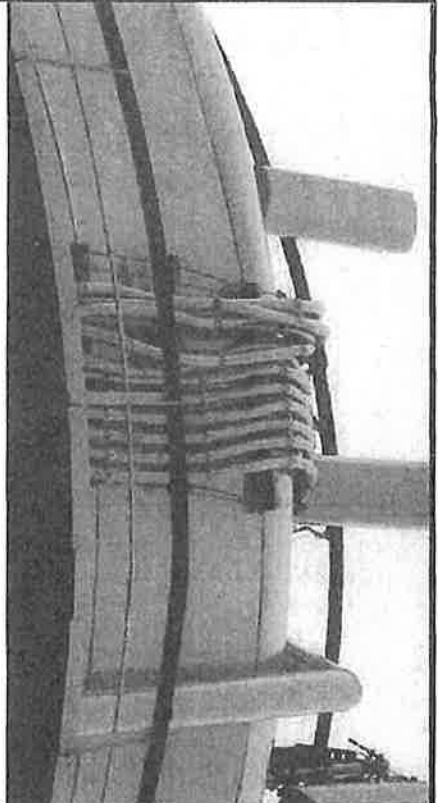
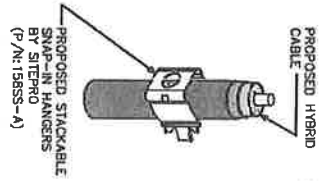
DRAWN BY: 595 | CHECKED BY: DMM

SHEET TITLE:
COAX LAYOUT

SHEET NUMBER: **C-6** | REVISION: **2**

TPF# 52861.152902

LEGEND	
	EXISTING COAX TO REMAIN
	EXISTING COAX TO BE REMOVED
	PROPOSED HYBRID
	EXISTING EW
	PROPOSED EW



LEGEND

WAVEGUIDE DET.

SNAPSTAK HANG.

USCC BOWL W.G.

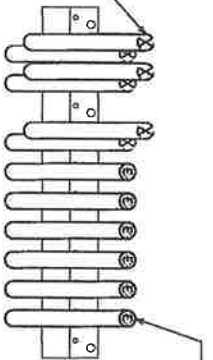
NOTE:

1. DUE TO QUALITY OF PICTURE AVAILABLE, CONTRACTOR TO VERIFY COAX LOCATION WITH STRUCTURAL ANALYSIS AND TOWER OWNER PRIOR TO INSTALLATION.

NOTE:

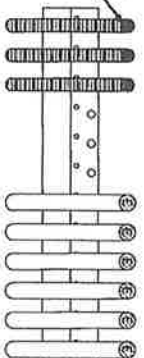
1. DUE TO QUALITY OF PICTURE AVAILABLE, CONTRACTOR TO VERIFY COAX LOCATION WITH STRUCTURAL ANALYSIS AND TOWER OWNER PRIOR TO INSTALLATION.

EXISTING STACKED FH 1/8" COAX TO BE RELOCATED. PRE-INTERGRATION, ALL TO BE RELOCATED TO THE RIGHT OF THE WAVEGUIDE TO ACCOMMODATE PROPOSED HYBRID CABLES. REMOVED POST INTERGRATION.



EXISTING FH 1/8" COAX TO BE SHIFTED DOWN ONE HOLE TO THE RIGHT OF THE WAVEGUIDE TO ACCOMMODATE PROPOSED HYBRIDS. WILL REMAIN IN RELOCATED POSITIONS (TYP OF 6)

PROPOSED 1/8" HYBRID CABLE (TYP OF 3) TO BE INSTALLED PRE INTERGRATION. CONTRACTOR TO INSTALL SNAP-STAK HANGERS AS NEEDED (TYP OF 3).



EXISTING TANK BOWL COAX LAYOUT



PROPOSED TANK BOWL COAX LAYOUT



PLANS PREPARED FOR:

U.S. Cellular
8410 W. BRYAN MAWR, SUITE 700
CHICAGO, IL 60651
(773) 399-8900

PROJECT INFORMATION:

768333
FORK UNION USE
2984 JAMES MADISON HIGHWAY
FORK UNION, VA 23022
(FLUVANNA COUNTY)

PLANS PREPARED BY:



TORNER ENGINEERING PROFESSIONALS
326 TRYON ROAD
RALEIGH, NC 27613-6590
OFFICE: (919) 861-6951
www.tpegroup.net

SEAL:

GRAHAM M. ANDRES
Lic. No. 44739

REV	DATE	ISSUED FOR:
2	04-12-18	CONSTRUCTION
1	03-26-18	PRELIMINARY
0	11-06-17	PRELIMINARY

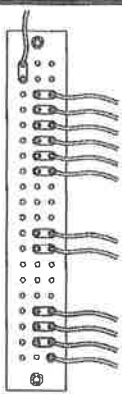
DRAWN BY: 395 | CHECKED BY: UAM

SHEET TITLE:
TANK BOWL COAX LAYOUT

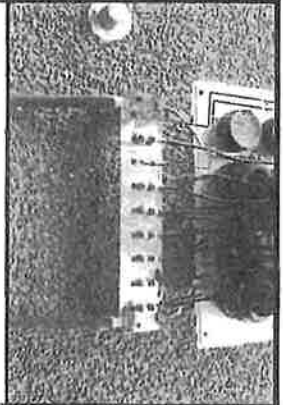
SHEET NUMBER: **C-7** | REVISION: **2**
TWP# 32061, 152902



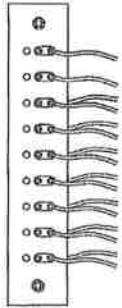
EXISTING INSIDE SHELTER
SCALE: N.T.S.



PROPOSED INSIDE SHELTER
SCALE: N.T.S.



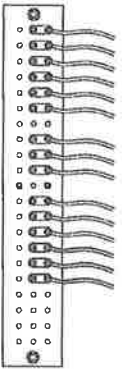
EXISTING OUTSIDE SHELTER
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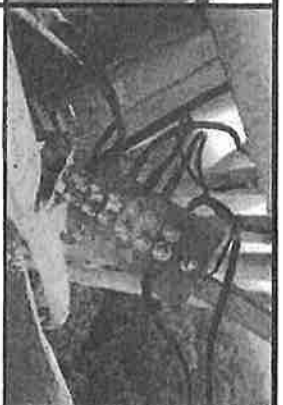
PROPOSED OUTSIDE SHELTER
SCALE: N.T.S.



EXISTING TOWER BOTTOM
SCALE: N.T.S.

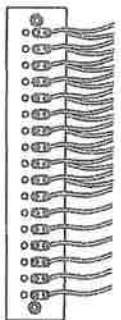


PROPOSED TOWER BOTTOM
SCALE: N.T.S.



EXISTING TOWER TOP
SCALE: N.T.S.

NOTE:
EXISTING GROUND BAR HAS INSUFFICIENT CAPACITY REQUIRED FOR NEW GROUND LEADS. PROPOSED GROUND BAR REQUIRED. SEE THIS SHEET FOR DETAILS.

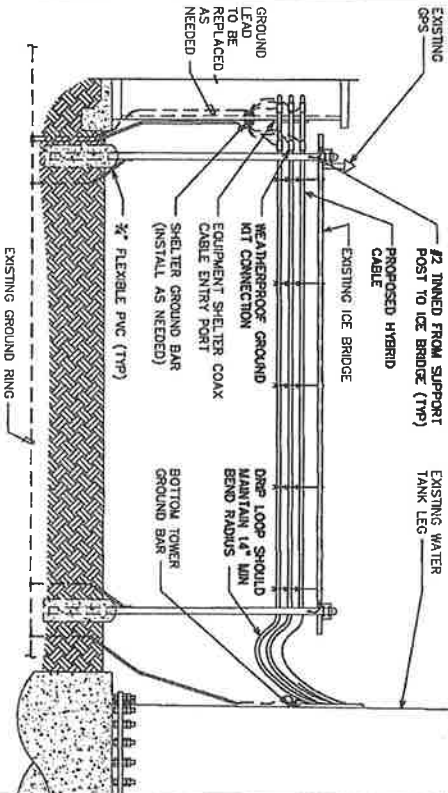


PROPOSED TOWER TOP
SCALE: N.T.S.

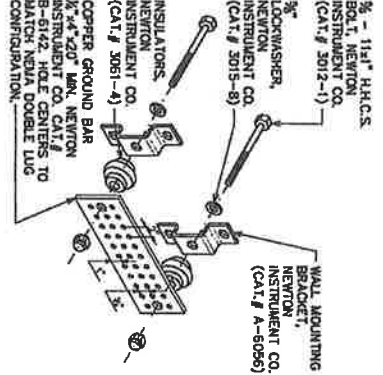
- NOTES:**
- MAX 20" GROUND BAR BY SITE PRO
 - P/N: MG4205-K
 - ACCEPTS 3/8" LUGS
 - 51-HOLES ALLOWS UP TO 17 RUNS
 - 0.75", 0.815" OR 1" HOLE SPACING
 - KIT INCLUDES INSULATORS AND STAINLESS STEEL BRACKETS TO REPLACE EXISTING LUGS AND GROUND LUG WASHERS AS NEEDED.



PROPOSED GND. BAR DETAIL
SCALE: N.T.S.



SIDE VIEW
SCALE: N.T.S.



STANDARD GND. BAR DETAIL
SCALE: N.T.S.

- NOTES:**
1. GROUND BAR SHALL BE SIZED TO ACCOMMODATE ALL GROUNDING CONNECTIONS REQUIRED PLUS PROVIDE 50% SPARE CAPACITY
 2. MINIMUM SPACING OF 12" BETWEEN ALL CONDUITS

PLANS PREPARED FOR:

U.S. Cellular
8410 W. BRYN MAWR, SUITE 700
CHICAGO, IL 60651
(773) 389-8900

PROJECT INFORMATION:

768333
FORK UNION USE
2984 JAMES HARRISON HIGHWAY
FORK UNION, VA 23022
(FLYNNANNA COUNTY)

PLANS PREPARED BY:



TOWER ENGINEERING PROFESSIONALS
2901 TRIVION ROAD
ROSELAND, IL 27003-3630
OFFICE: (919) 941-6351
www.towereng.com

SEAL: **COMMONWEALTH OF VIRGINIA**
PROFESSIONAL ENGINEER
GRAHAM M. ANDRES
Lic. No. 44739
April 12, 2016

2	04-12-16	CONSTRUCTION
1	03-26-16	PRELIMINARY
0	11-09-17	PRELIMINARY
REV	DATE	ISSUED FOR

DRAWN BY: SSS | CHECKED BY: LVM |
SHEET TITLE: **GROUND BAR DETAILS**

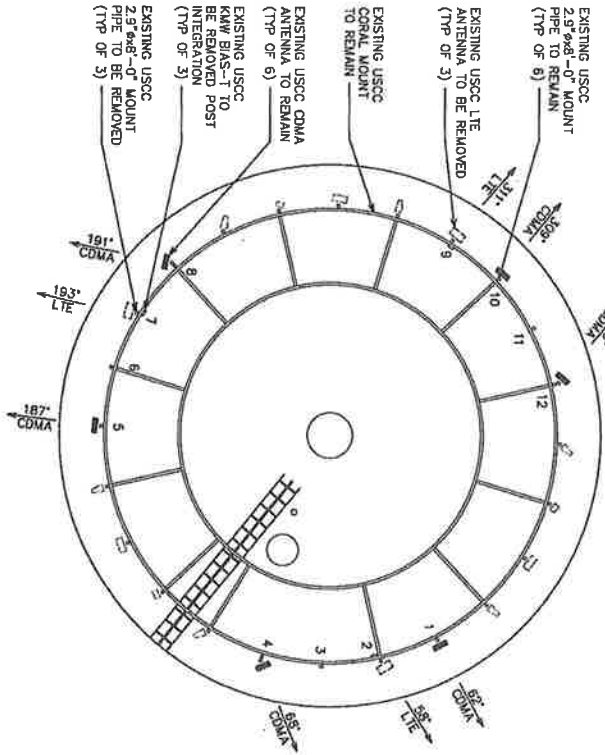
SHEET NUMBER: C-8	REVISION: 2
TEP # 52961 | 158902	

LEGEND

EXISTING LTE PANEL TO BE REMOVED

EXISTING CDMA PANEL TO REMAIN

EXISTING BIAS-T TO BE REMOVED



EXISTING LOADING

ANTENNA	WAVELENGTH		TYPE	MOUNT	CABLES		TOWER TOP RELATED EQUIPMENT		ALTERNATIVE
	FEET	INCHES			TYPE	TYPE	TYPE	TYPE	
ADNA 1	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 2	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 3	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 4	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 5	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 6	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 7	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 8	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 9	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 10	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 11	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 12	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED

EXISTING ANTENNA ASSIGNMENT

SCALE: 1" = 1'-0"

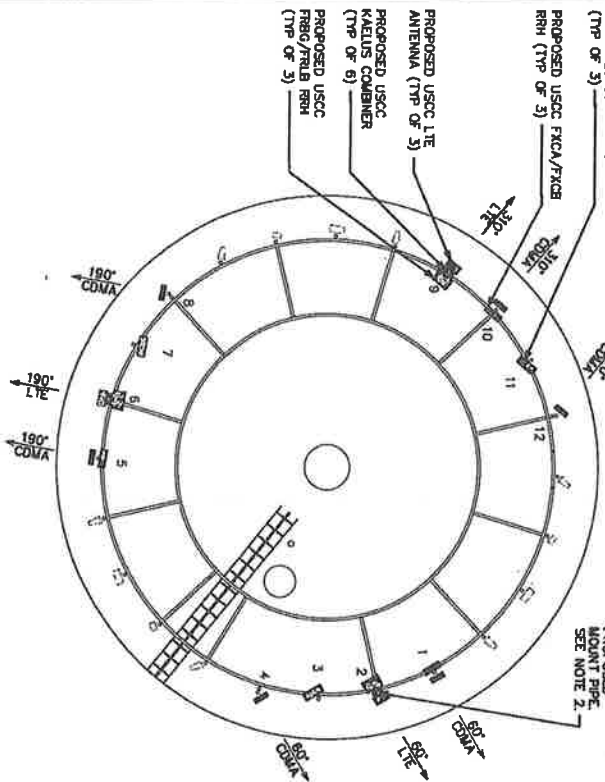
0 8 16

SCALE IN FEET

LEGEND

PROPOSED LTE PANEL TO BE INSTALLED

EXISTING CDMA PANEL



PROPOSED LOADING

ANTENNA	WAVELENGTH		TYPE	MOUNT	CABLES		TOWER TOP RELATED EQUIPMENT		ALTERNATIVE
	FEET	INCHES			TYPE	TYPE	TYPE	TYPE	
ADNA 1	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 2	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 3	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 4	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 5	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 6	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 7	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 8	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 9	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 10	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 11	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED
ADNA 12	2.9	4.10	CDMA	SS	SS	SS	SS	SS	TO BE REMOVED

PROPOSED ANTENNA ASSIGNMENT

SCALE: 1" = 1'-0"

0 8 16

SCALE IN FEET

NOTE:

1. CDMA ANTENNAS TO BE ROTATED TO DESIGN AZIMUTH.

2. EXISTING USCC 2.9" x 4.10" - 6" MOUNT PIPES LOCATED BEHIND PROPOSED LTE ANTENNAS TO BE REPLACED WITH SAREE 2.9" x 4.10" - 6" MOUNT PIPES (P/N: C10901310).

PLANS PREPARED FOR:

U.S. Cellular

8410 W. BRYAN MAWR, SUITE 700
CHICAGO, IL 60631
(773) 399-6900

PROJECT INFORMATION:

768333

FORK UNION USE

2984 JAMES MADISON HIGHWAY
FORK UNION, VA 23022
(FLUVANNA COUNTY)

PLANS PREPARED BY:



TOWER ENGINEERING PROFESSIONALS

326 TRIVOLI ROAD
RALEIGH, NC 27603-5530
OFFICE: (919) 581-5551
www.tep.com

SEAL:

GRAHAM M. ANDRES
Lic. No. 44739

PROFESSIONAL ENGINEER

April 12, 2018

SHEET NUMBER: **C-9**

REVISION: **2**

TDP # 52961.152902

SHEET TITLE:

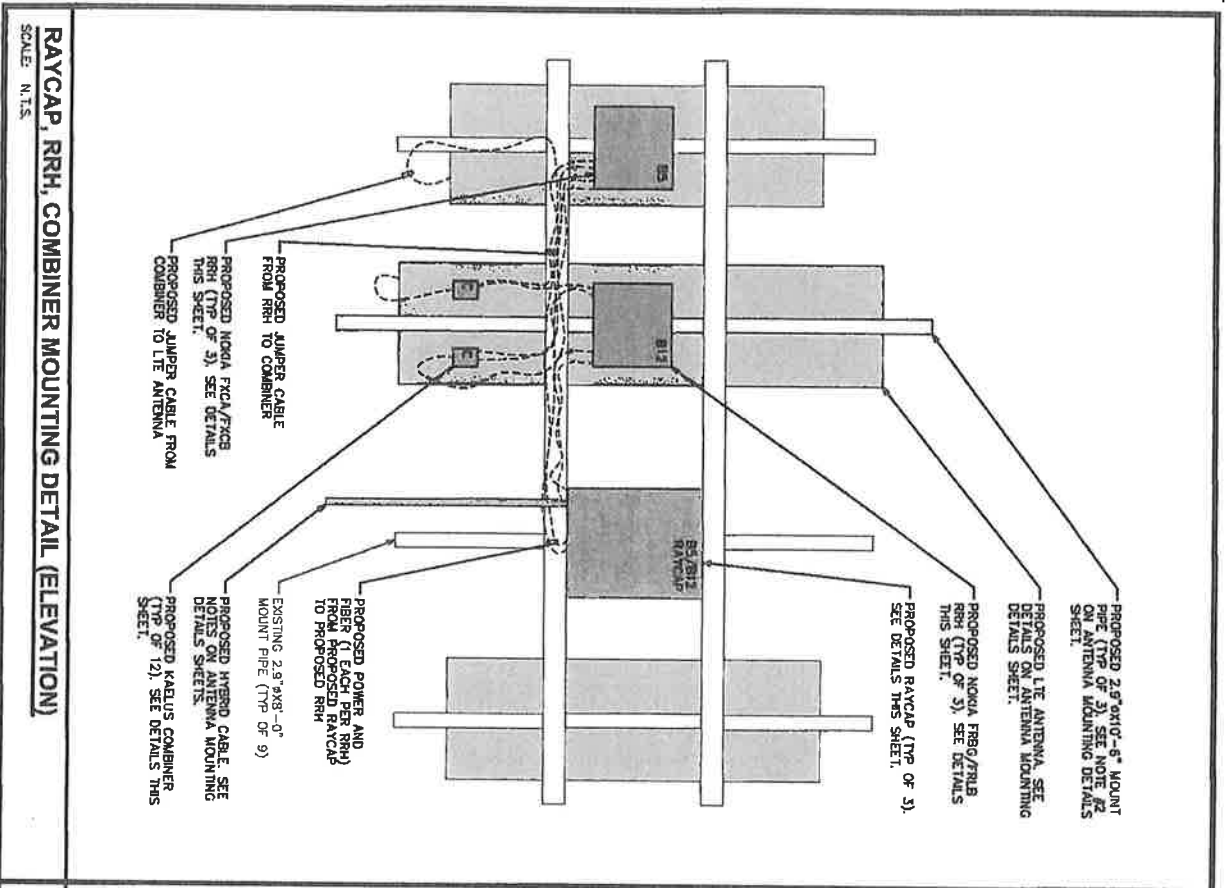
ANTENNA MOUNTING DETAILS

DATE: 04-12-18

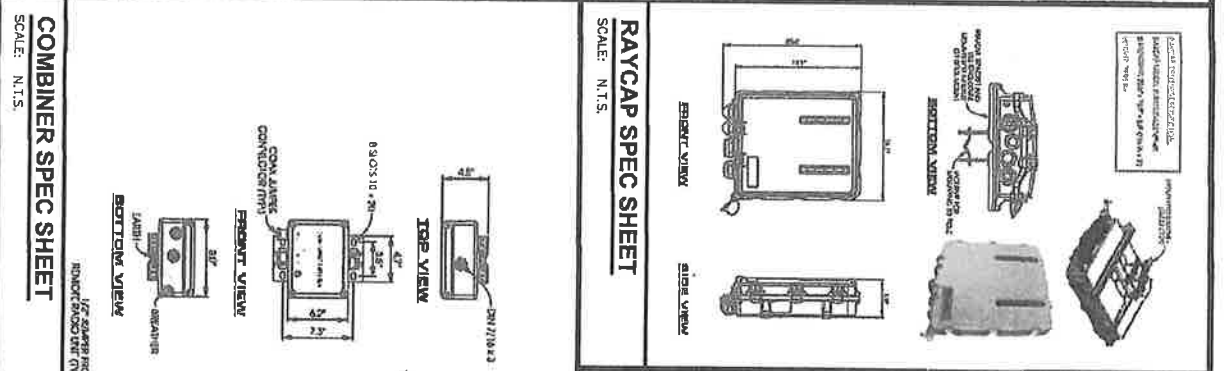
CONSTRUCTION: PRELIMINARY

ISSUED FOR: PRELIMINARY

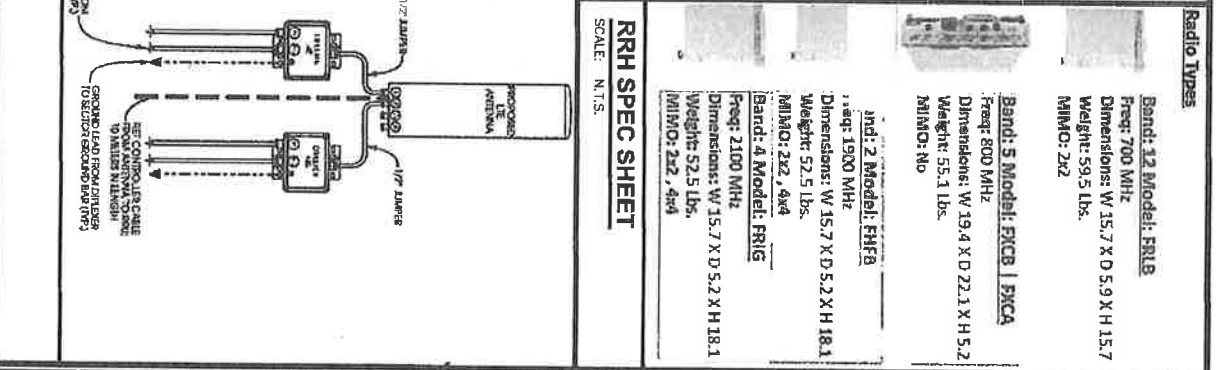
CHECKED BY: DMAT



RAYCAP RRH COMBINER MOUNTING DETAIL (ELEVATION)
SCALE: N.T.S.

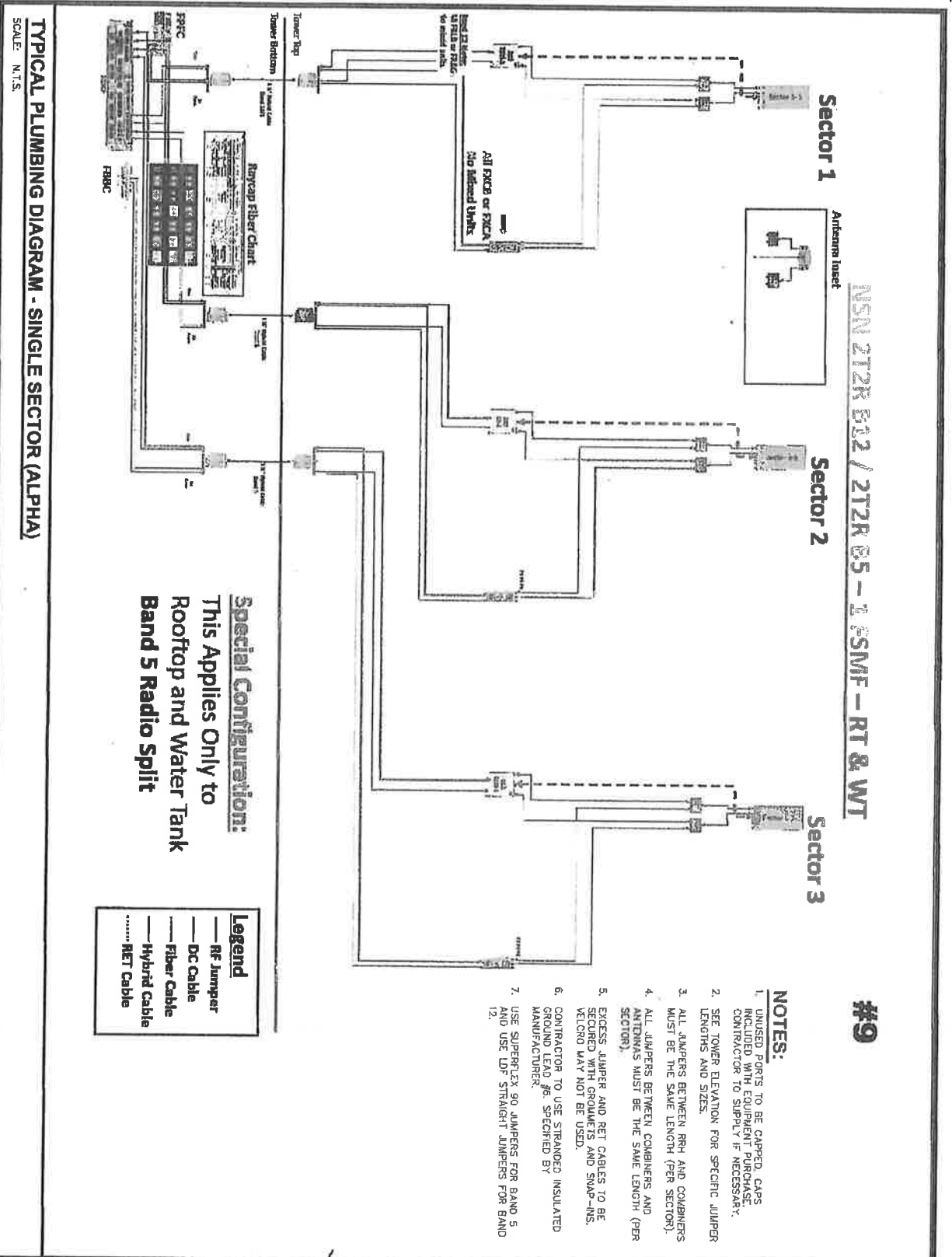


RAYCAP SPEC SHEET
SCALE: N.T.S.



RRH SPEC SHEET
SCALE: N.T.S.

<p>PLANS PREPARED FOR: U.S. Cellular 8410 W. BRYN MAWR, SUITE 700 CHICAGO, IL 60651 (773) 399-8900</p>		<p>PROJECT INFORMATION: 768333 FORK UNION USE 2984 JAMES MADISON HIGHWAY FORK UNION, VA 23022 (FLYVANIA COUNTY)</p>		<p>PLANS PREPARED BY: TURNER ENGINEERING-PROFESSIONALS 326 TRYON ROAD RALEIGH, NC 27603-3550 OFFICE: (919) 841-6351 www.tpepro.com</p>													
<p>SEAL: GRAHAM M. ANDRES Lic. No. 44739 PROFESSIONAL ENGINEER STATE OF VIRGINIA April 12, 2016</p>																	
<table border="1"> <tr> <th>REV</th> <th>DATE</th> <th>ISSUED FOR</th> </tr> <tr> <td>2</td> <td>04-12-16</td> <td>CONSTRUCTION</td> </tr> <tr> <td>1</td> <td>03-26-16</td> <td>PRELIMINARY</td> </tr> <tr> <td>0</td> <td>11-09-17</td> <td>PRELIMINARY</td> </tr> </table>						REV	DATE	ISSUED FOR	2	04-12-16	CONSTRUCTION	1	03-26-16	PRELIMINARY	0	11-09-17	PRELIMINARY
REV	DATE	ISSUED FOR															
2	04-12-16	CONSTRUCTION															
1	03-26-16	PRELIMINARY															
0	11-09-17	PRELIMINARY															
<p>DRAWN BY: SSS CHECKED BY: LMM</p>																	
<p>SHEET TITLE: RAYCAP RRH COMBINER SPEC SHEET (TYP)</p>																	
<p>SHEET NUMBER: C-10</p>		<p>REVISION: 2</p>															
<p>TEP# 5295.1.152902</p>																	



NSN 212R B12 / 212R 05 - 1 SMTF - RT & WT

#9

NOTES:

1. UNUSED PORTS TO BE CAPPED. CAPS INCLUDED WITH EQUIPMENT PURCHASE. CONTRACTOR TO SUPPLY IF NECESSARY.
2. SEE TOWER ELEVATION FOR SPECIFIC JUMPER LENGTHS AND SIZES.
3. ALL JUMPERS BETWEEN RBH AND COMBINERS MUST BE THE SAME LENGTH (PER SECTOR).
4. ALL JUMPERS BETWEEN COMBINERS AND ANTENNAS MUST BE THE SAME LENGTH (PER SECTOR).
5. EXCESS JUMPER AND RET CABLES TO BE SECURED WITH GROMMETS AND SWAG-INS. WELCRO MAY NOT BE USED.
6. CONTRACTOR TO USE STRANDED INSULATED GROUND LEAD #6. SPECIFIED BY MANUFACTURER.
7. USE SUPERFLEX 90 JUMPERS FOR BAND 5 AND USE LDF STRAIGHT JUMPERS FOR BAND 12.

Special Configuration:
This Applies Only to
Rooftop and Water Tank
Band 5 Radio Split

Legend

— RF Jumper
— DC Cable
— Fiber Cable
— Hybrid Cable
..... RET Cable

TYPICAL PLUMBING DIAGRAM - SINGLE SECTOR (ALPHA)

SCALE: N.T.S.

<p>PLANS PREPARED FOR:</p> <p>U.S. Cellular</p> <p>8410 W. BERRY AVE., SUITE 700 CHICAGO, IL 60651 (773) 599-6900</p>	<p>PROJECT INFORMATION:</p> <p>768333</p> <p>FORK UNION USE</p> <p>2984 JAMES MADISON HIGHWAY FORK UNION, VA 23022 (FLUVANNA COUNTY)</p>	<p>PLANS PREPARED BY:</p> <p>326 TRIVOLI ROAD RALEIGH, NC 27603-3530 OFFICE: (819) 661-6551 www.jaygroup.net</p>	<p>SEAL:</p> <p>GRAHAM M. ANDRES Lic. No. 44739</p> <p>PROFESSIONAL ENGINEER COMMUNICATIONS ENGINEERING</p> <p>April 11, 2014</p>												
<p>SHEET NUMBER: C-11</p> <p>REVISION: 2</p> <p>TEP #: 52261.152902</p>		<p>SHEET TITLE:</p> <p>PLUMBING DIAGRAM</p>													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>REV#</th> <th>DATE</th> <th>ISSUED FOR:</th> </tr> <tr> <td>2</td> <td>04-12-16</td> <td>CONSTRUCTION</td> </tr> <tr> <td>1</td> <td>03-29-16</td> <td>PRELIMINARY</td> </tr> <tr> <td>0</td> <td>11-09-17</td> <td>PRELIMINARY</td> </tr> </table>		REV#	DATE	ISSUED FOR:	2	04-12-16	CONSTRUCTION	1	03-29-16	PRELIMINARY	0	11-09-17	PRELIMINARY	<p>DRAWN BY: SSS CHECKED BY: LAM</p>	
REV#	DATE	ISSUED FOR:													
2	04-12-16	CONSTRUCTION													
1	03-29-16	PRELIMINARY													
0	11-09-17	PRELIMINARY													

AM-X-CD-17-65-00T-RET1g 65' Dual Broadband Antenna

Dual Band Electrical Downlink Antenna
 598 - 601000Hz, X-900, HBS 7.98.0
 1710 - 2120000Hz, X-2000, HBS 7.97.0



4115 Central Expressway
 Suite 200, Rockville, MD
 Tel: 301.461.1111
 Fax: 301.461.1112

Electrical Specification

Frequency Range	600-6040MHz	500	1710-21200MHz
Impedance			
Power Output		Dual Stream 145°	
Gain		18.0dB / 14.0dB @ 600-6040MHz 17.5dB / 15.5dB @ 624-680MHz	17.0dB / 14.0dB @ 1710-1750MHz 17.0dB / 16.0dB @ 1850-1900MHz 17.2dB / 15.5dB @ 2100-2150MHz
Bandwidth	Horizontal	60° @ 600-6040MHz 60° @ 624-680MHz	60° @ 1710-1750MHz 60° @ 1850-1900MHz 60° @ 2110-2150MHz
	Vertical	6.2° @ 600-6040MHz 6.0° @ 624-680MHz	7.0° @ 1710-1750MHz 6.7° @ 2110-2150MHz
VSWR		≤ 1.5:1	
Port-to-Port Return Loss		≥ 27 dB	
Shielded Downlink Range	2 - 18'	230 dB	0' - 10'
Isolation Between Ports		235 dB	
Isolation Between Ports at Different Frequency Elements		10.0 dB @ 450° 15.0 dB @ 0°	
Class 1/2 Certification		1008	
Port Upper Side Lobe Suppression		> 18 dB @ 0.6° TR > 18 dB @ 7.12° TR (Up to 10° from Beamwidth)	> 18 dB @ 0.6° TR > 18 dB @ 7.10° TR (Up to 10° from Beamwidth)
Side Lobe Suppression			
Power Intermodulation		5-150 dBc @ 2420W	
Input Maximum CW Power	500 W		500 W
Environmental Compliance		F903 for Performance F907 for Connections	
NET Meter Configuration		Field Replaceable NET Electronic Control Module / NET Meter is Integral to antenna & not field replaceable	
Compliant with ANSI 1.1 and 2.0		ANSI 1.1 and 2.0	

Mechanical Specification

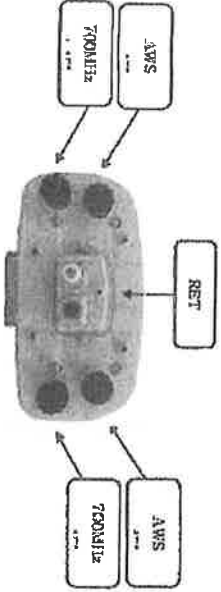
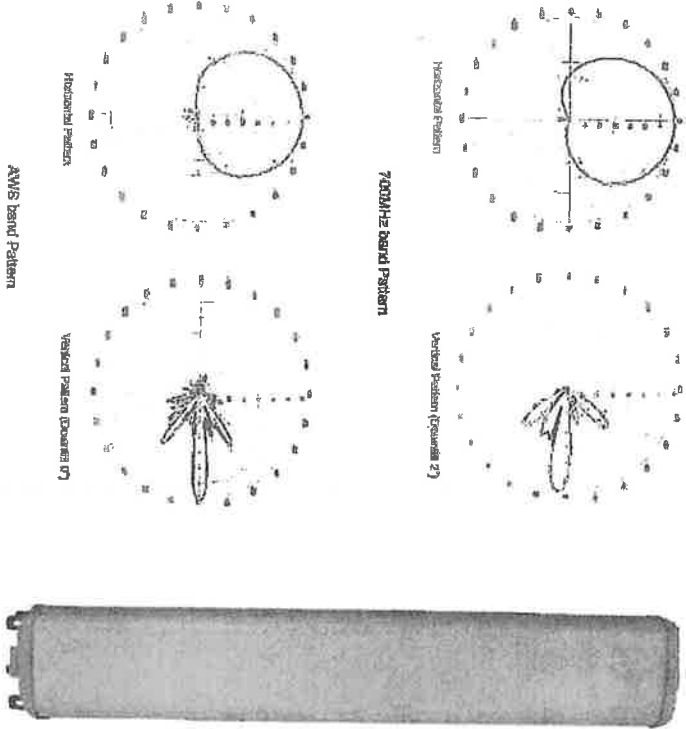
Dimensions (WxHxD)	11.8x6.0x46 inches
Weight (Without cabling)	58.5 lbs (27.0 kg)
Connections	4 x 7/16 DINM/F, Long Neck
Max Wind Speed	150 mph
Wind Load (@150 mph)	2621 N

KMW AM-X-CD-17-65-00T-RET
 SCALE: N.T.S.

AM-X-CD-17-65-00T-RET1g 65' Dual Broadband Antenna



4115 Central Expressway
 Suite 200, Rockville, MD
 Tel: 301.461.1111
 Fax: 301.461.1112



PLANS PREPARED FOR:
U.S. Cellular
 8410 W. BRYN MAWR, SUITE 700
 CHICAGO, IL 60651
 (773) 599-8900

PROJECT INFORMATION:
768333
FORK UNION USE
 2384 JAMES MADISON HIGHWAY
 FORK UNION, VA 23022
 (FLUYAUNA COUNTY)



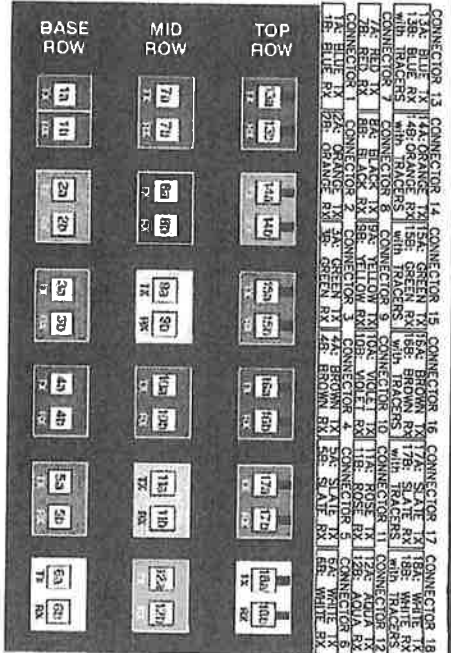
TORNER ENGINEERING PROFESSIONALS
 326 TRIVERTON ROAD
 RALEIGH, NC 27603-6590
 OFFICE: (919) 881-6351
 www.tornerpe.com

SEAL:

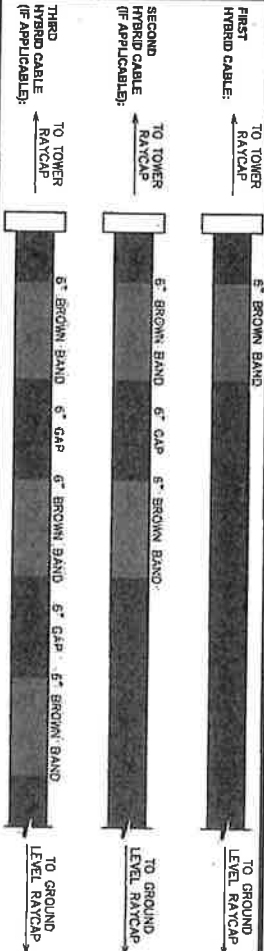
GRAHAM M. ANDRES
 Lic. No. 44739

2	04-12-18	CONSTRUCTION
1	03-26-18	PRELIMINARY
0	11-09-17	PRELIMINARY
REV	DATE	ISSUED FOR
DRAWN BY: 595 | CHECKED BY: LMM		
SHEET TITLE: ANTENNA SPEC SHEET		
SHEET NUMBER: C-12	REVISION: 2	TEP # 52861.182902

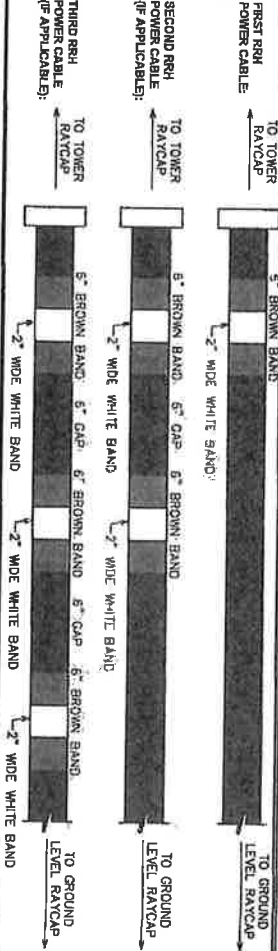
NOTE:
 REFER TO USOC DOCUMENT TOWER MOUNTED EQUIPMENT AND TOWER CABLE STANDARDS AT CELL SITES FOR COMPLETE COLOR CODING STANDARDS.



FIBER CABLE LABELING
 SCALE: N.T.S.



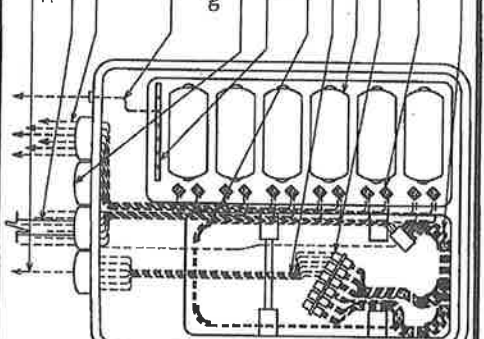
HYBRID CABLE LABELING
 SCALE: N.T.S.



FIBER CABLE LABELING
 SCALE: N.T.S.

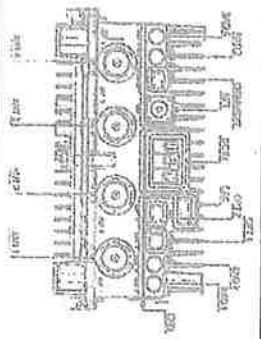
RAYCAP CABLING
 SCALE: N.T.S.

PROPOSED (24) FIBER CABLES _____
 PROPOSED (12) TERMINAL BLOCK 6-20 AWG _____
 PROPOSED (18) FIBER COUPLERS ON FIBER LANDING _____
 PROPOSED (9) STRIKES/RAMP MODULE _____
 PROPOSED (6) FIBER CABLES _____
 PROPOSED (5) BEND PROTECTORS _____
 PROPOSED GROUND STRIP FOR SHIELD AND DRAIN WIRES _____
 PROPOSED EMPTY PORT _____
 PROPOSED #8 INSULATED GROUND LEAD WITH 2 LUG MECHANICAL CONNECTION BETWEEN PROPOSED RAYCAP AND EXISTING #8 GROUND BAR _____
 PROPOSED POWER JUMPER CABLES TO RRHS _____
 PROPOSED 1/2" HYBRID CABLE _____
 PROPOSED FIBER OPTIC JUMPER CABLE TO RRHS _____



2T2R DEPLOYMENT
 SCALE: N.T.S.

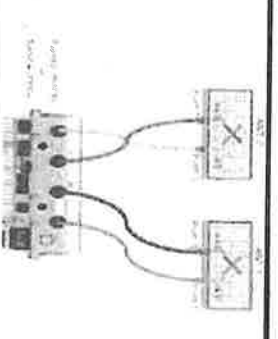
NOTE:
 USE PORTS 1 AND 3 FOR ANTENNA CONNECTIONS WITH PORTS 2 AND 4 LEFT OPEN. NOTE THAT PORT 1 IS ON THE RIGHT AND PORT 4 IS ON THE LEFT.



4T4R DEPLOYMENT
 SCALE: N.T.S.

NOTE:
 ALL PORTS TO BE USED FOR ANTENNA CONNECTIONS. NOTE THAT PORT 1 IS ON THE RIGHT AND PORT 4 IS ON THE LEFT.

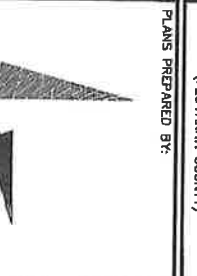
BAND 2 OR 4:
 PER SECTOR:
 RPH PORT 1 = ANT. 1/PORT 0 (-45)
 RPH PORT 2 = ANT. 1/PORT 1 (+45)
 RPH PORT 3 = ANT. 2/PORT 1 (+45)
 RPH PORT 4 = ANT. 2/PORT 0 (-45)



PLANS PREPARED FOR:

 8410 W. BRYN MAWR, SUITE 700
 CHICAGO, IL 60651
 (773) 399-8900

PROJECT INFORMATION:
 768333
 FORK UNION USF
 2984 JAMES MADISON HIGHWAY
 FORK UNION, VA 23022
 (FLUVANNA COUNTY)
 PLANS PREPARED BY:



TOWER ENGINEERING PROFESSIONALS
 326 TRYEN ROAD
 RALEIGH, NC 27813-5530
 OFFICE: (919) 861-6351
 MOBILE: (919) 861-6351

SEAL:

 GRAHAM M. ANDRES
 Lic. No. 44739
 PROFESSIONAL ENGINEER
 State of Virginia
 expires 7/1/2018

REV.	DATE	ISSUED FOR
2	04-12-16	CONSTRUCTION
1	03-20-16	PRELIMINARY
0	11-03-17	PRELIMINARY

DRAWN BY: SSS | CHECKED BY: LMM

SHEET TITLE:
LABELING STANDARDS I

SHEET NUMBER:
C-13

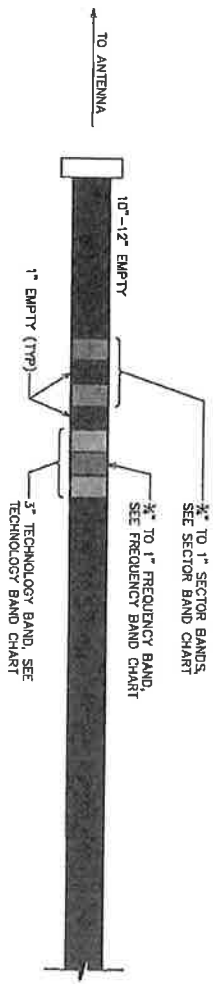
REVISION:
2

TEP R 5226/1.52902

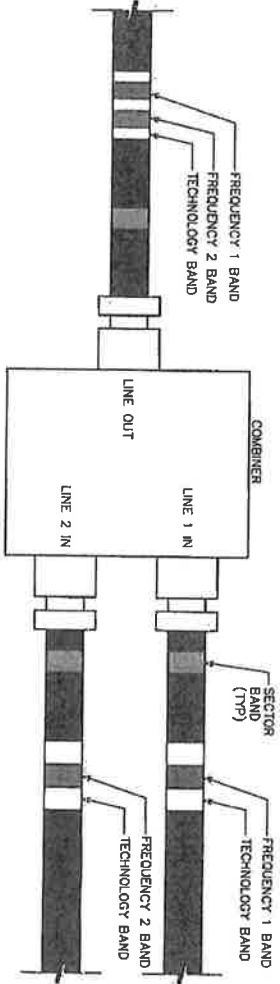
SECTOR BAND				
SECTOR	LINE 1 - FIRST TECHNOLOGY	LINE 2 - FIRST TECHNOLOGY	LINE 1 - SECOND TECHNOLOGY (IF APPLICABLE)	LINE 2 - SECOND TECHNOLOGY (IF APPLICABLE)
ALPHA	(1) RED BAND	(2) RED BANDS	(1) RED BAND	(2) RED BANDS
BETA	(1) WHITE BAND	(2) WHITE BANDS	(1) WHITE BAND	(2) WHITE BANDS
GAMMA	(1) BLUE BAND	(2) BLUE BANDS	(1) BLUE BAND	(2) BLUE BANDS
DELTA (IF APPLICABLE)	(1) GREEN BAND	(2) GREEN BANDS	(1) GREEN BAND	(2) GREEN BANDS
EPSILON (IF APPLICABLE)	(1) VIOLET BAND	(2) VIOLET BANDS	(1) VIOLET BAND	(2) VIOLET BANDS
ZETA (IF APPLICABLE)	(1) BROWN BAND	(2) BROWN BANDS	(1) BROWN BAND	(2) BROWN BANDS

TECHNOLOGY BAND	
TECHNOLOGY	TECHNOLOGY BAND
CDMA	YELLOW
GSM	VIOLET
LTE	ORANGE

FREQUENCY BAND	
FREQUENCY	FREQUENCY BAND
700	GREEN
800	BROWN
1900	BLUE
2100	WHITE



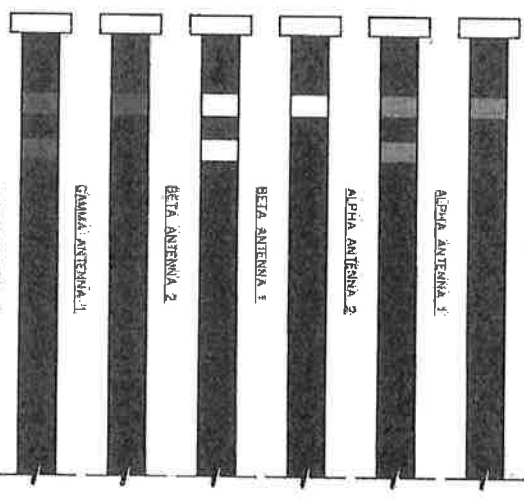
COAX CABLE BANDING
SCALE: N.T.S.



COAX BANDING THROUGH COMBINER
SCALE: N.T.S.

RET SECTOR BAND

SECTOR	LINE 1 - FIRST TECHNOLOGY	LINE 2 - FIRST TECHNOLOGY
ALPHA	(1) RED BAND	(2) RED BAND
BETA	(1) WHITE BAND	(2) WHITE BAND
GAMMA	(1) BLUE BAND	(2) BLUE BAND



RET CABLE BANDING
SCALE: N.T.S.

PLANS PREPARED FOR:

U.S. Cellular
8410 W. BRYN MAWR, SUITE 700
CHICAGO, IL 60651
(773) 599-8900

PROJECT INFORMATION:

768333
FORK UNION USE
2984 JAMES MADISON HIGHWAY
FORK UNION, VA 23022
(FLUVANNA COUNTY)

PLANS PREPARED BY:



TURNER ENGINEERING PROFESSIONALS
326 TRYON ROAD
RALEIGH, VA 27603-1390
OFFICE: (760) 851-6551
WWW.TEPENGINEERING.COM

SEAL
COMMONWEALTH OF VIRGINIA
PROFESSIONAL ENGINEER
GRAHAM M. ANDRES
Lic. No. 44739
April 13, 2016

REV	DATE	ISSUED FOR
2	04-12-10	CONSTRUCTION
1	03-23-10	PRELIMINARY
0	11-09-17	PRELIMINARY

DRAWN BY: 356 | CHECKED BY: LMM

SHEET TITLE:
LABELING STANDARDS II

SHEET NUMBER: **C-14**
REVISION: **2**
TEP# 52861.152902

GENERAL NOTES:

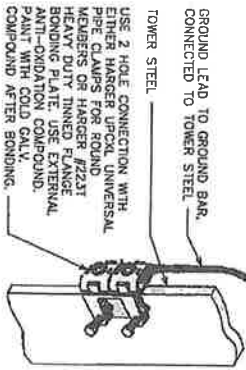
1. ALL REFERENCES TO OWNER IN THESE DOCUMENTS SHALL BE CONSIDERED U.S. CELLULAR OR IT'S DESIGNATED REPRESENTATIVE.
2. ALL WORK PRESENTED ON THESE DRAWINGS MUST BE COMPLETED BY THE CONTRACTOR UNLESS NOTED OTHERWISE. THE CONTRACTOR MUST HAVE CONSIDERABLE EXPERIENCE IN PERFORMANCE OF WORK SIMILAR TO THAT DESCRIBED HEREIN. BY ACCEPTING THIS CONTRACT, THE CONTRACTOR IS ATTESTING THAT HE DOES HAVE SUFFICIENT EXPERIENCE AND ABILITY THAT HE IS KNOWLEDGEABLE OF THE REQUIREMENTS OF THE PROJECT AND THAT HE IS PROPERLY LICENSED AND PROPERLY REGISTERED TO DO THIS WORK IN THE STATE OF VIRGINIA.
3. STRUCTURE IS DESIGNED IN ACCORDANCE WITH ANSI/AIA-222-G-2, 2009, AND THE REQUIREMENTS OF THE VIRGINIA CONSTRUCTION CODE, 2012 EDITION.
4. WORK SHALL BE COMPLETED IN ACCORDANCE WITH VIRGINIA CONSTRUCTION CODE, 2012 EDITION.
5. UNLESS SHOWN OR NOTED OTHERWISE ON THE CONTRACT DRAWINGS, OR IN THE SPECIFICATIONS, THE FOLLOWING NOTES SHALL APPLY TO THE MATERIALS LISTED HEREIN, AND TO THE PROCEDURES TO BE USED ON THIS PROJECT.
6. ALL HARDWARE ASSEMBLY MANUFACTURER'S INSTRUCTIONS SHALL BE FOLLOWED EXACTLY AND SHALL SUPERSEDE ANY CONFLICTING NOTES ENCLOSED HEREIN.
7. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE TO INSURE THE SAFETY OF THE STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION AND/OR FIELD MODIFICATIONS. THIS INCLUDES, BUT IS NOT LIMITED TO, THE ADDITION OF TEMPORARY BRACING, GUYS OR THE DOWNS THAT MAY BE NECESSARY. SUCH MATERIALS SHALL BE REMOVED AND SHALL REMAIN THE PROPERTY OF THE CONTRACTOR AFTER THE COMPLETION OF THE PROJECT.
8. ALL DIMENSIONS, ELEVATIONS, AND EXISTING CONDITIONS SHOWN ON THE DRAWINGS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO BEGINNING ANY MATERIALS ORDERING, FABRICATION OR CONSTRUCTION WORK ON THE PROJECT. IMMEDIATELY BROUGHT TO THE ATTENTION OF THE OWNER AND THE OWNER'S ENGINEER. THE DISCREPANCIES SHALL BE RESOLVED BEFORE THE CONTRACTOR IS TO PROCEED WITH THE WORK. THE OWNER SHALL HAVE A SET OF APPROVED PLANS AVAILABLE AT THE SITE AT ALL TIMES WHILE WORK IS BEING PERFORMED. A DESIGNATED RESPONSIBLE EMPLOYEE SHALL BE AVAILABLE FOR CONTACT BY GOVERNING AGENCY INSPECTORS. THE CONTRACT DOCUMENTS DO NOT INDICATE THE PLACEMENT OF CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS, INSURANCE, AND PROCEDURES. OBSERVATION VISITS TO THE SITE BY THE OWNER AND/OR THE ENGINEER SHALL NOT INCLUDE INSPECTION OF THE PROTECTIVE MEASURES OR THE PROCEDURES.
9. ALL MATERIALS AND EQUIPMENT FURNISHED SHALL BE NEW AND OF GOOD QUALITY, FREE FROM FAULTS AND DEFECTS AND IN CONFORMANCE WITH THE CONTRACT DOCUMENTS. ANY AND ALL SUBSTITUTIONS MUST BE PROPERLY APPROVED AND AUTHORIZED IN WRITING BY THE OWNER AND ENGINEER PRIOR TO INSTALLATION. THE CONTRACTOR SHALL FURNISH SATISFACTORY EVIDENCE AS TO THE KIND AND QUALITY OF THE MATERIALS AND EQUIPMENT BEING SUBSTITUTED.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND RELATED WORK COMPLETES WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL SAFETY CODES AND REGULATIONS GOVERNING THIS WORK.
11. ACCESS TO THE PROPOSED WORK SITE MAY BE RESTRICTED. THE CONTRACTOR SHALL COORDINATE INTENDED CONSTRUCTION ACTIVITY, INCLUDING WORK SCHEDULE AND MATERIALS ACCESS, WITH THE RESIDENT LEASING AGENT FOR APPROVAL.
12. BILL OF MATERIALS AND PART NUMBERS LISTED ON CONSTRUCTION DRAWINGS ARE INTENDED TO AID CONTRACTOR. CONTRACTOR SHALL VERIFY PARTS AND QUANTITIES WITH MANUFACTURER PRIOR TO ORDERING MATERIALS.
13. ALL PERMITS THAT MUST BE OBTAINED ARE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE RESPONSIBLE FOR ABIDING BY ALL CONDITIONS AND REQUIREMENTS OF THE PERMITS.
14. 24 HOURS PRIOR TO THE BEGINNING OF ANY CONSTRUCTION, THE CONTRACTOR MUST NOTIFY THE APPLICABLE JURISDICTIONAL (STATE, COUNTY OR CITY) ENGINEER.
15. THE CONTRACTOR SHALL REMOVED (DRY SCAFF, ETC.) ALL MATERIAL NOT SUITABLE FOR SUBGRADE IN IT'S PRESENT STATE AFTER REMOVAL. IF THE MATERIAL REMAINS UNSUITABLE, THE CONTRACTOR SHALL UNDERCUT THIS MATERIAL AND REPLACE WITH FILL. ALL SUBGRADE SHALL BE PROTECTED WITH A FULLY LOADED TANDY AXLE DUMP TRUCK PRIOR TO PAVING. ANY SORTER MATERIAL SHALL BE REMOVED OR REPLACED.

STRUCTURAL STEEL NOTES:

1. THE FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL CONFORM TO THE AISC SPECIFICATIONS AND MANUAL OF STEEL CONSTRUCTION, 14TH EDITION.
2. UNLESS OTHERWISE NOTED, ALL STRUCTURAL ELEMENTS SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:
 - A. STRUCTURAL STEEL, ASTM DESIGNATION A36 OR GR50.
 - B. ALL BOLTS, ASTM A325 TYPE I GALVANIZED HIGH STRENGTH BOLTS.
 - C. ALL NUTS, ASTM A563 CARBON AND ALLOY STEEL NUTS.
 - D. ALL WASHERS, ASTM F436 HANDED STEEL WASHERS.
3. ALL CONNECTIONS NOT FULLY DETAILED ON THESE PLANS SHALL BE DETAILED BY THE STEEL FABRICATOR IN ACCORDANCE WITH AISC SPECIFICATIONS AND MANUAL OF STEEL CONSTRUCTION, 14TH EDITION.
4. HOLES SHALL NOT BE FLAME CUT THRU STEEL UNLESS APPROVED BY THE ENGINEER.
5. HOT-DIP GALVANIZE ALL ITEMS UNLESS OTHERWISE NOTED. AFTER FABRICATION WHERE PRACTICABLE, REPAIR DAMAGED SURFACES WITH GALVANIZING REPAIR METHOD AND PAINT CONFORMING TO ASTM A780 OR BY APPLICATION OF THICK PASTED MATERIAL SPECIFICALLY DESIGNED FOR REPAIR OF GALVANIZING. CLEAN AREAS TO BE REPAIRED AND REMOVE SLAG FROM WELDS. HEAT SURFACES TO BE GALVANIZED OR PASTE MATERIAL IS APPLIED, WITH A TORCH TO A TEMPERATURE SUFFICIENT TO MELT THE METALLS IN STICK OR PASTED. SPREAD WAXTEN MATERIAL UNIFORMLY OVER SURFACES TO BE COATED AND Wipe OFF EXCESS MATERIAL.
7. A NUT LOCKING DEVICE SHALL BE INSTALLED ON ALL PROPOSED AND/OR REPLACED BOLTS.
8. ALL PROPOSED AND/OR REPLACED BOLTS SHALL BE OF SUFFICIENT LENGTH TO EXCLUDE THE THREADS FROM THE SHEAR PLANE.
9. ALL PROPOSED AND/OR REPLACED BOLTS SHALL BE OF SUFFICIENT LENGTH SUCH THAT THE END OF THE BOLT BE AT LEAST FLUSH WITH THE FACE OF THE NUT. IT IS NOT PERMITTED FOR THE BOLT END TO BE BELOW THE FACE OF THE NUT AFTER TIGHTENING IS COMPLETED.
10. ALL ASSEMBLY AND ANCHOR BOLTS ARE TO BE TIGHTENED TO A "SNUG TIGHT" CONDITION AS DEFINED IN SECTION 8.1 OF THE AISC. "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS", DATED JUNE 30, 2004.
11. PLANT WASHERS ARE TO BE INSTALLED WITH BOLTS OVER SLOTTED HOLES.
12. DO NOT OVER TORQUE ASSEMBLY BOLTS. GALVANIZING ON BOLTS, NUTS, AND STEEL PARTS MAY ACT AS A LUBRICANT. THIS OVER TIGHTENING MAY OCCUR AND MAY CAUSE BOLTS TO CRACK AND SNAP OFF.
13. PAL NUTS ARE TO BE INSTALLED AFTER NUTS ARE TIGHT AND WITH EDGE LIP OUT. PAL NUTS ARE NOT REQUIRED WHEN SELF-LOCKING NUTS ARE PROVIDED.
14. GALVANIZED ASTM A325 BOLTS SHALL NOT BE REUSED.
15. ALL WELDING SHALL BE IN ACCORDANCE WITH THE AWS D1.1:2010 STRUCTURAL WELDING CODE-REINFORCING STEEL. ALL WELDERS SHALL DISPLAY PROPER CERTIFICATION OF QUALIFICATION.

GROUNDING NOTES:

1. ALL CABLED CONNECTIONS TO GALVANIZED MATERIAL SHALL BE PROPERLY PREPARED TO ASSURE A SATISFACTORY CABLED.
2. CABLED CONNECTION SHALL BE COATED WITH COLD GALVANIZING SPRAY.
3. ALL VERTICAL JUMPERS SHALL NOT BE WELDED WITHIN TWO FT OF THE GROUND ROD.
4. SECTOR GROUNDING DIAGRAM:



<p>PLANS PREPARED FOR:</p> <p>U.S. Cellular</p> <p>8410 W. BRYN MAWR, SUITE 700 CHICAGO, IL 60631 (773) 395-6900</p> <p>PROJECT INFORMATION:</p> <p>768333</p> <p>FORK UNION USF</p> <p>2984 JAMES MADISON HIGHWAY FORK UNION, VA 23022 (FLUVANNA COUNTY)</p> <p>PLANS PREPARED BY:</p>	<p>SEAL:</p> <p>OTHER ENGINEERING PROFESSIONALS</p> <p>326 TRYON ROAD RALEIGH, NC 27604-5530 OFFICE (813) 651-4351 www.arpengineering.com</p> <p>GRAHAM M. ANDRES Lic. No. 44739</p> <p>Professional Engineer April 12, 2018</p>	<p>SHEET TITLE:</p> <p>GENERAL NOTES</p>	<p>SHEET NUMBER: N-1</p> <p>REVISION: 2</p> <p>REV. DATE: 04-12-18 CONSTRUCTION</p> <p>03-25-18 PRELIMINARY</p> <p>11-09-17 PRELIMINARY</p> <p>REV. DATE: ISSUED FOR</p> <p>DRAWN BY: 3955 CHECKED BY: LMK</p> <p>TEF # 52945 / 152902</p>
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**FLUVANNA COUNTY BOARD OF SUPERVISORS
AGENDA ITEM STAFF REPORT**

TAB F

MEETING DATE:	February 6, 2019				
AGENDA TITLE:	Consent to Modify Equipment on Water Tower with Cellco Partnership, d/b/a Verizon Wireless				
MOTION(s):	I move the Board of Supervisors ratify the “Consent to Modify Equipment”, with Cellco Partnership, d/b/a Verizon Wireless for the purposes of allowing the modifications described.				
TIED TO STRATEGIC INITIATIVES?	Yes	No	If yes, list initiative(s):		
		X			
AGENDA CATEGORY:	Public Hearing	Action Matter	Presentation	Consent Agenda	Other
				XX	
STAFF CONTACT(S):	Cyndi Toler, Purchasing Officer				
PRESENTER(S):	Cyndi Toler, Purchasing Officer				
RECOMMENDATION:	Approval.				
TIMING:	Current.				
DISCUSSION:	The Consent to Modify Equipment on Water Tower allows for the Tenant to make certain replacements and modifications to their equipment on the county owned water tower. Per the original lease agreement, this document is all that is required to give consent for these changes. All other terms of the original lease will stay the same.				
FISCAL IMPACT:	none				
POLICY IMPACT:	N/A				
LEGISLATIVE HISTORY:	N/A				
ENCLOSURES:	Second Amendment to Structure Lease Agreement				
REVIEWS COMPLETED:	Legal	Finance	Purchasing	HR	Other
	XX	XX			



January 8th, 2018

George N. Condyles, IV
The Atlantic Group of Companies
6260 Pine Slash Road
Mechanicsville, VA 23116

RE: Fluvanna County Water Tank – 2984 James Madison Highway
Lease Agreement between Cellco Partnership, a Delaware general partnership,
d/b/a Verizon Wireless (Lessee) & Board of Supervisors of Fluvanna County,
Virginia (Lessor) dated October 20th, 2011
Verizon Site Name: Bremo Bluff / Location Code #184106

Dear Mr. Condyles,

Per Section 8. (Use; Government Approvals) of the above referenced agreement,
Verizon Wireless is required to receive Lessor consent when any Lessee equipment
modification increases the tower loading. Verizon Wireless will be swapping (12)
existing antenna for (6) new antenna, add (6) new Remote Radio Heads, add (1)
OVP, and swap (1) existing coax for (1) new fiber cables. All modifications will be
made per structural analysis dated November 14th, 2018 completed by Tower
Engineering Professionals.

Please indicate below the Lessor's approval of the proposed changes. If you have
any questions or comments or need any additional information please let me know.

Sincerely,

Nathan Holland
GDN Sites on behalf of Verizon Wireless
Site Development Consultant
(757) 305-8420 / nathan.holland@gdnsites.com

By: 

Name: Steven M. Nichols
County Administrator

Title: Fluvanna County

Date: 1/23/19

513 Stewart Street
Suite E
Charlottesville, VA 22902



Tower Engineering Professionals
 326 Tryon Road
 Raleigh, NC 27603
 (919) 661-6351
Structures@tepgroup.net

November 14, 2018

Nathan Holland
 GDN Sites
 513 Stewart Street, Suite E
 Charlottesville, VA 22902
 (757) 305-8420

Subject: Structural Analysis Report

Carrier Designation: Verizon Wireless Reconfiguration
Site Number: 184106
Site Name: Fluvanna County WT

Engineering Firm Designation: TEP Project Number: 52861.195718

Site Data: 2984 James Madison Hwy,
 Fork Union, Fluvanna County, VA 23022
 Latitude 37° 45' 03.24", Longitude -78° 17' 11.17"
 115.3 Foot - 200,000 Gallon - 4-Column Elevated Water Tank

Dear Nathan Holland,

Tower Engineering Professionals is pleased to submit this "Structural Analysis Report" to determine the structural integrity of the above mentioned water tank.

The purpose of the analysis is to determine acceptability of the water tank stress level, including the lateral-resistance system. Based on our analysis we have determined the water tank stress level for the structure under the following load case, to be:

LC1: Existing + Proposed + Future Equipment

Sufficient Capacity

Note: See Table 1 for the existing, proposed, and future loading

Structure Capacity	Controlling Component	Notes
104.4%	Sway Rods	Lateral-Resistance System
80.3%	Diagonals	Corral Mount

The analysis has been performed in accordance with the ASCE 7-10 Minimum Design Loads for Buildings and Other Structures and the 2015 Virginia Construction Code based upon a wind speed of 120 mph 3-second gust and exposure category B.

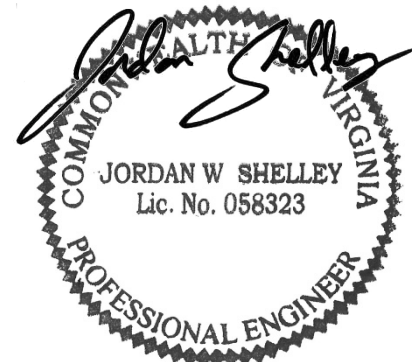
All modifications and equipment proposed in this report shall be installed in accordance with the appurtenances listed in Table 1 for the determined available structural capacity to be effective.

We at Tower Engineering Professionals appreciate the opportunity of providing our continuing professional services to you and GDN Sites. If you have any questions or need further assistance on this or any other projects please give us a call.

Structural analysis prepared by: Ryan N. Morofsky, E.I.

Respectfully submitted by:

Jordan W. Shelley, P.E.



11/14/2018

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Corral Mount Analysis

1) INTRODUCTION

The water tank is a 115.3-ft, 200,000-gallon, 4-column elevated water tank designed by Phoenix Fabricators and Erectors, Inc. in 2005. TEP visited the site in April of 2017 to collect existing steel and appurtenance information. All information provided to TEP was assumed to be accurate and complete.

2) ANALYSIS CRITERIA

The analysis has been performed in accordance with the ASCE 7-10 Minimum Design Loads for Buildings and Other Structures and the 2015 Virginia Construction Code using a 3-second gust wind speed of 120 mph with the following design criteria. Seismic loading was not considered in this analysis. The structure may remain unaltered with respect to the seismic loading per Section 1103.3 of the 2015 IEBC because the additional loading does not increase the seismic forces in any structural element by more than 10% cumulative since the original construction.

- 1) Classification of Structure: **Class III**
- 2) Exposure Category: **Exposure B**
- 3) Topographic Category: **Category 1**

Table 1 - Existing, Proposed, and Future Antenna and Cable Information

Existing/ Proposed	Elevation (ft)	Qty	Antenna Model	Mount Type	Qty Coax	Coax Size	Coax Location	Owner/ Tenant
Existing	118.5	3	KMW AM-X-CD-17-65-00T-RET	(24) Post Corral Mount	3	1 1/4 Hybrid 1 5/8	A-Leg	USCC
		6	Kaelus B12/B5 Combiner					
		3	Nokia FRBG B12 RRH					
		3	Nokia FXCB/A B5 RRH					
		3	Raycap RUSDC-6267-PF-48					
		6	Antel WPA 80063/8CF					
Final Proposed Config.	118.5	6	Andrew NHH-85C-R2B		6 3	1 5/8 Fiber	B-Leg	Verizon
		3	Nokia AHBC Airscale 4T4R B/5/B13 320W					
		3	Nokia AHFIC Airscale 4T4R B2/B66Aa 320W					
		3	Raycap RHSDC-3315-PF-48					
		6	Raycap RHSDC-1064-PF-48					
Reserved	95.0	6	Commscope RRV65B-C3-3XR	Catwalk Handrail	2 3	1/2 Hybrid	D-Leg¹	Shentel
		6	Alcatel Lucent FD-RRH-4x45-1900MHz					
		6	Alcatel Lucent FD-RRH-2x50-800MHz					
		1	2' MW Dish					
		1	Alcatel Lucent 9500 MPR					

Notes:

- 1) Coax location was not specified and was assumed by TEP.

3) ANALYSIS PROCEDURE

Table 2 - Documents Provided

Document	Remarks	Source
Steel and Appurtenance Mapping	Tower Engineering Professionals, Inc., dated September 4, 2014 TEP No. 52861.15529	TEP
Mount Mapping Report	Tower Engineering Professionals, Inc., dated May 26, 2017 TEP No. 52861.120867	TEP
Previous Structural Analysis	Tower Engineering Professionals, Inc., dated March 26, 2018 TEP No. 52861.152764	TEP
Construction Drawings	Tower Engineering Professionals, Inc., dated June 13, 2018 TEP No. 52861.152902	TEP
Correspondence	Correspondence from GDN Sites in reference to the existing, proposed, and reserved loading.	GDN

3.1) Analysis Method

RISA-3D (version 16.0.1), a commercially available analysis software package, was used to create a three-dimensional model of the water tank structure and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

- 1) The water tank, tank components, and foundation were built in accordance with the manufacturer's specifications.
- 2) The water tank, tank components, and foundation have been maintained in accordance with the manufacturer's specification.
- 3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Table 1.
- 4) All water tank components are in sufficient condition to carry their full design capacity.
- 5) Serviceability with respect to antenna twist, tilt, roll, or lateral translation, is not checked and is left to the carrier or tank owner to ensure conformance.
- 6) All antenna mounts and mounting hardware are structurally sufficient to carry the full design capacity requirements of appurtenance wind area and weight as provided by the original manufacturer specifications. It is the carrier's responsibility to ensure compliance to the structural limitations of the existing and/or proposed antenna mounts. TEP did not perform a site visit to verify the size, condition or capacity of the antenna mounts and did not analyze antennas supporting mounts as part of this structural analysis report.
- 7) The member stresses in the tank shell, catwalk handrail and platform, and inner corral mount were not considered as part of this analysis.
- 8) All member connections are assumed to have a greater capacity than the supporting member.
- 9) The following material grades were assumed:
 - a) All steel members: ASTM A36
 - b) Anchor bolts: ASTM A36

This analysis may be affected if any assumptions are not valid or have been made in error. Tower Engineering Professionals should be notified to determine the effect on the structural integrity of the water tank.

4) ANALYSIS RESULTS

Table 3 - Water Tank Component Capacity

Notes	Component	% Capacity	Pass / Fail
1	Columns	92.3	Pass
1	Riser	51.0	Pass
1,2	Sway Rods	104.4	Pass
1	Struts	43.3	Pass
1	Hub Rods	15.6	Pass
1	Anchor Bolts	80.0	Pass

Table 4 - Foundation Comparison Results

Component	Analysis without Antennas (kips)	Analysis with Antennas (kips)	Ratio	Notes
Column Download	460.3	506.2	1.10	Maximum Water
Column Uplift	.3	.3	.3	Minimum Water
Column Shear	27.3	38.3	1.41	-
Riser Download	751.7	751.7	1.00	-
Riser Shear	3.2	3.0	0.94	-

Structure Rating (max from all components) =	104.4%
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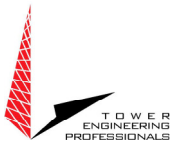
Notes:

- 1) See additional documentation in "Appendix A - Analysis Calculations" for calculations supporting the % capacity listed.
- 2) A structure rating of 105% or less is within engineering tolerances and considered acceptable per the 2012 IEBC Section 1007.1 Exception #1.
- 3) Uplift in columns is considered negligible compared to the other base reactions.

4.1) Recommendations

- 1) The tank and tank components have sufficient capacity to carry the existing and proposed loads. No modifications are required at this time.
- 2) This analysis assumes the structural integrity of the tank and tank components has not been compromised. TEP recommends inspection and maintenance be performed at regular intervals as prescribed by AWWA M42 (every three years).
- 3) If the load differs from that described in Table 1 of this report or the provisions of this analysis are found to be invalid, another structural analysis should be performed.
- 4) TEP did not have sufficient information to perform a foundation analysis. Provide TEP with foundation drawings and a geotechnical report for this site in order to determine the substructure capacity. If this information is not available, TEP recommends a foundation mapping and geotechnical investigation.

APPENDIX A
ANALYSIS CALCULATIONS



184106 - Fluvanna County WT
TEP #: 52861.195718
Analysis: RNM 11/14/2018
Check: WBA 11/14/2018

Water Tank Analysis_v0.6 - Inputs

Water Tank Type:	Multi Column	Exposure:	B
Code:	ASCE 7-10	Topo:	1
Wind Speed:	120 mph	Crest Ht.:	0

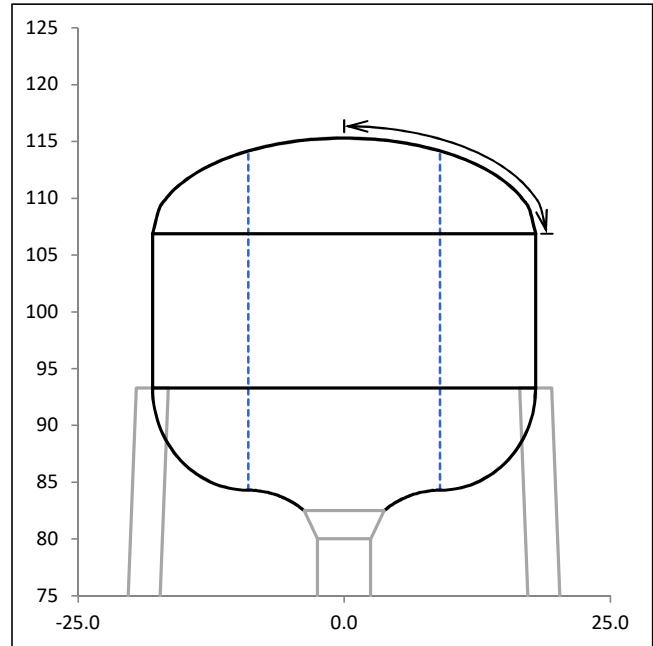
Column Quantity	Bays	Column Radius Bot. (ft)	Column Radius Top (ft)	Tank Radius (ft)
4	2	21.92	18.00	18.00

Riser Shape:	Pipe
Riser Size:	P60x0.304
Riser Height:	82.5 ft
BCL (estimated):	85.3 ft

Hub Rods @ top of Riser?

	Height (ft)	Column Type	Column Size	Sway Rod Type	Sway Rod Size	Sway Rod Stagger (0,1,2)	Strut Type	Strut Size	Hub Rod Type	Hub Rod Size
Bay 1:	46.38	Pipe	P24x0.301	SR	SR 1-1/2	0	WF	W8x31	SR	SR 1
Hub Rods:	81.00	Pipe	P24x0.301	SR	SR 1-1/2	0			SR	SR 1
B/Catwalk:	93.29									

Tank Shape		Height (ft)	t_{AVG} (in)
Torus Bottom		Top: 8.42	0.2500
		Middle: 13.58	0.3125
Torus Radius		Bottom: 10.79	0.3750
Assumed		Arc Length: 21.436	ft
		Volume: 26,861	ft ³
		Volume: 200,931	gal
		Assumed Rated Tank Volume: 200,000	gal
<input type="checkbox"/> Dry Riser?		Water Weight: 1668.33	kip
		Weight to Riser: 520.69	kip
S_{Area,top}:	1,368.7	A_{Proj,top}:	238.0
S_{Area,mid}:	1,536.2	A_{Proj,mid}:	489.0
S_{Area,bot}:	1,520.5	A_{Proj,bot}:	305.1
Total:	4,425.5	Total:	1,032.1
Wt_{top}:	13.97	Wind_{top}:	3.51
Wt_{mid}:	19.60	Wind_{mid}:	7.22
Wt_{bot}:	23.28	Wind_{bot}:	4.50
Total:	56.86	Total:	15.23



BASE REACTIONS			
Member	Download (k)	Uplift (k)	Shear (k)
Columns	506.2	112.2	38.3
Riser	751.7	0.0	3.0

COLUMN ANCHOR RODS			
Total Area (in ²)	φTn (kips)	φVn (kips)	Capacity
4.81	140.12	94.17	80.0%

184106 - Fluvanna County WT
TEP #: 52861.195718
Analysis: RNM 11/14/2018
Check: WBA 11/14/2018

Water Tank Analysis_v0.0 - Joint Reactions and Anchor Bolt Capacities

BASE REACTIONS			
Member	Download (k)	Uplift (k)	Shear (k)
Columns	506.23	112.15	38.35
Riser	751.67	0.00	3.02

Anchor Bolt Diameter: 1.750 in
 Anchor Bolt Quantity: 2
 Fy: 36 ksi
 Fu: 58 ksi

Ab = 2.405 in²
 Qty*Ab = 4.811 in²

Tension

ft = 23.314 ksi
 Fnt = 43.50 ksi
 F'nt = 38.84 ksi
 F''nt = 38.84 ksi
 Tu = 112.15 kips
 φTn = 140.12 kips

Shear

fv = 7.971 ksi
 Fnv = 26.10 ksi
 F'nv = 26.10 ksi
 F''nv = 26.10 ksi
 Vu = 38.35 kips
 φVn = 94.17 kips

Tension Capacity = **80.0%**
 Shear Capacity = **40.7%**
 Max Capacity = **80.0%**

Handrail Wind and Weight Calculations

Catwalk Radius ft Elevation of Appurtenances: ft
 Number of Posts

Horizontal Properties

Height Perpendicular to Wind of Horizontals	Shape	Area	Cf	CfA
Upper <input type="text" value="2.00"/> in	<input type="text" value="F"/>	13.33	2.00	26.67
Middle <input type="text" value="1.50"/> in	<input type="text" value="F"/>	10.00	2.00	20.00
Lower <input type="text" value="8.00"/> in	<input type="text" value="F"/>	53.33	2.00	106.67

Weight of Horizontals

	Weights
Upper <input type="text" value="2.44"/> plf	306.62
Middle <input type="text" value="1.28"/> plf	160.85
Other 1 <input type="text" value="13.61"/> plf	1710.28
Other 2 <input type="text" value="25.52"/> plf	3206.94

Post Properties

Post Width <input type="text" value="1.75"/> in	<input type="text" value="F"/>	13.42	1.97	26.39	236.32
Post Length <input type="text" value="3.50"/> ft					
Post Weight <input type="text" value="2.11"/> plf					

Appurtenance Properties

(6) Commscope RVV65B-C3-3XR

App. Height <input type="text" value="72.80"/> in	<input type="text" value="F"/>	36.10	1.39	50.00	304.20
App. Width (Wind) <input type="text" value="11.90"/> in					
App. Depth <input type="text" value="7.10"/> in					
App. Weight <input type="text" value="50.70"/> lbs					
Number of App. <input type="text" value="6"/>					

Appurtenance Properties

(1) 2' MW Dish

App. Height <input type="text" value="21.26"/> in	<input type="text" value="F"/>	3.14	1.30	4.08	75.00
App. Width (Wind) <input type="text" value="21.26"/> in					
App. Depth <input type="text" value="6.00"/> in					
App. Weight <input type="text" value="75.00"/> lbs					
Number of App. <input type="text" value="1"/>					

Appurtenance Properties

(6) ALU FD-RRH-4x45-1900 MHz

App. Height <input type="text" value="25.00"/> in	<input type="text" value="F"/>	11.56	1.32	15.27	360.00
App. Width (Wind) <input type="text" value="11.10"/> in					
App. Depth <input type="text" value="10.70"/> in					
App. Weight <input type="text" value="60.00"/> lbs					
Number of App. <input type="text" value="6"/>					

Appurtenance Properties

(6) ALU FD-RRH-2x50-800 MHz

App. Height <input type="text" value="19.00"/> in	<input type="text" value="F"/>	6.81	1.32	8.99	318.00
App. Width (Wind) <input type="text" value="8.60"/> in					
App. Depth <input type="text" value="19.00"/> in					
App. Weight <input type="text" value="53.00"/> lbs					
Number of App. <input type="text" value="6"/>					

Appurtenance Properties

(1) ALU 9500 MPR

App. Height <input type="text" value="11.00"/> in	<input type="text" value="F"/>	0.84	1.30	1.09	14.30
App. Width (Wind) <input type="text" value="11.00"/> in					
App. Depth <input type="text" value="6.50"/> in					
App. Weight <input type="text" value="14.30"/> lbs					
Number of App. <input type="text" value="1"/>					

Appurtenance Properties

(7) Mount Pipes (assumed)

App. Height <input type="text" value="96.00"/> in	<input type="text" value="R"/>	11.08	1.20	13.30	204.96
App. Width (Wind) <input type="text" value="2.38"/> in					
App. Depth <input type="text" value="2.38"/> in					
App. Weight <input type="text" value="29.28"/> lbs					
Number of App. <input type="text" value="7"/>					

Total Weight (kips) = 6.897

Total CfA = 272.5 sf
 Pw = 28.99 psf
 Ka = 0.75

Wind Force = 5.924 kips

BLC 6: HANDRAIL DL (WEIGHT)

N21	L	Y	-6.897
-----	---	---	--------

BLC 7: HANDRAIL LL (WIND)

N21	L	X	-5.924
-----	---	---	--------

Inner Corral Wind and Weight Calculations

Inner Corral Radius 10.19 ft
 Number of Posts 16

Elevation of Appurtenances: 118.50 ft

Horizontal Properties

Height Perpendicular to Wind of Horizontals

Upper	2.00 in
Middle	1.50 in
Lower	4.00 in

Shape	Area	Cf	CfA
F	6.79	2.00	13.59
F	5.10	2.00	10.19
F	13.59	2.00	27.17

Weight of Horizontals

Upper	2.44 plf
Middle	1.28 plf
Lower	3.40 plf

Weights

156.22
81.95
217.69

Post Properties

Post Width	1.75 in
Post Length	3.75 ft
Post Weight	2.11 plf

F	7.29	2.00	14.58	126.60
---	------	------	-------	--------

Total Weight (kips) = 0.582

Total CfA = 65.5 sf
 Pw = 30.88 psf
 Ka = 0.75

Wind Force = 1.518 kips

BLC 8: CORRAL DL (WEIGHT)

N22	L	Y	-0.582
-----	---	---	--------

BLC 9: CORRAL LL (WIND)

N22	L	X	-1.518
-----	---	---	--------

Top of Tank Wind and Weight Calculations

Corral Radius 15.00 ft
 Number of Posts 24

Elevation of Appurtenances: 118.50 ft

Horizontal Properties

Height Perpendicular to Wind of Horizontals

	Shape	Area	Cf	CfA
Upper 2.00 in	F	10.00	2.00	20.00
Middle 2.00 in	F	10.00	2.00	20.00
Lower 1.50 in	F	7.50	2.00	15.00
Toe Plate 4.00 in	F	20.00	2.00	40.00

Weight of Horizontals

	Weights
Upper 2.44 plf	229.96
Middle 2.44 plf	229.96
Lower 1.79 plf	168.70
Toe Plate 3.40 plf	320.44

Post Properties

Post Width 5.00 in	F	57.08	1.69	96.28	1279.20
Post Length 6.50 ft					
Post Weight 8.20 plf					

Kicker 1 Properties

Kicker Width 2.00 in	F	13.18	2.00	26.36	192.96
Kicker Length 6.59 ft					
Kicker Weight 2.44 plf					

Diagonal Properties

Diagonal Width 1.50 in	F	14.63	2.00	29.25	214.80
Diagonal Length 5.00 ft					
Diagonal Weight 1.79 plf					

Appurtenance Properties

	Existing- (6) Kaelus B12/B5 Combiner (USCC) (Shielded)				
App. Height 8.00 in	F	0.00	2.00	0.00	39.60
App. Width (Wind) 0.00 in					
App. Depth 3.70 in					
App. Weight 6.60 lbs					
Number of App. 6					

Appurtenance Properties		Existing - (3) Nokia FRBG B12 RRH (USCC) (Partially Shielded)					
App. Height	15.70	in	F	1.28	1.35	1.72	178.50
App. Width (Wind)	3.90	in					
App. Depth	5.90	in					
App. Weight	59.50	lbs					
Number of App.	3						

Appurtenance Properties		Existing - (3) Nokia FXCB/A B5 RRH (USCC) (Partially Shielded)					
App. Height	22.10	in	F	3.78	1.33	5.01	165.30
App. Width (Wind)	8.20	in					
App. Depth	5.20	in					
App. Weight	55.10	lbs					
Number of App.	3						

Appurtenance Properties		Existing - (3) Raycap RUSDC-6267-PF-48 (USCC)					
App. Height	20.52	in	F	8.08	1.30	10.52	75.00
App. Width (Wind)	18.90	in					
App. Depth	7.02	in					
App. Weight	25.00	lbs					
Number of App.	3						

Appurtenance Properties		Existing - (6) Antel WPA 80063/8CF (USCC)					
App. Height	94.60	in	F	44.15	1.45	63.93	114.00
App. Width (Wind)	11.20	in					
App. Depth	5.10	in					
App. Weight	19.00	lbs					
Number of App.	6						

Appurtenance Properties	Existing - (3) KMW AM-X-CD-17-65-00T-RET (USCC)					
App. Height	96.00	in	F	23.60	1.44	33.93 178.50
App. Width (Wind)	11.80	in				
App. Depth	6.00	in				
App. Weight	59.50	lbs				
Number of App.	3					

Appurtenance Properties	(9) 2.5SCH40 x 8' - USCC (Shielded)					
App. Height	96.00	in	R	0.01	1.20	0.01 417.60
App. Width (Wind)	0.00	in				
App. Depth	2.88	in				
App. Weight	46.40	lbs				
Number of App.	9					

Appurtenance Properties	(6) 2SCH40 x 7' - Verizon					
App. Height	84.00	in	R	8.31	1.20	9.98 153.72
App. Width (Wind)	2.38	in				
App. Depth	2.38	in				
App. Weight	25.62	lbs				
Number of App.	6					

Appurtenance Properties	(3) 2.5SCH40 x 7'-9" - USCC					
App. Height	93.00	in	R	5.57	1.20	6.68 134.85
App. Width (Wind)	2.88	in				
App. Depth	2.88	in				
App. Weight	44.95	lbs				
Number of App.	3					

Appurtenance Properties	Proposed - (6) Andrew NHH-85C-R2B (Verizon)					
App. Height	96.00	in	F	47.60	1.44	68.33 305.40
App. Width (Wind)	11.90	in				
App. Depth	7.10	in				
App. Weight	50.90	lbs				
Number of App.	6					

Appurtenance Properties	Proposed - (3) Nokia AHBCC Airscale 4T4R B/5/B13 320W (Verizon)						
App. Height	22.05	in	F	5.57	1.31	7.32	219.00
App. Width (Wind)	12.13	in					
App. Depth	7.44	in					
App. Weight	73.00	lbs					
Number of App.	3						

Appurtenance Properties	Proposed - (3) Nokia AHFIC Airscale 4T4R B2/B66Aa 320W (Verizon)						
App. Height	22.05	in	F	5.57	1.31	7.32	238.11
App. Width (Wind)	12.13	in					
App. Depth	7.13	in					
App. Weight	79.37	lbs					
Number of App.	3						

Appurtenance Properties	Proposed - (3) Raycap RHSDC-3315-PF-48 (Verizon)						
App. Height	25.66	in	F	8.41	1.31	11.02	96.00
App. Width (Wind)	15.73	in					
App. Depth	10.25	in					
App. Weight	32.00	lbs					
Number of App.	3						

Appurtenance Properties	Proposed - (6) Raycap RHSDC-1064-PF-48 (Verizon)						
App. Height	15.95	in	F	6.75	1.31	8.83	84.00
App. Width (Wind)	10.15	in					
App. Depth	8.15	in					
App. Weight	14.00	lbs					
Number of App.	6						

Appurtenance Properties	(6) 2SCH40 x 7' - Verizon (Shielded)						
App. Height	84.00	in	R	0.00	1.20	0.00	153.72
App. Width (Wind)	0.00	in					
App. Depth	2.38	in					
App. Weight	25.62	lbs					
Number of App.	6						

Total Weight (kips) = 5.189

Total CfA = 481.5 sf

Pw = 30.88 psf

Ka = 1.00

Wind Force = 14.869 kips

BLC 8: CORRAL DL (WEIGHT)

N22	L	Y	-5.189
-----	---	---	--------

BLC 9: CORRAL LL (WIND)

N22	L	X	-14.869
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Feed Line Wind and Weight Calculations

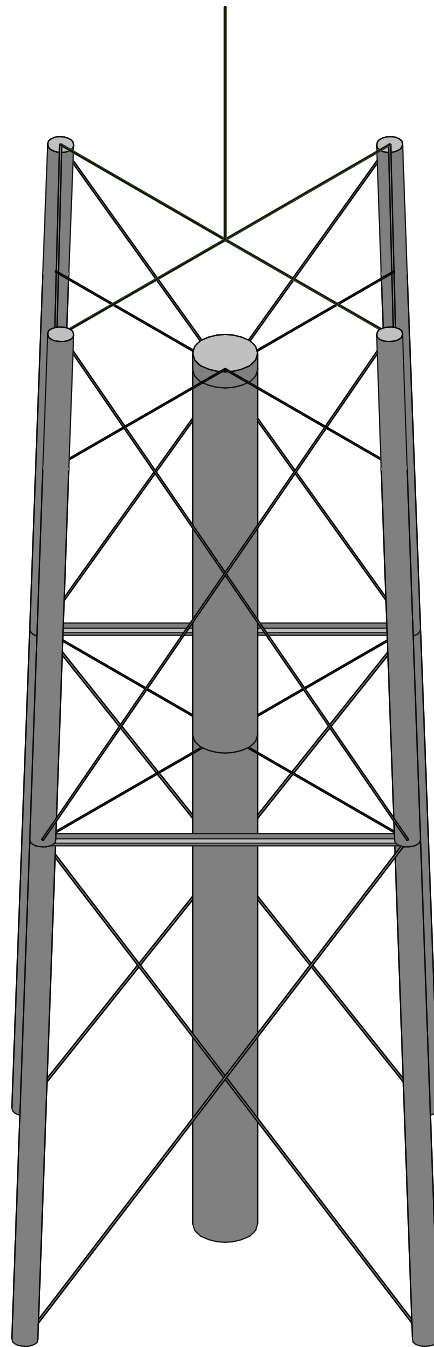
Leg	Description of Lines	Weight (plf)	R Width (in)	R Width (ft)	F Width (in)	F Width (ft)
A	USCC Coax	15.85	10.32	0.860	0.00	0.000
B	Verizon Coax	6.50	3.96	0.330	0.00	0.000
C	Ladder, Safety	8.87	2.36	0.197	2.00	0.167
D	Shentel Coax	2.76	1.63	0.135	0.00	0.000
Riser	Empty	0.00	0.00	0.000	0.00	0.000

BLC 6: HANDRAIL DL (WEIGHT)

COL_1	Y	-15.847	-15.847	0	%100
COL_2	Y	-6.495	-6.495	0	%100
COL_3	Y	-8.867	-8.867	0	%100
COL_4	Y	-2.760	-2.760	0	%100
COL_5	Y	-15.847	-15.847	0	%100
COL_6	Y	-6.495	-6.495	0	%100
COL_7	Y	-8.867	-8.867	0	%100
COL_8	Y	-2.760	-2.760	0	%100

BLC 7: HANDRAIL LL (WIND)

COL_1	X	-21.522	-21.522	0	%100
COL_2	X	-8.259	-8.259	0	%100
COL_3	X	-11.873	-11.873	0	%100
COL_4	X	-3.389	-3.389	0	%100
COL_5	X	-27.399	-27.399	0	%100
COL_6	X	-10.514	-10.514	0	%100
COL_7	X	-15.115	-15.115	0	%100
COL_8	X	-4.314	-4.314	0	%100



Envelope Only Solution

Tower Engineering Profes...

RNM

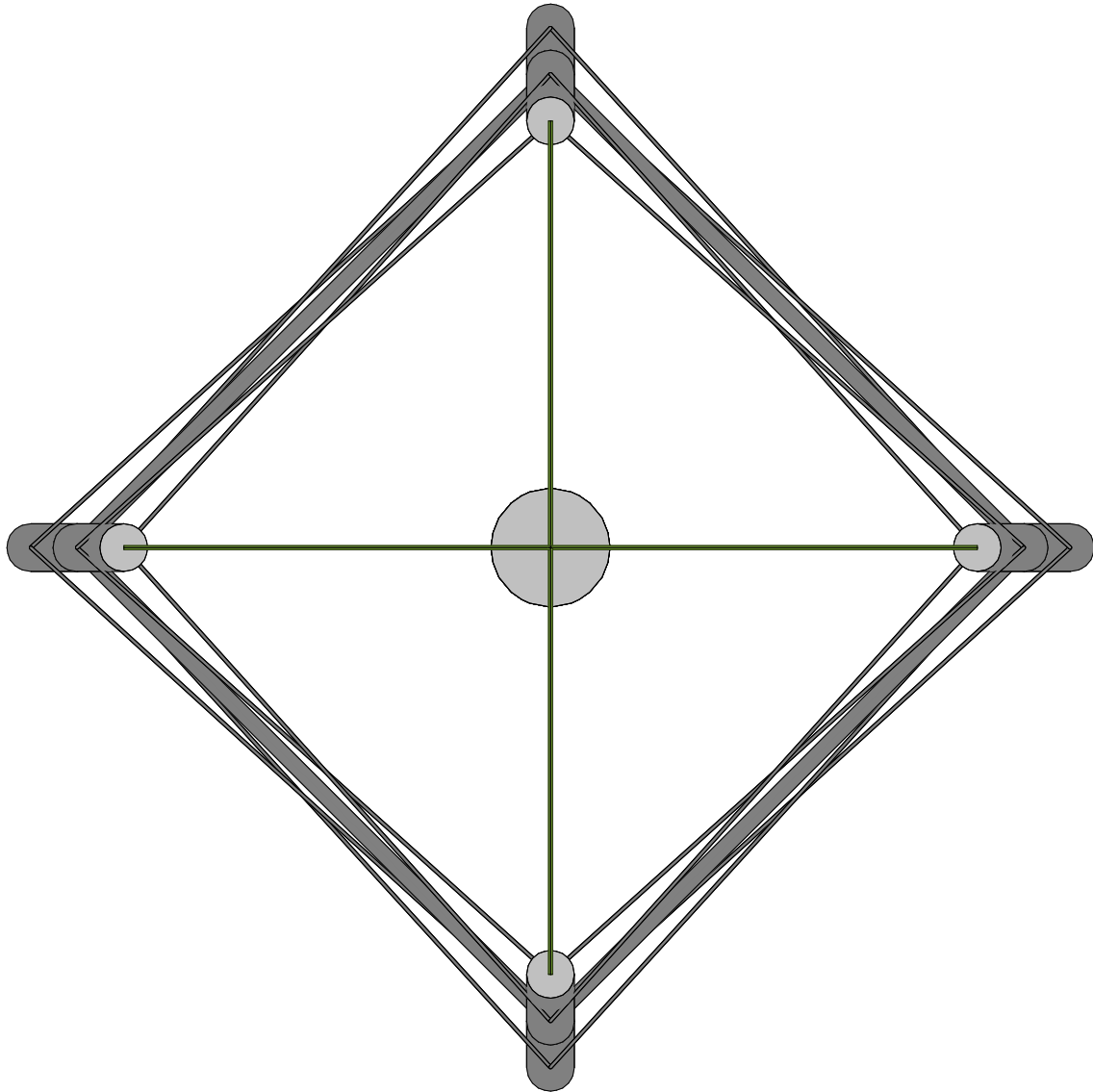
52861.195718

184106 - Fluvanna County WT(LC_1)

SK - 1

Nov 14, 2018 at 12:30 PM

Fork Union_USF_LC1.r3d



Envelope Only Solution

Tower Engineering Profes...

RNM

52861.195718

184106 - Fluvanna County WT(LC_1)

SK - 2

Nov 14, 2018 at 12:30 PM

Fork Union_USF_LC1.r3d



Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 52861.195718
 Model Name : 184106 - Fluvanna County WT(LC_1)

Nov 14, 2018
 2:37 PM
 Checked By: WBA

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	No
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): LRFD
Adjust Stiffness?	No
RISACONNECTION CODE	AISC 13th(360-05): ASD
Cold Formed Steel Code	None
Wood Code	AF&PA NDS-91/97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building AISC 14th(360-10): ASD

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR SET ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8



Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 52861.195718
 Model Name : 184106 - Fluvanna County WT(LC_1)

Nov 14, 2018
 2:37 PM
 Checked By: WBA

(Global) Model Settings, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct X	.035
Ct Z	.035
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	8.5
R Z	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1E..Density[k/ft..	Yield[ksi]	Ry	Fu[ksi]	Rt	
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	33 ksi	29000	11154	.3	.65	.49	33	1.5	58	1.2

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rul...	A [in2]	Iy [in4]	Izz [in4]	J [in4]
1	HR1A	W10x33	Beam	None	A36 Gr.36	Typical	9.71	36.6	171	.583

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N1	21.92	0	0	0	
2	N2	0	0	21.92	0	
3	N3	-21.92	0	0	0	
4	N4	-0.	0	-21.92	0	
5	N5	19.971136	46.38	0	0	
6	N6	0.	46.38	19.971136	0	
7	N7	-19.971136	46.38	0.	0	
8	N8	-0.	46.38	-19.971136	0	
9	N9	18.51642	81	0	0	
10	N10	0.	81	18.51642	0	
11	N11	-18.51642	81	0.	0	
12	N12	-0.	81	-18.51642	0	
13	N13	18	93.29	0	0	
14	N14	0.	93.29	18	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
15	N15	-18	93.29	0.	0	
16	N16	-0.	93.29	-18	0	
17	N17	0	0	0	0	
18	N18	0	46.38	0	0	
19	N19	0	81	0	0	
20	N20	0	82.5	0	0	
21	N21	0	93.29	0	0	
22	N22	0	115.333	0	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N1	Reaction	Reaction	Reaction			
2	N2	Reaction	Reaction	Reaction			
3	N3	Reaction	Reaction	Reaction			
4	N4	Reaction	Reaction	Reaction			
5	N17	Reaction	Reaction	Reaction		Reaction	

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design ...
1	COL 1	N1	N5			P24x0.301	None	None	A36 G...	Typical
2	COL 2	N2	N6			P24x0.301	None	None	A36 G...	Typical
3	COL 3	N3	N7			P24x0.301	None	None	A36 G...	Typical
4	COL 4	N4	N8			P24x0.301	None	None	A36 G...	Typical
5	COL 5	N5	N13			P24x0.301	None	None	A36 G...	Typical
6	COL 6	N6	N14			P24x0.301	None	None	A36 G...	Typical
7	COL 7	N7	N15			P24x0.301	None	None	A36 G...	Typical
8	COL 8	N8	N16			P24x0.301	None	None	A36 G...	Typical
9	SW RD 1	N1	N6			SR 1-1/2	None	None	A36 G...	Typical
10	SW RD 2	N2	N7			SR 1-1/2	None	None	A36 G...	Typical
11	SW RD 3	N3	N8			SR 1-1/2	None	None	A36 G...	Typical
12	SW RD 4	N4	N5			SR 1-1/2	None	None	A36 G...	Typical
13	SW RD 5	N5	N14			SR 1-1/2	None	None	A36 G...	Typical
14	SW RD 6	N6	N15			SR 1-1/2	None	None	A36 G...	Typical
15	SW RD 7	N7	N16			SR 1-1/2	None	None	A36 G...	Typical
16	SW RD 8	N8	N13			SR 1-1/2	None	None	A36 G...	Typical
17	SW RD 9	N5	N2			SR 1-1/2	None	None	A36 G...	Typical
18	SW RD 10	N6	N3			SR 1-1/2	None	None	A36 G...	Typical
19	SW RD 11	N7	N4			SR 1-1/2	None	None	A36 G...	Typical
20	SW RD 12	N8	N1			SR 1-1/2	None	None	A36 G...	Typical
21	SW RD 13	N13	N6			SR 1-1/2	None	None	A36 G...	Typical
22	SW RD 14	N14	N7			SR 1-1/2	None	None	A36 G...	Typical
23	SW RD 15	N15	N8			SR 1-1/2	None	None	A36 G...	Typical
24	SW RD 16	N16	N5			SR 1-1/2	None	None	A36 G...	Typical
25	HB RD 1	N5	N18			SR 1	None	None	A36 G...	Typical
26	HB RD 2	N6	N18			SR 1	None	None	A36 G...	Typical
27	HB RD 3	N7	N18			SR 1	None	None	A36 G...	Typical
28	HB RD 4	N8	N18			SR 1	None	None	A36 G...	Typical
29	HB RD 5	N9	N19			SR 1	None	None	A36 G...	Typical
30	HB RD 6	N10	N19			SR 1	None	None	A36 G...	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design ...
31	HB RD 7	N11	N19			SR 1	None	None	A36 G...	Typical
32	HB RD 8	N12	N19			SR 1	None	None	A36 G...	Typical
33	RISER 1	N17	N18			P60x0.304	None	None	A36 G...	Typical
34	RISER 2	N18	N19			P60x0.304	None	None	A36 G...	Typical
35	RISER 3	N19	N20			P60x0.304	None	None	A36 G...	Typical
36	STRUT 1	N5	N6			W8x31	None	None	A36 G...	Typical
37	STRUT 2	N6	N7			W8x31	None	None	A36 G...	Typical
38	STRUT 3	N7	N8			W8x31	None	None	A36 G...	Typical
39	STRUT 4	N8	N5			W8x31	None	None	A36 G...	Typical
40	RIGID1	N13	N21			RIGID	None	None	RIGID	Typical
41	RIGID2	N14	N21			RIGID	None	None	RIGID	Typical
42	RIGID3	N15	N21			RIGID	None	None	RIGID	Typical
43	RIGID4	N16	N21			RIGID	None	None	RIGID	Typical
44	RIGID5	N21	N22			RIGID	None	None	RIGID	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Analysi...	Inactive	Seismic Desig...
1	COL 1						Yes			None
2	COL 2						Yes			None
3	COL 3						Yes			None
4	COL 4						Yes			None
5	COL 5						Yes			None
6	COL 6						Yes			None
7	COL 7						Yes			None
8	COL 8						Yes			None
9	SW RD 1					Tension Only	Yes			None
10	SW RD 2					Tension Only	Yes			None
11	SW RD 3					Tension Only	Yes			None
12	SW RD 4					Tension Only	Yes			None
13	SW RD 5					Tension Only	Yes			None
14	SW RD 6					Tension Only	Yes			None
15	SW RD 7					Tension Only	Yes			None
16	SW RD 8					Tension Only	Yes			None
17	SW RD 9					Tension Only	Yes			None
18	SW RD 10					Tension Only	Yes			None
19	SW RD 11					Tension Only	Yes			None
20	SW RD 12					Tension Only	Yes			None
21	SW RD 13					Tension Only	Yes			None
22	SW RD 14					Tension Only	Yes			None
23	SW RD 15					Tension Only	Yes			None
24	SW RD 16					Tension Only	Yes			None
25	HB RD 1	BenPIN	BenPIN			Tension Only	Yes			None
26	HB RD 2	BenPIN	BenPIN			Tension Only	Yes			None
27	HB RD 3	BenPIN	BenPIN			Tension Only	Yes			None
28	HB RD 4	BenPIN	BenPIN			Tension Only	Yes			None
29	HB RD 5	BenPIN	BenPIN			Tension Only	Yes			None
30	HB RD 6	BenPIN	BenPIN			Tension Only	Yes			None
31	HB RD 7	BenPIN	BenPIN			Tension Only	Yes			None
32	HB RD 8	BenPIN	BenPIN			Tension Only	Yes			None
33	RISER 1						Yes			None



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 Designer : RNM
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Member Advanced Data (Continued)

Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical Analsi...	Inactive	Seismic Desig...
34	RISER 2					Yes		None
35	RISER 3					Yes		None
36	STRUT 1	BenPIN	BenPIN			Yes		None
37	STRUT 2	BenPIN	BenPIN			Yes		None
38	STRUT 3	BenPIN	BenPIN			Yes		None
39	STRUT 4	BenPIN	BenPIN			Yes		None
40	RIGID1					Yes		None
41	RIGID2					Yes		None
42	RIGID3					Yes		None
43	RIGID4					Yes		None
44	RIGID5					Yes		None

Hot Rolled Steel Design Parameters

Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	COL 1	P24x0.301	46.421					1	1		Lateral
2	COL 2	P24x0.301	46.421					1	1		Lateral
3	COL 3	P24x0.301	46.421					1	1		Lateral
4	COL 4	P24x0.301	46.421					1	1		Lateral
5	COL 5	P24x0.301	46.951					1	1		Lateral
6	COL 6	P24x0.301	46.951					1	1		Lateral
7	COL 7	P24x0.301	46.951					1	1		Lateral
8	COL 8	P24x0.301	46.951					1	1		Lateral
9	SW RD 1	SR 1-1/2	55.049					1	1		Lateral
10	SW RD 2	SR 1-1/2	55.049					1	1		Lateral
11	SW RD 3	SR 1-1/2	55.049					1	1		Lateral
12	SW RD 4	SR 1-1/2	55.049					1	1		Lateral
13	SW RD 5	SR 1-1/2	54.068					1	1		Lateral
14	SW RD 6	SR 1-1/2	54.068					1	1		Lateral
15	SW RD 7	SR 1-1/2	54.068					1	1		Lateral
16	SW RD 8	SR 1-1/2	54.068					1	1		Lateral
17	SW RD 9	SR 1-1/2	55.049					1	1		Lateral
18	SW RD 10	SR 1-1/2	55.049					1	1		Lateral
19	SW RD 11	SR 1-1/2	55.049					1	1		Lateral
20	SW RD 12	SR 1-1/2	55.049					1	1		Lateral
21	SW RD 13	SR 1-1/2	54.068					1	1		Lateral
22	SW RD 14	SR 1-1/2	54.068					1	1		Lateral
23	SW RD 15	SR 1-1/2	54.068					1	1		Lateral
24	SW RD 16	SR 1-1/2	54.068					1	1		Lateral
25	HB RD 1	SR 1	19.971					1	1		Lateral
26	HB RD 2	SR 1	19.971					1	1		Lateral
27	HB RD 3	SR 1	19.971					1	1		Lateral
28	HB RD 4	SR 1	19.971					1	1		Lateral
29	HB RD 5	SR 1	18.516					1	1		Lateral
30	HB RD 6	SR 1	18.516					1	1		Lateral
31	HB RD 7	SR 1	18.516					1	1		Lateral
32	HB RD 8	SR 1	18.516					1	1		Lateral
33	RISER 1	P60x0.304	46.38					1	1		Lateral
34	RISER 2	P60x0.304	34.62					1	1		Lateral
35	RISER 3	P60x0.304	1.5					1	1		Lateral
36	STRUT 1	W8x31	28.243					1	1		Lateral



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Hot Rolled Steel Design Parameters (Continued)

Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
37	STRUT 2	W8x31	28.243					1	1		Lateral
38	STRUT 3	W8x31	28.243					1	1		Lateral
39	STRUT 4	W8x31	28.243					1	1		Lateral

Joint Loads and Enforced Displacements (BLC 3 : TANK DL (WATER))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N20	L	Y	-520.694
2	N13	L	Y	-286.91
3	N14	L	Y	-286.91
4	N15	L	Y	-286.91
5	N16	L	Y	-286.91

Joint Loads and Enforced Displacements (BLC 4 : TANK DL (STEEL))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N13	L	Y	-14.215
2	N14	L	Y	-14.215
3	N15	L	Y	-14.215
4	N16	L	Y	-14.215

Joint Loads and Enforced Displacements (BLC 5 : TANK LL (WIND))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N13	L	X	-3.808
2	N14	L	X	-3.808
3	N15	L	X	-3.808
4	N16	L	X	-3.808

Joint Loads and Enforced Displacements (BLC 6 : HANDRAIL DL (WEIGHT))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N21	L	Y	-6.912

Joint Loads and Enforced Displacements (BLC 7 : HANDRAIL LL (WIND))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N21	L	X	-5.924

Joint Loads and Enforced Displacements (BLC 8 : CORRAL DL (WEIGHT))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N22	L	Y	-.582
2	N22	L	Y	-5.189

Joint Loads and Enforced Displacements (BLC 9 : CORRAL LL (WIND))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N22	L	X	-1.518
2	N22	L	X	-14.869



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Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Member Distributed Loads (BLC 2 : MEMBER WIND FORCES)

Member Label	Direction	Start Magnitude[lb/ft,F,ksf]	End Magnitude[lb/ft,F,ksf]	Start Location[ft,...]	End Location[ft,%]
1	COL 1	X	-50.008	-50.008	0 %100
2	COL 2	X	-50.052	-50.052	0 %100
3	COL 3	X	-50.008	-50.008	0 %100
4	COL 4	X	-50.052	-50.052	0 %100
5	COL 5	X	-63.662	-63.662	0 %100
6	COL 6	X	-63.718	-63.718	0 %100
7	COL 7	X	-63.662	-63.662	0 %100
8	COL 8	X	-63.718	-63.718	0 %100
9	SW RD 1	X	-2.87	-2.87	0 %100
10	SW RD 2	X	-2.915	-2.915	0 %100
11	SW RD 3	X	-2.87	-2.87	0 %100
12	SW RD 4	X	-2.915	-2.915	0 %100
13	SW RD 5	X	-3.701	-3.701	0 %100
14	SW RD 6	X	-3.755	-3.755	0 %100
15	SW RD 7	X	-3.701	-3.701	0 %100
16	SW RD 8	X	-3.755	-3.755	0 %100
17	SW RD 9	X	-2.915	-2.915	0 %100
18	SW RD 10	X	-2.87	-2.87	0 %100
19	SW RD 11	X	-2.915	-2.915	0 %100
20	SW RD 12	X	-2.87	-2.87	0 %100
21	SW RD 13	X	-3.755	-3.755	0 %100
22	SW RD 14	X	-3.701	-3.701	0 %100
23	SW RD 15	X	-3.755	-3.755	0 %100
24	SW RD 16	X	-3.701	-3.701	0 %100
25	HB RD 1	X	0	0	0 %100
26	HB RD 2	X	-2.362	-2.362	0 %100
27	HB RD 3	X	0	0	0 %100
28	HB RD 4	X	-2.362	-2.362	0 %100
29	HB RD 5	X	0	0	0 %100
30	HB RD 6	X	-2.77	-2.77	0 %100
31	HB RD 7	X	0	0	0 %100
32	HB RD 8	X	-2.77	-2.77	0 %100
33	RISER 1	X	-105.433	-105.433	0 %100
34	RISER 2	X	-130.735	-130.735	0 %100
35	RISER 3	X	-140.401	-140.401	0 %100
36	STRUT 1	X	-22.269	-22.269	0 %100
37	STRUT 2	X	-22.269	-22.269	0 %100
38	STRUT 3	X	-22.269	-22.269	0 %100
39	STRUT 4	X	-22.269	-22.269	0 %100

Member Distributed Loads (BLC 8 : CORRAL DL (WEIGHT))

Member Label	Direction	Start Magnitude[lb/ft,F,ksf]	End Magnitude[lb/ft,F,ksf]	Start Location[ft,...]	End Location[ft,%]
1	COL 1	Y	-15.847	-15.847	0 %100
2	COL 2	Y	-6.495	-6.495	0 %100
3	COL 3	Y	-8.867	-8.867	0 %100



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Member Distributed Loads (BLC 8 : CORRAL DL (WEIGHT)) (Continued)

Member Label	Direction	Start Magnitude[lb/ft,F,ksf]	End Magnitude[lb/ft,F,ksf]	Start Location[ft,...]	End Location[ft,%]
4	COL 4	Y	-2.535	-2.535	0 %100
5	COL 5	Y	-15.847	-15.847	0 %100
6	COL 6	Y	-6.495	-6.495	0 %100
7	COL 7	Y	-8.867	-8.867	0 %100
8	COL 8	Y	-2.535	-2.535	0 %100

Member Distributed Loads (BLC 9 : CORRAL LL (WIND))

Member Label	Direction	Start Magnitude[lb/ft,F,ksf]	End Magnitude[lb/ft,F,ksf]	Start Location[ft,...]	End Location[ft,%]
1	COL 1	X	-21.522	-21.522	0 %100
2	COL 2	X	-8.259	-8.259	0 %100
3	COL 3	X	-11.873	-11.873	0 %100
4	COL 4	X	-3.233	-3.233	0 %100
5	COL 5	X	-27.399	-27.399	0 %100
6	COL 6	X	-10.514	-10.514	0 %100
7	COL 7	X	-15.115	-15.115	0 %100
8	COL 8	X	-4.115	-4.115	0 %100

Basic Load Cases

BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed Area(Me...)	Surface(...)
1	GRAVITY	None	-1					
2	MEMBER WIND FORCES	None					39	
3	TANK DL (WATER)	None			5			
4	TANK DL (STEEL)	None			4			
5	TANK LL (WIND)	None			4			
6	HANDRAIL DL (WEIGHT)	None			1			
7	HANDRAIL LL (WIND)	None			1			
8	CORRAL DL (WEIGHT)	None			2		8	
9	CORRAL LL (WIND)	None			2		8	

Envelope Joint Reactions

Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC	
1	N1	max	38.347	3	440.894	1	.003	1	0	1	0	1	0	1
2		min	-18.482	1	-112.154	3	-.19	3	0	1	0	1	0	1
3	N2	max	15.135	2	440.201	1	12.831	3	0	1	0	1	0	1
4		min	.004	1	28.913	3	-18.465	1	0	1	0	1	0	1
5	N3	max	22.222	2	506.225	2	.003	1	0	1	0	1	0	1
6		min	7.53	3	153.755	3	.002	3	0	1	0	1	0	1
7	N4	max	14.843	2	439.73	1	18.455	1	0	1	0	1	0	1
8		min	.004	1	28.61	3	-12.642	3	0	1	0	1	0	1
9	N17	max	3.017	3	751.667	1	.005	1	0	1	0	1	0	1
10		min	.012	1	14.59	3	0	3	0	1	0	1	0	1
11	Totals:	max	78.786	2	2512.555	1	0	3						
12		min	0	1	113.714	3	0	1						



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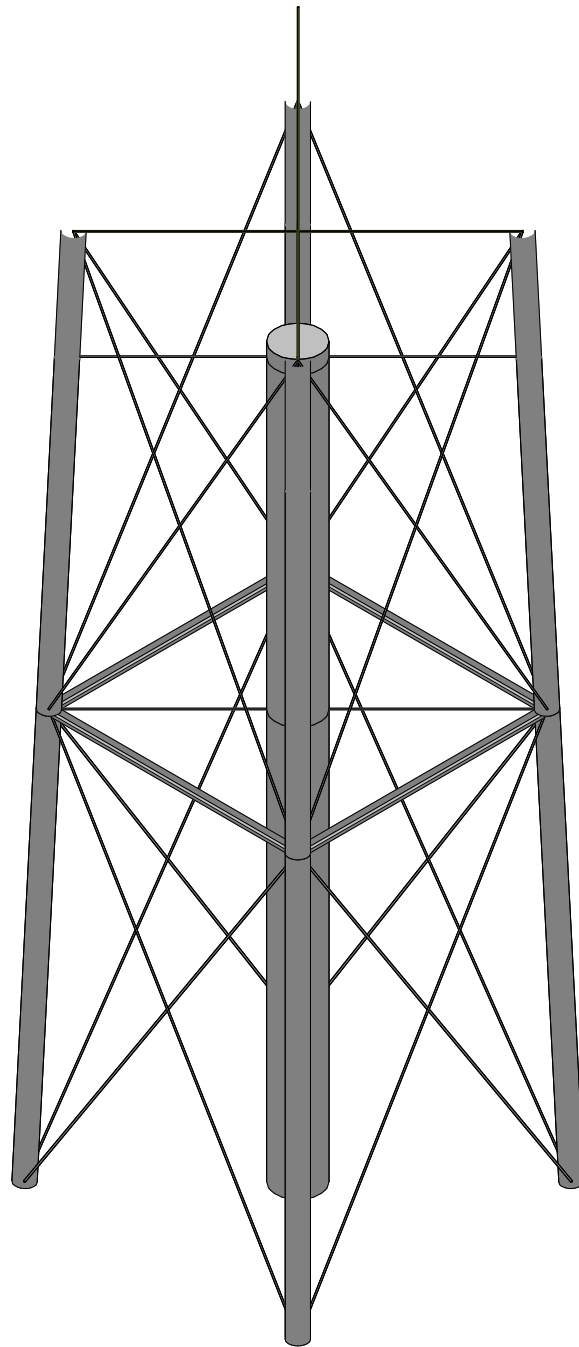
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Load Combinations

Description	So...	PDelta	S...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...
1	1.4D	Yes		1	1.4	2	3	1.4	4	1.4	5	L4	1.4	L5		
2	1.2D + 1W	Yes		1	1.2	2	1	3	1.2	4	1.2	5	1	L4	1.2	L5
3	0.9D + 1W	Yes		1	.9	2	1	3		4	.9	5	1	L4	.9	L5
4	ADD DL			6	1	8	1									
5	ADD WL			7	1	9	1									

Envelope AISC 14th(360-10): LRFD Steel Code Checks

Member	Shape	Code Check	Lo...	LG	Shear Ch...	Lo.....	phi*Pn...	phi*Pnt [k]	phi*...	phi*Mn ...	Cb	Eqn	
1	COL 3	P24x0.301	.923	46..	2	.009	46..	2	575.378	726.092	429...	429.171	2...H1...
2	COL 7	P24x0.301	.877	46..	2	.017	0	2	572.309	726.092	429...	429.171	1...H1...
3	COL 8	P24x0.301	.802	46..	2	.020	0	2	572.309	726.092	429...	429.171	1.2H1...
4	COL 6	P24x0.301	.801	45..	2	.020	0	2	572.309	726.092	429...	429.171	1...H1...
5	SW R...	SR 1-1/2	.794	55..	2	.007	55..	2	129	57.256	1.431	1.431	2...H1...
6	SW R...	SR 1-1/2	.785	0	2	.007	0	2	129	57.256	1.431	1.431	2...H1...
7	COL 1	P24x0.301	.770	0	1	.012	46..	2	575.378	726.092	429...	429.171	2...H1...
8	COL 2	P24x0.301	.768	0	1	.010	46..	2	575.378	726.092	429...	429.171	2...H1...
9	COL 4	P24x0.301	.768	0	1	.009	46..	2	575.378	726.092	429...	429.171	2...H1...
10	COL 5	P24x0.301	.756	0	1	.020	0	2	572.309	726.092	429...	429.171	1...H1...
11	SW R...	SR 1-1/2	.685	55..	2	.007	55..	2	129	57.256	1.431	1.431	2...H1...
12	SW R...	SR 1-1/2	.676	0	2	.007	0	2	129	57.256	1.431	1.431	2...H1...
13	SW R...	SR 1-1/2	.523	54..	3	.008	0	2	133	57.256	1.431	1.431	2...H1...
14	SW R...	SR 1-1/2	.520	0	3	.008	54..	2	133	57.256	1.431	1.431	2...H1...
15	RISER...	P60x0.304	.510	0	1	.006	0	3	1472.9...	1847.199	248...	2481.631	1...H1...
16	SW R...	SR 1-1/2	.505	54..	3	.008	0	2	133	57.256	1.431	1.431	2...H1...
17	SW R...	SR 1-1/2	.502	0	3	.008	54..	2	133	57.256	1.431	1.431	2...H1...
18	RISER...	P60x0.304	.495	0	1	.005	34..	3	1492.7...	1847.199	248...	2481.631	1...H1...
19	RISER...	P60x0.304	.481	0	1	.000	0	3	1517.9...	1847.199	248...	2481.631	1H1...
20	STRU...	W8x31	.380	14..	2	.012	28..	y	172.965	295.812	38.07	65.355	1...H1...
21	STRU...	W8x31	.379	13..	2	.012	0	y	172.965	295.812	38.07	65.355	1...H1...
22	STRU...	W8x31	.327	14..	2	.012	28..	y	172.965	295.812	38.07	65.355	1...H1...
23	STRU...	W8x31	.323	13..	2	.012	28..	y	172.965	295.812	38.07	65.355	1...H1...
24	HB R...	SR 1	.156	0	2	.003	19..	2	193	25.447	424	424	1...H1...
25	HB R...	SR 1	.129	0	3	.003	0	1	225	25.447	424	424	1...H1...
26	HB R...	SR 1	.008	0	2	.004	19..	2	193	25.447	424	424	1...H1...
27	HB R...	SR 1	.008	0	2	.004	19..	2	193	25.447	424	424	1...H1...
28	HB R...	SR 1	.001	0	1	.003	19..	1	193	25.447	424	424	1...H1...
29	HB R...	SR 1	.000	0	1	.003	0	1	225	25.447	424	424	1...H1...
30	SW R...	SR 1-1/2	.000	0	1	.000	0	1	129	57.256	1.431	1.431	1H1...
31	SW R...	SR 1-1/2	.000	0	1	.000	0	1	129	57.256	1.431	1.431	1H1...
32	SW R...	SR 1-1/2	.000	0	1	.000	0	1	133	57.256	1.431	1.431	1H1...
33	SW R...	SR 1-1/2	.000	0	1	.000	0	1	133	57.256	1.431	1.431	1H1...
34	SW R...	SR 1-1/2	.000	0	1	.000	0	1	129	57.256	1.431	1.431	1H1...
35	SW R...	SR 1-1/2	.000	0	1	.000	0	1	129	57.256	1.431	1.431	1H1...
36	SW R...	SR 1-1/2	.000	0	1	.000	0	1	133	57.256	1.431	1.431	1H1...
37	SW R...	SR 1-1/2	.000	0	1	.000	0	1	133	57.256	1.431	1.431	1H1...
38	HB R...	SR 1	.000	0	1	.000	0	1	225	25.447	424	424	1H1...
39	HB R...	SR 1	.000	0	1	.000	0	1	225	25.447	424	424	1H1...



Envelope Only Solution

Tower Engineering Profes...

RNM

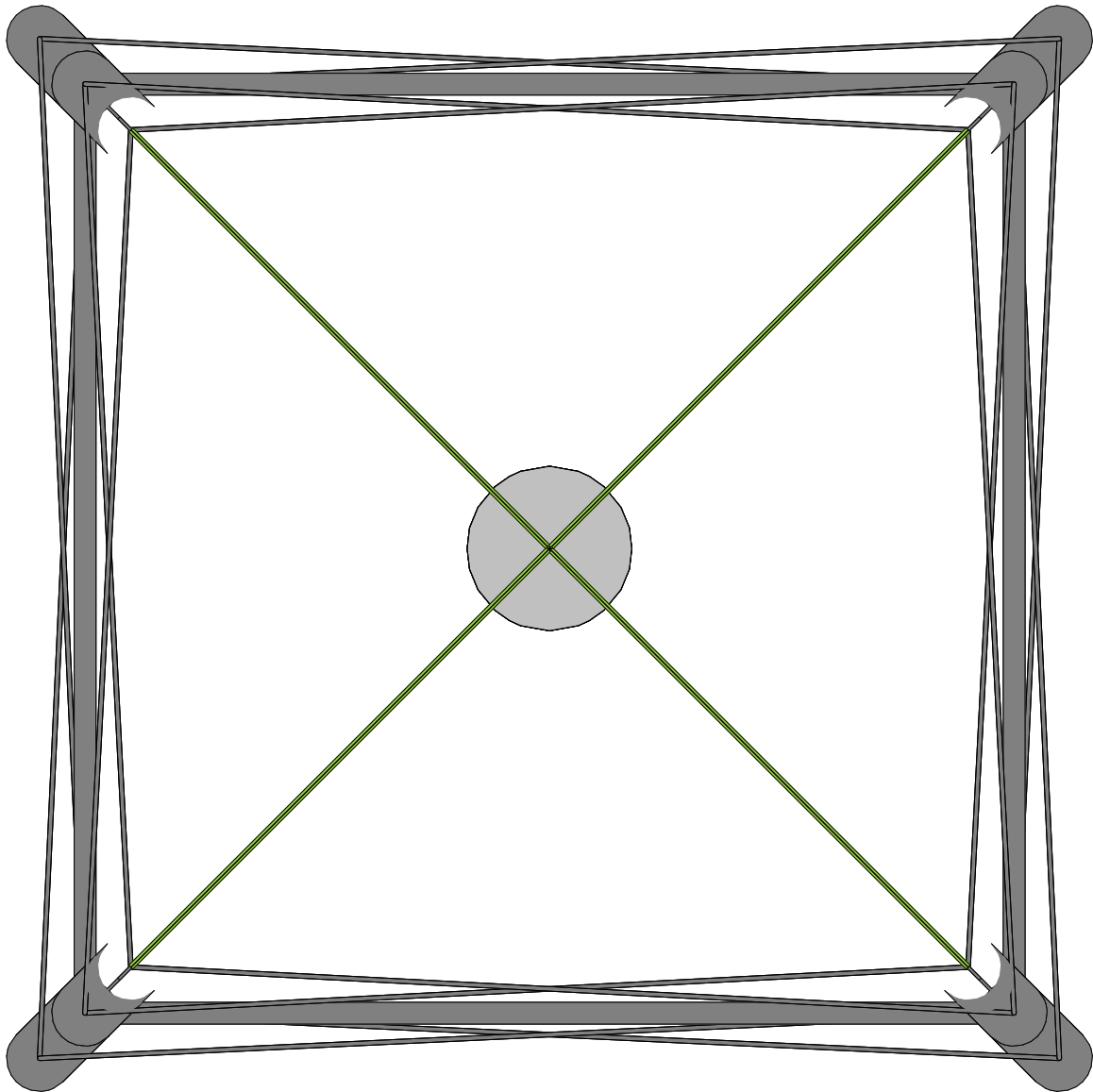
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184106 - Fluvanna County WT(LC_2)

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Fork Union_USF_LC2.r3d



Envelope Only Solution

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52861.195718

184106 - Fluvanna County WT(LC_2)

SK - 2

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Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 52861.195718
 Model Name : 184106 - Fluvanna County WT(LC_2)

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(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	No
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): LRFD
Adjust Stiffness?	No
RISACONNECTION CODE	AISC 13th(360-05): ASD
Cold Formed Steel Code	None
Wood Code	AF&PA NDS-91/97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building AISC 14th(360-10): ASD

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR SET ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8



Company : Tower Engineering Professionals, Inc.
 Designer : RNM
 Job Number : 52861.195718
 Model Name : 184106 - Fluvanna County WT(LC_2)

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(Global) Model Settings, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct X	.035
Ct Z	.035
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	8.5
R Z	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1/E, Density[k/ft., Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65 .49 36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65 .49 50	1.1	58	1.2
3	A992	29000	11154	.3	.65 .49 50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65 .49 42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65 .49 46	1.2	58	1.1
6	33 ksi	29000	11154	.3	.65 .49 33	1.5	58	1.2

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rul...	A [in2]	Iy [in4]	Izz [in4]	J [in4]
1	HR1A	W10x33	Beam	None	A36 Gr.36	Typical	9.71	36.6	171	.583

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
1	N1	15.499781	0	-15.499781	0	
2	N2	15.499781	0	15.499781	0	
3	N3	-15.499781	0	15.499781	0	
4	N4	-15.499781	0	-15.499781	0	
5	N5	14.121726	46.38	-14.121726	0	
6	N6	14.121726	46.38	14.121726	0	
7	N7	-14.121726	46.38	14.121726	0	
8	N8	-14.121726	46.38	-14.121726	0	
9	N9	13.093086	81	-13.093086	0	
10	N10	13.093086	81	13.093086	0	
11	N11	-13.093086	81	13.093086	0	
12	N12	-13.093086	81	-13.093086	0	
13	N13	12.727922	93.29	-12.727922	0	
14	N14	12.727922	93.29	12.727922	0	



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Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphragm
15	N15	-12.727922	93.29	12.727922	0	
16	N16	-12.727922	93.29	-12.727922	0	
17	N17	0	0	0	0	
18	N18	0	46.38	0	0	
19	N19	0	81	0	0	
20	N20	0	82.5	0	0	
21	N21	0	93.29	0	0	
22	N22	0	115.333	0	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N1	Reaction	Reaction	Reaction			
2	N2	Reaction	Reaction	Reaction			
3	N3	Reaction	Reaction	Reaction			
4	N4	Reaction	Reaction	Reaction			
5	N17	Reaction	Reaction	Reaction		Reaction	

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design ...
1	COL 1	N1	N5			P24x0.301	None	None	A36 G...	Typical
2	COL 2	N2	N6			P24x0.301	None	None	A36 G...	Typical
3	COL 3	N3	N7			P24x0.301	None	None	A36 G...	Typical
4	COL 4	N4	N8			P24x0.301	None	None	A36 G...	Typical
5	COL 5	N5	N13			P24x0.301	None	None	A36 G...	Typical
6	COL 6	N6	N14			P24x0.301	None	None	A36 G...	Typical
7	COL 7	N7	N15			P24x0.301	None	None	A36 G...	Typical
8	COL 8	N8	N16			P24x0.301	None	None	A36 G...	Typical
9	SW RD 1	N1	N6			SR 1-1/2	None	None	A36 G...	Typical
10	SW RD 2	N2	N7			SR 1-1/2	None	None	A36 G...	Typical
11	SW RD 3	N3	N8			SR 1-1/2	None	None	A36 G...	Typical
12	SW RD 4	N4	N5			SR 1-1/2	None	None	A36 G...	Typical
13	SW RD 5	N5	N14			SR 1-1/2	None	None	A36 G...	Typical
14	SW RD 6	N6	N15			SR 1-1/2	None	None	A36 G...	Typical
15	SW RD 7	N7	N16			SR 1-1/2	None	None	A36 G...	Typical
16	SW RD 8	N8	N13			SR 1-1/2	None	None	A36 G...	Typical
17	SW RD 9	N5	N2			SR 1-1/2	None	None	A36 G...	Typical
18	SW RD 10	N6	N3			SR 1-1/2	None	None	A36 G...	Typical
19	SW RD 11	N7	N4			SR 1-1/2	None	None	A36 G...	Typical
20	SW RD 12	N8	N1			SR 1-1/2	None	None	A36 G...	Typical
21	SW RD 13	N13	N6			SR 1-1/2	None	None	A36 G...	Typical
22	SW RD 14	N14	N7			SR 1-1/2	None	None	A36 G...	Typical
23	SW RD 15	N15	N8			SR 1-1/2	None	None	A36 G...	Typical
24	SW RD 16	N16	N5			SR 1-1/2	None	None	A36 G...	Typical
25	HB RD 1	N5	N18			SR 1	None	None	A36 G...	Typical
26	HB RD 2	N6	N18			SR 1	None	None	A36 G...	Typical
27	HB RD 3	N7	N18			SR 1	None	None	A36 G...	Typical
28	HB RD 4	N8	N18			SR 1	None	None	A36 G...	Typical
29	HB RD 5	N9	N19			SR 1	None	None	A36 G...	Typical
30	HB RD 6	N10	N19			SR 1	None	None	A36 G...	Typical



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Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design ...
31	HB RD 7	N11	N19			SR 1	None	None	A36 G...	Typical
32	HB RD 8	N12	N19			SR 1	None	None	A36 G...	Typical
33	RISER 1	N17	N18			P60x0.304	None	None	A36 G...	Typical
34	RISER 2	N18	N19			P60x0.304	None	None	A36 G...	Typical
35	RISER 3	N19	N20			P60x0.304	None	None	A36 G...	Typical
36	STRUT 1	N5	N6			W8x31	None	None	A36 G...	Typical
37	STRUT 2	N6	N7			W8x31	None	None	A36 G...	Typical
38	STRUT 3	N7	N8			W8x31	None	None	A36 G...	Typical
39	STRUT 4	N8	N5			W8x31	None	None	A36 G...	Typical
40	RIGID1	N13	N21			RIGID	None	None	RIGID	Typical
41	RIGID2	N14	N21			RIGID	None	None	RIGID	Typical
42	RIGID3	N15	N21			RIGID	None	None	RIGID	Typical
43	RIGID4	N16	N21			RIGID	None	None	RIGID	Typical
44	RIGID5	N21	N22			RIGID	None	None	RIGID	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Analysi...	Inactive	Seismic Desig...
1	COL 1						Yes			None
2	COL 2						Yes			None
3	COL 3						Yes			None
4	COL 4						Yes			None
5	COL 5						Yes			None
6	COL 6						Yes			None
7	COL 7						Yes			None
8	COL 8						Yes			None
9	SW RD 1					Tension Only	Yes			None
10	SW RD 2					Tension Only	Yes			None
11	SW RD 3					Tension Only	Yes			None
12	SW RD 4					Tension Only	Yes			None
13	SW RD 5					Tension Only	Yes			None
14	SW RD 6					Tension Only	Yes			None
15	SW RD 7					Tension Only	Yes			None
16	SW RD 8					Tension Only	Yes			None
17	SW RD 9					Tension Only	Yes			None
18	SW RD 10					Tension Only	Yes			None
19	SW RD 11					Tension Only	Yes			None
20	SW RD 12					Tension Only	Yes			None
21	SW RD 13					Tension Only	Yes			None
22	SW RD 14					Tension Only	Yes			None
23	SW RD 15					Tension Only	Yes			None
24	SW RD 16					Tension Only	Yes			None
25	HB RD 1	BenPIN	BenPIN			Tension Only	Yes			None
26	HB RD 2	BenPIN	BenPIN			Tension Only	Yes			None
27	HB RD 3	BenPIN	BenPIN			Tension Only	Yes			None
28	HB RD 4	BenPIN	BenPIN			Tension Only	Yes			None
29	HB RD 5	BenPIN	BenPIN			Tension Only	Yes			None
30	HB RD 6	BenPIN	BenPIN			Tension Only	Yes			None
31	HB RD 7	BenPIN	BenPIN			Tension Only	Yes			None
32	HB RD 8	BenPIN	BenPIN			Tension Only	Yes			None
33	RISER 1						Yes			None



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Member Advanced Data (Continued)

Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical Analsi...	Inactive	Seismic Desig...
34	RISER 2					Yes		None
35	RISER 3					Yes		None
36	STRUT 1	BenPIN	BenPIN			Yes		None
37	STRUT 2	BenPIN	BenPIN			Yes		None
38	STRUT 3	BenPIN	BenPIN			Yes		None
39	STRUT 4	BenPIN	BenPIN			Yes		None
40	RIGID1					Yes		None
41	RIGID2					Yes		None
42	RIGID3					Yes		None
43	RIGID4					Yes		None
44	RIGID5					Yes		None

Hot Rolled Steel Design Parameters

Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
1	COL 1	P24x0.301	46.421					1	1		Lateral
2	COL 2	P24x0.301	46.421					1	1		Lateral
3	COL 3	P24x0.301	46.421					1	1		Lateral
4	COL 4	P24x0.301	46.421					1	1		Lateral
5	COL 5	P24x0.301	46.951					1	1		Lateral
6	COL 6	P24x0.301	46.951					1	1		Lateral
7	COL 7	P24x0.301	46.951					1	1		Lateral
8	COL 8	P24x0.301	46.951					1	1		Lateral
9	SW RD 1	SR 1-1/2	55.049					1	1		Lateral
10	SW RD 2	SR 1-1/2	55.049					1	1		Lateral
11	SW RD 3	SR 1-1/2	55.049					1	1		Lateral
12	SW RD 4	SR 1-1/2	55.049					1	1		Lateral
13	SW RD 5	SR 1-1/2	54.068					1	1		Lateral
14	SW RD 6	SR 1-1/2	54.068					1	1		Lateral
15	SW RD 7	SR 1-1/2	54.068					1	1		Lateral
16	SW RD 8	SR 1-1/2	54.068					1	1		Lateral
17	SW RD 9	SR 1-1/2	55.049					1	1		Lateral
18	SW RD 10	SR 1-1/2	55.049					1	1		Lateral
19	SW RD 11	SR 1-1/2	55.049					1	1		Lateral
20	SW RD 12	SR 1-1/2	55.049					1	1		Lateral
21	SW RD 13	SR 1-1/2	54.068					1	1		Lateral
22	SW RD 14	SR 1-1/2	54.068					1	1		Lateral
23	SW RD 15	SR 1-1/2	54.068					1	1		Lateral
24	SW RD 16	SR 1-1/2	54.068					1	1		Lateral
25	HB RD 1	SR 1	19.971					1	1		Lateral
26	HB RD 2	SR 1	19.971					1	1		Lateral
27	HB RD 3	SR 1	19.971					1	1		Lateral
28	HB RD 4	SR 1	19.971					1	1		Lateral
29	HB RD 5	SR 1	18.516					1	1		Lateral
30	HB RD 6	SR 1	18.516					1	1		Lateral
31	HB RD 7	SR 1	18.516					1	1		Lateral
32	HB RD 8	SR 1	18.516					1	1		Lateral
33	RISER 1	P60x0.304	46.38					1	1		Lateral
34	RISER 2	P60x0.304	34.62					1	1		Lateral
35	RISER 3	P60x0.304	1.5					1	1		Lateral
36	STRUT 1	W8x31	28.243					1	1		Lateral



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Hot Rolled Steel Design Parameters (Continued)

Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	Kyy	Kzz	Cb	Function
37	STRUT 2	W8x31	28.243					1	1		Lateral
38	STRUT 3	W8x31	28.243					1	1		Lateral
39	STRUT 4	W8x31	28.243					1	1		Lateral

Joint Loads and Enforced Displacements (BLC 3 : TANK DL (WATER))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N20	L	Y	-520.694
2	N13	L	Y	-286.91
3	N14	L	Y	-286.91
4	N15	L	Y	-286.91
5	N16	L	Y	-286.91

Joint Loads and Enforced Displacements (BLC 4 : TANK DL (STEEL))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N13	L	Y	-14.215
2	N14	L	Y	-14.215
3	N15	L	Y	-14.215
4	N16	L	Y	-14.215

Joint Loads and Enforced Displacements (BLC 5 : TANK LL (WIND))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N13	L	X	-3.808
2	N14	L	X	-3.808
3	N15	L	X	-3.808
4	N16	L	X	-3.808

Joint Loads and Enforced Displacements (BLC 6 : HANDRAIL DL (WEIGHT))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N21	L	Y	-6.912

Joint Loads and Enforced Displacements (BLC 7 : HANDRAIL LL (WIND))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N21	L	X	-5.924

Joint Loads and Enforced Displacements (BLC 8 : CORRAL DL (WEIGHT))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N22	L	Y	-582
2	N22	L	Y	-5.189

Joint Loads and Enforced Displacements (BLC 9 : CORRAL LL (WIND))

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]	
1	N22	L	X	-1.518
2	N22	L	X	-14.869



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Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Member Distributed Loads (BLC 2 : MEMBER WIND FORCES)

	Member Label	Direction	Start Magnitude[lb/ft,F,ksf]	End Magnitude[lb/ft,F,ksf]	Start Location[ft,...]	End Location[ft,%]
1	COL 1	X	-50.008	-50.008	0	%100
2	COL 2	X	-50.052	-50.052	0	%100
3	COL 3	X	-50.008	-50.008	0	%100
4	COL 4	X	-50.052	-50.052	0	%100
5	COL 5	X	-63.662	-63.662	0	%100
6	COL 6	X	-63.718	-63.718	0	%100
7	COL 7	X	-63.662	-63.662	0	%100
8	COL 8	X	-63.718	-63.718	0	%100
9	SW RD 1	X	-2.87	-2.87	0	%100
10	SW RD 2	X	-2.915	-2.915	0	%100
11	SW RD 3	X	-2.87	-2.87	0	%100
12	SW RD 4	X	-2.915	-2.915	0	%100
13	SW RD 5	X	-3.701	-3.701	0	%100
14	SW RD 6	X	-3.755	-3.755	0	%100
15	SW RD 7	X	-3.701	-3.701	0	%100
16	SW RD 8	X	-3.755	-3.755	0	%100
17	SW RD 9	X	-2.915	-2.915	0	%100
18	SW RD 10	X	-2.87	-2.87	0	%100
19	SW RD 11	X	-2.915	-2.915	0	%100
20	SW RD 12	X	-2.87	-2.87	0	%100
21	SW RD 13	X	-3.755	-3.755	0	%100
22	SW RD 14	X	-3.701	-3.701	0	%100
23	SW RD 15	X	-3.755	-3.755	0	%100
24	SW RD 16	X	-3.701	-3.701	0	%100
25	HB RD 1	X	0	0	0	%100
26	HB RD 2	X	-2.362	-2.362	0	%100
27	HB RD 3	X	0	0	0	%100
28	HB RD 4	X	-2.362	-2.362	0	%100
29	HB RD 5	X	0	0	0	%100
30	HB RD 6	X	-2.77	-2.77	0	%100
31	HB RD 7	X	0	0	0	%100
32	HB RD 8	X	-2.77	-2.77	0	%100
33	RISER 1	X	-105.433	-105.433	0	%100
34	RISER 2	X	-130.735	-130.735	0	%100
35	RISER 3	X	-140.401	-140.401	0	%100
36	STRUT 1	X	-22.269	-22.269	0	%100
37	STRUT 2	X	-22.269	-22.269	0	%100
38	STRUT 3	X	-22.269	-22.269	0	%100
39	STRUT 4	X	-22.269	-22.269	0	%100

Member Distributed Loads (BLC 8 : CORRAL DL (WEIGHT))

	Member Label	Direction	Start Magnitude[lb/ft,F,ksf]	End Magnitude[lb/ft,F,ksf]	Start Location[ft,...]	End Location[ft,%]
1	COL 1	Y	-15.847	-15.847	0	%100
2	COL 2	Y	-6.495	-6.495	0	%100
3	COL 3	Y	-8.867	-8.867	0	%100



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Member Distributed Loads (BLC 8 : CORRAL DL (WEIGHT)) (Continued)

	Member Label	Direction	Start Magnitude[lb/ft,F,ksf]	End Magnitude[lb/ft,F,ksf]	Start Location[ft,...]	End Location[ft,%]
4	COL 4	Y	-2.535	-2.535	0	%100
5	COL 5	Y	-15.847	-15.847	0	%100
6	COL 6	Y	-6.495	-6.495	0	%100
7	COL 7	Y	-8.867	-8.867	0	%100
8	COL 8	Y	-2.535	-2.535	0	%100

Member Distributed Loads (BLC 9 : CORRAL LL (WIND))

	Member Label	Direction	Start Magnitude[lb/ft,F,ksf]	End Magnitude[lb/ft,F,ksf]	Start Location[ft,...]	End Location[ft,%]
1	COL 1	X	-21.522	-21.522	0	%100
2	COL 2	X	-8.259	-8.259	0	%100
3	COL 3	X	-11.873	-11.873	0	%100
4	COL 4	X	-3.233	-3.233	0	%100
5	COL 5	X	-27.399	-27.399	0	%100
6	COL 6	X	-10.514	-10.514	0	%100
7	COL 7	X	-15.115	-15.115	0	%100
8	COL 8	X	-4.115	-4.115	0	%100

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed Area(Me...)	Surface...
1	GRAVITY	None		-1					
2	MEMBER WIND FORCES	None						39	
3	TANK DL (WATER)	None				5			
4	TANK DL (STEEL)	None				4			
5	TANK LL (WIND)	None				4			
6	HANDRAIL DL (WEIGHT)	None				1			
7	HANDRAIL LL (WIND)	None				1			
8	CORRAL DL (WEIGHT)	None				2		8	
9	CORRAL LL (WIND)	None				2		8	

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	33.703	3	440.894	1	13.071	1	0	1	0	1	0	1
2		min	-13.067	1	-69.225	3	-2.6	3	0	1	0	1	0	1
3	N2	max	33.114	3	440.201	1	2.601	3	0	1	0	1	0	1
4		min	-13.054	1	-69.198	3	-13.06	1	0	1	0	1	0	1
5	N3	max	15.013	2	471.155	2	-3.51	3	0	1	0	1	0	1
6		min	4.622	3	118.645	3	-13.98	2	0	1	0	1	0	1
7	N4	max	14.875	2	471.357	2	13.989	2	0	1	0	1	0	1
8		min	4.484	3	118.903	3	3.519	3	0	1	0	1	0	1
9	N17	max	2.863	3	751.667	1	-.005	1	0	1	0	1	0	1
10		min	.012	1	14.59	3	-.01	3	0	1	0	1	0	1
11	Totals:	max	78.787	3	2512.555	1	0	2						
12		min	0	1	113.714	3	0	3						



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Load Combinations

Description	So...	PDelta	S...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...	BLC Fac...
1	1.4D	Yes		1	1.4	2	3	1.4	4	1.4	5	L4	1.4	L5	
2	1.2D + 1W	Yes		1	1.2	2	1	3	1.2	4	1.2	5	1	L4	1.2
3	0.9D + 1W	Yes		1	.9	2	1	3		4	.9	5	1	L4	.9
4	ADD DL			6	1	8	1								
5	ADD WL			7	1	9	1								

Envelope AISC 14th(360-10): LRFD Steel Code Checks

Member	Shape	Code Check	Lo...	LG	Shear Ch...	Lo.....	phi*Pn...	phi*Pnt [k]	phi*...	phi*Mn ...	Cb	Eqn
1	SW R... SR 1-1/2	1.044	0	2	.007	0	2	.129	57.256	1.431	1.431	2...H1...
2	SW R... SR 1-1/2	1.032	55...	2	.007	55...	2	.129	57.256	1.431	1.431	2...H1...
3	COL 3 P24x0.301	.858	46...	2	.009	46...	2	575.378	726.092	429...	429.171	2...H1...
4	COL 4 P24x0.301	.855	46...	2	.008	46...	2	575.378	726.092	429...	429.171	2...H1...
5	COL 8 P24x0.301	.825	46...	2	.017	0	2	572.309	726.092	429...	429.171	1...H1...
6	COL 7 P24x0.301	.821	43...	2	.018	0	2	572.309	726.092	429...	429.171	1...H1...
7	COL 1 P24x0.301	.770	0	1	.012	46...	2	575.378	726.092	429...	429.171	2...H1...
8	COL 2 P24x0.301	.768	0	1	.010	46...	2	575.378	726.092	429...	429.171	2...H1...
9	COL 5 P24x0.301	.756	0	1	.021	0	2	572.309	726.092	429...	429.171	1...H1...
10	COL 6 P24x0.301	.756	0	1	.019	0	2	572.309	726.092	429...	429.171	1...H1...
11	SW R... SR 1-1/2	.726	0	3	.007	54...	2	.133	57.256	1.431	1.431	2...H1...
12	SW R... SR 1-1/2	.722	54...	3	.007	0	2	.133	57.256	1.431	1.431	2...H1...
13	RISER... P60x0.304	.510	0	1	.005	0	3	1472.9...	1847.199	248...	2481.631	1...H1...
14	RISER... P60x0.304	.495	0	1	.005	34...	3	1492.7...	1847.199	248...	2481.631	1...H1...
15	RISER... P60x0.304	.481	0	1	.000	0	2	1517.9...	1847.199	248...	2481.631	1...H1...
16	STRU... W8x31	.433	13...	2	.012	28...	1	72.965	295.812	38.07	65.355	1...H1...
17	STRU... W8x31	.421	14...	2	.012	28...	1	72.965	295.812	38.07	65.355	1...H1...
18	STRU... W8x31	.133	14...	2	.012	28...	1	72.965	295.812	38.07	65.355	1...H1...
19	HB R... SR 1	.119	0	2	.003	19...	2	.193	25.447	.424	.424	1...H1...
20	HB R... SR 1	.117	0	2	.003	19...	2	.193	25.447	.424	.424	1...H1...
21	STRU... W8x31	.117	14...	2	.012	28...	1	72.965	295.812	38.07	65.355	1...H1...
22	HB R... SR 1	.086	0	3	.004	0	2	.225	25.447	.424	.424	1...H1...
23	HB R... SR 1	.086	0	3	.005	0	2	.225	25.447	.424	.424	1...H1...
24	SW R... SR 1-1/2	.021	0	3	.005	0	3	.129	57.256	1.431	1.431	2...H1...
25	SW R... SR 1-1/2	.021	55...	3	.005	55...	3	.129	57.256	1.431	1.431	2...H1...
26	HB R... SR 1	.002	0	1	.003	19...	1	.193	25.447	.424	.424	1...H1...
27	HB R... SR 1	.001	0	1	.003	19...	1	.193	25.447	.424	.424	1...H1...
28	SW R... SR 1-1/2	.000	0	1	.000	0	1	.129	57.256	1.431	1.431	1...H1...
29	SW R... SR 1-1/2	.000	0	1	.000	0	1	.129	57.256	1.431	1.431	1...H1...
30	SW R... SR 1-1/2	.000	0	1	.000	0	1	.133	57.256	1.431	1.431	1...H1...
31	SW R... SR 1-1/2	.000	0	1	.000	0	1	.133	57.256	1.431	1.431	1...H1...
32	SW R... SR 1-1/2	.000	0	1	.000	0	1	.133	57.256	1.431	1.431	1...H1...
33	SW R... SR 1-1/2	.000	0	1	.000	0	1	.129	57.256	1.431	1.431	1...H1...
34	SW R... SR 1-1/2	.000	0	1	.000	0	1	.129	57.256	1.431	1.431	1...H1...
35	SW R... SR 1-1/2	.000	0	1	.000	0	1	.133	57.256	1.431	1.431	1...H1...
36	SW R... SR 1-1/2	.000	0	1	.000	0	1	.133	57.256	1.431	1.431	1...H1...
37	SW R... SR 1-1/2	.000	0	1	.000	0	1	.133	57.256	1.431	1.431	1...H1...
38	HB R... SR 1	.000	0	1	.000	0	1	.225	25.447	.424	.424	1...H1...
39	HB R... SR 1	.000	0	1	.000	0	1	.225	25.447	.424	.424	1...H1...

APPENDIX B
CATWALK MOUNT ANALYSIS

Corral Mount Summary of Analysis

Introduction

The structure is a (24) post corral mount on the existing water tank at the 118.5-ft elevation. All other information provided to TEP was assumed to be accurate and complete.

Analysis Criteria

The analysis has been performed in accordance with the ANSI/TIA-222-G-2-2009 Structural Standard for Antenna Supporting Structures and Antennas – Addendum 2 using an ultimate 3-second gust wind speed of 115 mph converted to a nominal 3-second gust wind speed of 89 mph with no ice per section 1609.3.1 as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1, 30 mph with 0.75 inch ice thickness, and 60 mph under service loads. Risk Category II was used in this analysis with the following design criteria:

- 1) Type of Analysis: **Rigorous Structural Analysis**
- 2) Classification of Structure: **Class II**
- 3) Exposure Category: **Exposure B**
- 4) Topographic Category: **Category 1**

Analysis Results

Table 1 - Water Tank Component Capacity

Notes	Component	% Capacity	Pass / Fail
-	Post	41.6	Pass
-	Top Rail	31.7	Pass
-	Mid Rail	7.0	Pass
-	Toe Plate	15.0	Pass
-	Face Diagonal	80.3	Pass
-	Kicker	29.5	Pass
-	Mount Pipe	44.6	Pass
Structure Rating (max from all components) =			80.3%



184106 - Fluvanna County WT
TEP #: 52861.195718
Analysis: RNM 11/14/2018
Check: WBA 11/14/2018

Catwalk Handrail & Corral Mount Analysis_v1.0 - Inputs

Structure Type:

Top of Tank Height: ft
Wind Centerline Elevation: ft
Design Wind Velocity: mph
Ice Wind Velocity: mph
Base Ice Thickness: in
Structure Class:
Exposure Category:
Topographic Category:
Crest Height (H): ft

Options

- Use ASCE 7-10 Wind Speeds
- Use TIA Load Combos
- Partial Pin Plate Connections
- Mid-Rail Braces Posts

Input Overall Structure Geometry:

Total Number of Posts:
Post to Post Distance: in
Height to Mid Rail: in
Height to Top Rail: in

Height to Top of Post: in

Distance from Railing back to Kicker: in

Height to Kicker at Tank: in
Height to Kicker at Railing: in

Input Members:

Member	Description	Width (in)	Shape	Perimeter (in)	Length (in)	Rotation (Degrees)
Post	2L2 1/2 x 2 1/2 x 1/4	5.00	Flat	15.00	78.00	0
Top Rail	L 2 x 2 x 3/16	2.00	Flat	8.00	46.75	180
Mid Rail	L 2 x 2 x 3/16	2.00	Flat	8.00	46.75	180
Toe Plate	PL4 x 1/4	4.00	Flat	8.50	46.75	0
Kicker	L 2 x 2 x 3/16	2.00	Flat	8.00	71.69	180
Bottom Rail	L1 1/2 x 1 1/2 x 3/16	1.50	Flat	6.00	46.75	
Diagonal	L1 1/2 x 1 1/2 x 3/16	1.50	Flat	6.00	63.02	

$\epsilon = 0.255$ Calculated per 2.6.9.2.2 of TIA-222-G



184106 - Fluvanna County WT
TEP #: 52861.195718
Analysis: RNM 11/14/2018
Check: WBA 11/14/2018

Catwalk Handrail & Corral Mount Analysis_v1.0 -Antenna Inputs

Input Antenna Properties:

Antenna Description	Position	Ht. (in)	Wid. (in)	Dep. (in)	Wt. (lbs)	Azimuth*	Qty	Shape
Antel WPA 80063/8CF	5	94.60	11.20	5.10	19.00	62.00	1	Flat
Antel WPA 80063/8CF	8	94.60	11.20	5.10	19.00	58.00	1	Flat
Antel WPA 80063/8CF	13	94.60	11.20	5.10	19.00	187.00	1	Flat
Antel WPA 80063/8CF	16	94.60	11.20	5.10	19.00	191.00	1	Flat
Antel WPA 80063/8CF	22	94.60	11.20	5.10	19.00	309.00	1	Flat
Antel WPA 80063/8CF	24	94.60	11.20	5.10	19.00	310.00	1	Flat
KMW AM-X-CW-18-65-00T-RET	6	96.00	11.80	6.00	52.90	58.00	1	Flat
KMW AM-X-CW-18-65-00T-RET	15	96.00	11.80	6.00	52.90	193.00	1	Flat
KMW AM-X-CW-18-65-00T-RET	21	96.00	11.80	6.00	52.90	311.00	1	Flat
Kaelus B12/5 Combiner	6	8.00	6.20	3.70	6.60	60.00	2	Flat
Kaelus B12/5 Combiner	15	8.00	6.20	3.70	6.60	190.00	2	Flat
Kaelus B12/5 Combiner	21	8.00	6.20	3.70	6.60	310.00	2	Flat
Nokia FRBG B12 RRH	6	15.70	15.70	5.90	59.50	60.00	1	Flat
Nokia FRBG B12 RRH	15	15.70	15.70	5.90	59.50	190.00	1	Flat
Nokia FRBG B12 RRH	21	15.70	15.70	5.90	59.50	310.00	1	Flat
Nokia FXCB/A B5 RRH	8	22.10	19.40	5.20	55.10	60.00	1	Flat
Nokia FXCB/A B5 RRH	16	22.10	19.40	5.20	55.10	190.00	1	Flat
Nokia FXCB/A B5 RRH	24	22.10	19.40	5.20	55.10	310.00	1	Flat
Nokia FSES OVP	7	2.90	4.80	4.80	3.30	60.00	2	Flat
Nokia FSES OVP	14	2.90	4.80	4.80	3.30	190.00	2	Flat
Nokia FSES OVP	23	2.90	4.80	4.80	3.30	310.00	2	Flat
Raycap RUSDC-6267-PF-48	7	20.52	18.90	7.02	25.00	60.00	1	Flat
Raycap RUSDC-6267-PF-48	14	20.52	18.90	7.02	25.00	190.00	1	Flat
Raycap RUSDC-6267-PF-48	23	20.52	18.90	7.02	25.00	310.00	1	Flat
Coax Bundle	25	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	26	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	27	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	36	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	37	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	38	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	39	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	40	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	41	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	42	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	43	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	44	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	45	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	46	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	47	23.76	46.75	3.25	86.25	0.00	1	Round
Coax Bundle	48	23.76	46.75	3.25	86.25	0.00	1	Round

*All azimuths are global and assume that Post #1 is facing north



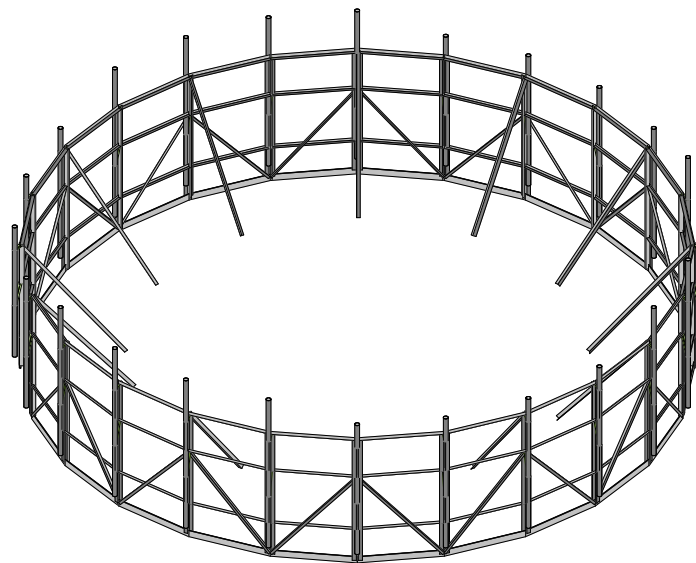
184106 - Fluvanna County WT
TEP #: 52861.195718
Analysis: RNM 11/14/2018
Check: WBA 11/14/2018

Catwalk Handrail & Corral Mount Analysis_v1.0 -Antenna Inputs

Input Antenna Properties:

Antenna Description	Position	Ht. (in)	Wid. (in)	Dep. (in)	Wt. (lbs)	Azimuth*	Qty	Shape
Andrew NHH-85C-R2B	1	96.00	14.60	8.00	50.00	40.00	1	Flat
Andrew NHH-85C-R2B	4	96.00	14.60	8.00	50.00	40.00	1	Flat
Andrew NHH-85C-R2B	9	96.00	14.60	8.00	50.00	160.00	1	Flat
Andrew NHH-85C-R2B	12	96.00	14.60	8.00	50.00	160.00	1	Flat
Andrew NHH-85C-R2B	17	96.00	14.60	8.00	50.00	280.00	1	Flat
Andrew NHH-85C-R2B	20	96.00	14.60	8.00	50.00	280.00	1	Flat
Nokia AHBCC Airscale 4T4R B/5/B13 320W	1	70.30	12.00	4.60	29.50	40.00	1	Flat
Nokia AHBCC Airscale 4T4R B/5/B13 320W	4	70.30	12.00	4.60	29.50	40.00	1	Flat
Nokia AHBCC Airscale 4T4R B/5/B13 320W	9	70.30	12.00	4.60	29.50	160.00	1	Flat
Nokia AHFIC Airscale 4T4R B2/B66Aa 320W	12	21.60	12.00	9.00	57.20	160.00	1	Flat
Nokia AHFIC Airscale 4T4R B2/B66Aa 320W	17	21.60	12.00	9.00	57.20	280.00	1	Flat
Nokia AHFIC Airscale 4T4R B2/B66Aa 320W	20	21.60	12.00	9.00	57.20	280.00	1	Flat
Raycap RHSDC-3315-PF-48	3	25.80	11.80	7.20	56.80	40.00	1	Flat
Raycap RHSDC-3315-PF-48	11	25.80	11.80	7.20	56.80	160.00	1	Flat
Raycap RHSDC-3315-PF-48	19	25.80	11.80	7.20	56.80	280.00	1	Flat
Raycap RHSDC-1064-PF-48	1	22.05	12.13	6.65	66.14	40.00	1	Flat
Raycap RHSDC-1064-PF-48	4	22.05	12.13	6.65	66.14	160.00	1	Flat
Raycap RHSDC-1064-PF-48	9	22.05	12.13	6.65	66.14	280.00	1	Flat
Raycap RHSDC-1064-PF-48	12	25.66	15.73	10.25	32.00	40.00	1	Flat
Raycap RHSDC-1064-PF-48	17	25.66	15.73	10.25	32.00	160.00	1	Flat
Raycap RHSDC-1064-PF-48	20	15.95	10.15	8.15	14.00	280.00	1	Flat
2SCH40 x7'-9"	7	93.00	2.40	2.40	28.37	0.00	1	Round
2SCH40 x7'-9"	14	93.00	2.40	2.40	28.37	0.00	1	Round
2SCH40 x7'-9"	23	93.00	2.40	2.40	28.37	0.00	1	Round

*All azimuths are global and assume that Post #1 is facing north

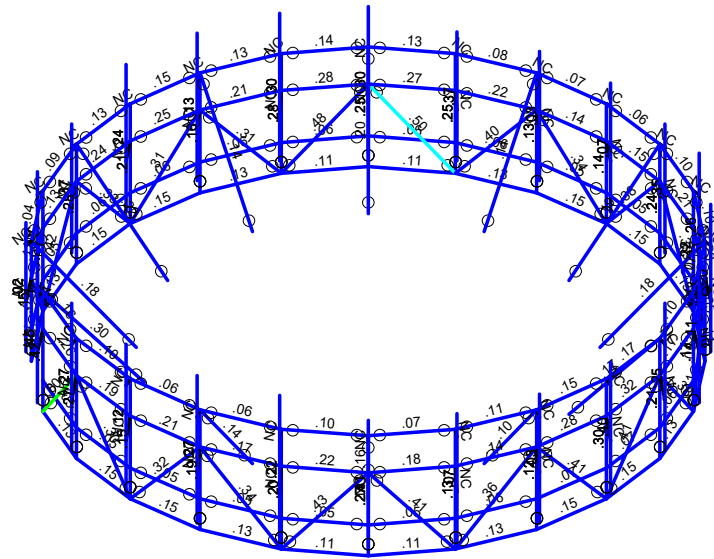
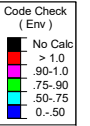


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TEP No. 52861.195718

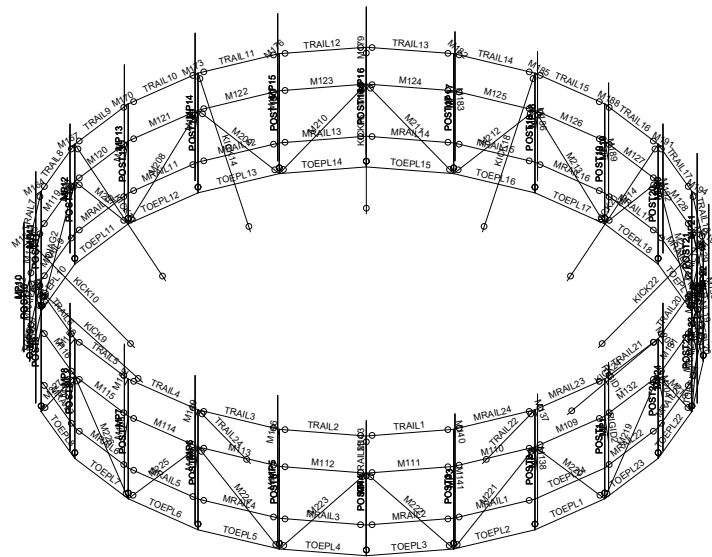
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SK - 1
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Mount Rev G.r3d



Member Code Checks Displayed (Enveloped)
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RNM		Nov 14, 2018 at 1:21 PM
TEP No. 52861.195718		Mount Rev G.r3d

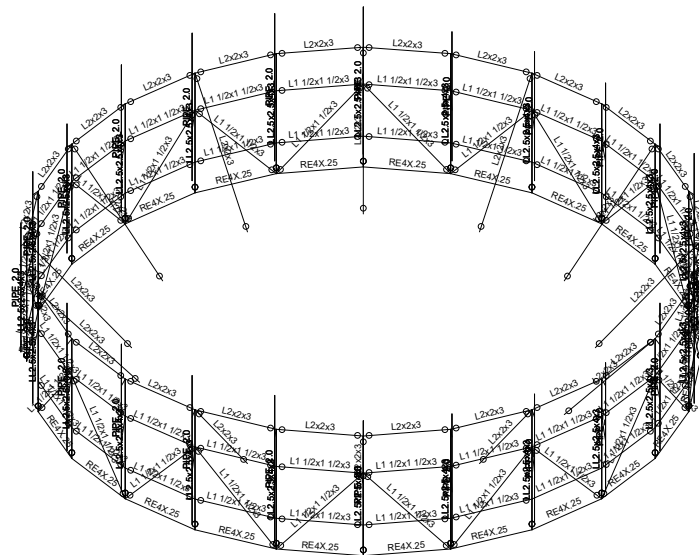


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TEP No. 52861.195718

184106 - Fluvanna County WT

SK - 4
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Mount Rev G.r3d



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Tower Engineering Profes...
RNM
TEP No. 52861.195718

184106 - Fluvanna County WT

SK - 5
Nov 14, 2018 at 1:22 PM
Mount Rev G.r3d



Company : Tower Engineering Professionals
 Designer : RNM
 Job Number : TEP No. 52861.195718
 Model Name : 184106 - Fluvanna County WT

Nov 14, 2018
 1:22 PM
 Checked By: WBA

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): LRFD
Adjust Stiffness?	No
RISAConnection Code	AISC 13th(360-05): ASD
Cold Formed Steel Code	AISI S100-07: ASD
Wood Code	AF&PA NDS-05/08: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-08
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building AISC 14th(360-10): ASD

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8



Company : Tower Engineering Professionals
 Designer : RNM
 Job Number : TEP No. 52861.195718
 Model Name : 184106 - Fluvanna County WT

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(Global) Model Settings, Continued

Seismic Code	ASCE 7-05
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Occupancy Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	1
Cd X	1
Rho Z	1
Rho X	1

Material Takeoff

	Material	Size	Pieces	Length[ft]	Weight[K]
1	General				
2	RIGID		48	38.4	0
3	Total General		48	38.4	0
4					
5	Hot Rolled Steel				
6	A36 Gr.36	L1 1/2x1 1/2x3	69	315.9	.6
7	A36 Gr.36	L2x2x3	35	178.4	.4
8	A36 Gr.36	LL2.5x2.5x4x3	24	156	1.3
9	A36 Gr.36	RE4X.25	23	89.6	.3
10	A53-B-35	PIPE_2.0	24	180	.6
11	Total HR Steel		175	920	3.2

Hot Rolled Steel Properties

Label	F [ksil]	G [ksil]	Nu	Therm (1E..)	Density[k/ft...]	Yield[ksil]	Ry	Fu[ksil]	Rt	
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
3	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.4	58	1.3
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.4	58	1.3
6	A53-B-35	29000	11154	.3	.65	.49	35	1.5	60	1.2

Hot Rolled Steel Section Sets

Label	Shape	Type	Design List	Material	Design R...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]	
1	Post	LL2.5x2.5x4x3	None	None	A36 Gr.36	Typical	2.38	3.31	1.38	.052
2	Toe Plate	RE4X.25	None	None	A36 Gr.36	Typical	1	.005	1.333	.02
3	Mid Rail	L2x2x3	None	None	A36 Gr.36	Typical	.722	.271	.271	.009
4	Mid-Rail2	L1 1/2x1 1/2x3	None	None	A36 Gr.36	Typical	.527	.11	.11	.006



Company : Tower Engineering Professionals
 Designer : RNM
 Job Number : TEP No. 52861.195718
 Model Name : 184106 - Fluvanna County WT

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Hot Rolled Steel Section Sets (Continued)

Label	Shape	Type	Design List	Material	Design R...	A [in2]	Iy [in4]	Izz [in4]	J [in4]	
5	Top-Rail	L2x2x3	None	None	A36 Gr.36	Typical	.722	.271	.271	.009
6	Kicker	L2x2x3	None	None	A36 Gr.36	Typical	.722	.271	.271	.009
7	Mount Pipe	PIPE 2.0	None	None	A53-B-35	Typical	1.02	.627	.627	1.25
8	Diagonals	L1 1/2x1 1/2x3	None	None	A36 Gr.36	Typical	.527	.11	.11	.006

Member Advanced Data

Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical Analy...	Inactive	Seismic Desig...
1	POST1	OOOOX				Yes		None
2	POST2	OOOOX				Yes		None
3	POST3	OOOOX				Yes		None
4	POST4	OOOOX				Yes		None
5	POST5	OOOOX				Yes		None
6	POST6	OOOOX				Yes		None
7	POST7	OOOOX				Yes		None
8	POST8	OOOOX				Yes		None
9	POST9	OOOOX				Yes		None
10	POST10	OOOOX				Yes		None
11	POST11	OOOOX				Yes		None
12	POST12	OOOOX				Yes		None
13	POST13	OOOOX				Yes		None
14	POST14	OOOOX				Yes		None
15	POST15	OOOOX				Yes		None
16	POST16	OOOOX				Yes		None
17	POST17	OOOOX				Yes		None
18	POST18	OOOOX				Yes		None
19	POST19	OOOOX				Yes		None
20	POST20	OOOOX				Yes		None
21	POST21	OOOOX				Yes		None
22	POST22	OOOOX				Yes		None
23	POST23	OOOOX				Yes		None
24	POST24	OOOOX				Yes		None
25	TOEPL1					Yes		None
26	TOEPL2					Yes		None
27	TOEPL3					Yes		None
28	TOEPL4					Yes		None
29	TOEPL5					Yes		None
30	TOEPL6					Yes		None
31	TOEPL7					Yes		None
32	TOEPL8					Yes		None
33	TOEPL9					Yes		None
34	TOEPL10					Yes		None
35	TOEPL11					Yes		None
36	TOEPL12					Yes		None
37	TOEPL13					Yes		None
38	TOEPL14					Yes		None
39	TOEPL15					Yes		None
40	TOEPL16					Yes		None
41	TOEPL17					Yes		None
42	TOEPL18					Yes		None
43	TOEPL19					Yes		None
44	TOEPL20					Yes		None
45	TOEPL21					Yes		None
46	TOEPL22					Yes		None
47	TOEPL23					Yes		None
48	TOEPL24					Yes		None



Company : Tower Engineering Professionals
 Designer : RNM
 Job Number : TEP No. 52861.195718
 Model Name : 184106 - Fluvanna County WT

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Member Advanced Data (Continued)

Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical Analy...	Inactive	Seismic Desig...
49	MRAIL1	OOOOX	OOOOX			Yes		None
50	MRAIL2	OOOOX	OOOOX			Yes		None
51	MRAIL3	OOOOX	OOOOX			Yes		None
52	MRAIL4	OOOOX	OOOOX			Yes		None
53	MRAIL5	OOOOX	OOOOX			Yes		None
54	MRAIL6	OOOOX	OOOOX			Yes		None
55	MRAIL7	OOOOX	OOOOX			Yes		None
56	MRAIL8	OOOOX	OOOOX			Yes		None
57	MRAIL9	OOOOX	OOOOX			Yes		None
58	MRAIL10	OOOOX	OOOOX			Yes		None
59	MRAIL11	OOOOX	OOOOX			Yes		None
60	MRAIL12	OOOOX	OOOOX			Yes		None
61	MRAIL13	OOOOX	OOOOX			Yes		None
62	MRAIL14	OOOOX	OOOOX			Yes		None
63	MRAIL15	OOOOX	OOOOX			Yes		None
64	MRAIL16	OOOOX	OOOOX			Yes		None
65	MRAIL17	OOOOX	OOOOX			Yes		None
66	MRAIL18	OOOOX	OOOOX			Yes		None
67	MRAIL19	OOOOX	OOOOX			Yes		None
68	MRAIL20	OOOOX	OOOOX			Yes		None
69	MRAIL21	OOOOX	OOOOX			Yes		None
70	MRAIL22	OOOOX	OOOOX			Yes		None
71	MRAIL23	OOOOX	OOOOX			Yes		None
72	MRAIL24	OOOOX	OOOOX			Yes		None
73	TRAIL1	OOOOX	OOOOX			Yes		None
74	TRAIL2	OOOOX	OOOOX			Yes		None
75	TRAIL3	OOOOX	OOOOX			Yes		None
76	TRAIL4	OOOOX	OOOOX			Yes		None
77	TRAIL5	OOOOX	OOOOX			Yes		None
78	TRAIL6	OOOOX	OOOOX			Yes		None
79	TRAIL7	OOOOX	OOOOX			Yes		None
80	TRAIL8	OOOOX	OOOOX			Yes		None
81	TRAIL9	OOOOX	OOOOX			Yes		None
82	TRAIL10	OOOOX	OOOOX			Yes		None
83	TRAIL11	OOOOX	OOOOX			Yes		None
84	TRAIL12	OOOOX	OOOOX			Yes		None
85	TRAIL13	OOOOX	OOOOX			Yes		None
86	TRAIL14	OOOOX	OOOOX			Yes		None
87	TRAIL15	OOOOX	OOOOX			Yes		None
88	TRAIL16	OOOOX	OOOOX			Yes		None
89	TRAIL17	OOOOX	OOOOX			Yes		None
90	TRAIL18	OOOOX	OOOOX			Yes		None
91	TRAIL19	OOOOX	OOOOX			Yes		None
92	TRAIL20	OOOOX	OOOOX			Yes		None
93	TRAIL21	OOOOX	OOOOX			Yes		None
94	TRAIL22	OOOOX	OOOOX			Yes		None
95	TRAIL23	OOOOX	OOOOX			Yes		None
96	TRAIL24	OOOOX	OOOOX			Yes		None
97	KICK9	OOOOX	OOOOX			Yes		None
98	KICK10	OOOOX	OOOOX			Yes		None
99	KICK12	OOOOX	OOOOX			Yes		None
100	KICK14	OOOOX	OOOOX			Yes		None
101	KICK16	OOOOX	OOOOX			Yes		None
102	KICK18	OOOOX	OOOOX			Yes		None
103	KICK20	OOOOX	OOOOX			Yes		None
104	KICK22	OOOOX	OOOOX			Yes		None
105	KICK24	OOOOX	OOOOX			Yes		None



Company : Tower Engineering Professionals
Designer : RNM
Job Number : TEP No. 52861.195718
Model Name : 184106 - Fluvanna County WT

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Member Advanced Data (Continued)

Table with columns: Label, I Release, J Release, I Offset[in], J Offset[in], T/C Only, Physical Analysis, Inactive, Seismic Design. Rows include M109-M162 and MP1-MP12.



Company : Tower Engineering Professionals
Designer : RNM
Job Number : TEP No. 52861.195718
Model Name : 184106 - Fluvanna County WT

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Member Advanced Data (Continued)

Table with columns: Label, I Release, J Release, I Offset[in], J Offset[in], T/C Only, Physical Analysis, Inactive, Seismic Design. Rows include M167-M223 and MP13-MP23.



Company : Tower Engineering Professionals
 Designer : RNM
 Job Number : TEP No. 52861.195718
 Model Name : 184106 - Fluvanna County WT

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Member Advanced Data (Continued)

Label	I Release	J Release	I Offset(in)	J Offset(in)	T/C Only	Physical Analysis	Inactive	Seismic Desig.
220	M224	00000X	00000X			Yes		None
221	M225	00000X	00000X			Yes		None
222	M226	00000X	00000X			Yes		None
223	M227	00000X	00000X			Yes		None

Hot Rolled Steel Design Parameters

Label	Shape	Length(ft)	Lbyy(ft)	Lbzz(ft)	Lcomp top(ft)	Lcomp bot(ft)	L-torq...	Kyy	Kzz	Cb	Functi...
1	POST1	Post	6.5	6.281	4.49			2.1	2.1		Lateral
2	POST2	Post	6.5	6.281	4.49			2.1	2.1		Lateral
3	POST3	Post	6.5	6.281	4.49			2.1	2.1		Lateral
4	POST4	Post	6.5	6.281	4.49			2.1	2.1		Lateral
5	POST5	Post	6.5	6.281	4.49			2.1	2.1		Lateral
6	POST6	Post	6.5	6.281	4.49			2.1	2.1		Lateral
7	POST7	Post	6.5	6.281	4.49			2.1	2.1		Lateral
8	POST8	Post	6.5	6.281	4.49			2.1	2.1		Lateral
9	POST9	Post	6.5	6.281	4.49			2.1	2.1		Lateral
10	POST10	Post	6.5	6.281	4.49			2.1	2.1		Lateral
11	POST11	Post	6.5	6.281	4.49			2.1	2.1		Lateral
12	POST12	Post	6.5	6.281	4.49			2.1	2.1		Lateral
13	POST13	Post	6.5	6.281	4.49			2.1	2.1		Lateral
14	POST14	Post	6.5	6.281	4.49			2.1	2.1		Lateral
15	POST15	Post	6.5	6.281	4.49			2.1	2.1		Lateral
16	POST16	Post	6.5	6.281	4.49			2.1	2.1		Lateral
17	POST17	Post	6.5	6.281	4.49			2.1	2.1		Lateral
18	POST18	Post	6.5	6.281	4.49			2.1	2.1		Lateral
19	POST19	Post	6.5	6.281	4.49			2.1	2.1		Lateral
20	POST20	Post	6.5	6.281	4.49			2.1	2.1		Lateral
21	POST21	Post	6.5	6.281	4.49			2.1	2.1		Lateral
22	POST22	Post	6.5	6.281	4.49			2.1	2.1		Lateral
23	POST23	Post	6.5	6.281	4.49			2.1	2.1		Lateral
24	POST24	Post	6.5	6.281	4.49			2.1	2.1		Lateral
25	TOEPL1	Toe Plate	3.896					.65	.65		Lateral
26	TOEPL2	Toe Plate	3.896					.65	.65		Lateral
27	TOEPL3	Toe Plate	3.896					.65	.65		Lateral
28	TOEPL4	Toe Plate	3.896					.65	.65		Lateral
29	TOEPL5	Toe Plate	3.896					.65	.65		Lateral
30	TOEPL6	Toe Plate	3.896					.65	.65		Lateral
31	TOEPL7	Toe Plate	3.896					.65	.65		Lateral
32	TOEPL8	Toe Plate	3.896					.65	.65		Lateral
33	TOEPL9	Toe Plate	3.896					.65	.65		Lateral
34	TOEPL10	Toe Plate	3.896					.65	.65		Lateral
35	TOEPL11	Toe Plate	3.896					.65	.65		Lateral
36	TOEPL12	Toe Plate	3.896					.65	.65		Lateral
37	TOEPL13	Toe Plate	3.896					.65	.65		Lateral
38	TOEPL14	Toe Plate	3.896					.65	.65		Lateral
39	TOEPL15	Toe Plate	3.896					.65	.65		Lateral
40	TOEPL16	Toe Plate	3.896					.65	.65		Lateral
41	TOEPL17	Toe Plate	3.896					.65	.65		Lateral
42	TOEPL18	Toe Plate	3.896					.65	.65		Lateral
43	TOEPL19	Toe Plate	3.896					.65	.65		Lateral
44	TOEPL20	Toe Plate	3.896					.65	.65		Lateral
45	TOEPL21	Toe Plate	3.896					.65	.65		Lateral
46	TOEPL22	Toe Plate	3.896					.65	.65		Lateral
47	TOEPL23	Toe Plate	3.896					.65	.65		Lateral
48	TOEPL24	Mid-Rail2	3.896					.65	1		Lateral



Company : Tower Engineering Professionals
 Designer : RNM
 Job Number : TEP No. 52861.195718
 Model Name : 184106 - Fluvanna County WT

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Hot Rolled Steel Design Parameters (Continued)

Label	Shape	Length(ft)	Lbyy(ft)	Lbzz(ft)	Lcomp top(ft)	Lcomp bot(ft)	L-torq...	Kyy	Kzz	Cb	Functi...
49	MRAIL1	Mid-Rail2	3.896					.65	1		Lateral
50	MRAIL2	Mid-Rail2	3.896					.65	1		Lateral
51	MRAIL3	Mid-Rail2	3.896					.65	1		Lateral
52	MRAIL4	Mid-Rail2	3.896					.65	1		Lateral
53	MRAIL5	Mid-Rail2	3.896					.65	1		Lateral
54	MRAIL6	Mid-Rail2	3.896					.65	1		Lateral
55	MRAIL7	Mid-Rail2	3.896					.65	1		Lateral
56	MRAIL8	Mid-Rail2	3.896					.65	1		Lateral
57	MRAIL9	Mid-Rail2	3.896					.65	1		Lateral
58	MRAIL10	Mid-Rail2	3.896					.65	1		Lateral
59	MRAIL11	Mid-Rail2	3.896					.65	1		Lateral
60	MRAIL12	Mid-Rail2	3.896					.65	1		Lateral
61	MRAIL13	Mid-Rail2	3.896					.65	1		Lateral
62	MRAIL14	Mid-Rail2	3.896					.65	1		Lateral
63	MRAIL15	Mid-Rail2	3.896					.65	1		Lateral
64	MRAIL16	Mid-Rail2	3.896					.65	1		Lateral
65	MRAIL17	Mid-Rail2	3.896					.65	1		Lateral
66	MRAIL18	Mid-Rail2	3.896					.65	1		Lateral
67	MRAIL19	Mid-Rail2	3.896					.65	1		Lateral
68	MRAIL20	Mid-Rail2	3.896					.65	1		Lateral
69	MRAIL21	Mid-Rail2	3.896					.65	1		Lateral
70	MRAIL22	Mid-Rail2	3.896					.65	1		Lateral
71	MRAIL23	Top-Rail	3.896					.65	1		Lateral
72	MRAIL24	Top-Rail	3.896					.65	1		Lateral
73	TRAIL1	Top-Rail	3.896					.65	1		Lateral
74	TRAIL2	Top-Rail	3.896					.65	1		Lateral
75	TRAIL3	Top-Rail	3.896					.65	1		Lateral
76	TRAIL4	Top-Rail	3.896					.65	1		Lateral
77	TRAIL5	Top-Rail	3.896					.65	1		Lateral
78	TRAIL6	Top-Rail	3.896					.65	1		Lateral
79	TRAIL7	Top-Rail	3.896					.65	1		Lateral
80	TRAIL8	Top-Rail	3.896					.65	1		Lateral
81	TRAIL9	Top-Rail	3.896					.65	1		Lateral
82	TRAIL10	Top-Rail	3.896					.65	1		Lateral
83	TRAIL11	Top-Rail	3.896					.65	1		Lateral
84	TRAIL12	Top-Rail	3.896					.65	1		Lateral
85	TRAIL13	Top-Rail	3.896					.65	1		Lateral
86	TRAIL14	Top-Rail	3.896					.65	1		Lateral
87	TRAIL15	Top-Rail	3.896					.65	1		Lateral
88	TRAIL16	Top-Rail	3.896					.65	1		Lateral
89	TRAIL17	Top-Rail	3.896					.65	1		Lateral
90	TRAIL18	Top-Rail	3.896					.65	1		Lateral
91	TRAIL19	Top-Rail	3.896					.65	1		Lateral
92	TRAIL20	Top-Rail	3.896					.65	1		Lateral
93	TRAIL21	Top-Rail	3.896					.65	1		Lateral
94	TRAIL22	Kicker	7.404					1	.65		Lateral
95	TRAIL23	Kicker	7.404					1	.65		Lateral
96	TRAIL24	Kicker	7.404					1	.65		Lateral
97	KICK9	Kicker	7.404					1	.65		Lateral
98	KICK10	Kicker	7.404					1	.65		Lateral
99	KICK12	Kicker	7.404					1	.65		Lateral
100	KICK14	Kicker	7.404					1	.65		Lateral
101	KICK16	Kicker	7.404					1	.65		Lateral
102	KICK18	Kicker	7.404					1	.65		Lateral
103	KICK20	Kicker	7.404					1	.65		Lateral
104	KICK22	Kicker	7.404					1	.65		Lateral
105	KICK24	Kicker	7.404					1	.65		Lateral



Company : Tower Engineering Professionals
 Designer : RNM
 Job Number : TEP No. 52861.195718
 Model Name : 184106 - Fluvanna County WT

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Hot Rolled Steel Design Parameters (Continued)

Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp.top[ft]	Lcomp.bot[ft]	L-torq...	Kyy	Kzz	Cb	Functi...
106	M109	Mid-Rail2	3.896					.65	1		Lateral
107	M110	Mid-Rail2	3.896					.65	1		Lateral
108	M111	Mid-Rail2	3.896					.65	1		Lateral
109	M112	Mid-Rail2	3.896					.65	1		Lateral
110	M113	Mid-Rail2	3.896					.65	1		Lateral
111	M114	Mid-Rail2	3.896					.65	1		Lateral
112	M115	Mid-Rail2	3.896					.65	1		Lateral
113	M116	Mid-Rail2	3.896					.65	1		Lateral
114	M118	Mid-Rail2	3.896					.65	1		Lateral
115	M119	Mid-Rail2	3.896					.65	1		Lateral
116	M120	Mid-Rail2	3.896					.65	1		Lateral
117	M121	Mid-Rail2	3.896					.65	1		Lateral
118	M122	Mid-Rail2	3.896					.65	1		Lateral
119	M123	Mid-Rail2	3.896					.65	1		Lateral
120	M124	Mid-Rail2	3.896					.65	1		Lateral
121	M125	Mid-Rail2	3.896					.65	1		Lateral
122	M126	Mid-Rail2	3.896					.65	1		Lateral
123	M127	Mid-Rail2	3.896					.65	1		Lateral
124	M128	Mid-Rail2	3.896					.65	1		Lateral
125	M129	Mid-Rail2	3.896					.65	1		Lateral
126	M130	Mid-Rail2	3.896					.65	1		Lateral
127	M131	Mid-Rail2	3.896					.65	1		Lateral
128	M132	Mid-Rail2	3.896					.65	1		Lateral
129	MP1	Mount Pipe	7	Segment	Segment			2.1	2.1		Lateral
130	MP2	Mount Pipe	7	Segment	Segment			2.1	2.1		Lateral
131	MP3	Mount Pipe	7	Segment	Segment			2.1	2.1		Lateral
132	MP4	Mount Pipe	7	Segment	Segment			2.1	2.1		Lateral
133	MP5	Mount Pipe	8	Segment	Segment			2.1	2.1		Lateral
134	MP6	Mount Pipe	8	Segment	Segment			2.1	2.1		Lateral
135	MP7	Mount Pipe	8	Segment	Segment			2.1	2.1		Lateral
136	MP8	Mount Pipe	8	Segment	Segment			2.1	2.1		Lateral
137	MP9	Mount Pipe	7	Segment	Segment			2.1	2.1		Lateral
138	MP10	Mount Pipe	7	Segment	Segment			2.1	2.1		Lateral
139	MP11	Mount Pipe	7	Segment	Segment			2.1	2.1		Lateral
140	MP12	Mount Pipe	7	Segment	Segment			2.1	2.1		Lateral
141	MP13	Mount Pipe	8	Segment	Segment			2.1	2.1		Lateral
142	MP14	Mount Pipe	8	Segment	Segment			2.1	2.1		Lateral
143	MP15	Mount Pipe	8	Segment	Segment			2.1	2.1		Lateral
144	MP16	Mount Pipe	8	Segment	Segment			2.1	2.1		Lateral
145	MP17	Mount Pipe	7	Segment	Segment			2.1	2.1		Lateral
146	MP18	Mount Pipe	7	Segment	Segment			2.1	2.1		Lateral
147	MP19	Mount Pipe	7	Segment	Segment			2.1	2.1		Lateral
148	MP20	Mount Pipe	7	Segment	Segment			2.1	2.1		Lateral
149	MP21	Mount Pipe	8	Segment	Segment			2.1	2.1		Lateral
150	MP22	Mount Pipe	8	Segment	Segment			2.1	2.1		Lateral
151	MP23	Mount Pipe	8	Segment	Segment			2.1	2.1		Lateral
152	MP24	Mount Pipe	8	Segment	Segment			2.1	2.1		Lateral
153	DIAG1	Diagonals	5.944					.65	1		Lateral
154	DIAG2	Diagonals	5.944					.65	1		Lateral
155	M207	Diagonals	5.945					.65	1		Lateral
156	M208	Diagonals	5.945					.65	1		Lateral
157	M209	Diagonals	5.944					.65	1		Lateral
158	M210	Diagonals	5.944					.65	1		Lateral
159	M211	Diagonals	5.944					.65	1		Lateral
160	M212	Diagonals	5.944					.65	1		Lateral
161	M213	Diagonals	5.945					.65	1		Lateral
162	M214	Diagonals	5.945					.65	1		Lateral



Company : Tower Engineering Professionals
 Designer : RNM
 Job Number : TEP No. 52861.195718
 Model Name : 184106 - Fluvanna County WT

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Hot Rolled Steel Design Parameters (Continued)

Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp.top[ft]	Lcomp.bot[ft]	L-torq...	Kyy	Kzz	Cb	Functi...
163	M215	Diagonals	5.944					.65	1		Lateral
164	M216	Diagonals	5.944					.65	1		Lateral
165	M217	Diagonals	5.944					.65	1		Lateral
166	M218	Diagonals	5.944					.65	1		Lateral
167	M219	Diagonals	5.945					.65	1		Lateral
168	M220	Diagonals	5.945					.65	1		Lateral
169	M221	Diagonals	5.944					.65	1		Lateral
170	M222	Diagonals	5.944					.65	1		Lateral
171	M223	Diagonals	5.944					.65	1		Lateral
172	M224	Diagonals	5.944					.65	1		Lateral
173	M225	Diagonals	5.945					.65	1		Lateral
174	M226	Diagonals	5.945					.65	1		Lateral
175	M227	Diagonals	5.944					.65	1		Lateral

Joint Boundary Conditions

Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot [k-ft/rad]	Y Rot [k-ft/rad]	Z Rot [k-ft/rad]
1	1	Reaction	Reaction	Reaction	Reaction	Reaction
2	2	Reaction	Reaction	Reaction	Reaction	Reaction
3	3	Reaction	Reaction	Reaction	Reaction	Reaction
4	4	Reaction	Reaction	Reaction	Reaction	Reaction
5	5	Reaction	Reaction	Reaction	Reaction	Reaction
6	6	Reaction	Reaction	Reaction	Reaction	Reaction
7	7	Reaction	Reaction	Reaction	Reaction	Reaction
8	8	Reaction	Reaction	Reaction	Reaction	Reaction
9	9	Reaction	Reaction	Reaction	Reaction	Reaction
10	10	Reaction	Reaction	Reaction	Reaction	Reaction
11	11	Reaction	Reaction	Reaction	Reaction	Reaction
12	12	Reaction	Reaction	Reaction	Reaction	Reaction
13	13	Reaction	Reaction	Reaction	Reaction	Reaction
14	14	Reaction	Reaction	Reaction	Reaction	Reaction
15	15	Reaction	Reaction	Reaction	Reaction	Reaction
16	16	Reaction	Reaction	Reaction	Reaction	Reaction
17	17	Reaction	Reaction	Reaction	Reaction	Reaction
18	18	Reaction	Reaction	Reaction	Reaction	Reaction
19	19	Reaction	Reaction	Reaction	Reaction	Reaction
20	20	Reaction	Reaction	Reaction	Reaction	Reaction
21	21	Reaction	Reaction	Reaction	Reaction	Reaction
22	22	Reaction	Reaction	Reaction	Reaction	Reaction
23	23	Reaction	Reaction	Reaction	Reaction	Reaction
24	24	Reaction	Reaction	Reaction	Reaction	Reaction
25	25	Reaction	Reaction	Reaction	Reaction	Reaction
26	26	Reaction	Reaction	Reaction	Reaction	Reaction
27	27	Reaction	Reaction	Reaction	Reaction	Reaction
28	28	Reaction	Reaction	Reaction	Reaction	Reaction
29	29	Reaction	Reaction	Reaction	Reaction	Reaction
30	30	Reaction	Reaction	Reaction	Reaction	Reaction
31	31	Reaction	Reaction	Reaction	Reaction	Reaction
32	32	Reaction	Reaction	Reaction	Reaction	Reaction
33	33	Reaction	Reaction	Reaction	Reaction	Reaction
34	34	Reaction	Reaction	Reaction	Reaction	Reaction
35	35	Reaction	Reaction	Reaction	Reaction	Reaction
36	36	Reaction	Reaction	Reaction	Reaction	Reaction
37	37	Reaction	Reaction	Reaction	Reaction	Reaction
38	38	Reaction	Reaction	Reaction	Reaction	Reaction
39	39	Reaction	Reaction	Reaction	Reaction	Reaction



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Joint Boundary Conditions (Continued)

Joint Label	X lk/in1	Y lk/in1	Z lk/in1	X Rot.lk-ft/rad1	Y Rot.lk-ft/rad1	Z Rot.lk-ft/rad1
40	40	Reaction	Reaction	Reaction	Reaction	Reaction
41	41	Reaction	Reaction	Reaction	Reaction	Reaction
42	42	Reaction	Reaction	Reaction	Reaction	Reaction
43	43	Reaction	Reaction	Reaction	Reaction	Reaction
44	44	Reaction	Reaction	Reaction	Reaction	Reaction
45	45	Reaction	Reaction	Reaction	Reaction	Reaction
46	46	Reaction	Reaction	Reaction	Reaction	Reaction
47	47	Reaction	Reaction	Reaction	Reaction	Reaction
48	48	Reaction	Reaction	Reaction	Reaction	Reaction

Basic Load Cases

BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed Area(Me...	Surface...
1 Dead Load	DL		-1			74		
2 Wind 1 (0 Deg)	WL					74	1	
3 Wind 2 (45 Deg)	WL					148	2	
4 Wind 3 (90 Deg)	WL					74	1	
5 Wind 4 (135 Deg)	WL					148	2	
6 Wind 5 (180 Deg)	WL					74	1	
7 Wind 6 (225 Deg)	WL					148	2	
8 Wind 7 (270 Deg)	WL					74	1	
9 Wind 8 (315 Deg)	WL					148	2	
10 Ice Weight	DL					74	152	
11 Ice + Wind 1 (0 Deg)	WL					74	1	
12 Ice + Wind 2 (45 Deg)	WL					148	2	
13 Ice + Wind 3 (90 Deg)	WL					74	1	
14 Ice + Wind 4 (135 Deg)	WL					148	2	
15 Ice + Wind 5 (180 Deg)	WL					74	1	
16 Ice + Wind 6 (225 Deg)	WL					148	2	
17 Ice + Wind 7 (270 Deg)	WL					74	1	
18 Ice + Wind 8 (315 Deg)	WL					148	2	
19 BLC 2 Transient Area Loads	None						223	
20 BLC 3 Transient Area Loads	None						446	
21 BLC 4 Transient Area Loads	None						223	
22 BLC 5 Transient Area Loads	None						446	
23 BLC 6 Transient Area Loads	None						223	
24 BLC 7 Transient Area Loads	None						446	
25 BLC 8 Transient Area Loads	None						223	
26 BLC 9 Transient Area Loads	None						446	
27 BLC 11 Transient Area Loads	None						223	
28 BLC 12 Transient Area Loads	None						446	
29 BLC 13 Transient Area Loads	None						223	
30 BLC 14 Transient Area Loads	None						446	
31 BLC 15 Transient Area Loads	None						223	
32 BLC 16 Transient Area Loads	None						446	
33 BLC 17 Transient Area Loads	None						223	
34 BLC 18 Transient Area Loads	None						446	

Load Combinations

Description	So...	PDelta	S...	BLC Fac..	BLCFac..	BLCFac..	BLCFac..	BLCFac..	BLCFac..	BLCFac..	BLCFac..	BLCFac..
1 1.0D	Yes	Y	1	1								
2 1.2D + 1.6W1 (0)	Yes	Y	1	1.2	2	1.6						
3 0.9D + 1.6W1 (0)	Yes	Y	1	.9	2	1.6						
4 1.2D + 1.6W2 (45)	Yes	Y	1	1.2	3	1.6						
5 0.9D + 1.6W2 (45)	Yes	Y	1	.9	3	1.6						



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Load Combinations (Continued)

Description	So...	PDelta	S...	BLC Fac..	BLCFac..	BLCFac..	BLCFac..	BLCFac..	BLCFac..	BLCFac..	BLCFac..	BLCFac..
6 1.2D + 1.6W3 (90)	Yes	Y	1	1.2	4	1.6						
7 0.9D + 1.6W3 (90)	Yes	Y	1	.9	4	1.6						
8 1.2D + 1.6W4 (135)	Yes	Y	1	1.2	5	1.6						
9 0.9D + 1.6W4 (135)	Yes	Y	1	.9	5	1.6						
10 1.2D + 1.6W5 (180)	Yes	Y	1	1.2	6	1.6						
11 0.9D + 1.6W5 (180)	Yes	Y	1	.9	6	1.6						
12 1.2D + 1.6W6 (225)	Yes	Y	1	1.2	7	1.6						
13 0.9D + 1.6W6 (225)	Yes	Y	1	.9	7	1.6						
14 1.2D + 1.6W7 (270)	Yes	Y	1	1.2	8	1.6						
15 0.9D + 1.6W7 (270)	Yes	Y	1	.9	8	1.6						
16 1.2D + 1.6W8 (315)	Yes	Y	1	1.2	9	1.6						
17 0.9D + 1.6W8 (315)	Yes	Y	1	.9	9	1.6						
18 1.2D + 1.0 Ice	Yes	Y	1	1.2	10	1						
19 1.2D + 1.0 Ice + 1	Yes	Y	1	1.2	10	1	11	1				
20 1.2D + 1.0 Ice + 1	Yes	Y	1	1.2	10	1	12	1				
21 1.2D + 1.0 Ice + 1	Yes	Y	1	1.2	10	1	13	1				
22 1.2D + 1.0 Ice + 1	Yes	Y	1	1.2	10	1	14	1				
23 1.2D + 1.0 Ice + 1	Yes	Y	1	1.2	10	1	15	1				
24 1.2D + 1.0 Ice + 1	Yes	Y	1	1.2	10	1	16	1				
25 1.2D + 1.0 Ice + 1	Yes	Y	1	1.2	10	1	17	1				
26 1.2D + 1.0 Ice + 1	Yes	Y	1	1.2	10	1	18	1				

Member Point Loads (BLC 1 : Dead Load)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
1 MP1	Y	-0.73	0
2 MP3	Y	-0.28	0
3 MP4	Y	-0.73	0
4 MP5	Y	-0.01	0
5 MP6	Y	-0.63	0
6 MP7	Y	-0.03	0
7 MP8	Y	-0.37	0
8 MP9	Y	-0.73	0
9 MP11	Y	-0.28	0
10 MP12	Y	-0.07	0
11 MP13	Y	-0.01	0
12 MP14	Y	-0.03	0
13 MP15	Y	-0.63	0
14 MP16	Y	-0.37	0
15 MP17	Y	-0.07	0
16 MP19	Y	-0.28	0
17 MP20	Y	-0.61	0
18 MP21	Y	-0.63	0
19 MP22	Y	-0.01	0
20 MP23	Y	-0.03	0
21 MP24	Y	-0.37	0
22 POST1	Y	-0.43	0
23 POST2	Y	-0.43	0
24 POST3	Y	-0.43	0
25 POST12	Y	-0.43	0
26 POST13	Y	-0.43	0
27 POST14	Y	-0.43	0
28 POST15	Y	-0.43	0
29 POST16	Y	-0.43	0
30 POST17	Y	-0.43	0
31 POST18	Y	-0.43	0



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Member Point Loads (BLC 1 : Dead Load) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
32	POST19	Y	-0.43	0
33	POST20	Y	-0.43	0
34	POST21	Y	-0.43	0
35	POST22	Y	-0.43	0
36	POST23	Y	-0.43	0
37	POST24	Y	-0.43	0
38	MP1	Y	-0.73	%100
39	MP3	Y	-0.28	%100
40	MP4	Y	-0.73	%100
41	MP5	Y	-0.01	%100
42	MP6	Y	-0.63	%100
43	MP7	Y	-0.03	%100
44	MP8	Y	-0.37	%100
45	MP9	Y	-0.73	%100
46	MP11	Y	-0.28	%100
47	MP12	Y	-0.07	%100
48	MP13	Y	-0.01	%100
49	MP14	Y	-0.03	%100
50	MP15	Y	-0.63	%100
51	MP16	Y	-0.37	%100
52	MP17	Y	-0.07	%100
53	MP19	Y	-0.28	%100
54	MP20	Y	-0.61	%100
55	MP21	Y	-0.63	%100
56	MP22	Y	-0.01	%100
57	MP23	Y	-0.03	%100
58	MP24	Y	-0.37	%100
59	POST1	Y	-0.43	%100
60	POST2	Y	-0.43	%100
61	POST3	Y	-0.43	%100
62	POST12	Y	-0.43	%100
63	POST13	Y	-0.43	%100
64	POST14	Y	-0.43	%100
65	POST15	Y	-0.43	%100
66	POST16	Y	-0.43	%100
67	POST17	Y	-0.43	%100
68	POST18	Y	-0.43	%100
69	POST19	Y	-0.43	%100
70	POST20	Y	-0.43	%100
71	POST21	Y	-0.43	%100
72	POST22	Y	-0.43	%100
73	POST23	Y	-0.43	%100
74	POST24	Y	-0.43	%100

Member Point Loads (BLC 2 : Wind 1 (0 Deg))

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
1	MP1	X	-0.164	0
2	MP3	X	-0.18	0
3	MP4	X	-0.167	0
4	MP5	X	-0.06	0
5	MP6	X	-0.083	0
6	MP7	X	-0.032	0
7	MP8	X	-0.076	0
8	MP9	X	-0.183	0
9	MP11	X	-0.021	0
10	MP12	X	-0.151	0



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Member Point Loads (BLC 2 : Wind 1 (0 Deg)) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
11	MP13	X	-0.09	0
12	MP14	X	-0.045	0
13	MP15	X	-0.118	0
14	MP16	X	-0.119	0
15	MP17	X	-0.114	0
16	MP19	X	-0.014	0
17	MP20	X	-0.095	0
18	MP21	X	-0.091	0
19	MP22	X	-0.067	0
20	MP23	X	-0.035	0
21	MP24	X	-0.085	0
22	POST1	X	-0.46	0
23	POST2	X	-0.46	0
24	POST3	X	-0.46	0
25	POST12	X	-0.46	0
26	POST13	X	-0.46	0
27	POST14	X	-0.46	0
28	POST15	X	-0.46	0
29	POST16	X	-0.46	0
30	POST17	X	-0.46	0
31	POST18	X	-0.46	0
32	POST19	X	-0.46	0
33	POST20	X	-0.46	0
34	POST21	X	-0.46	0
35	POST22	X	-0.46	0
36	POST23	X	-0.46	0
37	POST24	X	-0.46	0
38	MP1	X	-0.164	%100
39	MP3	X	-0.18	%100
40	MP4	X	-0.167	%100
41	MP5	X	-0.06	%100
42	MP6	X	-0.083	%100
43	MP7	X	-0.032	%100
44	MP8	X	-0.076	%100
45	MP9	X	-0.183	%100
46	MP11	X	-0.021	%100
47	MP12	X	-0.151	%100
48	MP13	X	-0.09	%100
49	MP14	X	-0.045	%100
50	MP15	X	-0.118	%100
51	MP16	X	-0.119	%100
52	MP17	X	-0.114	%100
53	MP19	X	-0.014	%100
54	MP20	X	-0.095	%100
55	MP21	X	-0.091	%100
56	MP22	X	-0.067	%100
57	MP23	X	-0.035	%100
58	MP24	X	-0.085	%100
59	POST1	X	-0.46	%100
60	POST2	X	-0.46	%100
61	POST3	X	-0.46	%100
62	POST12	X	-0.46	%100
63	POST13	X	-0.46	%100
64	POST14	X	-0.46	%100
65	POST15	X	-0.46	%100
66	POST16	X	-0.46	%100
67	POST17	X	-0.46	%100



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Member Point Loads (BLC 2 : Wind 1 (0 Deg)) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
68	POST18	X	-0.46	%100
69	POST19	X	-0.46	%100
70	POST20	X	-0.46	%100
71	POST21	X	-0.46	%100
72	POST22	X	-0.46	%100
73	POST23	X	-0.46	%100
74	POST24	X	-0.46	%100

Member Point Loads (BLC 3 : Wind 2 (45 Deg))

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
1	MP1	X	-0.116	0
2	MP3	X	-0.013	0
3	MP4	X	-0.118	0
4	MP5	X	-0.042	0
5	MP6	X	-0.058	0
6	MP7	X	-0.023	0
7	MP8	X	-0.054	0
8	MP9	X	-0.129	0
9	MP11	X	-0.015	0
10	MP12	X	-0.107	0
11	MP13	X	-0.064	0
12	MP14	X	-0.032	0
13	MP15	X	-0.084	0
14	MP16	X	-0.084	0
15	MP17	X	-0.08	0
16	MP19	X	-0.01	0
17	MP20	X	-0.067	0
18	MP21	X	-0.064	0
19	MP22	X	-0.047	0
20	MP23	X	-0.025	0
21	MP24	X	-0.06	0
22	POST1	X	-0.032	0
23	POST2	X	-0.032	0
24	POST3	X	-0.032	0
25	POST12	X	-0.032	0
26	POST13	X	-0.032	0
27	POST14	X	-0.032	0
28	POST15	X	-0.032	0
29	POST16	X	-0.032	0
30	POST17	X	-0.032	0
31	POST18	X	-0.032	0
32	POST19	X	-0.032	0
33	POST20	X	-0.032	0
34	POST21	X	-0.032	0
35	POST22	X	-0.032	0
36	POST23	X	-0.032	0
37	POST24	X	-0.032	0
38	MP1	X	-0.116	%100
39	MP3	X	-0.013	%100
40	MP4	X	-0.118	%100
41	MP5	X	-0.042	%100
42	MP6	X	-0.058	%100
43	MP7	X	-0.023	%100
44	MP8	X	-0.054	%100
45	MP9	X	-0.129	%100
46	MP11	X	-0.015	%100



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Member Point Loads (BLC 3 : Wind 2 (45 Deg)) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
47	MP12	X	-0.107	%100
48	MP13	X	-0.064	%100
49	MP14	X	-0.032	%100
50	MP15	X	-0.084	%100
51	MP16	X	-0.084	%100
52	MP17	X	-0.08	%100
53	MP19	X	-0.01	%100
54	MP20	X	-0.067	%100
55	MP21	X	-0.064	%100
56	MP22	X	-0.047	%100
57	MP23	X	-0.025	%100
58	MP24	X	-0.06	%100
59	POST1	X	-0.032	%100
60	POST2	X	-0.032	%100
61	POST3	X	-0.032	%100
62	POST12	X	-0.032	%100
63	POST13	X	-0.032	%100
64	POST14	X	-0.032	%100
65	POST15	X	-0.032	%100
66	POST16	X	-0.032	%100
67	POST17	X	-0.032	%100
68	POST18	X	-0.032	%100
69	POST19	X	-0.032	%100
70	POST20	X	-0.032	%100
71	POST21	X	-0.032	%100
72	POST22	X	-0.032	%100
73	POST23	X	-0.032	%100
74	POST24	X	-0.032	%100
75	MP1	Z	-0.106	0
76	MP3	Z	-0.012	0
77	MP4	Z	-0.104	0
78	MP5	Z	-0.058	0
79	MP6	Z	-0.075	0
80	MP7	Z	-0.029	0
81	MP8	Z	-0.074	0
82	MP9	Z	-0.092	0
83	MP11	Z	-0.01	0
84	MP12	Z	-0.08	0
85	MP13	Z	-0.036	0
86	MP14	Z	-0.02	0
87	MP15	Z	-0.05	0
88	MP16	Z	-0.044	0
89	MP17	Z	-0.107	0
90	MP19	Z	-0.015	0
91	MP20	Z	-0.101	0
92	MP21	Z	-0.07	0
93	MP22	Z	-0.053	0
94	MP23	Z	-0.027	0
95	MP24	Z	-0.068	0
96	POST1	Z	-0.003	0
97	POST2	Z	-0.003	0
98	POST3	Z	-0.003	0
99	POST12	Z	-0.003	0
100	POST13	Z	-0.003	0
101	POST14	Z	-0.003	0
102	POST15	Z	-0.003	0
103	POST16	Z	-0.003	0



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Member Point Loads (BLC 3 : Wind 2 (45 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
104	POST17	Z	-0.003	0
105	POST18	Z	-0.003	0
106	POST19	Z	-0.003	0
107	POST20	Z	-0.003	0
108	POST21	Z	-0.003	0
109	POST22	Z	-0.003	0
110	POST23	Z	-0.003	0
111	POST24	Z	-0.003	0
112	MP1	Z	-0.106	%100
113	MP3	Z	-0.012	%100
114	MP4	Z	-0.104	%100
115	MP5	Z	-0.058	%100
116	MP6	Z	-0.075	%100
117	MP7	Z	-0.029	%100
118	MP8	Z	-0.074	%100
119	MP9	Z	-0.092	%100
120	MP11	Z	-0.01	%100
121	MP12	Z	-0.08	%100
122	MP13	Z	-0.036	%100
123	MP14	Z	-0.02	%100
124	MP15	Z	-0.05	%100
125	MP16	Z	-0.044	%100
126	MP17	Z	-0.107	%100
127	MP19	Z	-0.015	%100
128	MP20	Z	-0.101	%100
129	MP21	Z	-0.07	%100
130	MP22	Z	-0.053	%100
131	MP23	Z	-0.027	%100
132	MP24	Z	-0.068	%100
133	POST1	Z	-0.003	%100
134	POST2	Z	-0.003	%100
135	POST3	Z	-0.003	%100
136	POST12	Z	-0.003	%100
137	POST13	Z	-0.003	%100
138	POST14	Z	-0.003	%100
139	POST15	Z	-0.003	%100
140	POST16	Z	-0.003	%100
141	POST17	Z	-0.003	%100
142	POST18	Z	-0.003	%100
143	POST19	Z	-0.003	%100
144	POST20	Z	-0.003	%100
145	POST21	Z	-0.003	%100
146	POST22	Z	-0.003	%100
147	POST23	Z	-0.003	%100
148	POST24	Z	-0.003	%100

Member Point Loads (BLC 4 : Wind 3 (90 Deg))

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
1	MP1	Z	-0.149	0
2	MP3	Z	-0.017	0
3	MP4	Z	-0.147	0
4	MP5	Z	-0.082	0
5	MP6	Z	-0.106	0
6	MP7	Z	-0.041	0
7	MP8	Z	-0.104	0
8	MP9	Z	-0.131	0



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Member Point Loads (BLC 4 : Wind 3 (90 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
9	MP11	Z	-0.015	0
10	MP12	Z	-0.113	0
11	MP13	Z	-0.051	0
12	MP14	Z	-0.029	0
13	MP15	Z	-0.071	0
14	MP16	Z	-0.062	0
15	MP17	Z	-0.151	0
16	MP19	Z	-0.021	0
17	MP20	Z	-0.142	0
18	MP21	Z	-0.098	0
19	MP22	Z	-0.075	0
20	MP23	Z	-0.038	0
21	MP24	Z	-0.095	0
22	POST1	Z	-0.004	0
23	POST2	Z	-0.004	0
24	POST3	Z	-0.004	0
25	POST12	Z	-0.004	0
26	POST13	Z	-0.004	0
27	POST14	Z	-0.004	0
28	POST15	Z	-0.004	0
29	POST16	Z	-0.004	0
30	POST17	Z	-0.004	0
31	POST18	Z	-0.004	0
32	POST19	Z	-0.004	0
33	POST20	Z	-0.004	0
34	POST21	Z	-0.004	0
35	POST22	Z	-0.004	0
36	POST23	Z	-0.004	0
37	POST24	Z	-0.004	0
38	MP1	Z	-0.149	%100
39	MP3	Z	-0.017	%100
40	MP4	Z	-0.147	%100
41	MP5	Z	-0.082	%100
42	MP6	Z	-0.106	%100
43	MP7	Z	-0.041	%100
44	MP8	Z	-0.104	%100
45	MP9	Z	-0.131	%100
46	MP11	Z	-0.015	%100
47	MP12	Z	-0.113	%100
48	MP13	Z	-0.051	%100
49	MP14	Z	-0.029	%100
50	MP15	Z	-0.071	%100
51	MP16	Z	-0.062	%100
52	MP17	Z	-0.151	%100
53	MP19	Z	-0.021	%100
54	MP20	Z	-0.142	%100
55	MP21	Z	-0.098	%100
56	MP22	Z	-0.075	%100
57	MP23	Z	-0.038	%100
58	MP24	Z	-0.095	%100
59	POST1	Z	-0.004	%100
60	POST2	Z	-0.004	%100
61	POST3	Z	-0.004	%100
62	POST12	Z	-0.004	%100
63	POST13	Z	-0.004	%100
64	POST14	Z	-0.004	%100
65	POST15	Z	-0.004	%100



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Member Point Loads (BLC 4 : Wind 3 (90 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
66	POST16	Z	-0.04	%100
67	POST17	Z	-0.04	%100
68	POST18	Z	-0.04	%100
69	POST19	Z	-0.04	%100
70	POST20	Z	-0.04	%100
71	POST21	Z	-0.04	%100
72	POST22	Z	-0.04	%100
73	POST23	Z	-0.04	%100
74	POST24	Z	-0.04	%100

Member Point Loads (BLC 5 : Wind 4 (135 Deg))

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
1	MP1	X	.116	0
2	MP3	X	.013	0
3	MP4	X	.118	0
4	MP5	X	.042	0
5	MP6	X	.058	0
6	MP7	X	.023	0
7	MP8	X	.054	0
8	MP9	X	.129	0
9	MP11	X	.015	0
10	MP12	X	.107	0
11	MP13	X	.064	0
12	MP14	X	.032	0
13	MP15	X	.084	0
14	MP16	X	.084	0
15	MP17	X	.08	0
16	MP19	X	.01	0
17	MP20	X	.067	0
18	MP21	X	.064	0
19	MP22	X	.047	0
20	MP23	X	.025	0
21	MP24	X	.06	0
22	POST1	X	.032	0
23	POST2	X	.032	0
24	POST3	X	.032	0
25	POST12	X	.032	0
26	POST13	X	.032	0
27	POST14	X	.032	0
28	POST15	X	.032	0
29	POST16	X	.032	0
30	POST17	X	.032	0
31	POST18	X	.032	0
32	POST19	X	.032	0
33	POST20	X	.032	0
34	POST21	X	.032	0
35	POST22	X	.032	0
36	POST23	X	.032	0
37	POST24	X	.032	0
38	MP1	X	.116	%100
39	MP3	X	.013	%100
40	MP4	X	.118	%100
41	MP5	X	.042	%100
42	MP6	X	.058	%100
43	MP7	X	.023	%100
44	MP8	X	.054	%100



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Member Point Loads (BLC 5 : Wind 4 (135 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
45	MP9	X	.129	%100
46	MP11	X	.015	%100
47	MP12	X	.107	%100
48	MP13	X	.064	%100
49	MP14	X	.032	%100
50	MP15	X	.084	%100
51	MP16	X	.084	%100
52	MP17	X	.08	%100
53	MP19	X	.01	%100
54	MP20	X	.067	%100
55	MP21	X	.064	%100
56	MP22	X	.047	%100
57	MP23	X	.025	%100
58	MP24	X	.06	%100
59	POST1	X	.032	%100
60	POST2	X	.032	%100
61	POST3	X	.032	%100
62	POST12	X	.032	%100
63	POST13	X	.032	%100
64	POST14	X	.032	%100
65	POST15	X	.032	%100
66	POST16	X	.032	%100
67	POST17	X	.032	%100
68	POST18	X	.032	%100
69	POST19	X	.032	%100
70	POST20	X	.032	%100
71	POST21	X	.032	%100
72	POST22	X	.032	%100
73	POST23	X	.032	%100
74	POST24	X	.032	%100
75	MP1	Z	-1.06	0
76	MP3	Z	-.012	0
77	MP4	Z	-1.04	0
78	MP5	Z	-.058	0
79	MP6	Z	-.075	0
80	MP7	Z	-.029	0
81	MP8	Z	-.074	0
82	MP9	Z	-.092	0
83	MP11	Z	-.01	0
84	MP12	Z	-.08	0
85	MP13	Z	-.036	0
86	MP14	Z	-.02	0
87	MP15	Z	-.05	0
88	MP16	Z	-.044	0
89	MP17	Z	-.107	0
90	MP19	Z	-.015	0
91	MP20	Z	-.101	0
92	MP21	Z	-.07	0
93	MP22	Z	-.053	0
94	MP23	Z	-.027	0
95	MP24	Z	-.068	0
96	POST1	Z	-.003	0
97	POST2	Z	-.003	0
98	POST3	Z	-.003	0
99	POST12	Z	-.003	0
100	POST13	Z	-.003	0
101	POST14	Z	-.003	0



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Member Point Loads (BLC 5 : Wind 4 (135 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
102	POST15	Z	-0.003	0
103	POST16	Z	-0.003	0
104	POST17	Z	-0.003	0
105	POST18	Z	-0.003	0
106	POST19	Z	-0.003	0
107	POST20	Z	-0.003	0
108	POST21	Z	-0.003	0
109	POST22	Z	-0.003	0
110	POST23	Z	-0.003	0
111	POST24	Z	-0.003	0
112	MP1	Z	-0.106	%100
113	MP3	Z	-0.012	%100
114	MP4	Z	-0.104	%100
115	MP5	Z	-0.058	%100
116	MP6	Z	-0.075	%100
117	MP7	Z	-0.029	%100
118	MP8	Z	-0.074	%100
119	MP9	Z	-0.092	%100
120	MP11	Z	-0.01	%100
121	MP12	Z	-0.08	%100
122	MP13	Z	-0.036	%100
123	MP14	Z	-0.02	%100
124	MP15	Z	-0.05	%100
125	MP16	Z	-0.044	%100
126	MP17	Z	-0.107	%100
127	MP19	Z	-0.015	%100
128	MP20	Z	-0.101	%100
129	MP21	Z	-0.07	%100
130	MP22	Z	-0.053	%100
131	MP23	Z	-0.027	%100
132	MP24	Z	-0.068	%100
133	POST1	Z	-0.003	%100
134	POST2	Z	-0.003	%100
135	POST3	Z	-0.003	%100
136	POST12	Z	-0.003	%100
137	POST13	Z	-0.003	%100
138	POST14	Z	-0.003	%100
139	POST15	Z	-0.003	%100
140	POST16	Z	-0.003	%100
141	POST17	Z	-0.003	%100
142	POST18	Z	-0.003	%100
143	POST19	Z	-0.003	%100
144	POST20	Z	-0.003	%100
145	POST21	Z	-0.003	%100
146	POST22	Z	-0.003	%100
147	POST23	Z	-0.003	%100
148	POST24	Z	-0.003	%100

Member Point Loads (BLC 6 : Wind 5 (180 Deg))

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
1	MP1	X	.164	0
2	MP3	X	.018	0
3	MP4	X	.167	0
4	MP5	X	.06	0
5	MP6	X	.083	0
6	MP7	X	.032	0



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Member Point Loads (BLC 6 : Wind 5 (180 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
7	MP8	X	.076	0
8	MP9	X	.183	0
9	MP11	X	.021	0
10	MP12	X	.151	0
11	MP13	X	.09	0
12	MP14	X	.045	0
13	MP15	X	.118	0
14	MP16	X	.119	0
15	MP17	X	.114	0
16	MP19	X	.014	0
17	MP20	X	.095	0
18	MP21	X	.091	0
19	MP22	X	.067	0
20	MP23	X	.035	0
21	MP24	X	.085	0
22	POST1	X	.046	0
23	POST2	X	.046	0
24	POST3	X	.046	0
25	POST12	X	.046	0
26	POST13	X	.046	0
27	POST14	X	.046	0
28	POST15	X	.046	0
29	POST16	X	.046	0
30	POST17	X	.046	0
31	POST18	X	.046	0
32	POST19	X	.046	0
33	POST20	X	.046	0
34	POST21	X	.046	0
35	POST22	X	.046	0
36	POST23	X	.046	0
37	POST24	X	.046	0
38	MP1	X	.164	%100
39	MP3	X	.018	%100
40	MP4	X	.167	%100
41	MP5	X	.06	%100
42	MP6	X	.083	%100
43	MP7	X	.032	%100
44	MP8	X	.076	%100
45	MP9	X	.183	%100
46	MP11	X	.021	%100
47	MP12	X	.151	%100
48	MP13	X	.09	%100
49	MP14	X	.045	%100
50	MP15	X	.118	%100
51	MP16	X	.119	%100
52	MP17	X	.114	%100
53	MP19	X	.014	%100
54	MP20	X	.095	%100
55	MP21	X	.091	%100
56	MP22	X	.067	%100
57	MP23	X	.035	%100
58	MP24	X	.085	%100
59	POST1	X	.046	%100
60	POST2	X	.046	%100
61	POST3	X	.046	%100
62	POST12	X	.046	%100
63	POST13	X	.046	%100



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Member Point Loads (BLC 6 : Wind 5 (180 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
64	POST14	X	.046	%100
65	POST15	X	.046	%100
66	POST16	X	.046	%100
67	POST17	X	.046	%100
68	POST18	X	.046	%100
69	POST19	X	.046	%100
70	POST20	X	.046	%100
71	POST21	X	.046	%100
72	POST22	X	.046	%100
73	POST23	X	.046	%100
74	POST24	X	.046	%100

Member Point Loads (BLC 7 : Wind 6 (225 Deg))

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
1	MP1	X	.116	0
2	MP3	X	.013	0
3	MP4	X	.118	0
4	MP5	X	.042	0
5	MP6	X	.058	0
6	MP7	X	.023	0
7	MP8	X	.054	0
8	MP9	X	.129	0
9	MP11	X	.015	0
10	MP12	X	.107	0
11	MP13	X	.064	0
12	MP14	X	.032	0
13	MP15	X	.084	0
14	MP16	X	.084	0
15	MP17	X	.08	0
16	MP19	X	.01	0
17	MP20	X	.067	0
18	MP21	X	.064	0
19	MP22	X	.047	0
20	MP23	X	.025	0
21	MP24	X	.06	0
22	POST1	X	.032	0
23	POST2	X	.032	0
24	POST3	X	.032	0
25	POST12	X	.032	0
26	POST13	X	.032	0
27	POST14	X	.032	0
28	POST15	X	.032	0
29	POST16	X	.032	0
30	POST17	X	.032	0
31	POST18	X	.032	0
32	POST19	X	.032	0
33	POST20	X	.032	0
34	POST21	X	.032	0
35	POST22	X	.032	0
36	POST23	X	.032	0
37	POST24	X	.032	0
38	MP1	X	.116	%100
39	MP3	X	.013	%100
40	MP4	X	.118	%100
41	MP5	X	.042	%100
42	MP6	X	.058	%100



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Member Point Loads (BLC 7 : Wind 6 (225 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
43	MP7	X	.023	%100
44	MP8	X	.054	%100
45	MP9	X	.129	%100
46	MP11	X	.015	%100
47	MP12	X	.107	%100
48	MP13	X	.064	%100
49	MP14	X	.032	%100
50	MP15	X	.084	%100
51	MP16	X	.084	%100
52	MP17	X	.08	%100
53	MP19	X	.01	%100
54	MP20	X	.067	%100
55	MP21	X	.064	%100
56	MP22	X	.047	%100
57	MP23	X	.025	%100
58	MP24	X	.06	%100
59	POST1	X	.032	%100
60	POST2	X	.032	%100
61	POST3	X	.032	%100
62	POST12	X	.032	%100
63	POST13	X	.032	%100
64	POST14	X	.032	%100
65	POST15	X	.032	%100
66	POST16	X	.032	%100
67	POST17	X	.032	%100
68	POST18	X	.032	%100
69	POST19	X	.032	%100
70	POST20	X	.032	%100
71	POST21	X	.032	%100
72	POST22	X	.032	%100
73	POST23	X	.032	%100
74	POST24	X	.032	%100
75	MP1	Z	.106	0
76	MP3	Z	.012	0
77	MP4	Z	.104	0
78	MP5	Z	.058	0
79	MP6	Z	.075	0
80	MP7	Z	.029	0
81	MP8	Z	.074	0
82	MP9	Z	.092	0
83	MP11	Z	.01	0
84	MP12	Z	.08	0
85	MP13	Z	.036	0
86	MP14	Z	.02	0
87	MP15	Z	.05	0
88	MP16	Z	.044	0
89	MP17	Z	.107	0
90	MP19	Z	.015	0
91	MP20	Z	.101	0
92	MP21	Z	.07	0
93	MP22	Z	.053	0
94	MP23	Z	.027	0
95	MP24	Z	.068	0
96	POST1	Z	.003	0
97	POST2	Z	.003	0
98	POST3	Z	.003	0
99	POST12	Z	.003	0



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Member Point Loads (BLC 7 : Wind 6 (225 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
100	POST13	.003	0
101	POST14	.003	0
102	POST15	.003	0
103	POST16	.003	0
104	POST17	.003	0
105	POST18	.003	0
106	POST19	.003	0
107	POST20	.003	0
108	POST21	.003	0
109	POST22	.003	0
110	POST23	.003	0
111	POST24	.003	0
112	MP1	.106	%100
113	MP3	.012	%100
114	MP4	.104	%100
115	MP5	.058	%100
116	MP6	.075	%100
117	MP7	.029	%100
118	MP8	.074	%100
119	MP9	.092	%100
120	MP11	.01	%100
121	MP12	.08	%100
122	MP13	.036	%100
123	MP14	.02	%100
124	MP15	.05	%100
125	MP16	.044	%100
126	MP17	.107	%100
127	MP19	.015	%100
128	MP20	.101	%100
129	MP21	.07	%100
130	MP22	.053	%100
131	MP23	.027	%100
132	MP24	.068	%100
133	POST1	.003	%100
134	POST2	.003	%100
135	POST3	.003	%100
136	POST12	.003	%100
137	POST13	.003	%100
138	POST14	.003	%100
139	POST15	.003	%100
140	POST16	.003	%100
141	POST17	.003	%100
142	POST18	.003	%100
143	POST19	.003	%100
144	POST20	.003	%100
145	POST21	.003	%100
146	POST22	.003	%100
147	POST23	.003	%100
148	POST24	.003	%100

Member Point Loads (BLC 8 : Wind 7 (270 Deg))

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
1	MP1	.149	0
2	MP3	.017	0
3	MP4	.147	0
4	MP5	.082	0



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Member Point Loads (BLC 8 : Wind 7 (270 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
5	MP6	.106	0
6	MP7	.041	0
7	MP8	.104	0
8	MP9	.131	0
9	MP11	.015	0
10	MP12	.113	0
11	MP13	.051	0
12	MP14	.029	0
13	MP15	.071	0
14	MP16	.062	0
15	MP17	.151	0
16	MP19	.021	0
17	MP20	.142	0
18	MP21	.098	0
19	MP22	.075	0
20	MP23	.038	0
21	MP24	.095	0
22	POST1	.004	0
23	POST2	.004	0
24	POST3	.004	0
25	POST12	.004	0
26	POST13	.004	0
27	POST14	.004	0
28	POST15	.004	0
29	POST16	.004	0
30	POST17	.004	0
31	POST18	.004	0
32	POST19	.004	0
33	POST20	.004	0
34	POST21	.004	0
35	POST22	.004	0
36	POST23	.004	0
37	POST24	.004	0
38	MP1	.149	%100
39	MP3	.017	%100
40	MP4	.147	%100
41	MP5	.082	%100
42	MP6	.106	%100
43	MP7	.041	%100
44	MP8	.104	%100
45	MP9	.131	%100
46	MP11	.015	%100
47	MP12	.113	%100
48	MP13	.051	%100
49	MP14	.029	%100
50	MP15	.071	%100
51	MP16	.062	%100
52	MP17	.151	%100
53	MP19	.021	%100
54	MP20	.142	%100
55	MP21	.098	%100
56	MP22	.075	%100
57	MP23	.038	%100
58	MP24	.095	%100
59	POST1	.004	%100
60	POST2	.004	%100
61	POST3	.004	%100



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Member Point Loads (BLC 8 : Wind 7 (270 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
62	POST12	Z	.004	%100
63	POST13	Z	.004	%100
64	POST14	Z	.004	%100
65	POST15	Z	.004	%100
66	POST16	Z	.004	%100
67	POST17	Z	.004	%100
68	POST18	Z	.004	%100
69	POST19	Z	.004	%100
70	POST20	Z	.004	%100
71	POST21	Z	.004	%100
72	POST22	Z	.004	%100
73	POST23	Z	.004	%100
74	POST24	Z	.004	%100

Member Point Loads (BLC 9 : Wind 8 (315 Deg))

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
1	MP1	X	-0.116	0
2	MP3	X	-0.13	0
3	MP4	X	-0.118	0
4	MP5	X	-0.042	0
5	MP6	X	-0.058	0
6	MP7	X	-0.023	0
7	MP8	X	-0.054	0
8	MP9	X	-0.129	0
9	MP11	X	-0.015	0
10	MP12	X	-0.107	0
11	MP13	X	-0.064	0
12	MP14	X	-0.032	0
13	MP15	X	-0.084	0
14	MP16	X	-0.084	0
15	MP17	X	-0.08	0
16	MP19	X	-0.01	0
17	MP20	X	-0.067	0
18	MP21	X	-0.064	0
19	MP22	X	-0.047	0
20	MP23	X	-0.025	0
21	MP24	X	-0.06	0
22	POST1	X	-0.032	0
23	POST2	X	-0.032	0
24	POST3	X	-0.032	0
25	POST12	X	-0.032	0
26	POST13	X	-0.032	0
27	POST14	X	-0.032	0
28	POST15	X	-0.032	0
29	POST16	X	-0.032	0
30	POST17	X	-0.032	0
31	POST18	X	-0.032	0
32	POST19	X	-0.032	0
33	POST20	X	-0.032	0
34	POST21	X	-0.032	0
35	POST22	X	-0.032	0
36	POST23	X	-0.032	0
37	POST24	X	-0.032	0
38	MP1	X	-0.116	%100
39	MP3	X	-0.13	%100
40	MP4	X	-0.118	%100



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Member Point Loads (BLC 9 : Wind 8 (315 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
41	MP5	X	-0.042	%100
42	MP6	X	-0.058	%100
43	MP7	X	-0.023	%100
44	MP8	X	-0.054	%100
45	MP9	X	-0.129	%100
46	MP11	X	-0.015	%100
47	MP12	X	-0.107	%100
48	MP13	X	-0.064	%100
49	MP14	X	-0.032	%100
50	MP15	X	-0.084	%100
51	MP16	X	-0.084	%100
52	MP17	X	-0.08	%100
53	MP19	X	-0.01	%100
54	MP20	X	-0.067	%100
55	MP21	X	-0.064	%100
56	MP22	X	-0.047	%100
57	MP23	X	-0.025	%100
58	MP24	X	-0.06	%100
59	POST1	X	-0.032	%100
60	POST2	X	-0.032	%100
61	POST3	X	-0.032	%100
62	POST12	X	-0.032	%100
63	POST13	X	-0.032	%100
64	POST14	X	-0.032	%100
65	POST15	X	-0.032	%100
66	POST16	X	-0.032	%100
67	POST17	X	-0.032	%100
68	POST18	X	-0.032	%100
69	POST19	X	-0.032	%100
70	POST20	X	-0.032	%100
71	POST21	X	-0.032	%100
72	POST22	X	-0.032	%100
73	POST23	X	-0.032	%100
74	POST24	X	-0.032	%100
75	MP1	Z	.106	0
76	MP3	Z	.012	0
77	MP4	Z	.104	0
78	MP5	Z	.058	0
79	MP6	Z	.075	0
80	MP7	Z	.029	0
81	MP8	Z	.074	0
82	MP9	Z	.092	0
83	MP11	Z	.01	0
84	MP12	Z	.08	0
85	MP13	Z	.036	0
86	MP14	Z	.02	0
87	MP15	Z	.05	0
88	MP16	Z	.044	0
89	MP17	Z	.107	0
90	MP19	Z	.015	0
91	MP20	Z	.101	0
92	MP21	Z	.07	0
93	MP22	Z	.053	0
94	MP23	Z	.027	0
95	MP24	Z	.068	0
96	POST1	Z	.003	0
97	POST2	Z	.003	0



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Member Point Loads (BLC 9 : Wind 8 (315 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
98	POST3	.003	0
99	POST12	.003	0
100	POST13	.003	0
101	POST14	.003	0
102	POST15	.003	0
103	POST16	.003	0
104	POST17	.003	0
105	POST18	.003	0
106	POST19	.003	0
107	POST20	.003	0
108	POST21	.003	0
109	POST22	.003	0
110	POST23	.003	0
111	POST24	.003	0
112	MP1	.106	%100
113	MP3	.012	%100
114	MP4	.104	%100
115	MP5	.058	%100
116	MP6	.075	%100
117	MP7	.029	%100
118	MP8	.074	%100
119	MP9	.092	%100
120	MP11	.01	%100
121	MP12	.08	%100
122	MP13	.036	%100
123	MP14	.02	%100
124	MP15	.05	%100
125	MP16	.044	%100
126	MP17	.107	%100
127	MP19	.015	%100
128	MP20	.101	%100
129	MP21	.07	%100
130	MP22	.053	%100
131	MP23	.027	%100
132	MP24	.068	%100
133	POST1	.003	%100
134	POST2	.003	%100
135	POST3	.003	%100
136	POST12	.003	%100
137	POST13	.003	%100
138	POST14	.003	%100
139	POST15	.003	%100
140	POST16	.003	%100
141	POST17	.003	%100
142	POST18	.003	%100
143	POST19	.003	%100
144	POST20	.003	%100
145	POST21	.003	%100
146	POST22	.003	%100
147	POST23	.003	%100
148	POST24	.003	%100

Member Point Loads (BLC 10 : Ice Weight)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
1	MP1	-.269	0
2	MP3	-.041	0



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Member Point Loads (BLC 10 : Ice Weight) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
3	MP4	-.269	0
4	MP5	-.11	0
5	MP6	-.171	0
6	MP7	-.092	0
7	MP8	-.155	0
8	MP9	-.269	0
9	MP11	-.041	0
10	MP12	-.245	0
11	MP13	-.11	0
12	MP14	-.092	0
13	MP15	-.171	0
14	MP16	-.155	0
15	MP17	-.245	0
16	MP19	-.041	0
17	MP20	-.217	0
18	MP21	-.171	0
19	MP22	-.11	0
20	MP23	-.092	0
21	MP24	-.155	0
22	POST1	-.209	0
23	POST2	-.209	0
24	POST3	-.209	0
25	POST12	-.209	0
26	POST13	-.209	0
27	POST14	-.209	0
28	POST15	-.209	0
29	POST16	-.209	0
30	POST17	-.209	0
31	POST18	-.209	0
32	POST19	-.209	0
33	POST20	-.209	0
34	POST21	-.209	0
35	POST22	-.209	0
36	POST23	-.209	0
37	POST24	-.209	0
38	MP1	-.269	%100
39	MP3	-.041	%100
40	MP4	-.269	%100
41	MP5	-.11	%100
42	MP6	-.171	%100
43	MP7	-.092	%100
44	MP8	-.155	%100
45	MP9	-.269	%100
46	MP11	-.041	%100
47	MP12	-.245	%100
48	MP13	-.11	%100
49	MP14	-.092	%100
50	MP15	-.171	%100
51	MP16	-.155	%100
52	MP17	-.245	%100
53	MP19	-.041	%100
54	MP20	-.217	%100
55	MP21	-.171	%100
56	MP22	-.11	%100
57	MP23	-.092	%100
58	MP24	-.155	%100
59	POST1	-.209	%100



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Member Point Loads (BLC 10 : Ice Weight) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
60	POST2	Y	-209	%100
61	POST3	Y	-209	%100
62	POST12	Y	-209	%100
63	POST13	Y	-209	%100
64	POST14	Y	-209	%100
65	POST15	Y	-209	%100
66	POST16	Y	-209	%100
67	POST17	Y	-209	%100
68	POST18	Y	-209	%100
69	POST19	Y	-209	%100
70	POST20	Y	-209	%100
71	POST21	Y	-209	%100
72	POST22	Y	-209	%100
73	POST23	Y	-209	%100
74	POST24	Y	-209	%100

Member Point Loads (BLC 11 : Ice + Wind 1 (0 Deg))

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
1	MP1	X	-025	0
2	MP3	X	-003	0
3	MP4	X	-025	0
4	MP5	X	-01	0
5	MP6	X	-014	0
6	MP7	X	-007	0
7	MP8	X	-012	0
8	MP9	X	-027	0
9	MP11	X	-003	0
10	MP12	X	-022	0
11	MP13	X	-013	0
12	MP14	X	-009	0
13	MP15	X	-018	0
14	MP16	X	-018	0
15	MP17	X	-018	0
16	MP19	X	-003	0
17	MP20	X	-016	0
18	MP21	X	-015	0
19	MP22	X	-011	0
20	MP23	X	-008	0
21	MP24	X	-014	0
22	POST1	X	-006	0
23	POST2	X	-006	0
24	POST3	X	-006	0
25	POST12	X	-006	0
26	POST13	X	-006	0
27	POST14	X	-006	0
28	POST15	X	-006	0
29	POST16	X	-006	0
30	POST17	X	-006	0
31	POST18	X	-006	0
32	POST19	X	-006	0
33	POST20	X	-006	0
34	POST21	X	-006	0
35	POST22	X	-006	0
36	POST23	X	-006	0
37	POST24	X	-006	0
38	MP1	X	-025	%100



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Member Point Loads (BLC 11 : Ice + Wind 1 (0 Deg)) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
39	MP3	X	-003	%100
40	MP4	X	-025	%100
41	MP5	X	-01	%100
42	MP6	X	-014	%100
43	MP7	X	-007	%100
44	MP8	X	-012	%100
45	MP9	X	-027	%100
46	MP11	X	-003	%100
47	MP12	X	-022	%100
48	MP13	X	-013	%100
49	MP14	X	-009	%100
50	MP15	X	-018	%100
51	MP16	X	-018	%100
52	MP17	X	-018	%100
53	MP19	X	-003	%100
54	MP20	X	-016	%100
55	MP21	X	-015	%100
56	MP22	X	-011	%100
57	MP23	X	-008	%100
58	MP24	X	-014	%100
59	POST1	X	-006	%100
60	POST2	X	-006	%100
61	POST3	X	-006	%100
62	POST12	X	-006	%100
63	POST13	X	-006	%100
64	POST14	X	-006	%100
65	POST15	X	-006	%100
66	POST16	X	-006	%100
67	POST17	X	-006	%100
68	POST18	X	-006	%100
69	POST19	X	-006	%100
70	POST20	X	-006	%100
71	POST21	X	-006	%100
72	POST22	X	-006	%100
73	POST23	X	-006	%100
74	POST24	X	-006	%100

Member Point Loads (BLC 12 : Ice + Wind 2 (45 Deg))

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
1	MP1	X	-018	0
2	MP3	X	-002	0
3	MP4	X	-018	0
4	MP5	X	-007	0
5	MP6	X	-01	0
6	MP7	X	-005	0
7	MP8	X	-009	0
8	MP9	X	-019	0
9	MP11	X	-002	0
10	MP12	X	-016	0
11	MP13	X	-009	0
12	MP14	X	-006	0
13	MP15	X	-013	0
14	MP16	X	-013	0
15	MP17	X	-013	0
16	MP19	X	-002	0
17	MP20	X	-011	0



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Member Point Loads (BLC 12 : Ice + Wind 2 (45 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
18	MP21	X	-0.11	0
19	MP22	X	-0.07	0
20	MP23	X	-0.005	0
21	MP24	X	-0.01	0
22	POST1	X	-0.005	0
23	POST2	X	-0.005	0
24	POST3	X	-0.005	0
25	POST12	X	-0.005	0
26	POST13	X	-0.005	0
27	POST14	X	-0.005	0
28	POST15	X	-0.005	0
29	POST16	X	-0.005	0
30	POST17	X	-0.005	0
31	POST18	X	-0.005	0
32	POST19	X	-0.005	0
33	POST20	X	-0.005	0
34	POST21	X	-0.005	0
35	POST22	X	-0.005	0
36	POST23	X	-0.005	0
37	POST24	X	-0.005	0
38	MP1	X	-0.018	%100
39	MP3	X	-0.002	%100
40	MP4	X	-0.018	%100
41	MP5	X	-0.007	%100
42	MP6	X	-0.01	%100
43	MP7	X	-0.005	%100
44	MP8	X	-0.009	%100
45	MP9	X	-0.019	%100
46	MP11	X	-0.002	%100
47	MP12	X	-0.016	%100
48	MP13	X	-0.009	%100
49	MP14	X	-0.006	%100
50	MP15	X	-0.013	%100
51	MP16	X	-0.013	%100
52	MP17	X	-0.013	%100
53	MP19	X	-0.002	%100
54	MP20	X	-0.011	%100
55	MP21	X	-0.011	%100
56	MP22	X	-0.007	%100
57	MP23	X	-0.005	%100
58	MP24	X	-0.01	%100
59	POST1	X	-0.005	%100
60	POST2	X	-0.005	%100
61	POST3	X	-0.005	%100
62	POST12	X	-0.005	%100
63	POST13	X	-0.005	%100
64	POST14	X	-0.005	%100
65	POST15	X	-0.005	%100
66	POST16	X	-0.005	%100
67	POST17	X	-0.005	%100
68	POST18	X	-0.005	%100
69	POST19	X	-0.005	%100
70	POST20	X	-0.005	%100
71	POST21	X	-0.005	%100
72	POST22	X	-0.005	%100
73	POST23	X	-0.005	%100
74	POST24	X	-0.005	%100



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Member Point Loads (BLC 12 : Ice + Wind 2 (45 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
75	MP1	Z	-0.016	0
76	MP3	Z	-0.002	0
77	MP4	Z	-0.016	0
78	MP5	Z	-0.009	0
79	MP6	Z	-0.012	0
80	MP7	Z	-0.006	0
81	MP8	Z	-0.011	0
82	MP9	Z	-0.015	0
83	MP11	Z	-0.002	0
84	MP12	Z	-0.013	0
85	MP13	Z	-0.006	0
86	MP14	Z	-0.005	0
87	MP15	Z	-0.009	0
88	MP16	Z	-0.008	0
89	MP17	Z	-0.016	0
90	MP19	Z	-0.003	0
91	MP20	Z	-0.015	0
92	MP21	Z	-0.011	0
93	MP22	Z	-0.008	0
94	MP23	Z	-0.006	0
95	MP24	Z	-0.011	0
96	POST1	Z	-0.001	0
97	POST2	Z	-0.001	0
98	POST3	Z	-0.001	0
99	POST12	Z	-0.001	0
100	POST13	Z	-0.001	0
101	POST14	Z	-0.001	0
102	POST15	Z	-0.001	0
103	POST16	Z	-0.001	0
104	POST17	Z	-0.001	0
105	POST18	Z	-0.001	0
106	POST19	Z	-0.001	0
107	POST20	Z	-0.001	0
108	POST21	Z	-0.001	0
109	POST22	Z	-0.001	0
110	POST23	Z	-0.001	0
111	POST24	Z	-0.001	0
112	MP1	Z	-0.016	%100
113	MP3	Z	-0.002	%100
114	MP4	Z	-0.016	%100
115	MP5	Z	-0.009	%100
116	MP6	Z	-0.012	%100
117	MP7	Z	-0.006	%100
118	MP8	Z	-0.011	%100
119	MP9	Z	-0.015	%100
120	MP11	Z	-0.002	%100
121	MP12	Z	-0.013	%100
122	MP13	Z	-0.006	%100
123	MP14	Z	-0.005	%100
124	MP15	Z	-0.009	%100
125	MP16	Z	-0.008	%100
126	MP17	Z	-0.016	%100
127	MP19	Z	-0.003	%100
128	MP20	Z	-0.015	%100
129	MP21	Z	-0.011	%100
130	MP22	Z	-0.008	%100
131	MP23	Z	-0.006	%100



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Member Point Loads (BLC 12 : Ice + Wind 2 (45 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
132	MP24	Z	-0.11	%100
133	POST1	Z	-0.01	%100
134	POST2	Z	-0.01	%100
135	POST3	Z	-0.01	%100
136	POST12	Z	-0.01	%100
137	POST13	Z	-0.01	%100
138	POST14	Z	-0.01	%100
139	POST15	Z	-0.01	%100
140	POST16	Z	-0.01	%100
141	POST17	Z	-0.01	%100
142	POST18	Z	-0.01	%100
143	POST19	Z	-0.01	%100
144	POST20	Z	-0.01	%100
145	POST21	Z	-0.01	%100
146	POST22	Z	-0.01	%100
147	POST23	Z	-0.01	%100
148	POST24	Z	-0.01	%100

Member Point Loads (BLC 13 : Ice + Wind 3 (90 Deg))

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
1	MP1	Z	-0.23	0
2	MP3	Z	-0.03	0
3	MP4	Z	-0.23	0
4	MP5	Z	-0.12	0
5	MP6	Z	-0.17	0
6	MP7	Z	-0.08	0
7	MP8	Z	-0.16	0
8	MP9	Z	-0.21	0
9	MP11	Z	-0.03	0
10	MP12	Z	-0.18	0
11	MP13	Z	-0.09	0
12	MP14	Z	-0.07	0
13	MP15	Z	-0.13	0
14	MP16	Z	-0.11	0
15	MP17	Z	-0.22	0
16	MP19	Z	-0.04	0
17	MP20	Z	-0.21	0
18	MP21	Z	-0.16	0
19	MP22	Z	-0.11	0
20	MP23	Z	-0.08	0
21	MP24	Z	-0.15	0
22	POST1	Z	-0.01	0
23	POST2	Z	-0.01	0
24	POST3	Z	-0.01	0
25	POST12	Z	-0.01	0
26	POST13	Z	-0.01	0
27	POST14	Z	-0.01	0
28	POST15	Z	-0.01	0
29	POST16	Z	-0.01	0
30	POST17	Z	-0.01	0
31	POST18	Z	-0.01	0
32	POST19	Z	-0.01	0
33	POST20	Z	-0.01	0
34	POST21	Z	-0.01	0
35	POST22	Z	-0.01	0
36	POST23	Z	-0.01	0



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Member Point Loads (BLC 13 : Ice + Wind 3 (90 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
37	POST24	Z	-0.01	0
38	MP1	Z	-0.23	%100
39	MP3	Z	-0.03	%100
40	MP4	Z	-0.23	%100
41	MP5	Z	-0.12	%100
42	MP6	Z	-0.17	%100
43	MP7	Z	-0.08	%100
44	MP8	Z	-0.16	%100
45	MP9	Z	-0.21	%100
46	MP11	Z	-0.03	%100
47	MP12	Z	-0.18	%100
48	MP13	Z	-0.09	%100
49	MP14	Z	-0.07	%100
50	MP15	Z	-0.13	%100
51	MP16	Z	-0.11	%100
52	MP17	Z	-0.22	%100
53	MP19	Z	-0.04	%100
54	MP20	Z	-0.21	%100
55	MP21	Z	-0.16	%100
56	MP22	Z	-0.11	%100
57	MP23	Z	-0.08	%100
58	MP24	Z	-0.15	%100
59	POST1	Z	-0.01	%100
60	POST2	Z	-0.01	%100
61	POST3	Z	-0.01	%100
62	POST12	Z	-0.01	%100
63	POST13	Z	-0.01	%100
64	POST14	Z	-0.01	%100
65	POST15	Z	-0.01	%100
66	POST16	Z	-0.01	%100
67	POST17	Z	-0.01	%100
68	POST18	Z	-0.01	%100
69	POST19	Z	-0.01	%100
70	POST20	Z	-0.01	%100
71	POST21	Z	-0.01	%100
72	POST22	Z	-0.01	%100
73	POST23	Z	-0.01	%100
74	POST24	Z	-0.01	%100

Member Point Loads (BLC 14 : Ice + Wind 4 (135 Deg))

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
1	MP1	X	.018	0
2	MP3	X	.002	0
3	MP4	X	.018	0
4	MP5	X	.007	0
5	MP6	X	.01	0
6	MP7	X	.005	0
7	MP8	X	.009	0
8	MP9	X	.019	0
9	MP11	X	.002	0
10	MP12	X	.016	0
11	MP13	X	.009	0
12	MP14	X	.006	0
13	MP15	X	.013	0
14	MP16	X	.013	0
15	MP17	X	.013	0



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Member Point Loads (BLC 14 : Ice + Wind 4 (135 Deg)) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
16	MP19	X	.002	0
17	MP20	X	.011	0
18	MP21	X	.011	0
19	MP22	X	.007	0
20	MP23	X	.005	0
21	MP24	X	.01	0
22	POST1	X	.005	0
23	POST2	X	.005	0
24	POST3	X	.005	0
25	POST12	X	.005	0
26	POST13	X	.005	0
27	POST14	X	.005	0
28	POST15	X	.005	0
29	POST16	X	.005	0
30	POST17	X	.005	0
31	POST18	X	.005	0
32	POST19	X	.005	0
33	POST20	X	.005	0
34	POST21	X	.005	0
35	POST22	X	.005	0
36	POST23	X	.005	0
37	POST24	X	.005	0
38	MP1	X	.018	%100
39	MP3	X	.002	%100
40	MP4	X	.018	%100
41	MP5	X	.007	%100
42	MP6	X	.01	%100
43	MP7	X	.005	%100
44	MP8	X	.009	%100
45	MP9	X	.019	%100
46	MP11	X	.002	%100
47	MP12	X	.016	%100
48	MP13	X	.009	%100
49	MP14	X	.006	%100
50	MP15	X	.013	%100
51	MP16	X	.013	%100
52	MP17	X	.013	%100
53	MP19	X	.002	%100
54	MP20	X	.011	%100
55	MP21	X	.011	%100
56	MP22	X	.007	%100
57	MP23	X	.005	%100
58	MP24	X	.01	%100
59	POST1	X	.005	%100
60	POST2	X	.005	%100
61	POST3	X	.005	%100
62	POST12	X	.005	%100
63	POST13	X	.005	%100
64	POST14	X	.005	%100
65	POST15	X	.005	%100
66	POST16	X	.005	%100
67	POST17	X	.005	%100
68	POST18	X	.005	%100
69	POST19	X	.005	%100
70	POST20	X	.005	%100
71	POST21	X	.005	%100
72	POST22	X	.005	%100



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Member Point Loads (BLC 14 : Ice + Wind 4 (135 Deg)) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
73	POST23	X	.005	%100
74	POST24	X	.005	%100
75	MP1	Z	-.016	0
76	MP3	Z	-.002	0
77	MP4	Z	-.016	0
78	MP5	Z	-.009	0
79	MP6	Z	-.012	0
80	MP7	Z	-.006	0
81	MP8	Z	-.011	0
82	MP9	Z	-.015	0
83	MP11	Z	-.002	0
84	MP12	Z	-.013	0
85	MP13	Z	-.006	0
86	MP14	Z	-.005	0
87	MP15	Z	-.009	0
88	MP16	Z	-.008	0
89	MP17	Z	-.016	0
90	MP19	Z	-.003	0
91	MP20	Z	-.015	0
92	MP21	Z	-.011	0
93	MP22	Z	-.008	0
94	MP23	Z	-.006	0
95	MP24	Z	-.011	0
96	POST1	Z	-.001	0
97	POST2	Z	-.001	0
98	POST3	Z	-.001	0
99	POST12	Z	-.001	0
100	POST13	Z	-.001	0
101	POST14	Z	-.001	0
102	POST15	Z	-.001	0
103	POST16	Z	-.001	0
104	POST17	Z	-.001	0
105	POST18	Z	-.001	0
106	POST19	Z	-.001	0
107	POST20	Z	-.001	0
108	POST21	Z	-.001	0
109	POST22	Z	-.001	0
110	POST23	Z	-.001	0
111	POST24	Z	-.001	0
112	MP1	Z	-.016	%100
113	MP3	Z	-.002	%100
114	MP4	Z	-.016	%100
115	MP5	Z	-.009	%100
116	MP6	Z	-.012	%100
117	MP7	Z	-.006	%100
118	MP8	Z	-.011	%100
119	MP9	Z	-.015	%100
120	MP11	Z	-.002	%100
121	MP12	Z	-.013	%100
122	MP13	Z	-.006	%100
123	MP14	Z	-.005	%100
124	MP15	Z	-.009	%100
125	MP16	Z	-.008	%100
126	MP17	Z	-.016	%100
127	MP19	Z	-.003	%100
128	MP20	Z	-.015	%100
129	MP21	Z	-.011	%100



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Member Point Loads (BLC 14 : Ice + Wind 4 (135 Deg)) (Continued)

Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]	
130	MP22	Z	-0.008	%100
131	MP23	Z	-0.006	%100
132	MP24	Z	-0.011	%100
133	POST1	Z	-0.001	%100
134	POST2	Z	-0.001	%100
135	POST3	Z	-0.001	%100
136	POST12	Z	-0.001	%100
137	POST13	Z	-0.001	%100
138	POST14	Z	-0.001	%100
139	POST15	Z	-0.001	%100
140	POST16	Z	-0.001	%100
141	POST17	Z	-0.001	%100
142	POST18	Z	-0.001	%100
143	POST19	Z	-0.001	%100
144	POST20	Z	-0.001	%100
145	POST21	Z	-0.001	%100
146	POST22	Z	-0.001	%100
147	POST23	Z	-0.001	%100
148	POST24	Z	-0.001	%100

Member Point Loads (BLC 15 : Ice + Wind 5 (180 Deg))

Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]	
1	MP1	X	.025	0
2	MP3	X	.003	0
3	MP4	X	.025	0
4	MP5	X	.01	0
5	MP6	X	.014	0
6	MP7	X	.007	0
7	MP8	X	.012	0
8	MP9	X	.027	0
9	MP11	X	.003	0
10	MP12	X	.022	0
11	MP13	X	.013	0
12	MP14	X	.009	0
13	MP15	X	.018	0
14	MP16	X	.018	0
15	MP17	X	.018	0
16	MP19	X	.003	0
17	MP20	X	.016	0
18	MP21	X	.015	0
19	MP22	X	.011	0
20	MP23	X	.008	0
21	MP24	X	.014	0
22	POST1	X	.006	0
23	POST2	X	.006	0
24	POST3	X	.006	0
25	POST12	X	.006	0
26	POST13	X	.006	0
27	POST14	X	.006	0
28	POST15	X	.006	0
29	POST16	X	.006	0
30	POST17	X	.006	0
31	POST18	X	.006	0
32	POST19	X	.006	0
33	POST20	X	.006	0
34	POST21	X	.006	0



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Member Point Loads (BLC 15 : Ice + Wind 5 (180 Deg)) (Continued)

Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]	
35	POST22	X	.006	0
36	POST23	X	.006	0
37	POST24	X	.006	0
38	MP1	X	.025	%100
39	MP3	X	.003	%100
40	MP4	X	.025	%100
41	MP5	X	.01	%100
42	MP6	X	.014	%100
43	MP7	X	.007	%100
44	MP8	X	.012	%100
45	MP9	X	.027	%100
46	MP11	X	.003	%100
47	MP12	X	.022	%100
48	MP13	X	.013	%100
49	MP14	X	.009	%100
50	MP15	X	.018	%100
51	MP16	X	.018	%100
52	MP17	X	.018	%100
53	MP19	X	.003	%100
54	MP20	X	.016	%100
55	MP21	X	.015	%100
56	MP22	X	.011	%100
57	MP23	X	.008	%100
58	MP24	X	.014	%100
59	POST1	X	.006	%100
60	POST2	X	.006	%100
61	POST3	X	.006	%100
62	POST12	X	.006	%100
63	POST13	X	.006	%100
64	POST14	X	.006	%100
65	POST15	X	.006	%100
66	POST16	X	.006	%100
67	POST17	X	.006	%100
68	POST18	X	.006	%100
69	POST19	X	.006	%100
70	POST20	X	.006	%100
71	POST21	X	.006	%100
72	POST22	X	.006	%100
73	POST23	X	.006	%100
74	POST24	X	.006	%100

Member Point Loads (BLC 16 : Ice + Wind 6 (225 Deg))

Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]	
1	MP1	X	.018	0
2	MP3	X	.002	0
3	MP4	X	.018	0
4	MP5	X	.007	0
5	MP6	X	.01	0
6	MP7	X	.005	0
7	MP8	X	.009	0
8	MP9	X	.019	0
9	MP11	X	.002	0
10	MP12	X	.016	0
11	MP13	X	.009	0
12	MP14	X	.006	0
13	MP15	X	.013	0



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Member Point Loads (BLC 16 : Ice + Wind 6 (225 Deg)) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
14	MP16	X	.013	0
15	MP17	X	.013	0
16	MP19	X	.002	0
17	MP20	X	.011	0
18	MP21	X	.011	0
19	MP22	X	.007	0
20	MP23	X	.005	0
21	MP24	X	.01	0
22	POST1	X	.005	0
23	POST2	X	.005	0
24	POST3	X	.005	0
25	POST12	X	.005	0
26	POST13	X	.005	0
27	POST14	X	.005	0
28	POST15	X	.005	0
29	POST16	X	.005	0
30	POST17	X	.005	0
31	POST18	X	.005	0
32	POST19	X	.005	0
33	POST20	X	.005	0
34	POST21	X	.005	0
35	POST22	X	.005	0
36	POST23	X	.005	0
37	POST24	X	.005	0
38	MP1	X	.018	%100
39	MP3	X	.002	%100
40	MP4	X	.018	%100
41	MP5	X	.007	%100
42	MP6	X	.01	%100
43	MP7	X	.005	%100
44	MP8	X	.009	%100
45	MP9	X	.019	%100
46	MP11	X	.002	%100
47	MP12	X	.016	%100
48	MP13	X	.009	%100
49	MP14	X	.006	%100
50	MP15	X	.013	%100
51	MP16	X	.013	%100
52	MP17	X	.013	%100
53	MP19	X	.002	%100
54	MP20	X	.011	%100
55	MP21	X	.011	%100
56	MP22	X	.007	%100
57	MP23	X	.005	%100
58	MP24	X	.01	%100
59	POST1	X	.005	%100
60	POST2	X	.005	%100
61	POST3	X	.005	%100
62	POST12	X	.005	%100
63	POST13	X	.005	%100
64	POST14	X	.005	%100
65	POST15	X	.005	%100
66	POST16	X	.005	%100
67	POST17	X	.005	%100
68	POST18	X	.005	%100
69	POST19	X	.005	%100
70	POST20	X	.005	%100



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Member Point Loads (BLC 16 : Ice + Wind 6 (225 Deg)) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
71	POST21	X	.005	%100
72	POST22	X	.005	%100
73	POST23	X	.005	%100
74	POST24	X	.005	%100
75	MP1	Z	.016	0
76	MP3	Z	.002	0
77	MP4	Z	.016	0
78	MP5	Z	.009	0
79	MP6	Z	.012	0
80	MP7	Z	.006	0
81	MP8	Z	.011	0
82	MP9	Z	.015	0
83	MP11	Z	.002	0
84	MP12	Z	.013	0
85	MP13	Z	.006	0
86	MP14	Z	.005	0
87	MP15	Z	.009	0
88	MP16	Z	.008	0
89	MP17	Z	.016	0
90	MP19	Z	.003	0
91	MP20	Z	.015	0
92	MP21	Z	.011	0
93	MP22	Z	.008	0
94	MP23	Z	.006	0
95	MP24	Z	.011	0
96	POST1	Z	.001	0
97	POST2	Z	.001	0
98	POST3	Z	.001	0
99	POST12	Z	.001	0
100	POST13	Z	.001	0
101	POST14	Z	.001	0
102	POST15	Z	.001	0
103	POST16	Z	.001	0
104	POST17	Z	.001	0
105	POST18	Z	.001	0
106	POST19	Z	.001	0
107	POST20	Z	.001	0
108	POST21	Z	.001	0
109	POST22	Z	.001	0
110	POST23	Z	.001	0
111	POST24	Z	.001	0
112	MP1	Z	.016	%100
113	MP3	Z	.002	%100
114	MP4	Z	.016	%100
115	MP5	Z	.009	%100
116	MP6	Z	.012	%100
117	MP7	Z	.006	%100
118	MP8	Z	.011	%100
119	MP9	Z	.015	%100
120	MP11	Z	.002	%100
121	MP12	Z	.013	%100
122	MP13	Z	.006	%100
123	MP14	Z	.005	%100
124	MP15	Z	.009	%100
125	MP16	Z	.008	%100
126	MP17	Z	.016	%100
127	MP19	Z	.003	%100



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Member Point Loads (BLC 16 : Ice + Wind 6 (225 Deg)) (Continued)

Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
128	MP20	Z	.015 %100
129	MP21	Z	.011 %100
130	MP22	Z	.008 %100
131	MP23	Z	.006 %100
132	MP24	Z	.011 %100
133	POST1	Z	.001 %100
134	POST2	Z	.001 %100
135	POST3	Z	.001 %100
136	POST12	Z	.001 %100
137	POST13	Z	.001 %100
138	POST14	Z	.001 %100
139	POST15	Z	.001 %100
140	POST16	Z	.001 %100
141	POST17	Z	.001 %100
142	POST18	Z	.001 %100
143	POST19	Z	.001 %100
144	POST20	Z	.001 %100
145	POST21	Z	.001 %100
146	POST22	Z	.001 %100
147	POST23	Z	.001 %100
148	POST24	Z	.001 %100

Member Point Loads (BLC 17 : Ice + Wind 7 (270 Deg))

Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	MP1	Z	.023 0
2	MP3	Z	.003 0
3	MP4	Z	.023 0
4	MP5	Z	.012 0
5	MP6	Z	.017 0
6	MP7	Z	.008 0
7	MP8	Z	.016 0
8	MP9	Z	.021 0
9	MP11	Z	.003 0
10	MP12	Z	.018 0
11	MP13	Z	.009 0
12	MP14	Z	.007 0
13	MP15	Z	.013 0
14	MP16	Z	.011 0
15	MP17	Z	.022 0
16	MP19	Z	.004 0
17	MP20	Z	.021 0
18	MP21	Z	.016 0
19	MP22	Z	.011 0
20	MP23	Z	.008 0
21	MP24	Z	.015 0
22	POST1	Z	.001 0
23	POST2	Z	.001 0
24	POST3	Z	.001 0
25	POST12	Z	.001 0
26	POST13	Z	.001 0
27	POST14	Z	.001 0
28	POST15	Z	.001 0
29	POST16	Z	.001 0
30	POST17	Z	.001 0
31	POST18	Z	.001 0
32	POST19	Z	.001 0



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Member Point Loads (BLC 17 : Ice + Wind 7 (270 Deg)) (Continued)

Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
33	POST20	Z	.001 0
34	POST21	Z	.001 0
35	POST22	Z	.001 0
36	POST23	Z	.001 0
37	POST24	Z	.001 0
38	MP1	Z	.023 %100
39	MP3	Z	.003 %100
40	MP4	Z	.023 %100
41	MP5	Z	.012 %100
42	MP6	Z	.017 %100
43	MP7	Z	.008 %100
44	MP8	Z	.016 %100
45	MP9	Z	.021 %100
46	MP11	Z	.003 %100
47	MP12	Z	.018 %100
48	MP13	Z	.009 %100
49	MP14	Z	.007 %100
50	MP15	Z	.013 %100
51	MP16	Z	.011 %100
52	MP17	Z	.022 %100
53	MP19	Z	.004 %100
54	MP20	Z	.021 %100
55	MP21	Z	.016 %100
56	MP22	Z	.011 %100
57	MP23	Z	.008 %100
58	MP24	Z	.015 %100
59	POST1	Z	.001 %100
60	POST2	Z	.001 %100
61	POST3	Z	.001 %100
62	POST12	Z	.001 %100
63	POST13	Z	.001 %100
64	POST14	Z	.001 %100
65	POST15	Z	.001 %100
66	POST16	Z	.001 %100
67	POST17	Z	.001 %100
68	POST18	Z	.001 %100
69	POST19	Z	.001 %100
70	POST20	Z	.001 %100
71	POST21	Z	.001 %100
72	POST22	Z	.001 %100
73	POST23	Z	.001 %100
74	POST24	Z	.001 %100

Member Point Loads (BLC 18 : Ice + Wind 8 (315 Deg))

Member Label	Direction	Magnitude[k, k-ft]	Location[ft, %]
1	MP1	X	-.018 0
2	MP3	X	-.002 0
3	MP4	X	-.018 0
4	MP5	X	-.007 0
5	MP6	X	-.01 0
6	MP7	X	-.005 0
7	MP8	X	-.009 0
8	MP9	X	-.019 0
9	MP11	X	-.002 0
10	MP12	X	-.016 0
11	MP13	X	-.009 0



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Member Point Loads (BLC 18 : Ice + Wind 8 (315 Deg)) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
12	MP14	X	-0.06	0
13	MP15	X	-0.13	0
14	MP16	X	-0.13	0
15	MP17	X	-0.13	0
16	MP19	X	-0.02	0
17	MP20	X	-0.11	0
18	MP21	X	-0.11	0
19	MP22	X	-0.07	0
20	MP23	X	-0.05	0
21	MP24	X	-0.1	0
22	POST1	X	-0.05	0
23	POST2	X	-0.05	0
24	POST3	X	-0.05	0
25	POST12	X	-0.05	0
26	POST13	X	-0.05	0
27	POST14	X	-0.05	0
28	POST15	X	-0.05	0
29	POST16	X	-0.05	0
30	POST17	X	-0.05	0
31	POST18	X	-0.05	0
32	POST19	X	-0.05	0
33	POST20	X	-0.05	0
34	POST21	X	-0.05	0
35	POST22	X	-0.05	0
36	POST23	X	-0.05	0
37	POST24	X	-0.05	0
38	MP1	X	-0.18	%100
39	MP3	X	-0.02	%100
40	MP4	X	-0.18	%100
41	MP5	X	-0.07	%100
42	MP6	X	-0.1	%100
43	MP7	X	-0.05	%100
44	MP8	X	-0.09	%100
45	MP9	X	-0.19	%100
46	MP11	X	-0.02	%100
47	MP12	X	-0.16	%100
48	MP13	X	-0.09	%100
49	MP14	X	-0.06	%100
50	MP15	X	-0.13	%100
51	MP16	X	-0.13	%100
52	MP17	X	-0.13	%100
53	MP19	X	-0.02	%100
54	MP20	X	-0.11	%100
55	MP21	X	-0.11	%100
56	MP22	X	-0.07	%100
57	MP23	X	-0.05	%100
58	MP24	X	-0.1	%100
59	POST1	X	-0.05	%100
60	POST2	X	-0.05	%100
61	POST3	X	-0.05	%100
62	POST12	X	-0.05	%100
63	POST13	X	-0.05	%100
64	POST14	X	-0.05	%100
65	POST15	X	-0.05	%100
66	POST16	X	-0.05	%100
67	POST17	X	-0.05	%100
68	POST18	X	-0.05	%100



Company : Tower Engineering Professionals
 Designer : RNM
 Job Number : TEP No. 52861.195718
 Model Name : 184106 - Fluvanna County WT

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Member Point Loads (BLC 18 : Ice + Wind 8 (315 Deg)) (Continued)

	Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]
69	POST19	X	-0.05	%100
70	POST20	X	-0.05	%100
71	POST21	X	-0.05	%100
72	POST22	X	-0.05	%100
73	POST23	X	-0.05	%100
74	POST24	X	-0.05	%100
75	MP1	Z	.016	0
76	MP3	Z	.002	0
77	MP4	Z	.016	0
78	MP5	Z	.009	0
79	MP6	Z	.012	0
80	MP7	Z	.006	0
81	MP8	Z	.011	0
82	MP9	Z	.015	0
83	MP11	Z	.002	0
84	MP12	Z	.013	0
85	MP13	Z	.006	0
86	MP14	Z	.005	0
87	MP15	Z	.009	0
88	MP16	Z	.008	0
89	MP17	Z	.016	0
90	MP19	Z	.003	0
91	MP20	Z	.015	0
92	MP21	Z	.011	0
93	MP22	Z	.008	0
94	MP23	Z	.006	0
95	MP24	Z	.011	0
96	POST1	Z	.001	0
97	POST2	Z	.001	0
98	POST3	Z	.001	0
99	POST12	Z	.001	0
100	POST13	Z	.001	0
101	POST14	Z	.001	0
102	POST15	Z	.001	0
103	POST16	Z	.001	0
104	POST17	Z	.001	0
105	POST18	Z	.001	0
106	POST19	Z	.001	0
107	POST20	Z	.001	0
108	POST21	Z	.001	0
109	POST22	Z	.001	0
110	POST23	Z	.001	0
111	POST24	Z	.001	0
112	MP1	Z	.016	%100
113	MP3	Z	.002	%100
114	MP4	Z	.016	%100
115	MP5	Z	.009	%100
116	MP6	Z	.012	%100
117	MP7	Z	.006	%100
118	MP8	Z	.011	%100
119	MP9	Z	.015	%100
120	MP11	Z	.002	%100
121	MP12	Z	.013	%100
122	MP13	Z	.006	%100
123	MP14	Z	.005	%100
124	MP15	Z	.009	%100
125	MP16	Z	.008	%100



Company : Tower Engineering Professionals
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 Model Name : 184106 - Fluvanna County WT

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 Checked By: WBA

Member Point Loads (BLC 18 : Ice + Wind 8 (315 Deg)) (Continued)

Member Label	Direction	Magnitude[k.k-ft]	Location[ft.%]	
126	MP17	Z	.016	%100
127	MP19	Z	.003	%100
128	MP20	Z	.015	%100
129	MP21	Z	.011	%100
130	MP22	Z	.008	%100
131	MP23	Z	.006	%100
132	MP24	Z	.011	%100
133	POST1	Z	.001	%100
134	POST2	Z	.001	%100
135	POST3	Z	.001	%100
136	POST12	Z	.001	%100
137	POST13	Z	.001	%100
138	POST14	Z	.001	%100
139	POST15	Z	.001	%100
140	POST16	Z	.001	%100
141	POST17	Z	.001	%100
142	POST18	Z	.001	%100
143	POST19	Z	.001	%100
144	POST20	Z	.001	%100
145	POST21	Z	.001	%100
146	POST22	Z	.001	%100
147	POST23	Z	.001	%100
148	POST24	Z	.001	%100

Member Area Loads (BLC 2 : Wind 1 (0 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W1	W2	W6	W5	X	Open Structure	-.037

Member Area Loads (BLC 3 : Wind 2 (45 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W1	W2	W6	W5	X	Open Structure	-.026
2	W2	W3	W7	W6	Z	Open Structure	-.026

Member Area Loads (BLC 4 : Wind 3 (90 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W2	W3	W7	W6	Z	Open Structure	-.037

Member Area Loads (BLC 5 : Wind 4 (135 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W3	W4	W8	W7	X	Open Structure	.026
2	W2	W3	W7	W6	Z	Open Structure	-.026

Member Area Loads (BLC 6 : Wind 5 (180 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W3	W4	W8	W7	X	Open Structure	.037

Member Area Loads (BLC 7 : Wind 6 (225 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W3	W4	W8	W7	X	Open Structure	.026
2	W4	W1	W5	W8	Z	Open Structure	.026

Member Area Loads (BLC 8 : Wind 7 (270 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]
---------	---------	---------	---------	-----------	--------------	----------------



Company : Tower Engineering Professionals
 Designer : RNM
 Job Number : TEP No. 52861.195718
 Model Name : 184106 - Fluvanna County WT

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Member Area Loads (BLC 8 : Wind 7 (270 Deg)) (Continued)

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W4	W1	W5	W8	Z	Open Structure	.037

Member Area Loads (BLC 9 : Wind 8 (315 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W1	W2	W6	W5	X	Open Structure	-.026
2	W4	W1	W5	W8	Z	Open Structure	.026

Member Area Loads (BLC 11 : Ice + Wind 1 (0 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W1	W2	W6	W5	X	Open Structure	-.009

Member Area Loads (BLC 12 : Ice + Wind 2 (45 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W1	W2	W6	W5	X	Open Structure	-.007
2	W2	W3	W7	W6	Z	Open Structure	-.007

Member Area Loads (BLC 13 : Ice + Wind 3 (90 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W2	W3	W7	W6	Z	Open Structure	-.009

Member Area Loads (BLC 14 : Ice + Wind 4 (135 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W3	W4	W8	W7	X	Open Structure	.007
2	W2	W3	W7	W6	Z	Open Structure	-.007

Member Area Loads (BLC 15 : Ice + Wind 5 (180 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W3	W4	W8	W7	X	Open Structure	.009

Member Area Loads (BLC 16 : Ice + Wind 6 (225 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W3	W4	W8	W7	X	Open Structure	.007
2	W4	W1	W5	W8	Z	Open Structure	.007

Member Area Loads (BLC 17 : Ice + Wind 7 (270 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W4	W1	W5	W8	Z	Open Structure	.009

Member Area Loads (BLC 18 : Ice + Wind 8 (315 Deg))

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]	
1	W1	W2	W6	W5	X	Open Structure	-.007
2	W4	W1	W5	W8	Z	Open Structure	.007

Envelope AISC 14th(360-10): LRFD Steel Code Checks

Member	Shape	Code Check	L	LC	Sh	Lo	phi*Pn	phi*Pnt	phi*Mn	phi*Vn	Eqn	
1	M227	L1 1/2x...	.803	5...	6	.008	5...	4.769	17.086	.293	.545	H2-1
2	M211	L1 1/2x...	.503	0	9	.004	0	4.769	17.086	.293	.545	H2-1
3	M210	L1 1/2x...	.480	5...	17	.005	5...	4.769	17.086	.293	.545	H2-1
4	DIAG1	L1 1/2x...	.460	5...	3	.005	0	4.769	17.086	.293	.545	H2-1
5	MP9	PIPE ...	.446	4...	10	.034	4...	21.535	32.13	1.872	1.872	H1...
6	M223	L1 1/2x...	.435	0	17	.007	0	4.769	17.086	.293	.545	H2-1



Company : Tower Engineering Professionals
Designer : RNM
Job Number : TEP No. 52861.195718
Model Name : 184106 - Fluvanna County WT

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Envelope AISC 14th(360-10): LRFD Steel Code Checks (Continued)

Table with columns: Member, Shape, Code Check, L, LC, Sh, Lo, phi*Pn, phi*Pnt, phi*Mn, y, phi*, Egn. Rows 7-63.



Company : Tower Engineering Professionals
Designer : RNM
Job Number : TEP No. 52861.195718
Model Name : 184106 - Fluvanna County WT

Nov 14, 2018
1:22 PM
Checked By: WBA

Envelope AISC 14th(360-10): LRFD Steel Code Checks (Continued)

Table with columns: Member, Shape, Code Check, L, LC, Sh, Lo, phi*Pn, phi*Pnt, phi*Mn, y, phi*, Egn. Rows 64-120.



Company : Tower Engineering Professionals
 Designer : RNM
 Job Number : TEP No. 52861.195718
 Model Name : 184106 - Fluvanna County WT

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 Checked By: WBA

Envelope AISC 14th(360-10): LRFD Steel Code Checks (Continued)

Member	Shape	Code Check	L	LC	Sh	Lo	phi*Pn	phi*Pnt	phi*Mn	phi*	Eqn	
121	MP23	PIPE	.114	5	14	.013	2.25	21.535	32.13	1.872	1.872	H1
122	MRAIL24	L2x2x3	.112	0	10	.005	0	16.966	23.393	.558	1.112	H2-1
123	M118	L1 1/2x	.109	2	10	.004	3	9.713	17.086	.293	.603	H2-1
124	TOEPL3	RE4X	.106	3	4	.003	3	1.274	32.4	.169	2.192	H1
125	TOEPL4	RE4X	.106	3	4	.003	3	1.274	32.4	.169	2.192	H1
126	TOEPL9	RE4X	.106	3	8	.003	3	1.274	32.4	.169	2.192	H1
127	TOEPL14	RE4X	.106	3	4	.003	3	1.274	32.4	.169	2.192	H1
128	TOEPL15	RE4X	.106	3	4	.003	3	1.274	32.4	.169	2.192	H1
129	TOEPL20	RE4X	.106	3	8	.003	3	1.274	32.4	.169	2.192	H1
130	TOEPL21	RE4X	.106	3	8	.003	3	1.274	32.4	.169	2.192	H1
131	TRAIL17	L2x2x3	.104	0	8	.010	0	16.966	23.393	.558	1.112	H2-1
132	TRAIL20	L2x2x3	.103	3	10	.007	3	16.966	23.393	.558	1.112	H2-1
133	TRAIL18	L2x2x3	.101	0	14	.009	3	16.966	23.393	.558	1.112	H2-1
134	TRAIL2	L2x2x3	.096	0	14	.008	0	16.966	23.393	.558	1.112	H2-1
135	TRAIL5	L2x2x3	.096	0	16	.010	0	16.964	23.393	.558	1.112	H2-1
136	TRAIL22	L2x2x3	.095	0	3	.007	0	3.127	23.393	.558	.933	H2-1
137	POST11	LL2.5x	.094	4	6	.010	4	24.351	77.112	5.321	2.083	H1
138	TRAIL8	L2x2x3	.091	3	16	.007	3	16.966	23.393	.558	1.112	H2-1
139	TRAIL14	L2x2x3	.083	0	10	.007	3	16.966	23.393	.558	1.112	H2-1
140	TRAIL1	L2x2x3	.073	3	10	.005	3	16.966	23.393	.558	1.112	H2-1
141	MP11	PIPE	.072	4	2	.007	4	21.535	32.13	1.872	1.872	H1
142	MP19	PIPE	.072	4	14	.007	4	21.535	32.13	1.872	1.872	H1
143	MRAIL22	L1 1/2x	.070	2	2	.007	0	9.71	17.086	.293	.603	H2-1
144	TRAIL19	L2x2x3	.069	0	8	.005	0	16.966	23.393	.558	1.112	H2-1
145	TRAIL15	L2x2x3	.067	0	4	.004	3	16.964	23.393	.558	1.112	H2-1
146	TOEPL24	L1 1/2x	.067	3	3	.008	3	9.71	17.086	.293	.667	H2-1
147	MP3	PIPE	.065	4	10	.006	4	21.535	32.13	1.872	1.872	H1
148	TRAIL3	L2x2x3	.063	3	12	.007	3	16.966	23.393	.558	1.112	H2-1
149	TRAIL4	L2x2x3	.061	0	14	.006	0	16.964	23.393	.558	1.112	H2-1
150	MRAIL14	L1 1/2x	.059	2	12	.005	0	9.713	17.086	.293	.603	H2-1
151	MRAIL11	L1 1/2x	.058	1	10	.005	3	9.71	17.086	.293	.603	H2-1
152	MRAIL1	L1 1/2x	.058	0	3	.005	3	9.713	17.086	.293	.603	H2-1
153	MRAIL15	L1 1/2x	.058	1	12	.006	3	9.713	17.086	.293	.603	H2-1
154	MRAIL21	L1 1/2x	.058	3	3	.005	0	9.713	17.086	.293	.603	H2-1
155	MRAIL13	L1 1/2x	.057	1	12	.005	0	9.713	17.086	.293	.603	H2-1
156	TRAIL16	L2x2x3	.056	3	6	.005	3	16.964	23.393	.558	1.112	H2-1
157	MRAIL12	L1 1/2x	.055	2	12	.005	0	9.713	17.086	.293	.603	H2-1
158	MRAIL10	L1 1/2x	.055	1	10	.004	0	9.71	17.086	.293	.603	H2-1
159	MRAIL19	L1 1/2x	.054	1	26	.005	0	9.713	17.086	.293	.603	H2-1
160	MRAIL20	L1 1/2x	.054	1	26	.005	3	9.713	17.086	.293	.603	H2-1
161	MRAIL18	L1 1/2x	.053	1	26	.004	3	9.713	17.086	.293	.603	H2-1
162	MRAIL17	L1 1/2x	.053	1	26	.005	0	9.71	17.086	.293	.603	H2-1
163	MRAIL16	L1 1/2x	.053	1	25	.005	3	9.71	17.086	.293	.603	H2-1
164	MRAIL2	L1 1/2x	.052	1	20	.005	3	9.713	17.086	.293	.603	H2-1
165	MRAIL3	L1 1/2x	.052	1	20	.004	0	9.713	17.086	.293	.603	H2-1
166	MRAIL4	L1 1/2x	.051	1	20	.004	3	9.713	17.086	.293	.603	H2-1
167	MRAIL7	L1 1/2x	.051	0	14	.005	3	9.713	17.086	.293	.603	H2-1
168	MRAIL5	L1 1/2x	.049	1	20	.004	3	9.71	17.086	.293	.603	H2-1
169	MRAIL9	L1 1/2x	.049	1	23	.004	0	9.713	17.086	.293	.603	H2-1
170	MRAIL6	L1 1/2x	.048	1	22	.006	3	9.71	17.086	.293	.603	H2-1
171	MRAIL8	L1 1/2x	.047	1	24	.004	0	9.713	17.086	.293	.603	H2-1
172	TRAIL7	L2x2x3	.036	0	16	.006	0	16.966	23.393	.558	1.112	H2-1
173	MP18	PIPE	.030	1	3	.006	1	19.969	32.13	1.872	1.872	H1
174	MP2	PIPE	.026	1	8	.006	4	19.969	32.13	1.872	1.872	H1
175	MP10	PIPE	.023	4	2	.004	1	21.535	32.13	1.872	1.872	H1

**FLUVANNA COUNTY BOARD OF SUPERVISORS
AGENDA ITEM STAFF REPORT**

TAB G

MEETING DATE:	February 6, 2019				
AGENDA TITLE:	Surveying for Zion Crossroads Water & Sewer System Project Agreement #4				
MOTION(s):	I move the Board of Supervisors approve the 2nd Amendment to Project Agreement #4 between Fluvanna County and Bowman Consulting Group for additional services associated with easement platting revisions and record platting for the Department of Corrections for the Zion Crossroads Water & Sewer System project totaling \$1,000, and further authorize the County Administrator to execute the agreement subject to approval as to form by the County Attorney.				
STRATEGIC INITIATIVE?	Yes	No	If yes, list initiative(s):	C7	
	X				
AGENDA CATEGORY:	Public Hearing	Action Matter	Presentation	Consent Agenda	Other
				xx	
STAFF CONTACT(S):	Cyndi Toler, Purchasing Officer				
PRESENTER(S):	Cyndi Toler, Purchasing Officer				
RECOMMENDATION:	Approval				
TIMING:	Routine				
DISCUSSION:	This agreement is required for easement platting revisions as requested by the DOC to accurately reflect the limits of ownership by the County.				
FISCAL IMPACT:	Budgeted within the ZXR Budget				
POLICY IMPACT:	N/A				
LEGISLATIVE HISTORY:	N/A				
ENCLOSURES:	Project Agreement #4 – Zion Crossroads Water & Sewer System Design/Services				
REVIEWS COMPLETED:	Legal	Finance	Purchasing	HR	Other
	X	X	X		

2nd AMENDMENT TO PROJECT AGREEMENT # 4
ZION CROSSROADS WATER & SEWER SYSTEM DESIGN/SERVICES

This 2nd Amendment to Project Agreement #4 (the “Amendment”) made this ____ day of _____, 2019, between Fluvanna County, Virginia (the “County”), a political subdivision of the Commonwealth of Virginia, and Bowman Consulting Group, LTD.(“A/E”) (the “Consultant”), a Virginia corporation, amends that Project Agreement #4 under that TERM CONTRACT BETWEEN COUNTY AND ARCHITECT/ENGINEER FOR PROFESSIONAL SERVICES dated the 5th day of September, 2013, (including all exhibits thereto the “Agreement”). All defined terms in the Agreement shall have the same meaning as in this Amendment except for terms specifically defined herein.

Whereas, pursuant to the Agreement the County shall issue written task orders to the Contractor as services are needed;

Whereas, the County entered into Project Agreement #4 for the Consultant complete “SX005 – Easement Platting revisions” and “SX006 – Record Plat for the Department of Corrections” (the “Services”) as described therein; and

Whereas, the County now desires to amend such Project Agreement #4 to add certain Additional Services and the Consultant desires to accept the Additional Services and complete all work and services necessary and related thereto.

For good and valuable consideration, the parties hereby agree as follows:

- I. **ADDITIONAL SERVICES:** In addition to all those services currently provided under Project Agreement #4, the Consultant shall provide all work, labor, training, supervision, maintenance and materials necessary to perform all those services described below (the “Additional Services”) as Additional Services under the Agreement and must meet or exceed the requirements of this Amendment, Project Agreement #4 and the Agreement. All items provided and Additional Services rendered under this Contact shall be done in a good and workmanlike manner of the highest professional standards and so as to pass without exception in the industry and shall be consistent with applicable local, state and federal laws, statutes, ordinances and requirements while performing the Services.
 - a. The Additional Services are defined as follows:
 - i. Minor Revisions to the easement plat entitled “Plat Showing Proposed Utility Easements & Temporary Construction Easements on the Property of the commonwealth Department of Corrections P.I.D. 4-A-97” dated August 18, 2018, (the “Plat”). This task includes computations, revising line and curve tables, and updating area tabulations, if applicable;
 - ii. Revisions to address minor comments and concerns similar to those in Exhibit 1 (and not major design changes) of the project’s engineer and the Virginia Department of Corrections or the Virginia Department of General Services (collectively the “Commonwealth”) in preparation for recordation of a Deed of Easement as requested from time to time until March 15, 2019, including the following identified issues on a marked-up copy of the Plat from the Commonwealth attached hereto as Exhibit 1;
 - iii. Minor Revisions or Corrections (and not Major Design Changes) to the easement plat from time to time as requested by the County through March 15, 2019.
- II. **COMPENSATION:** The flat fee for the Additional Services is ONE THOUSAND DOLLARS AND NO/100 DOLLARS (\$1,000.00) due and payable upon completion. The Consultant shall

submit an invoice to County. This shall be in addition to those other amounts due for Project Agreement #4. All such invoicing and payments shall be made in accordance with Section 47 "Payment" of the General Terms.

- III. **TERM: The Consultant shall complete to the sole satisfaction of the County the services on relating to the changes required pursuant to the attached Exhibit 1 no later than February 5, 2019**, time being of the essence. Any Additional Services requested from time to time shall be completed as needed within fifteen (15) days' notice of an additional change.
- IV. **MISCELLANEOUS.** The headings of the sections of this Amendment are inserted for convenience only and do not alter or amend the provisions hereof. A word importing the masculine or neuter gender only may extend and be applied to females and to corporations as well as males, and vice versa. A word importing the singular number only may extend and be applied to several persons or things as well as to one person or thing; and a word importing the plural number only may extend and be applied to one person or thing, as well as to several persons or things. This Amendment may be executed in multiple counterparts each of which shall be deemed an original and together which shall constitute the Agreement. This Amendment may be executed in duplicate originals, any of which shall be equally authentic. In addition to allowing electronic signatures upon an electronic copy of this Agreement, as provided by Virginia law, facsimile signatures upon any signature page will be considered to be original signatures. This Agreement, together with exhibits hereto, contains the entire understanding of the parties with respect to the subject matter hereof and is to be modified only by a writing signed by the parties to this Agreement. Except as specifically amended hereby, Project Agreement #4 remains in full force and effect.

In witness whereof the undersigned duly authorized representatives have executed this Agreement on the dates set forth beside their respective signatures.

Consultant: Bowman Consulting Group, LTD.

County: Fluvanna County

By: _____

By: _____

Name: _____

Name: _____

Title: _____

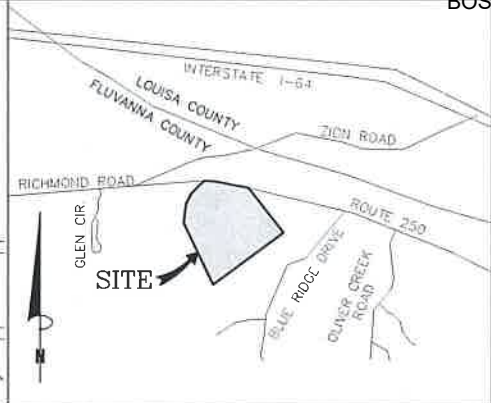
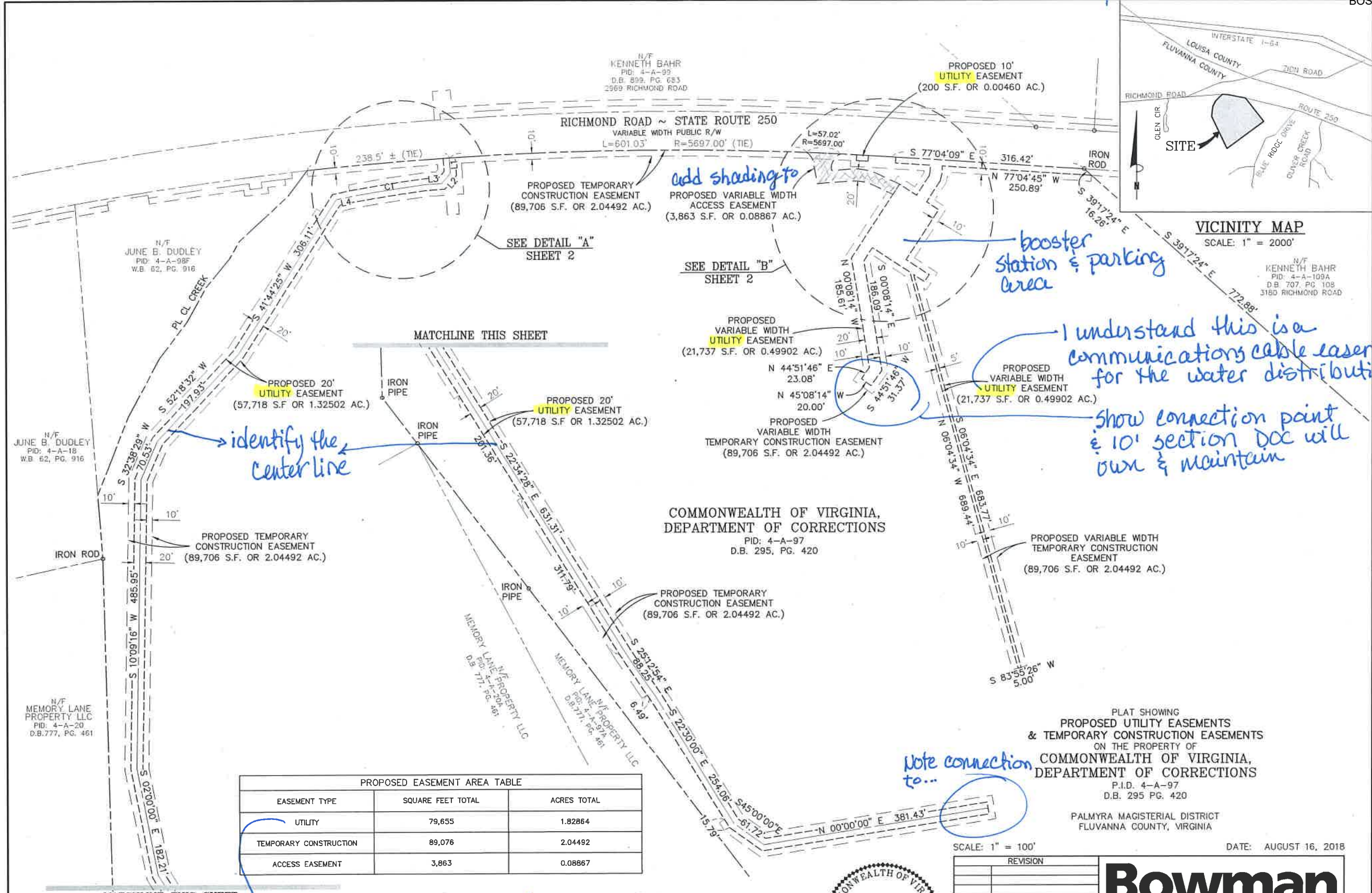
Title: _____

Date: _____

Date: _____

Approved as to form:

Fluvanna County Attorney



I understand this is a communications cable easement for the water distribution - correct?
 show connection point & 10' section Doc will own & maintain

PROPOSED EASEMENT AREA TABLE

EASEMENT TYPE	SQUARE FEET TOTAL	ACRES TOTAL
UTILITY	79,655	1.82864
TEMPORARY CONSTRUCTION	89,076	2.04492
ACCESS EASEMENT	3,863	0.08867

separate by type in table & on plat labels

PLAT SHOWING
 PROPOSED UTILITY EASEMENTS
 & TEMPORARY CONSTRUCTION EASEMENTS
 ON THE PROPERTY OF
 COMMONWEALTH OF VIRGINIA,
 DEPARTMENT OF CORRECTIONS
 P.I.D. 4-A-97
 D.B. 295 PG. 420

SCALE: 1" = 100' DATE: AUGUST 16, 2018

REVISION	DATE	BY	CHK	QC

Bowman CONSULTING

Bowman Consulting Group, Ltd.
 3951 Weststar Parkway, Suite 150
 Richmond, Virginia 23233
 Phone: (804) 616-3240
 Fax: (804) 270-2008
 www.bowmanconsulting.com

BY: RD CHK: CSM QC: []

BCG PROJECT NO: 8258-01-003 TASK: 003 COUNTY REF NO: SHEET 1 OF 2



APPROVED BY THE
 FLUVANNA COUNTY PLANNING
 COMMISSION AND/OR
 DIRECTOR OF PLANNING

DATE _____ ACTING SECRETARY/AGENT _____

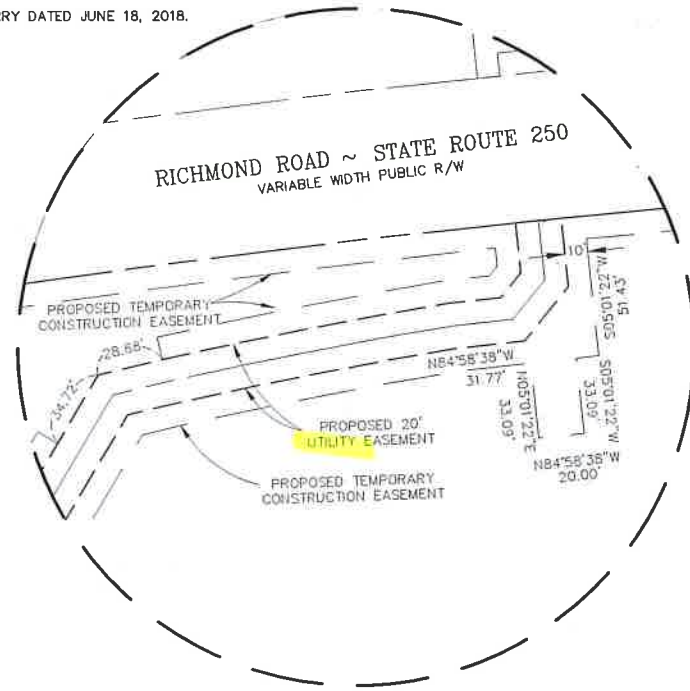
SEE CURVE AND LINE TABLES ON SHEET 2



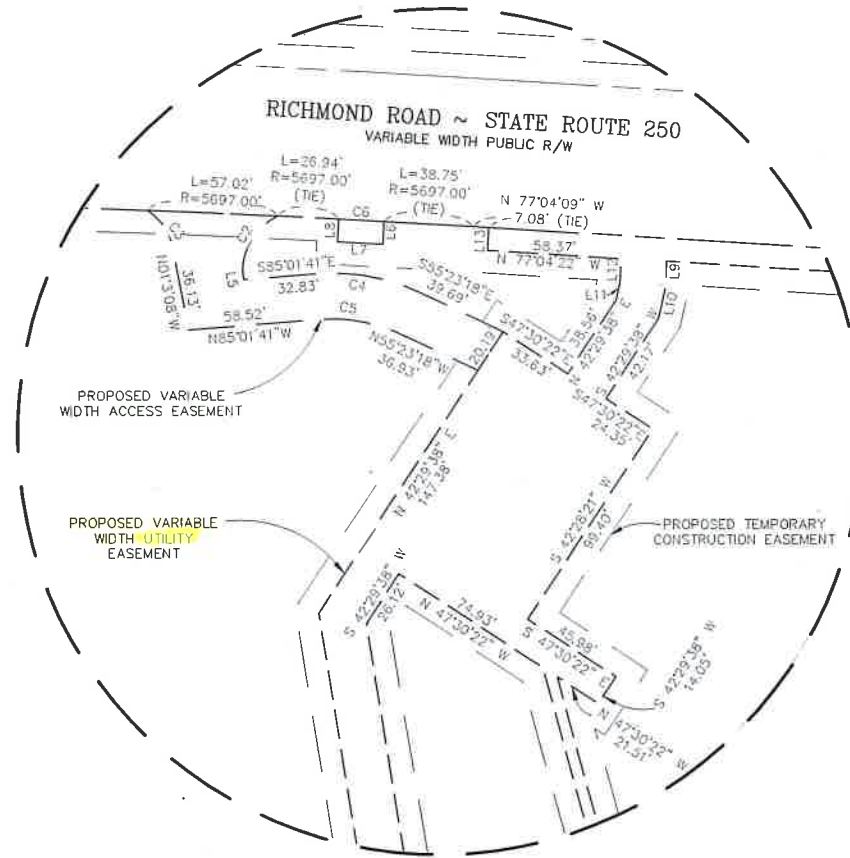
8258-C-RP-002

NOTES

1. THE SURVEYED PROPERTIES DELINEATED HEREON ARE LOCATED IN FLUVANNA AND LOUISA COUNTIES.
3. BOUNDARY INFORMATION AS SHOWN HEREON IS COMPILED FROM EXISTING LAND RECORDS OF FLUVANNA AND LOUISA COUNTY, VIRGINIA, AND MADE TO BETS FIT FOUND MONUMENTATION, BASED OFF A FIELD SURVEY PERFORMED BY BOWMAN CONSULTING GROUP, LTD. IN AUGUST, 2016 THROUGH NOVEMBER, 2, 2016.
4. HORIZONTAL DATUM IS BASED ON NGS AND/OR LOCAL COUNTY GPS MONUMENTS.
5. THIS SURVEY DOES NOT REPRESENT A BOUNDARY SURVEY OF ANY PARCEL, NOR HAVE ANY CORNERS BEEN SET.
6. THE SURVEYED PROPERTIES AS SHOWN HEREON IS SUBJECT TO ALL COVENANTS AND RESTRICTIONS OF RECORD. BOWMAN CONSULTING GROUP, LTD. WAS NOT PROVIDED COMMITMENTS FOR TITLE INSURANCE THEREFORE NOT ALL EASEMENTS MAY BE SHOWN AND PROPERTIES ARE SUBJECT TO ALL ENCUMBRANCES OF RECORD.
7. THE SURVEYED PROPERTIES SHOWN HEREON LIE IN ZONE X (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN) AS SHOWN ON FEMA FLOOD INSURANCE RATE MAPS FOR FLUVANNA COUNTY, VIRGINIA, COMMUNITY PANEL NUMBERS 51065C0060C, EFFECTIVE MAY 16, 2008, AND 51065C0100C, EFFECTIVE MAY 16, 2008, AND FEMA FLOOD INSURANCE RATE MAP FOR LOUISA COUNTY, VIRGINIA, COMMUNITY PANEL NUMBER 51109C0250 B, EFFECTIVE NOVEMBER 5, 1997.
8. EASEMENT DESIGN INFORMATION WAS RECEIVED FROM DEWBERRY DATED JUNE 18, 2018.



DETAIL "A"
SCALE: 1" = 50'



DETAIL "B"
SCALE: 1" = 50'

PLAT SHOWING
PROPOSED UTILITY EASEMENTS
& TEMPORARY CONSTRUCTION EASEMENTS
ON THE PROPERTY OF
COMMONWEALTH OF VIRGINIA,
DEPARTMENT OF CORRECTIONS
P.I.D. 4-A-97
D.B. 295 PG. 420

PALMYRA MAGISTERIAL DISTRICT
FLUVANNA COUNTY, VIRGINIA

SCALE: 1" = 100'

DATE: AUGUST 16, 2018

CURVE TABLE

CURVE	RADIUS	LENGTH	BEARING	CHORD	DELTA	TANGENT
C1	2303.07'	124.69'	N 89°46'19" W	124.68'	3°06'07"	62.36'
C2	26.94'	30.57'	S 41°31'08" W	28.96'	65°00'51"	17.17'
C3	23.83'	20.69'	N 24°13'11" W	20.05'	49°44'51"	11.05'
C4	90.00'	46.56'	S 70°12'29" E	46.04'	29°38'23"	23.81'
C5	70.00'	36.21'	N 70°12'29" W	35.81'	29°38'23"	18.52'
C6	2678.14'	20.00'	S 77°36'16" E	20.00'	0°25'40"	10.00'

LINE TABLE

LINE	BEARING	DISTANCE
L1	S 05°01'22" W	26.02'
L2	S 50°01'22" W	22.06'
L3	N 84°58'38" W	26.74'
L4	S 87°38'05" W	26.87'
L5	N 00°33'27" E	3.37'
L6	N 12°23'44" E	10.00'
L7	N 77°36'16" W	20.00'
L8	N 12°23'44" E	10.00'
L9	S 10°44'38" W	11.27'
L10	S 21°59'38" W	13.67'
L11	N 21°59'38" E	8.08'
L12	N 10°44'38" E	10.06'
L13	N 12°55'39" E	10.00'



REVISION	

Bowman CONSULTING

Bowman Consulting Group, Ltd.
3961 Westerra Parkway, Suite 150
Richmond, Virginia 23233

Phone: (804) 616-3240
Fax: (804) 270-2008
www.bowmanconsulting.com

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DWG: P:\0029 - Fluvanna County, VA, Rte 250\0029-01-001 (S)R - Zen Overroads Water & Sewer Fluvanna Survey\Plan\0029-C-01-001 000 Parcel.dwg BY: RD CHK: CSM QC:
BCG PROJECT NO: 8258-01-003 TASK: 003 COUNTY REF NO: SHEET 2 OF 2

8258-C-RP-002

**FLUVANNA COUNTY BOARD OF SUPERVISORS
MEETING PACKAGE ATTACHMENTS**

Y/N	Item
Y	Unassigned Fund Balance Report
Y	BOS Contingency Balance Report
Y	Capital Reserve Balances Memo
	Fluvanna County Bank Balances
Y	Building Inspections Report
Y	VDOT Monthly Report

MEMORANDUM

Date: February 6, 2019
From: Eric Pollitt – Management Analyst
To: Board of Supervisors
Subject: FY19 BOS Contingency Balance

The FY19 BOS Contingency line balance is as follows:

Beginning Budget:	\$150,000.00
Less: FY19 Non-Profit Budget Allocations Change – 05.16.18	-\$14,180.00
Less: FY19 C.A.R.E. Task Force Container for Clean Up Day – 09.19.18	-\$500.00
Less: FY19 Building & Program Feasibility Study – 11.20.18	-\$10,690.00
Less: FY19 Additional Public Safety Radios for St. Troopers – 12.19.18	-\$12,000.00
Available:	\$112,630.00

MEMORANDUM

Date: February 6, 2019
From: Eric Pollitt – Management Analyst
To: Board of Supervisors
Subject: FY19 Capital Reserve Balances

The FY19 Capital Reserve account balances are as follows:

County Capital Reserve:

FY19 Budget Allocation:	\$0
FY18 Carryover	\$67,256
FY18 Closed Out Projects	\$163,865
Total FY19 Budget:	\$231,121
Less: I.T. Air Conditioning Unit – 09.19.18	-\$7,000
Less: FSPCA Building Renovations – 10.17.18	-\$45,000
Less: Palmyra Rescue Squad Building Renovations – 10.17.18	-\$15,000
Less: Historic Courthouse Oil Furnace Replacement – 01.09.19	-\$8,948
Less: Social Services Heat Pump – 01.09.19	-\$6,061
FY19 Available:	\$149,112

Schools Capital Reserve:

FY19 Budget Allocation:	\$150,000
FY18 Carryover	\$116,308
FY18 Closed Out Projects	\$13,046
Total FY19 Budget:	\$266,308
Plus: BOS Unassigned Fund Balance: Middle School Debt Proceeds – 09.19.18	\$72,001

Less: Abrams Abatement: Classroom & Crawl Space – 09.19.18	-\$72,001
Less: Carysbrook & Central Elementary Blacktop Repair – 09.19.18	-\$10,650
Less: Central Elementary School Partition – 09.19.18	-\$12,000
Less: Bus 21 Engine/ Motor Replacement – 11.07.18	-\$22,500
Less: FCHS Water Tank – 12.19.18	-\$2,450
Less: FMS Fire Alarm Install, Removal, and Replacement – 12.19.18	-\$4,422
FY19 Available:	\$227,332

MEMORANDUM

Date: February 6, 2019
From: Eric Pollitt – Management Analyst
To: Board of Supervisors
Subject: Unassigned Fund Balance

FY18 Year End Audited Total Unassigned Fund Balance:	\$14,532,691
Unassigned Fund Balance – 12% Target Per Policy:	\$8,687,777
Unassigned Fund Balance – Excess Above Policy Target:	\$5,844,914
Less: FY19 Abrams Abatement Classroom and Crawl Space – 09.19.18	-\$72,001
Less: FY19 Fire Hydrant Installation (JRWA) – 10.17.18	-\$142,500
Less: FY18-19 Various Carryover Requests – 11.20.18	-\$240,700
Current FY19 Unassigned Fund Balance – Excess Above Policy Target:	\$5,389,713

BUILDING INSPECTIONS MONTHLY REPORT

County of Fluvanna

Building Official:	Period:
Kevin Zoll	December 2018

Category	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
BUILDING PERMITS ISSUED														
NEW - Single Family Detached (incl. Trades permits)	2014	7	1	4	6	9	16	5	12	6	8	4	9	87
	2015	4	5	10	9	12	12	14	13	2	4	7	3	95
	2016	11	11	8	15	9	18	6	5	9	2	6	8	108
	2017	3	2	16	6	4	10	6	5	14	5	7	13	91
	2018	8	3	15	11	13	17	13	10	8	8	6	9	121
NEW - Single Family Attached	2014	0	0	6	0	0	0	0	0	0	0	2	0	8
	2015	2	0	0	0	0	0	0	2	0	0	0	0	4
	2016	0	0	0	0	0	5	0	0	0	0	0	0	5
	2017	0	0	0	0	0	0	0	0	0	0	0	0	0
	2018	0	0	0	0	0	0	0	0	0	0	0	0	0
NEW - Mobil Homes	2014	0	1	1	0	0	1	1	0	1	0	0	0	5
	2015	0	0	0	0	1	1	0	2	0	0	0	0	4
	2016	0	1	0	0	0	0	0	1	0	0	0	0	2
	2017	0	0	0	0	2	1	0	1	0	0	0	0	4
	2018	0	0	1	1	0	0	0	0	0	0	0	1	3
Additions and Alterations	2014	22	12	17	29	31	28	18	28	31	36	25	25	302
	2015	21	30	38	28	21	30	22	25	23	27	35	18	318
	2016	13	10	31	27	29	29	15	32	31	28	27	27	299
	2017	29	20	29	43	20	29	32	18	23	27	43	28	341
	2018*	19	6	10	19	8	13	26	25	32	42	22	21	243
* Trade permits count not included as in previous years														
Accessory Buildings	2014	2	0	2	0	4	1	3	5	1	2	2	1	23
	2015	4	4	3	4	1	0	0	2	6	0	0	3	27
	2016	3	4	4	6	2	2	1	2	1	3	3	6	37
	2017	0	4	2	3	2	2	2	4	2	0	2	2	25
	2018	2	3	3	6	2	1	4	2	1	2	2	2	30
Swimming Pools	2014	0	0	0	1	0	0	0	0	0	0	0	1	2
	2015	0	0	0	0	0	0	0	1	1	0	0	0	2
	2016	0	0	0	0	0	1	1	0	0	0	0	0	2
	2017	0	0	0	0	0	1	1	0	0	1	1	0	4
	2018	0	1	1	1	0	1	2	0	1	2	0	0	9
Commercial/Industrial Build/Cell Towers	2014	0	0	0	0	0	2	1	0	0	0	0	1	4
	2015	1	0	0	0	0	0	2	0	0	1	1	1	6
	2016	0	0	2	2	0	0	1	0	1	1	1	1	9
	2017	1	2	0	0	0	0	2	2	1	1	0	0	9
	2018	0	0	0	0	0	2	0	0	0	0	0	0	2
TOTAL BUILDING PERMITS	2014	31	14	30	36	44	48	28	45	39	46	33	37	431
	2015	32	39	51	41	35	43	38	45	32	32	43	25	456
	2016	27	26	45	50	40	55	24	40	42	34	37	42	462
	2017	33	28	47	52	28	43	43	30	40	34	53	43	474
	2018**	29	13	30	38	23	34	45	37	42	54	30	33	408
** Trade permits count not included as in previous years														

BUILDING VALUES FOR PERMITS ISSUED														
TOTAL BUILDING VALUES	2014	\$1,902,399	\$458,326	\$1,783,992	\$2,540,111	\$2,570,600	\$3,119,933	\$1,724,192	\$2,586,705	\$1,353,471	\$1,922,260	\$1,461,680	\$2,563,409	\$ 23,987,078
	2015	\$1,384,631	\$1,560,716	\$2,916,520	\$3,567,237	\$2,999,918	\$4,280,357	\$5,272,378	\$3,107,731	\$2,625,563	\$2,203,913	\$1,931,893	\$6,252,403	\$ 38,103,260
	2016	\$1,817,981	\$2,555,455	\$5,542,458	\$3,711,821	\$2,447,891	\$5,181,921	\$3,611,179	\$1,817,783	\$3,089,971	\$1,889,279	\$2,028,590	\$2,937,783	\$ 36,632,112
	2017	\$857,767	\$827,724	\$4,859,777	\$2,066,132	\$1,512,789	\$3,676,118	\$1,904,915	\$2,359,988	\$2,846,545	\$1,957,646	\$1,897,110	\$3,479,285	\$ 28,245,796
	2018	\$2,541,433	\$1,075,551	\$3,544,096	\$2,513,241	\$3,834,995	\$5,693,348	\$3,156,593	\$4,729,005	\$3,637,992	\$1,791,222	\$2,169,284	\$2,421,169	\$ 37,107,929

Category	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
LAND DISTURBING PERMITS ISSUED														
LAND DISTURBING PERMITS	2014	8	1	10	4	8	16	3	10	5	9	6	10	90
	2015	6	5	9	10	10	12	15	16	3	5	10	5	106
	2016	12	11	8	14	10	17	7	6	11	3	9	9	117
	2017	3	2	17	7	7	9	6	6	15	8	7	14	101
	2018	10	4	16	13	11	17	13	7	9	6	7	8	121
INSPECTIONS COMPLETED														
TOTAL INSPECTIONS	2014	135	149	103	180	113	168	173	148	155	167	112	162	1,765
	2015	105	137	146	214	113	232	193	181	208	206	149	149	2,033
	2016	116	91	153	157	155	214	249	230	197	181	184	172	2,099
	2017	159	144	171	141	177	152	202	182	153	183	181	169	2,014
	2018	163	148	173	186	215	176	164	220	144	221	154	141	2,105
FEES COLLECTED														
Building Permits	2014	\$9,160	\$2,655	\$10,041	\$11,601	\$11,808	\$18,950	\$6,913	\$12,848	\$8,080	\$11,602	\$9,740	\$11,568	\$ 124,966
	2015	\$6,731	\$8,351	\$13,711	\$16,037	\$13,508	\$16,628	\$14,931	\$18,895	\$10,411	\$8,558	\$10,381	\$9,575	\$ 147,717
	2016	\$11,850	\$11,954	\$11,576	\$14,889	\$8,447	\$18,588	\$12,947	\$7,537	\$11,285	\$12,548	\$8,361	\$11,213	\$ 141,195
	2017	\$4,060	\$3,660	\$22,692	\$9,249	\$6,703	\$11,948	\$9,494	\$7,790	\$13,169	\$6,895	\$9,022	\$12,886	\$ 117,568
	2018	\$8,988	\$4,311	\$9,939	\$14,765	\$13,796	\$23,633	\$14,993	\$8,748	\$10,826	\$12,613	\$9,556	\$14,570	\$ 146,739
Land Disturbing Permits	2014	\$2,125	\$1,225	\$2,400	\$2,300	\$1,310	\$8,500	\$2,739	\$2,850	\$625	\$2,839	\$2,450	\$2,850	\$ 32,213
	2015	\$1,775	\$875	\$1,425	\$3,425	\$1,750	\$1,850	\$2,325	\$3,338	\$1,085	\$2,819	\$10,450	\$2,298	\$ 33,415
	2016	\$3,200	\$2,575	\$1,700	\$1,950	\$2,250	\$2,200	\$4,020	\$875	\$28,074	\$2,000	\$1,450	\$1,200	\$ 51,494
	2017	\$475	\$800	\$7,000	\$1,523	\$2,366	\$2,425	\$1,733	\$7,784	\$2,100	\$2,050	\$1,000	\$1,625	\$ 30,881
	2018	\$1,450	\$5,975	\$1,890	\$1,625	\$1,625	\$2,850	\$1,625	\$1,175	\$1,125	\$875	\$10,675	\$2,150	\$ 33,040
Zoning Permits/ Proffers	2014	\$1,000	\$250	\$1,800	\$1,100	\$14,200	\$2,400	\$1,050	\$19,900	\$1,400	\$1,350	\$950	\$1,700	\$ 47,100
	2015	\$1,200	\$1,000	\$1,650	\$2,600	\$1,500	\$1,850	\$1,850	\$2,400	\$1,650	\$1,050	\$900	\$850	\$ 18,500
	2016	\$1,150	\$1,250	\$1,800	\$2,450	\$1,650	\$2,700	\$1,150	\$1,150	\$1,900	\$1,050	\$900	\$850	\$ 18,000
	2017	\$400	\$1,000	\$2,400	\$950	\$1,500	\$1,800	\$1,245	\$1,250	\$1,600	\$1,050	\$1,250	\$1,550	\$ 15,995
	2018	\$1,400	\$800	\$1,750	\$1,600	\$1,400	\$2,200	\$2,050	\$1,400	\$1,050	\$1,400	\$700	\$1,400	\$ 17,150
TOTAL FEES	2014	\$12,285	\$4,130	\$14,241	\$15,001	\$27,318	\$29,850	\$10,702	\$35,598	\$10,105	\$15,791	\$13,140	\$16,118	\$ 204,279
	2015	\$9,706	\$10,226	\$16,786	\$22,062	\$16,758	\$20,328	\$19,106	\$24,633	\$13,146	\$12,427	\$21,731	\$12,723	\$ 199,632
	2016	\$16,200	\$15,779	\$15,076	\$19,289	\$12,347	\$23,488	\$18,117	\$9,562	\$41,259	\$15,598	\$10,711	\$13,263	\$ 210,689
	2017	\$4,935	\$5,460	\$32,092	\$11,722	\$10,569	\$16,173	\$12,472	\$16,824	\$16,869	\$9,995	\$11,272	\$16,061	\$ 164,444
	2018	\$11,838	\$11,086	\$13,579	\$17,990	\$16,821	\$28,683	\$18,668	\$11,323	\$13,001	\$14,888	\$20,931	\$18,120	\$ 196,929

Culpeper District, Louisa Residency Fluvanna County Monthly Report: February 2019

Fluvanna Mileage, Structures

PRIMARY MILES	SECONDARY MILES	STRUCTURES	TOTAL MILES
102.34	598.62	75	700.96

Fatal Accidents

DATE	LOCATION	ALCOHOL	RESTRAINT
05/05	Route 250, at Route 631 Troy Rd	No	No
08/24	Route 250	Hit & Run	Pedestrian
09/18	Route 607	No	N/A
10/17	Route 619, East of Route 660	No	N/A
12/11	Route 659, 0.50 miles N of Route 626	No	Pedestrian
<p>**Of the 843 fatalities in VA in 2017, 208 were related to distracted driving and 308 were motor vehicle occupants not wearing a seatbelt.</p>			

[Link to SmarTeScale information](#)

[Link to SmarTeScale Projects \(Filter for Fluvanna Co. Projects\)](#)

SmartScale Round 3 Applications:

- Thomas Jefferson Pkwy (Rte 53) & Turkeysag Trail (Rte 1015)
- James Madison Hwy (Rte 15) & Bybees Church Rd (Rte 613)
- James Madison Hwy (Rte 15) & Hunters Lodge Rd (Rte 631)
- Route 250 at Toy Road (Route 631)



Key Dates:

- Commonwealth Transportation Board will release scores in early 2019

Projects:

PROJECT	LAST MILESTONE	NEXT MILESTONE	AD DATE
Route 53 Safety improvements at Route 618, Roundabout, (UPC:96938)	Obtain Environmental Permits	Pre-Advertisement Meeting	Anticipated MAR 2020
Route 680 – Rural Rustic (UPC:107558)	CN Begins (State Forces)	Completion	Anticipated Completion Summer 2019
Route 629 Bridge Replacement (UPC 104848)	Construction Authorization	CN Begins (State Forces)	Anticipated Completion December 2019
Route 600-618 Intersection Improvements (UPC 111739)	Environmental Review Process	Scoping	Anticipated FEB 2022

Additional Road Projects:

- On-Call Pipe Replacements (UPC 106020)
- District Wide Guardrail Repair and/or Replacement (UPC 106849)

- **District Wide ADA Compliance** (UPC 108027)
- **On-Call District Wide Pavement Marking** (UPC 108282)
- **District-Wide Primary Rumble-Strips, 9999-967-280** (UPC 106978)

State-Force and District-Wide Bridge Projects:

- **District Wide Bridge Deck Cleaning and Washing** (UPC 105980) ;
- **District Wide Bridge Maintenance** (UPC 105979);
- **Route 623 over Venable Creek, Completed;**

Traffic Engineering

Studies under Review:

- Route 250 speed study, from Route 631 to Route 15.
- Route 53 shoulder safety improvements (proximity 4800 block +/-)
 - Corridor safety study ongoing

Completed Studies:

- Route 600/616 intersection: sight-distance and pavement marking improvements completed

County Safety and Operational Improvements:

- Route 250 at Route 631 (Troy Rd): grading to improve sight distance is completed
- Village of Palmyra Traffic Circle: County and VDOT staff plan to simulate EMS response prior to installing pavement markings;
- Route 53 at Route 619 (Cunningham): VDOT continues to evaluate this intersection for interim and long-term safety improvements
- Route 629/631 intersection review completed; VDOT is coordinating with property owners to perform minor grading to improve sight distance

Area Land Use

Fluvanna County Plan/Plat Review - Received Dec-Jan 2019

Project Name	Routes/Address	Submission Type	VDOT Contact	VDOT Received Date	Locality Due Date	VDOT Comment Date	Status
Broadleaf Farms, LLC	650-Mountain Hill Road	Preliminary Plat Review,	Mark Wood	12/13/2018	1/25/2019	12/27/2018	Review Complete - Acceptable
Kennedy Boundary Line Adjustment	n/a	Final Plat Review,	Mark Wood	12/21/2018	2/1/2019	12/26/2018	Review Complete - Acceptable
Fluvanna Self Storage Phase 2 site plan	618-Lake Monticello Road	Site Plan,	Mark Wood	12/21/2018	2/1/2019		Review Underway
Gardenkeepers of Virginia, LLC	15-17934 James Madison Hwy., Palmyra, VA	Site Plan,	Mark Wood	12/27/2018	2/8/2019		Review Underway
250 West Boundary Line Adjustment	606-4807 Hells Bend Rd., Palmyra, VA 22963	Final Plat Review,	Mark Wood	1/4/2019	2/15/2019	1/13/2019	Review Complete - Acceptable
Parrish & Thomas Minor Subdivision	660-2901 Slaters Ford Rd., Palmyra, VA 22963	Preliminary Plat Review,	Mark Wood	1/16/2019	3/1/2019		Review Underway

Maintenance Activities

VDOT crews in Palmyra and Zion Crossroads Area HQ have responded to **267** Work Orders in FY19. Top actives have been dead animal removal and culvert work.

BOS Manual:

http://www.virginiadot.org/business/resources/local_assistance/BOSmanual.pdf

Alan Saunders, P.E.
Residency Engineer
VDOT Louisa Residency
540-967-3710



Culpeper District
Louisa Residency
Fluvanna County 2019 Pavement Resurfacing

Route	Name	From	To	Pavement Resurfacing	Cost	District
6	West River Rd.	.09 mi E Rt 640, Haden Martin Rd.	Rt. 650, Mountain Hill Rd.	Plant Mix	\$352,848.84	Fork Union
53	Thomas Jefferson Pkwy	Albemarle C.L.	Rt 636, Garden Ln.	Plant Mix	\$510,826.17	Cunningham
601	Courthouse Rd	Rt 15, James Madison Hwy	Rt 608, Wilmington Rd	Surface Treatment	\$61,844.99	Fork Union
601	Venable Rd	Rt 659, Cedar Lane Rd	Rt 653, Three Chopt Rd	Surface Treatment	\$51,987.83	Columbia
601	Venable Rd	Rt 608, Wilmington Rd	Rt 630, Mountian Laurel Rd	Surface Treatment	\$26,442.60	Columbia
601	Venable Rd	Rt 630, Mountian Laurel Rd	Rt 659, Kents Store Way	Surface Treatment	\$47,069.37	Columbia
607	Bybee Rd	Louisa Co. Line	Louisa Co. Line	Surface Treatment	\$16,114.56	Columbia
611	Paynes Landing Rd	Rt 6, West River Rd	End State Maintenance	Surface Treatment	\$18,416.64	Cunningham
617	Little Creek Rd	Rt 631, Troy Rd	Rt 15, James Madison Hwy	Surface Treatment	\$13,812.48	Columbia
620	Rolling Rd S	Rt 6, West River Rd	Albemarle Co. Line	Surface Treatment	\$107,531.92	Cunningham
640	Shores Rd	Rt 697, Cunningham Rd	Rt 6, West River Rd	Surface Treatment	\$5,831.50	Fork Union
640	Shores Rd	Rt 658, Lowfields Ln	Rt 697, Cunningham Rd	Surface Treatment	\$57,552.00	Fork Union
643	Transco Rd	Rt 637, Antioch Rd	Rt 620, Rolling Rd S	Surface Treatment	\$21,869.76	Cunningham
659	Kents Store Way	Rt 601, Venable Rd	Louisa Co. Line	Surface Treatment	\$55,863.01	Columbia
659	Cedar Lane Rd	Rt 630, Plain Dealing Rd	Rt 601 Venable Rd	Surface Treatment	\$32,316.17	Columbia
665	Grace Johnson Rd	Rt 653, Three Chopt Rd	Rt 250, Three Notch Rd	Surface Treatment	\$1,215.35	Columbia
666	Magnolia Ln	Rt 657, Bremono Bluff Rd	End State Maintenance	Surface Treatment	\$1,342.88	Fork Union
676	Oliver Creek Rd	Rt 633, North Boston Rd	Rt 250, Richmond Rd	Surface Treatment	\$36,182.05	Palmyra
1085	Westview Ln	Rt 799, Beaverdam Rd	End State Maintenance	Surface Treatment	\$4,060.25	Palmyra
1086	West Ridge Ct	Rt 1085, Westview Ln	End State Maintenance	Surface Treatment	\$780.44	Palmyra
1087	Red Maple Ln	Rt 1085, Westview Ln	End State Maintenance	Surface Treatment	\$1,266.58	Palmyra
9150	Palmyra Elementary	Rt 15, James Madison Hwy	Rt 15, James Madison Hwy	Surface Treatment	\$1,918.40	Palmyra
1030	Fieldstone Dr	Rt 250, Richmond Rd	End State Maintenance	Surface Treatment	\$11,150.70	Palmyra
1031	Willow Dr	Rt 1030, Fieldstone Dr	End State Maintenance	Surface Treatment	\$4,124.56	Palmyra
1031	Autumn Ridge Dr	Rt 1030, Fieldstone Dr	End State Maintenance	Surface Treatment	\$3,995.94	Palmyra
1032	Pembroke Ct	Rt 1031, Autumn Ridge Dr	End State Maintenance	Surface Treatment	\$926.50	Palmyra
1033	Deer Crossing Dr	Rt 1030, Fieldstone Dr	End State Maintenance	Surface Treatment	\$2,007.78	Palmyra
1034	Spring Meadow Ln	Rt 1030, Fieldstone Dr	End State Maintenance	Surface Treatment	\$3,504.35	Palmyra
1035	Pine Ridge Ct	Rt 1030, Fieldstone Dr	End State Maintenance	Surface Treatment	\$830.58	Palmyra
1036	Tall Oaks Ct	Rt 1031, Willow Dr	End State Maintenance	Surface Treatment	\$889.44	Palmyra

* Residential areas identified for advance notice

Size	Typical Locations	Representative Signs	Cost Ranges**	Notes
Very Small ground-mounts (1-6.5 SF)	Two-lane roads, urban streets, subdivisions	<ul style="list-style-type: none"> • Parking Restrictions (4~6 SF) • Route Markers (4~6 SF per sign) • Speed Limit signs (small – 24"x30") • Stop signs (small – 30"x30") • Civil War Trails and Virginia Byways (4~7 SF) • Bicycle lane / bicycle destination signs 	\$750	<ul style="list-style-type: none"> • Single square tube steel post foundation • Add up to \$600 if contracted out (See Note 3)
Small ground-mounts (7-11 SF)	Two-lane roads	<ul style="list-style-type: none"> • Memorial/Dedication sign (small – 60"x18") • Diamond-shaped warning signs (small – 36"x36") – "Watch for Children", Signal Ahead, etc. • Stop signs (medium – 36" x 36") 	\$850	<ul style="list-style-type: none"> • Single square tube steel post foundation • Add up to \$600 if contracted out (See Note 3)
Medium ground-mounts (12-19 SF)	Multilane secondaries and primaries	<ul style="list-style-type: none"> • Speed Limit signs (medium – 36"x48") • Diamond-shaped warning signs (large – 48"x48") – Signal Ahead, Deer, etc. • Stop signs (large – 48"x48") 	12 SF: \$1,500 16 SF: \$1,800 19 SF: \$2,000	<ul style="list-style-type: none"> • 1-2 square tube steel posts & slip base foundations (3 feet deep concrete)
Large ground-mounts (20-60 SF)	Divided primaries, limited access freeways	<ul style="list-style-type: none"> • Memorial/Dedication sign (large – 20~30 SF) • College, airport, watershed, etc. signs (size varies) • "Move Over" signs (66"x66" or 96"x96") • Speed Limit signs on freeways (large – 48"x60") • Speed Limit signs with Minimum Speeds (48"x96") • Informational/Guide/Destination signs (size varies) 	20 SF: \$2,200 30 SF: \$2,700 40 SF: \$3,100 50 SF: \$3,900 60 SF: \$4,500	<ul style="list-style-type: none"> • 1-3 square tube steel posts, inner posts, & slip base concrete foundations • 20-40 SF signs - concrete foundations are typically 3 feet deep • 50-60 SF signs - concrete foundations are up to 7 feet deep
Very large ground-mounts (140-200 SF)	Limited-access freeways	<ul style="list-style-type: none"> • Informational/Guide/Destination signs (size varies) (See Notes 7 and 8) 	140 SF: \$18,000 200 SF: \$25,000	<ul style="list-style-type: none"> • 2-3 steel I-beam posts & concrete foundations (7~12 feet deep)
Replace overhead sign on existing structure	Limited-access freeways	<ul style="list-style-type: none"> • Informational/Guide/Destination signs (See Notes 7 and 8) 	\$14,500	<ul style="list-style-type: none"> • Assumes the sign will replace a sign of equal or lesser size • Lane closure costs are included
Overhead sign on new cantilever structure	Limited-access freeways	<ul style="list-style-type: none"> • Informational/Guide/Destination signs (See Notes 7 and 8) 	\$120k ~ \$160k for 40 ft span	<ul style="list-style-type: none"> • Lane closure cost is included • Many new overhead sign structures require new/modified guardrail

****Cost Range Notes:**

- 1) The costs are preliminary estimates; actual costs vary based on geographic location, road type, roadside topography, and exact sign dimensions.
- 2) **Cost estimates are based on current statewide average prices and do not account for potential future escalation in steel or aluminum costs.**
- 3) Cost estimates for smaller signs assume some in-house work. Cost estimates for larger signs assume all work is contracted out.
- 4) Cost estimates assume three trips: locating the sign structures/marketing utilities, installing foundation/structure, and erecting a sign panel once the foundation has cured.
- 5) These estimates do not account for other incidental costs such as Right of Way, additional earthwork, utility relocation, mobilization, guardrail, removal of existing signs, etc.
- 6) Construction Engineering/Inspection (CEI) costs are not included due to the unknown variability in size and scope of the project.
- 7) These estimate ranges may not be appropriate to use for very large or very small-scale projects, and should not be used for on-call contracts.
- 8) Costs for electrical components of signs (sign lighting, luminaire retrieval systems, changeable message sign elements, flashing beacons, etc.) are not included.
- 9) Larger signs in eastern portions of Hampton Roads District may be 5%~10% more expensive due to need to design for stronger hurricane winds and poorer soil conditions.
- 10) Cost ranges have been updated from previous December 2016 cost guidelines to reflect rising steel, aluminum, and labor costs, recent bid histories, and changes in VDOT sign structure standards.

Picture	Component	Notes
	Sign Panel	<ul style="list-style-type: none"> • Most signs use highly reflective sheeting with a 12-year warranty to ensure signs retain nighttime visibility without fading or cracking under sun/rain/ice exposure. • Sign panels can weigh anywhere from 10~200 lbs, and often must be lifted using small crane trucks.
	Bracing & hardware	<ul style="list-style-type: none"> • All but the smallest signs must have horizontal bracing on the back side to prevent the sign panel from warping or bending in stiff winds. • Sign panels must be rigidly attached to the post so as to withstand 20+ years of constant wind buffeting.
	Posts	<ul style="list-style-type: none"> • Most posts are either steel square tubes (2"-4") or steel I-beams (up to 21" deep). • Posts are designed to withstand hurricane-force winds against the sign surface. • Most signs must be elevated 7 feet above the road's surface to be visible. • Larger signs require 2 or 3 posts.
	Breakaway Assemblies & Foundations	<ul style="list-style-type: none"> • Breakaway slip base assemblies are designed to cleanly yield or break away when struck to reduce risk of serious injury, and facilitate easier replacement. • Most posts must be embedded in concrete so that the sign will remain rigid under hurricane-force winds or when struck. • Concrete foundation depths can range from 3~12 feet, depending on sign size.
	Maintenance of Traffic	<ul style="list-style-type: none"> • Most sign installations require cones, work zone signs, etc. to keep workers and road users safe during construction. • Some sign installs require flagger crews, greatly increasing costs.
	Site Review & Inspection	<ul style="list-style-type: none"> • An advance site trip is necessary to identify and stake a feasible location. • If the installation work is done by contractors, VDOT may have to make a subsequent trip to inspect the completed work.
	Installation & Outsourcing	<ul style="list-style-type: none"> • Sign crews may spend hours just traveling to and from isolated sign sites. • VDOT often must use contractors for fabrication and/or installation work, due to complexity of installation or lack of in-house resource availability. • Some sign installs also require removal or relocation of existing signs.
	Maintenance	<ul style="list-style-type: none"> • Some signs require regular vegetation trimming to maintain visibility. • VDOT replaces thousands of signs per year due to knockdowns, graffiti, etc. • Signs increase complexity and cost of mowing. • After 15~20 years, sign sheeting becomes too cracked/faded to be useful.