AUDIT/FINANCE COMMITTEE BEGINS AT 6:00PM

TOWN COUNCIL WORK SESSION

Monday, October 21, 2019 @ 7:00 p.m.
Town Hall Council Chambers

TOWN/STAFF RELATED ITEMS

1. Crooked Run West Presentation
2. Passenger Bus Service Franchise Renewal– *Director of Community Development/Tourism*
3. Subdivision Plan for Happy Creek Knolls Sec 4 – Chris Ramsey – *Director of Planning*
4. Continued Discussion for Water/Sewer on Guard Hill Rd – Chris Ramsey– *Town Manager*
5. Special Use Permit for Daycare at 460 Commerce Ave – *Director of Planning/Zoning*
6. Letter of Support from Alliance for the Shenandoah Valley requesting funding from the State for the Stormwater Local Assistance Fund (SLAF) – *Director of Public Works*
7. Project Costs for Fairground Road Water Tank Rehabilitation – *Director of Finance*
8. Goals/Update – *Town Manager*

COUNCIL/MAYOR RELATED ITEMS:

9. BAR Term Expires
10. Continued Discussion Pertaining to Ordinance to Amend Chapter 134 Pertaining to Water and Sewer Connection Fees and Installation
11. Open Discussion
12. CLOSED MEETING – Personnel

Motion to Go Into Closed Meeting - I move that Town Council convene and go into Closed Meeting for discussion and consideration of performance, demotion, salaries, disciplining, or resignation of specific public officers, appointees, or employees of Town Council, pursuant to Section 2.2-3711. A. 1. of the Code of Virginia.

Motion to Certify Closed Meeting at its Conclusion *[At the conclusion of the Closed Meeting, immediately re-convene in open meeting and take a roll call vote on the following:]* I move that Town Council certify that to the best of each member's knowledge, as recognized by each Council member's affirmative vote, that only such public business matters lawfully exempted from Open Meeting requirements under the Virginia Freedom of Information Act as were identified in the motion by which the Closed Meeting was convened were heard, discussed or considered in the Closed Meeting by Council, and that the vote of each individual member of Council be taken by roll call and recorded and included in the minutes of the meeting of Town Council.

1

Work Session Agenda Form

Item # 1

DATE: October 21, 2019

Work Session

AGENDA ITEM: Crooked Run West Presentation

SUMMARY: Representatives for Crooked Run West will be presenting to Council tonight

BUDGET/FUNDING: None

STAFF RECOMMENDATION: None

2

Work Session Agenda Form

Item # 2

DATE: October 21, 2019

Work Session

AGENDA ITEM: Passenger Bus Service Franchise Renewal

SUMMARY: Virginia Regional Transit (VRT), also known as the Front Royal Trolley Service, provides affordable transportation through bus passenger service in the Town. The enclosed schedule shows the various bus stops throughout Town and across the bridges to Crooked Run and Village Commons Shopping Centers, all for a fare of fifty cents (.50). The low rates are achievable because of funding provided to VRT by Section 5311 of the Federal Service Transportation Efficiency Act. The Town granted a five (5) year franchise to VRT originally effective July 1, 2004, which has been renewed every five (5) years. It was last renewed on October 1, 2014. In addition, VRT works with Randolph Macon Academy (RMA) to subsidize the weekend route to give RMA students free access to the trolley service. A copy of the Ordinance, Chapter 180 of the Town Code, Public Passenger Bus Service, whereby the franchise to VRT was granted, is enclosed. This franchise, if not renewed, will expire January 1, 2020. The reason for granting any such franchise or privilege for a term in excess of five (5) years is because of Va. Con. Art. 7 § 9 (1971), which states: "[b]efore granting any such franchise or privilege for a term in excess of five (5) years, except for a trunk railway, the city or town shall, after due advertisement, publicly received bids therefor."

Council is requested to consider whether it wants to renew the franchise of VRT for an additional five (5) year term. Council should also review and approve the recommended updates to bring current the other terms of Chapter 180.

BUDGET/FUNDING: The Town Code sets this out as follows:

"180-185.9 Annual Payment and Operation

A. Beginning on or about (October 1, 2014 and ending September 30, 2019), sixty-eight percent (68%) of the hourly costs of the operation, as invoiced from VRT to the Town, shall be paid to VRT by Federal and State contributions under the FTA 5311 Program. Thirty-two percent (32%) of the hourly costs shall be paid to VRT by the Town of Front Royal from such general funds as may be required to total the thirty-two percent (32%) local match.

B. VRT shall apply for capital asset grant assistance from the Virginia Department of Rail and Public Transportation to purchase an appropriate vehicle or vehicles for revenue service. The Town shall contribute the local match amount required to draw down such funding which traditionally has been and presently is 4%. The Town will be made aware of any such requirements or changes to the local match percentage prior to vehicle purchase commitment.

C. VRT shall replace revenue vehicles used under this Franchise in accordance with the Federal Transit Administration Useful Life Criteria as described in FTA Circular 5010.1D; and as approved through VRT's capital replacement grant requests through the Commonwealth of Virginia Department of Rail and Public Transportation.

D. In the event that VRT fails to receive funds for the cost operation of the Franchise in accordance with the payment schedule set forth above, then VRT shall have the right to terminate the operation of the Franchise upon thirty (30) days prior written notice to the Town."

STAFF RECOMMENDATION: Currently, VRT's weekday South Loop has stops at the Visitors Center, Skate Park, Kerfoot and Brown Avenue, NW Community Services, Samuels Library/Royal Arms Apartments, Gateway Plaza, Royal Plaza/Royal King, South Street/Pine, Court House, and Valley Health/Laura Virginia Hale.

The weekday North Loops has stops at the Visitors Center, Warren County Government Center, Fantasy Land Playground, Warren Memorial Hospital, Mountain Oaks Apartments, Health Department/DSS, Family Store/Monroe Avenue, Warren County Community Center, and Randolph Macon Academy.

Saturday/Sunday service has stops at the Visitors Center, RMA Circle, Subway, Royal Theatre, Bowling Alley, Gateway Plaza, Royal Plaza, and Target and Walmart.

In addition, VRT extends service to the Appalachian Trail Crossing from May 11 to August 31.

Because the Appalachian Trail stop has been so successful, not only in the number of riders, but also the positive public relations comments we have achieved via the hikers social media sites, staff is currently working with VRT to extend the Appalachian Trail crossing starting in April and ending in September.

We are working with several local businesses who are willing to subsidize the fifty cent (.50) fare for our visiting hikers.

Staff is also working with VRT to review current stops and the possibly of expanding our service throughout additional neighborhoods to increase accessibility to our citizens. There will be no additional costs to the Town to do so. Adjusting our stops and times will also allow us to better align with the new pick-up/drop-off times of the Corridor Connector.

VRT has worked diligently to increase our ADA pickups by providing, in many cases, front door service for those needing access to this service.

VRT is also now willing to provide bus shelters free of charge to the Town. The Town will initially be responsible for pouring the concrete slab and installing the shelter provided by VRT. Upon completion of the installation, VRT will assume future maintenance and responsibility of the shelter.

Staff is not aware of any issues that warrant not recommending renewal of the franchise to VRT.

PUBLIC PASSENGER BUS SERVICE

180-185.1 FRANCHISE GRANTED

The Virginia Regional Transit, hereinafter known as "VRT", its lessees, successors and assigns, for the term and subject to the conditions and limitations hereinafter stated, is hereby granted a Franchise to occupy and use the streets, roads, avenues, alleys and other public places of the Town of Front Royal, Virginia, and to designate, maintain and use adjacent sidewalks for the operation of public passenger bus transportation services to the people of Front Royal utilizing the FTA 5311 Rural Transit Program (Section 5311 of the Federal Surface Transportation Efficiency Act).

180-185.2 PURPOSE OF THE FRANCHISE

The purpose of the Franchise is to permit VRT the right and privilege of operating a public passenger bus transportation service consisting of one or more passenger buses or mini-buses, wheelchair lift equipped and ADA compliant, driven by VRT-employed drivers with commercial driver's licenses, within the Town of Front Royal, and such portions of Warren County as the Town, the County, and VRT shall mutually agree, subject to the conditions and agreements as hereafter set forth.

180-185.3 TERM OF FRANCHISE

The term of the Franchise shall be for a period of five (5) years and ~~three (3)~~ six (6) months from the effective date of this Ordinance.

180-185.4 BUSES

For the purpose of providing public passenger bus service, VRT is authorized to operate buses capable of seating a minimum of thirteen (13) and a maximum of thirty-five (35) passengers along one or more routes to be determined by the Town following route surveys made by VRT. The buses shall be equipped with wheelchair lifts and shall be compliant with the Americans with Disabilities Act. The buses may bear such decorations, logos or insignias as shall be prescribed by Town Council. VRT shall perform such routine and appropriate maintenance of its bus(es) as shall be necessary to ensure uninterrupted, safe and effective service of this Franchise. VRT shall further employ drivers who have been appropriately trained and licensed for the operation of public passenger-buses, who have been familiar with the Town of Front Royal and the route(s) established therein, who have been submitted to a criminal background investigation, initial drug screening, and who are subject to periodic random drug testing pursuant to Federal regulations.

180-185.5 REPAIRS

VRT shall promptly repair or replace any sidewalk, street, or other property of the Town which may be damaged or displaced by VRT in the operation of its public bus system. In the event that VRT fails or refuses to repair any damage to the property of the Town of Front Royal upon ten (10) days written notice to VRT, the Town may then undertake to repair or replace any damaged or displaced Town property, and the expense of such repairs or replacement shall be paid to the

Town by VRT, and may be recovered in any manner prescribed by law, including application of the performance bond imposed hereunder.

180-185.6 INDEMNIFICATION

VRT agrees and bonds itself, by the acceptance of this Ordinance, to indemnify, keep and hold the Town of Front Royal free and harmless from liability on account of injury to persons or property growing out of the negligence of VRT, or its employees, or agents in the operation of its public bus service. Nothing herein, however, shall be construed to render VRT liable for the negligence of the Town of Front Royal, its agents or employees, or the negligence of other persons or entities.

180-185.7 MAINTENANCE

The rights and privileges set forth herein are granted to VRT upon the expressed condition and understanding that VRT will maintain its vehicles located within the Town of Front Royal in good and safe repair and order at all times during the terms of this Franchise Agreement.

180-185.8 INSPECTIONS

The Town of Front Royal, its employees or agents, shall have the right at any time to make inspections, upon reasonable notice, of VRT's buses or any part thereof.

180-185.9 ANNUAL PAYMENT AND OPERATION

VRT's operation under this Franchise Agreement shall be subject to an annual payment to the Town of Front Royal of ONE DOLLAR ($1.00). The cost of operation of the Franchise shall be borne as follows:

A. Beginning on or about (October 1, 2014 and ending September 30, 2019), sixty-eight percent (68%) of the hourly costs of the operation, as invoiced from VRT to the Town, shall be paid to VRT by Federal and State contributions under the FTA 5311 Program. Thirty-two percent (32%) of the hourly costs shall be paid to the VRT by the Town of Front Royal from such general funds as may be required to total the thirty-two percent (32%) local match.

~~B. VRT shall purchase one or more buses for the operation of the Franchise. VRT shall bear eighty-five percent (85%) of the cost to purchase, equip and decorate the bus(es) and the Town shall contribute to VRT fifteen percent (15%) of the cost. VRT shall purchase a vehicle or vehicles for the operation of the Franchise.~~ VRT shall apply for capital asset grant assistance from the Virginia Department of Rail and Public Transportation to purchase an appropriate vehicle or vehicles for revenue service. The Town shall contribute the local match amount required to draw down such funding which traditionally has been and presently is 4%. The Town will be made aware of any such requirements or changes to the local match percentage prior to vehicle purchase commitment.

C. ~~VRT shall replace its bus(es) used under this Franchise upon the later of three (3) years of service or 150,000 miles traveled. Each party shall bear the same proportion of the cost of replacement as is prescribed for the initial bus purchase in Subsection (B) above.~~ VRT shall replace

revenue vehicles used under this Franchise in accordance with the Federal Transit Administration Useful Life Criteria as described in FTA Circular 5010.1D; and as approved through VRT's capital replacement grant requests through the Commonwealth of Virginia Department of Rail and Public Transportation.

D. In the event that VRT fails to receive funds for the cost operation of the Franchise in accordance with the payment schedule set forth above, and then VRT shall have the right to terminate the operation of the Franchise upon thirty (30) days prior written notice to the Town.

180-185.10 PASSENGER FARES

VRT drivers shall collect from each passenger a fare to be set and determined by the Town Council by resolution. In setting fares, the Town Council may establish separate rates for adults, senior citizens, persons with physical disabilities, students and children. Town Council may provide for the advance purchase of tickets or tokens to be used for the payment of fares by passengers.

180-185.11 SCHEDULES

VRT's bus(es) shall operate on such schedules(s) as shall be established and adopted by the Town Manager or his designee, pursuant to route surveys completed by VRT or by demand or both. Buses shall not operate on the following holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day and Christmas Day.

180-185.12 ROUTES AND STOPS

VRT's bus(es) shall operate on such route(s) and regularly make such scheduled stops at locations established by the Town Manager or his designee, pursuant to route surveys completed by VRT or by demand or both. VRT shall be responsible for the marking of regular bus stops by appropriate signage containing route name or number and schedule for stop, as shall be appropriate.

180-185.13 COMPLIANCE WITH LAWS

VRT and its drivers shall comply with all state and local traffic, registration, licensing and inspection laws, including, but not limited to, Sections 46.2-107, 46.2-694 and 46.2-695 of the Code of Virginia (1950), as amended.

180-185.14 INSURANCE

VRT, as a condition of Franchise approval, shall obtain and maintain throughout the term of the Franchise a General Liability insurance policy in the amount of not less than TEN MILLION DOLLARS ($10,000,000.00) from an insurance provider approved to do business within the Commonwealth of Virginia, and shall name the Town of Front Royal as an additional insured party.

180-185.15 BOND ?????

VRT, as a condition of Franchise approval, shall execute a bond in the amount of ONE THOUSAND DOLLARS ($1,000.00) with security acceptable to the Town of Front Royal to ensure VRT's satisfactory performance of its obligation under this Franchise.

180-185.16 GOVERNING LAW

In any controversy or dispute concerning the terms of the Franchise, the laws of the State of Virginia shall apply.

180-185.17 SEVERABILITY

In the event that any section, subsection, sentence, clause, phrase or a portion of the Franchise Ordinance is for any reasons held to be invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct and independent provision, and will be severed from all other portions without affecting the validity of the remainder.

180-185.18 EQUAL OPPORTUNITY REQUIRED

VRT shall not refuse to hire, or employ, nor bar, nor discharge from employment, nor discriminate against any person, because of sex, race, creed, religion, age or national origin.

180-185.19 SUCCESSORS OR ASSIGNEES

The rights, privileges and obligations hereby granted to VRT may not be assigned without express written consent of the Town Council.

All rights and privileges hereby granted to VRT may be exercised by any successor or assignee of VRT, but said successor or assignee shall be subject to the provisions, obligations, stipulations and requirements hereby prescribed. The Town reserves the right to increase the required performance bond imposed hereunder for any successor or assignee.

180-185.20 FRANCHISE RIGHTS

The Town of Front Royal grants to VRT an exclusive Franchise for the operation of a public passenger bus service and for no other purpose.

180-185.21 REMEDIES

A. The sole remedy for any violation of this Franchise shall be limited to the following. Upon the occurrence of any uncured default in the obligations of the Franchise, Town shall have the right:

1. To compel the Franchisee by mandamus or injunction to cure and correct any violation or default of the terms and obligations of the Franchise;

2. To suspend or revoke the Franchise. Upon such revocation, the Franchise shall be automatically deemed null and void and have no force or effect, and Franchisee shall remove its equipment from Town as and when requested by Town.

B. In the event that the Town believes that grounds for suspension or revocation exist or have existed the Town may notify the Franchisee in writing set forth the nature and facts of such non-compliance. If within thirty (30) days following such written notification that the Franchisee has not furnished reasonably satisfactory evidence that corrective action has been taken or is being actively and expeditiously pursued, or that the alleged violations did not occur, or that the alleged violations were beyond the Franchisee's control, the Town shall publish a notice setting forth the time, place, and general purpose of a public hearing to consider suspension or revocation of the Franchise notice of such hearing at least ten (10) days prior to such public hearing. The Franchisee and any interested person shall be entitled to be heard at such hearing. Upon a finding by the Town Council of uncorrected defaults in the terms and obligations under this Franchise, the Council shall have the option to suspend or revoke the Franchise.

This ordinance shall become effective upon passage.

APPROVED:

_____
Matthew A. Tederick, Interim Mayor

ATTEST:

_____
Jennifer E. Berry, MMC, Clerk of Council

THIS ORDINANCE was approved at the Regular Meeting of the Town of Front Royal, Virginia on its second reading, conducted _____2019, upon the following recorded vote:

Eugene R. Tewalt	Yes/No	Jacob L. Meza	Yes/No
William A. Sealock	Yes/No	Chris W. Holloway	Yes/No
Letasha Thompson	Yes/No	Gary Gillispie	Yes/No

A public hearing on the above was held on _____, 2019, having been advertised in the Northern Virginia Daily on _____, 2019,

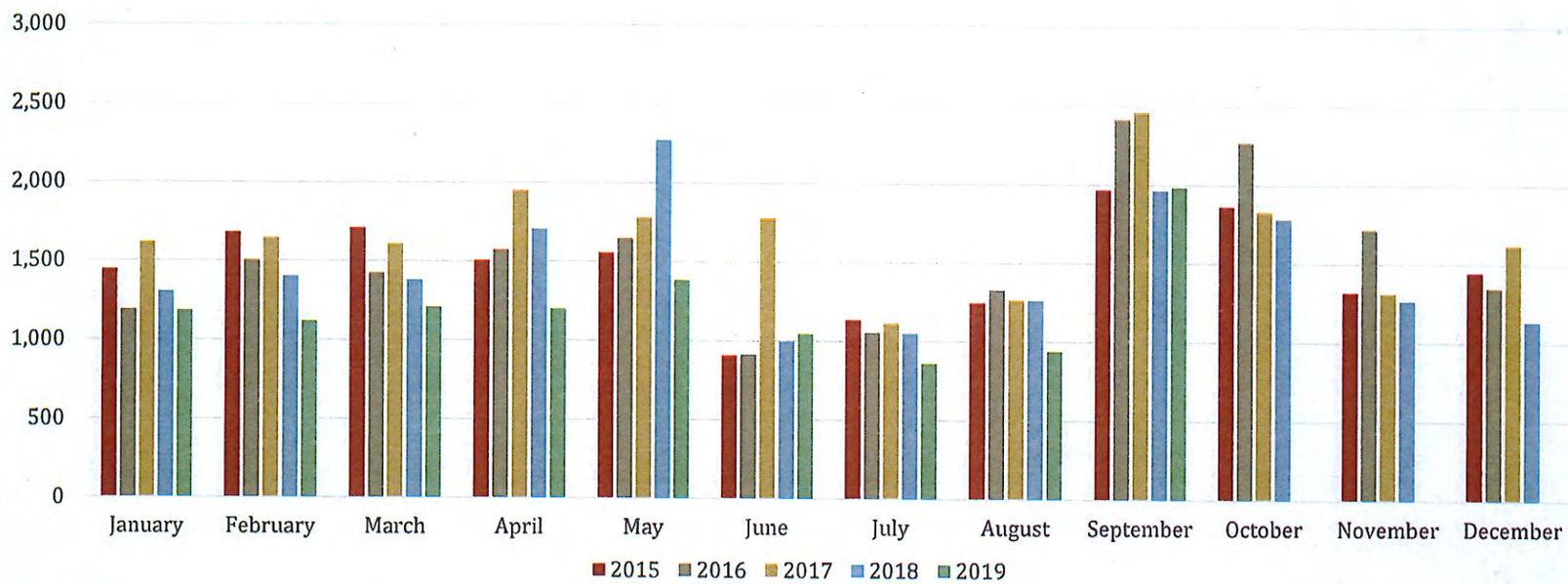
and _____, 2019. The Ordinance was enacted at the Regular Meeting of the Town Council held _____2019, to become effective immediately.

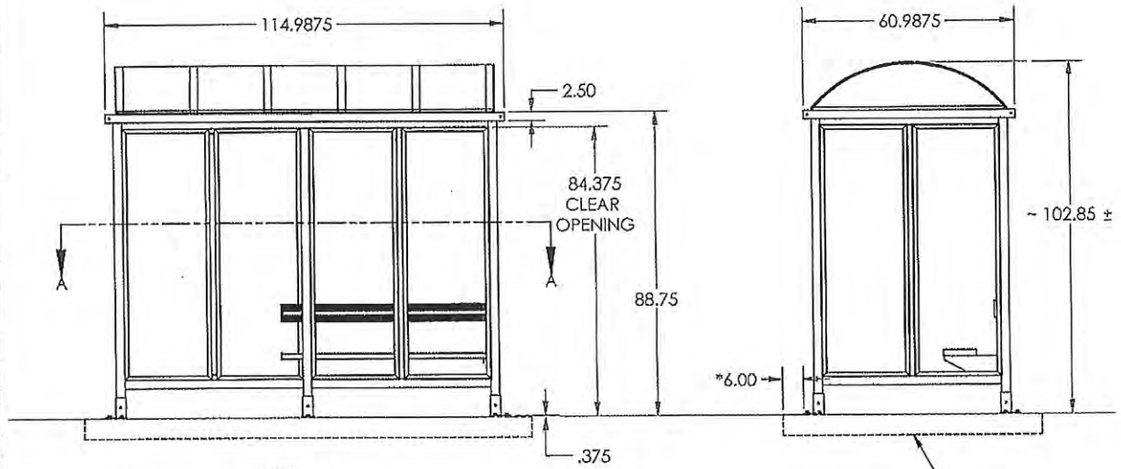
Approved as to form and legality:

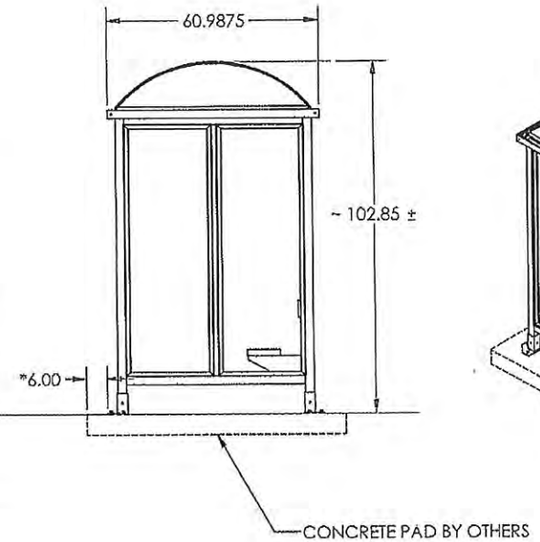
_____
Douglas W. Napier, Town Attorney

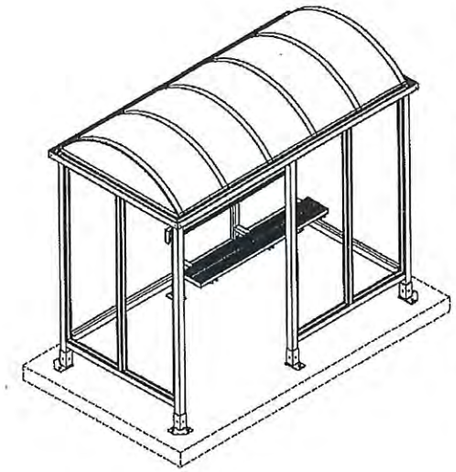
Date: ____/____/_____

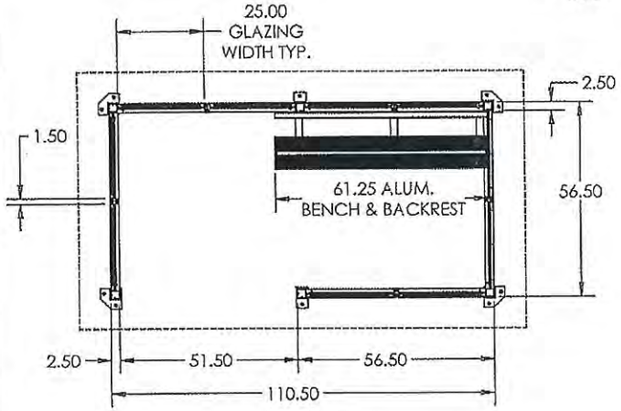
FR TROLLEY SERVICE











SECTION A-A
SCALE 1 : 30

* CONCRETE PAD INFORMATION IS BASED ON RECOMMENDATION. CUSTOMER TO FOLLOW LOCAL, REGIONAL, AND PROJECT SPECIFIC CRITERIA.

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF DUO-GARD INDUSTRIES, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF DUO-GARD INDUSTRIES, INC. IS PROHIBITED.

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	JF	7/5/2011
CHECKED	FK	7/5/2011
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

Duo-Gard Industries, Inc.

TITLE:
10096 Virginia Regional Transit

SIZE B | DWG. NO. Overall Dimensions | REV 1

SCALE: 1:48 WEIGHT: SHEET 2 OF 5

Virginia Regional Transit

109 N Bailey Lane
Purcellville, Virginia 20132
(877)777-2708 fax (540)338-0690

Invoice No. TOFR-1920

INVOICE

Customer

Name: Town of Front Royal
Address: Attn: Accounts Payable
Address: P.O. Box 1560
City: Front Royal State: VA Zip: 22630
Phone:

Date: 07/22/19
PO:
Terms:
Sales Person:
FOB:

Qty	Description	Unit Price	TOTAL
1	**Town of Front Royal Fixed Route Service** **The Royal Trolley 2236 Hours funded by Town** **The Royal Trolley 520 Hours funded by RMA** **2019-20 Budget Request $39,025** 1205-47012 7/25/19	$39,025.00	$39,025.00

SubTotal	$39,025.00
Shipping & Handling	$0.00
Taxes	
TOTAL	$39,025.00

Payment Details

Cash
Check

Thank You For Your Business!

RECEIVED

By:

ROYAL TROLLEY

Front Royal, Virginia

ROYAL TROLLEY

Rules of Riding:

- Smoking, profanity, and eating and drinking are prohibited.
- NO animals, except service animals, permitted on buses.
- NO standing in front of white or yellow line or in stairwells.
- Shirts and shoes are required for all passengers.
- Drivers reserve the right to refuse service to anyone not observing regulations or whose behavior is hazardous to passengers or vehicular safety.
- Carry-on items are limited to what passengers can bring and take off the bus by themselves in one trip.
- When using cell phones, please be considerate.
- Headphones are required for portable music and gaming devices.
- Seat belts are available and recommended, for your safety.

Fares:

50¢ each way.

Children 12 years of age and under, when accompanied by an adult, ride free.

ADA Compliant Service:

Eligible certified riders are encouraged to make reservations for the ADA compliant deviated fixed route service on the prior day, and up to two weeks in advance by calling the customer service phone number. (540) 825-2456

How to Ride the Trolley:

- For the safety of all passengers, stand at designated bus stop locations whenever possible.
- Allow a few minutes for delays in scheduled arrival times.
- Please have EXACT fare ready when you board, drivers DO NOT carry change.
- In case of inclement weather, routes will operate if safely possible.
- Check out local radio (95.3), social media and our website for service changes. You may also contact the customer service phone number (540) 825-2456
- Riders choosing to transport a bicycle can secure it on the rack in front of the bus before boarding.

Title VI Non-Discrimination Policy Statement

Virginia Regional Transit (VRT) operates the Royal Trolley Service on behalf of the town, and is committed to ensuring that no person is excluded from participation in, or denied the benefits of, or be subject to discrimination in the receipt of its services or programs on the basis of race, color or national origin or any other characteristics protected by law, including Title VI of the Civil Rights Act of 1964, as amended. Further, under the Americans with Disabilities Act (ADA) of 1990, no entity shall discriminate against an individual with physical or mental disability in connection with the provision of transportation service.

To obtain more information on VRT's nondiscrimination obligations or to file a Title VI complaint, contact Bruce Simms, CEO, VRT, 109 N. Bailey Lane, Purcellville, VA 20132 by mail, phone (540) 338-1610 or email bruce@vatransit.org

A complaint may be filed directly with the Federal Transit Administration at: The Office of Civil Rights, Attention: Title VI Program Coordinator, East Building, 5th Floor-TCR, 1200 New Jersey Ave., SE, Washington, D.C. 20590.

A complaint may be filed no later than 180 calendar days after the date of the alleged discrimination.

rev7/18

ROYAL TROLLEY

Front Royal, Virginia

SERVICES THE

Front Royal

AREA

Monday - Friday with Alternate Saturday/Sunday Service

Customer Service Phone Number:

540-825-2456

www.vatransit.org

50¢ Fare Each Way

Need more information?
Call us at
(540) 825-2456

SCHEDULE INTERRUPTIONS
When inclement weather or other circumstances cause an interruption of service, Public Service announcements will be broadcast on:
KFTR (1450 AM)
WZRV (95.3 FM)

ACCESSIBLE

MONDAY-FRIDAY SOUTH LOOP

1	Visitors Center	8:30	9:30	10:30	11:30	1:00	2:00	3:00	4:00
2	Skate Park	8:35	9:35	10:35	11:35	1:05	2:05	3:05	4:05
3	Kerfoot and Brown Ave.	8:37	9:37	10:37	11:37	1:07	2:07	3:07	4:07
4	NW Community Services	8:39	9:39	10:39	11:39	1:09	2:09	3:09	4:09
5	Samuels Library/Royal Arms	8:42	9:42	10:42	11:42	1:12	2:12	3:12	4:12
5B	Appalachian Trail Crossing		9:45*				2:20*		
6	Gateway Plaza	8:44	9:50	10:44	11:44	1:14	2:14	3:14	4:14
7	Royal Plaza/Rural King	8:48	9:53	10:48	11:48	1:18	2:18	3:18	4:18
8	South St./Pine	8:54	9:55	10:54	11:54	1:24	2:24	3:24	4:24
9	Court House	9:55	9:57	10:55	11:55	1:25	2:25	3:25	4:25
10	Valley Health/Laura Va. Hale	8:57	9:59	10:57	11:57	1:27	2:27	3:27	4:27
1	Visitors Center	9:00	10:00	11:00	12:00	1:30	2:30	3:30	4:30

* 5B Service only available 5/1 - 7/31

MONDAY-FRIDAY NORTH LOOP

1	Visitors Center	9:00	10:00	11:00	12:00	1:30	2:30	3:30	4:30
11	Warren Co. Gov't Center	9:01	10:01	11:01	12:01	1:31	2:31	3:31	4:31
12	Fantasy Land Playground	9:03	10:03	11:03	12:03	1:33	2:33	3:33	4:33
13	Warren Memorial Hospital	9:05	10:05	11:05	12:05	1:35	2:35	3:35	4:35
14	Mountain Oaks Apts.	9:09	10:09	11:09	12:09	1:39	2:39	3:39	4:39
15	Health Department/DSS	9:11	10:11	11:11	12:11	1:41	2:41	3:41	4:41
16	Family Store/Monroe Ave.	9:16	10:16	11:16	12:16	1:46	2:46	3:46	4:46
17	Warren County Comm. Cntr	9:18	10:18	11:18	12:18	1:48	2:48	3:48	4:48
18	Randolph Macon Academy	9:22	10:22	11:22	12:22	1:52	2:52	3:52	4:52
1	Visitors Center	9:25	10:25	11:25	12:25	1:55	2:55	3:55	4:55

Daily Service to: Shop 'n Save, Martin's, CVS Pharmacy, Downtown Front Royal, Warren Memorial Hospital & Randolph Macon Academy

SATURDAY SERVICE

18	RMA Circle	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00	5:30
●	Subway	1:03	1:33	2:03	2:33	3:03	3:33	4:03	4:33	5:03	5:33
●	Royal Theatre	1:07	1:37	2:07	2:37	3:07	3:37	4:07	4:37	5:07	5:37
1	Visitors Center	1:08	1:38	2:08	2:38	3:08	3:38	4:08	4:38	5:08	5:38
●	Bowling Alley	1:14	1:44	2:14	2:44	3:14	3:44	4:14	4:44	5:14	5:44
5B	A.T. Crossing			2:20*						5:20*	
6	Gateway Plaza	1:16	1:46	2:16	2:46	3:16	3:46	4:16	4:46	5:16	5:46
7	Royal Plaza	1:22	1:52	2:22	2:52	3:22	3:52	4:22	4:52	5:22	5:52
●	Royal Theatre	1:26	1:56	2:26	2:56	3:26	3:56	4:26	4:56	5:26	5:56
18	RMA Circle	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00	5:30	6:00

●●● = Courtesy stops only

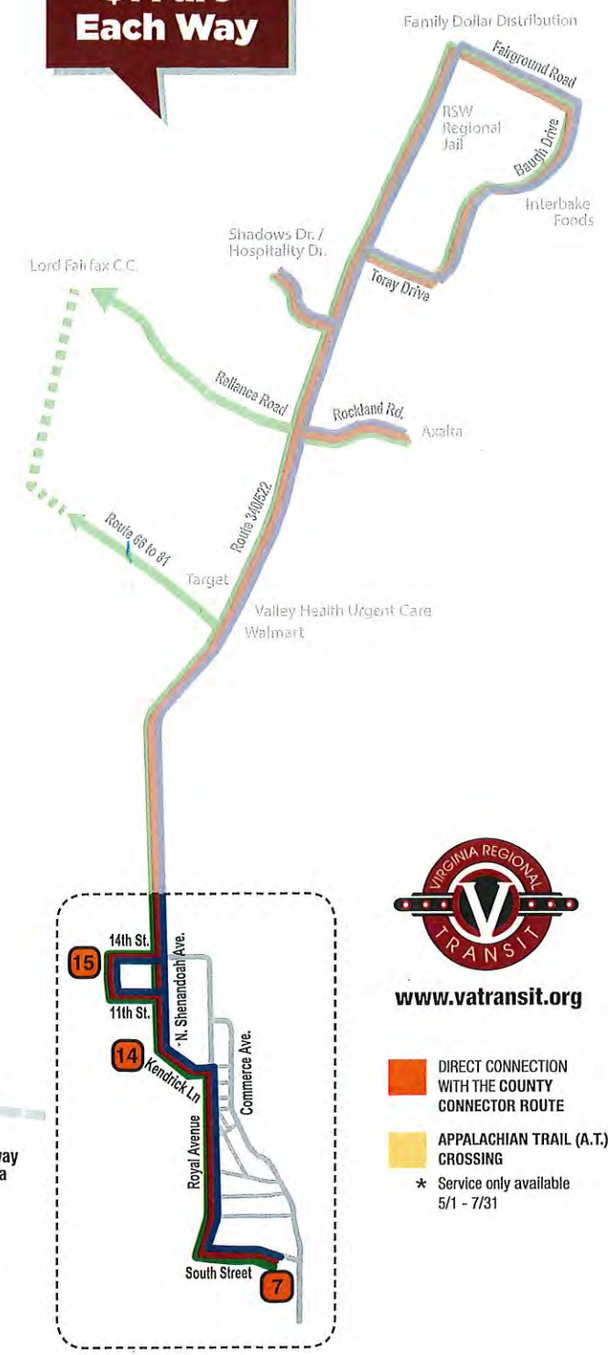
SUNDAY SERVICE

18	RMA Circle	1:00	2:00	3:00	4:00	5:00	6:00
●	Subway	1:03	2:03	3:03	4:03	5:03	
●	Royal Theatre	1:08	2:08	3:08	4:08	5:08	
1	Visitors Center	1:14	2:14	3:14	4:14	5:14	
●	Bowling Alley	1:16	2:16	3:16	4:16	5:16	
5B	A.T. Crossing		2:20*			5:20*	
6	Gateway Plaza	1:18	2:18	3:18	4:18	5:18	
7	Royal Plaza	1:22	2:22	3:22	4:22	5:22	
19	Target/Walmart	1:40	2:40	3:40	4:40	5:40	
18	RMA Circle	2:00	3:00	4:00	5:00	6:00	

Sunday Service to: Randolph Macon Academy, Target, Walmart & Valley Health

ROUTES SERVED
ROYAL TROLLEY
1-540-825-2456

County Connector
$1 Fare Each Way



VIRGINIA REGIONAL TRANSIT

www.vatransit.org

DIRECT CONNECTION WITH THE COUNTY CONNECTOR ROUTE

APPALACHIAN TRAIL (A.T.) CROSSING

* Service only available 5/1 - 7/31

3

Work Session Agenda Form

Item # 3

DATE: October 21, 2019

Work Session

AGENDA ITEM: Subdivision Plan for Happy Creek Knolls, Section 4
Director of Planning/Zoning

SUMMARY: Chris Ramsey has submitted a Subdivision Plan for a new subdivision with 33 building lots. The submission also includes submission of final plats. In addition, a development guarantee (letter of credit/bond/escrow) and maintenance agreement is required before final approval.

The following documents are attached with this coversheet that provide additional information on this application:

- Staff Report (includes "bond" estimate breakdown, Planning Commission action, and review comments)
- Application
- Subdivision Plan
- Final Plats
- Applicant Response Letter following Planning Commission meeting.

BUDGET/FUNDING: No budget change is necessary. Construction costs are the responsibility of the developer. Upon completion of the proposed public infrastructure, the Town would maintain this infrastructure (utilities / streets).

STAFF RECOMMENDATION: Schedule the application for approval at an upcoming Town Council Meeting. No public hearing is required since the subdivision is by-right. Ensure that Town Council's motion of approval requires the bond and maintenance agreement which are both required by Town Code along with the Final Plats and Subdivision Plan.

TOWN OF FRONT ROYAL
DEPARTMENT OF PLANNING & ZONING

STAFF REPORT FOR THE SEPTEMBER 18, 2019 PLANNING COMMISSION MEETING

APPLICATION #:
FRSUB-001521-2019

APPLICANT:
Ramsey Inc.

APPLICATION SUMMARY:

The application is a Subdivision Plan (Major) and Final Plats for 33 lots within the R-1 Zoning District, titled as Happy Creek Knolls, Section 4. The project also includes an open space parcel that will include a stormwater management pond and pump station on it.

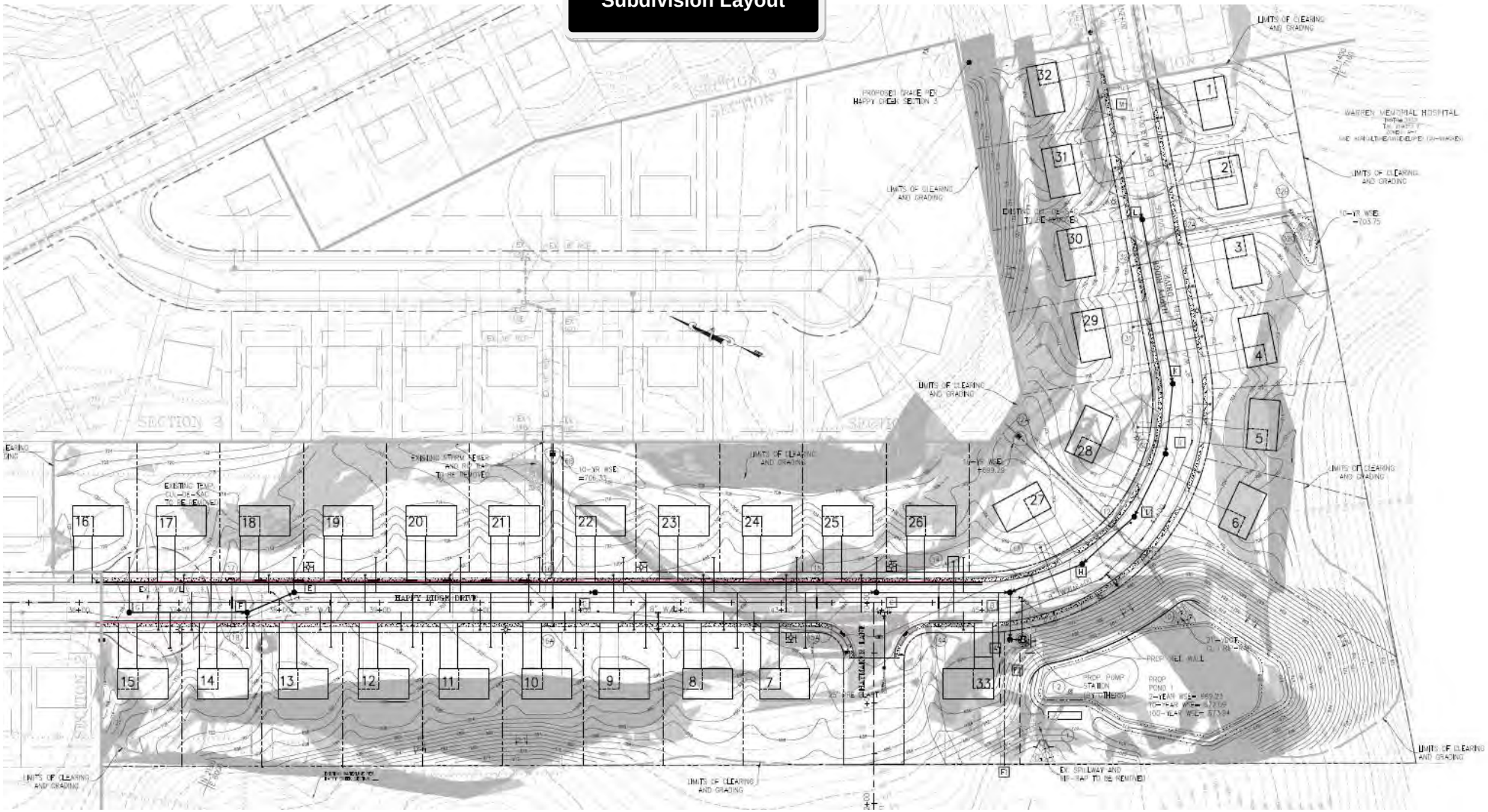
GENERAL INFORMATION:

Site Address	No address currently.		
Zoning District	R-1, Residential District		
Overlay Districts	Historic Area – NO	Floodway - NO	Entrance Corridor – NO
Tax IDs	20A21-3-G		
Location	The subject property is located at the end of Ewell Street and the end of Happy Ridge Drive.		
Existing Use	Vacant lot		
Proposed Use	33 single-family detached residential building lots and an open space lot with a SWM facility.		

AERIAL MAP
(WC GIS)

Zoning Map
(WC GIS)

Subdivision Layout



ADDITIONAL INFORMATION

Summary	This application is for final approval of a subdivision that would include 33 lots on 12.43 acres within the R-1 Zoning District. Happy Ridge Drive will be extended to access the proposed lots and be built to Town specifications. There will also be a stub street included that will be extended to the HEPTAD property upon its development. Streets shall include lighting, hydrants, curb and gutter, utility lines, sidewalks and landscaping. A preliminary plan of this subdivision was approved by the Planning Commission on May 15, 2019, with certain conditions. A handrail was added along the sidewalk that is adjacent to the stormwater management pond for public safety purposes. A landscaping plan was added, as required by Town Code. The applicant also revised the grading of the stormwater management pond to eliminate 2:1 slopes. This was achieved by adding a retaining wall. Details for the proposed pump station were also included on the plans. However, the applicant is pursuing a gravity line through the properties to the south. If he obtains approval for this from these property owners, he will need to submit a revised plan with the gravity line for review and approval by the Town.
Preliminary Plan	Town Code, Chapter 148, Section 310, specifies that "(a) Preliminary Plan is required for all proposed major subdivisions. The Preliminary Plan review process includes review and approval of the subdivision design before submission of a Subdivision Plan and Final Plats. The Planning Commission has approval authority for Preliminary Plans. A preliminary plan for this project was approved on May 15, 2019.
Subdivision Plan	Town Code 148-315 of the Town Code requires major subdivisions to obtain approval of a subdivision plan and final plats within thirty-six (36) months of approval of the preliminary plan. This will be the current step in the process for approval of this subdivision prior to recordation of the lots and development. Unlike Preliminary Plans, Subdivision Plans and Final Plats require approval by Town Council. In addition, bonding is required.
Review Comments	A. <u>PLANNING & ZONING REVIEW COMMENTS.</u> 1. Street Name. The portion of Ewell Street that is south of Imboden Drive, from the centerline intersection, will need to be renamed to Happy Ridge Drive based on the proposed street extension layout. Please include new street signage at this intersection as part of the plans. 2. Final Plats. You will need to submit signed and stamped final plats prior to final approval. Thank you for submitting the advanced copies for review.

3. Development Surety. After consultation with the Town Engineer and Public Works Department, a development guarantee, such as a performance bond, letter of credit or cash escrow, is required in the amount of $1,024,397.00. This will need to be submitted to the Town before final approvals are granted.

• **Domestic Water**	
8" Class 52 Ductile Iron Water Main	$164, 500.00
3/4" Water Services	$76,800.00
Fire Hydrant Assembly	$3,500.00
• **Sanitary Sewer**	
8" SDR, 35 PVC Sewer Main	$127,500.00
4" Sch. 40 PVC Sewer Laterals	$44,800.00
2" Sewer pump Line	$26, 250.00
Sewer Pump Station	$50,000.00
Sanitary Sewer Manholes with Frames & Covers	$28,600.00
• **Storm Sewer**	
Reinforced Concrete Pipe	$95,535.00
Storm Inlet Structures	$34,000.00
• **Public Street Improvements**	
Asphalt	$202,860.00
Curb & Gutter	$13,800.00
Sidewalk	$12,960.00
Driveway Aprons	$23,165.00
Handrail	$21,000.00
Street Trees	$6,000.00
• **Public Infrastructure Bond Amount**	$931,270.00
• *Contingency (10%)*	*$93,127.00*
TOTAL BOND AMOUNT REQUIRED	***$1,024,397.00***

(revised)

4. Maintenance of nondedicated open space. Please submit for review by the Town Attorney all covenants or other documents governing the reservation and maintenance of undedicated open space, including the proposed stormwater management facility. A maintenance agreement with the Town is required. Town Staff can provide you with a template document.

5. Subdivision Name Error. Correct the name of the subdivision under the Owner's Certificate on page 1 of 33 and provide the owner's signature here on the final plan sets for approval. It currently states that the subdivision name is Happy Hills.

B. TOWN ENERGY SERVICES DEPARTMENT.

- The plans must have a sheet with underground electrical conduit drawings shown as to where contractor will be installing primary conduit to feed distribution transformers for the community and where it is being fed from.

C. TOWN PUBLIC WORKS DEPARTMENT

- There needs to be three (3) valves at every MJ tee.
- The Applicant will need a Right-of-Way utilization permit and bond.
- Landscaping. Please modify the landscaping plan to address the following review comments from the Town's arborist/horticulturalist.
  - Diversify the White Pine species with other evergreen species to avoid creating a monoculture. Other species that may be used include: Japanese Cedar, Norway Spruce, White Spruce, Serbian Spruce and Virginia Pine. Leyland Cypress trees are NOT appropriate species.
  - Pin Oaks should not be planted next to sidewalks due to downward growing branches and the need for constant pruning. Include other oak varieties, or other shade trees, like London Plane Tree, Blackgum, Hybrid Elms and/or Hackberry.
  - Use mixed cultivars for Red Maples. You may also use Sugar Maples and Freeman Maples.

D. TOWN ENGINEER

- The subdivision plans do not show the future continuation of the gravity sewer line, so the Applicant would have to submit a new plan and profile of the sewer extension before making the off-site connection.

- A maintenance agreement for the pond will have to be recorded as part of DEQ's permitting process. I don't think the Town will need a separate agreement since it will be maintained by the POA.

E. WARREN COUNTY BUILDING OFFICIAL

- Evidence of an existing (current) Stormwater Management (SWM) plan and permit with Department of Environmental Quality (DEQ). If that does not exist, DEQ must be contacted to determine what is required.

- Evidence of an existing (current) Erosion and Sediment Control (ESC) plan and permit with Warren County. If that does not exist, a new plan and permit would be required

Planning Commission Action	The Front Royal Planning Commission recommended approval in September of this subdivision application with the following conditions: 1) The Applicant shall be responsible for all costs associated with the design, bonding, and construction of the proposed improvements. 2) All of the review comments shall be adequately addressed prior to Town Council approval. A public hearing is not required. Approval by Town Council is required.

ATTACHMENTS:
Attachment A - Application
Attachment B – Subdivision Plan
Attachment C – Advanced Copy of Final Plats

FRSUB1521-2019

TOWN OF FRONT ROYAL
DEPARTMENT OF PLANNING & ZONING
102 EAST MAIN STREET
P.O. BOX 1560
FRONT ROYAL, VA 22630

Main: 540.635.4236
Fax: 540.631.2727
Internet: www.frontroyalva.com

APPLICATION FOR FINAL PLAT APPROVAL

(involving new streets, utilities or more than 8 lots)

MAJOR SUBDIVISIONS

Application is hereby made for approval of a final plat of a major subdivision as shown on the accompanying documents.

1. Applicant's name Chris Ramsey Phone 540-635-5637

   Applicant's Address 508 Commerce Avenue Front Royal, VA 22630

2. Subdivision name Happy Creek Knolls

3. Present owner (if other than #1) Ewell & Happy Ridge Dr

4. Location of Subdivision The subject site is located ~~off of Rail Road~~

5. Tax Map Number 20A213 Parcel Number Parcel G

6. Total Acreage 12.43 Zoning Classification R-1

   Number of Existing Lots/Parcels 1

   Total Number of Lots 33

7. Acreage of adjoining land in same ownership (if any) N/A

8. Date of Preliminary Plat Approval by Planning Commission May 15, 2019

9. List any changes made in this plat since preliminary plat approval N/A

   (attach additional sheets if needed)

10. Number of lots proposed for final approval 33

RECEIVED
JUL 25 2019
TOWN OF FRONT ROYAL
PLANNING & ZONING DEPARTMENT

PLEASE COMPLETE REVERSE SIDE

2-12-13

11. Attach:

(A) Eight copies of Final Plat, along with a *digital copy*

(B) Street Cross - Sectional Drawings showing existing & proposed grades (Section 148-14)

(C) Land Disturbing Permit (obtained through Building Inspector's office)

(D) Surface Drainage/Erosion & Sediment Control Information

(E) Landscaping Plan (Section 148-46)

(F) Performance Bond in amount determined by Town Engineer and approved by Town Attorney

(G) Additional documents required by Sections 148-14 and 148-15 of the Subdivision and Land Development Ordinance

The above information is correct and the proposed subdivision will conform with the regulations of the Town of Front Royal Subdivision and Land Development Ordinance and the Standards and Specifications for Water & Sewer, adopted January 11, 1988, as amended.

7-24-2019
Date

Signature of Applicant

By submitting this application, the applicant grants permission to Town officials and employees to enter upon the property, which is the subject of this application, during reasonable hours and for purposes related to the application process.

Designated contact for applicant: N/A

Fee 4,300.00 *

Date Paid 7-25-2019

pd 4300.- Check# 4031

*Final plat fee is $1,000.00 per plat, plus $100.00 per lot.

GENERAL NOTES:

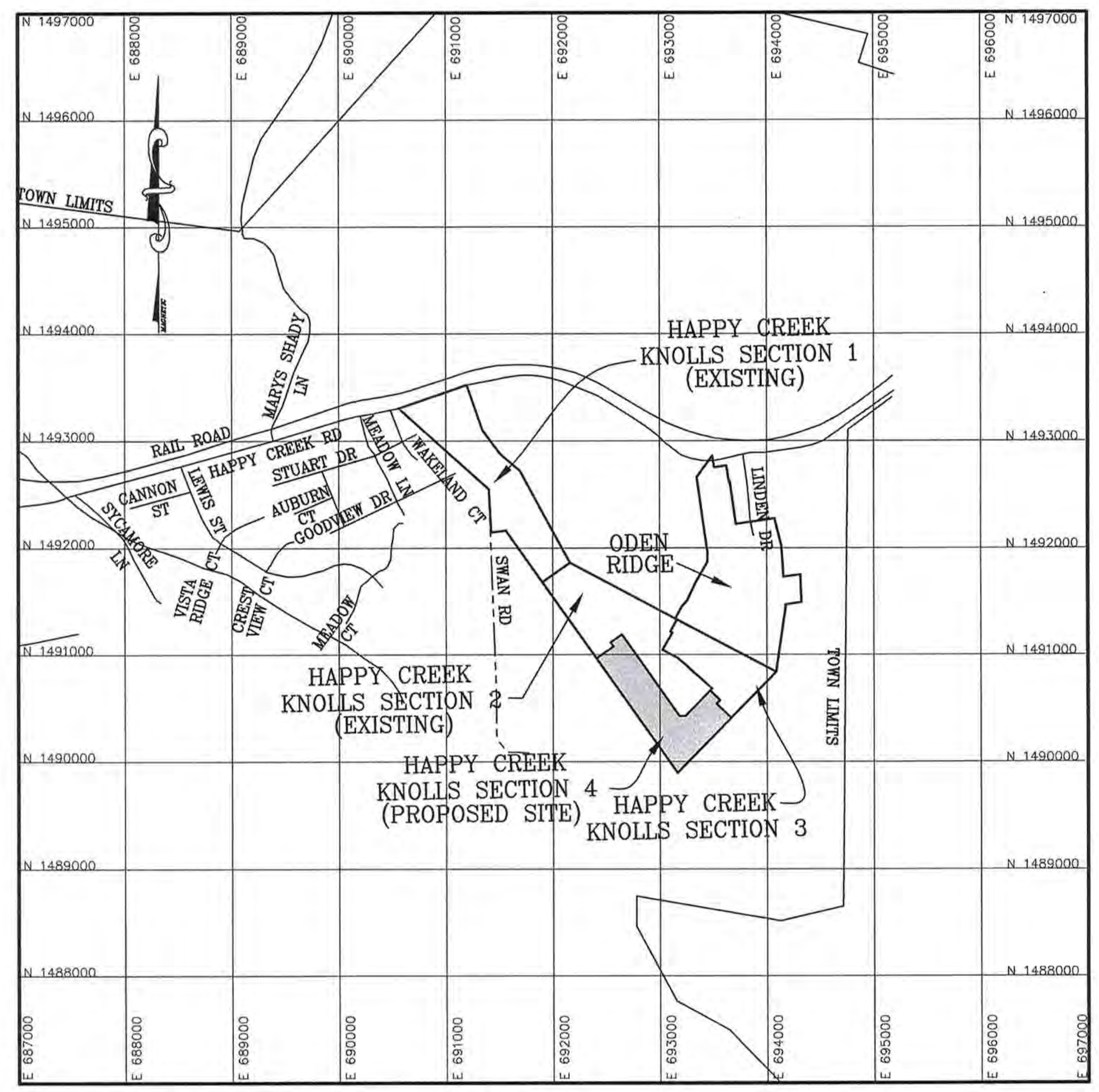
1. BOUNDARY AND NORTH MERIDIAN INFORMATION AS SHOWN HEREON ARE BASED ON A RECORD PLAT OF HAPPY CREEK KNOLLS, SECTION 1 AS RECORDED IN INSTRUMENT 01-0009421 AMONG THE LAND RECORDS OF WARREN COUNTY, VIRGINIA.
2. THESE PLANS HAVE BEEN PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT AND DO NOT NECESSARILY INDICATE ALL ENCUMBRANCES.
3. TOPOGRAPHIC DATA AS CONTAINED HEREIN WAS OBTAINED FROM FIELD RUN SURVEY PREPARED BY BOWMAN CONSULTING GROUP LTD. SAID SURVEY BEING DATED OCT. 12, 2017. DATUM BASED ON ASSUMED DATUM PER EXISTING FACILITIES. THE CONTOUR INTERVAL IS 2 FOOT. STEEP AND VERY STEEP SLOPES HAVE BEEN IDENTIFIED ON THE SUBJECT PROPERTY BASED ON FIELD RUN TOPO BY BOWMAN CONSULTING.
4. THE CONTRACTOR SHALL CONTACT MISS UTILITY AT 1-800-257-7777, UTILITY COMPANY REPRESENTATIVES, PERFORM TEST PITS, REVIEW CURRENT TEST PIT DATA, AND WHATEVER OTHER OPERATIONS AVAILABLE TO INSURE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL UTILITIES IN THE AREA OF CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY BOWMAN CONSULTING GROUP OF ANY POTENTIAL CONFLICTS PRIOR TO COMMENCING CONSTRUCTION.
5. THE CONTRACTOR SHALL CAREFULLY EXAMINE THE SITE AND MAKE ALL INSPECTIONS NECESSARY IN ORDER TO DETERMINE THE FULL EXTENT OF THE WORK REQUIRED TO MAKE THE PROPOSED WORK CONFORM TO THE DRAWINGS AND SPECIFICATIONS. THE CONTRACTOR SHALL SATISFY HIMSELF AS TO THE NATURE AND LOCATION OF THE WORK, CONDITIONS, AND CONFORMATION AND CONDITION OF EXISTING GROUND SURFACE AND THE CHARACTER OF THE EQUIPMENT AND FACILITIES NEEDED PRIOR TO AND DURING PROSECUTION OF THE WORK. THE CONTRACTOR SHALL SATISFY HIMSELF AS TO THE CHARACTER, QUANTITY AND QUALITY OF SURFACE AND SUBSURFACE MATERIALS OR OBSTACLES TO BE ENCOUNTERED. ANY INACCURACIES OR DISCREPANCIES BETWEEN THE DRAWINGS AND SPECIFICATIONS MUST BE BOUGHT TO THE OWNER'S ATTENTION IN ORDER TO CLARIFY THE EXACT NATURE OF THE WORK TO BE PERFORMED PRIOR TO THE COMMENCEMENT OF ANY WORK.
6. IN ORDER TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF A GIVEN UTILITY AND TO ASSIST THE CONTRACTOR AND/OR OWNER IN DETERMINING AREAS OF SPECIAL CONCERN, BOWMAN CONSULTING GROUP HAS INDICATED HEREIN CERTAIN LOCATIONS WHERE TEST PITS SHOULD BE EXCAVATED PRIOR TO COMMENCING CONSTRUCTION. THESE INDICATIONS ARE NOT INTENDED TO BE ALL INCLUSIVE AND WILL NOT RELIEVE THE CONTRACTOR AND/OR OWNER OF THE RESPONSIBLITY OF DIGGING ADDITIONAL TEST PITS, AS MIGHT BE REQUIRED BY ACTUAL SITE CONDITIONS, ANY DECREPANCIES FOUND BETWEEN ACTUAL AND ASSUMED CONDITIONS SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF BOWMAN CONSULTING GROUP.
7. UNLESS OTHERWISE NOTED, ALL PROPOSED ELEVATIONS AS SHOWN HEREIN ARE FINISHED GRADE.
8. UNLESS OTHERWISE NOTED HEREIN ALL PROPOSED UTILITIES ARE TO BE INSTALLED UNDERGROUND.
9. FOR THE PURPOSE OF DESIGN COORDINATION, CERTAIN FUTURE CONSTRUCTION IMPROVEMENTS ARE SHOWN HEREIN AS EXISTING. THESE FEATURES MAY INCLUDE BUT ARE NOT NECESSARILY LIMITED TO THE HORIZONTAL & VERTICAL LOCATION OF CURBS, SIDEWALKS, PAVEMENTS AND UTILITIES.
10. ALL UNDERGROUND UTILITIES WITHIN THE STREET RIGHT-OF-WAY SHALL BE INSTALLED TO THE REQUIRED DISTANCE BEYOND THE RIGHT-OF-WAY LINE PRIOR TO THE INSTALLATION OF ANY SUBBASE MATERIAL, CURB AND GUTTER OR SIDEWALK.
11. NO BLASTING SHALL BE PERMITTED WITHIN 25' OF EXISTING UTILITIES LINE OR STRUCTURES. BLASTING TO BE EXTENDED TO 25' BEYOND PROPOSED STRUCTURES IF CONDITIONS WARRANT FUTURE EXTENSIONS.
12. THE DEVELOPER IS RESPONSIBLE FOR ANY DAMAGE TO EXISTING ROADS AND UTILITIES WHICH OCCUR AS A RESULT OF PROJECT CONSTRUCTION WITHIN OR CONTIGUOUS TO EXISTING RIGHT-OF-WAY.
13. THE APPROVAL OF THIS PLAN SHALL IN NO WAY GRANT PERMISSION BY THE COUNTY FOR THE DEVELOPER TO TRESPASS ON OFF-SITE PROPERTIES.
14. THE APPROVAL OF THESE PLANS SHALL IN NO WAY RELIEVE THE OWNER OF COMPLYING WITH OTHER APPLICABLE LOCAL, STATE, AND FEDERAL REQUIREMENTS.
15. THE ENGINEER SHALL NOT HAVE CONTROL OVER OR CHARGE OF AND SHALL NOT BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES OR FOR SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK SHOWN ON THESE PLANS. THE ENGINEER SHALL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S SCHEDULES OR FAILURE TO CARRY OUT THE WORK. THE ENGINEER IS NOT RESPONSIBLE FOR ACTS OR OMISSIONS OF THE CONTRACTOR, SUBCONTRACTORS, OR THEIR AGENTS OR EMPLOYEES, OR OF ANY OTHER PERSONS PERFORMING PORTIONS OF THE WORK.
16. IN RESPONSE TO THE TOWN OF FRONT ROYAL'S DEPARTMENT OF BUILDING AND DEVELOPMENT'S REQUEST FOR FIELD ASSISTANCE, WHEN REQUIRED TO IDENTIFY SPECIFICATIONS OF PROPOSED DEVELOPMENT, AS RELATED TO SPECIFIC SITE CONDITIONS, PLEASE CONTACT JERRY DOVE AT BOWMAN CONSULTING GROUP (703) 443-2400.
17. EMERGENCY VEHICLE ACCESS SHALL BE PROVIDED DURING ALL PHASES OF CONSTRUCTION.
18. WHERE IMPROVEMENTS ARE PROPOSED WITHIN EXISTING EASEMENTS OF RECORD, THE DEVELOPER SHALL OBTAIN WRITTEN PERMISSION FROM THE AUTHORITIES THAT ARE DOMINANT TENEMENTS OF THESE EASEMENTS FOR PERMIT FOR ANY DISTURBANCES WITHIN THESE AREAS PRIOR TO CONSTRUCTION.
19. ALL FINISHED GRADING, SEEDING, SODDING OR PAVING SHALL BE DONE IN SUCH A MANNER TO PRECLUDE THE PONDING OF WATER
20. ALL EXISTING ON-SITE WELLS AND DRAINFIELDS WHICH ARE NOT REQUIRED TO SUPPORT THIS PROJECT WILL BE ABANDONED BY THE CONTRACTOR ACCORDING TO LAW.
21. NO KNOWN GRAVE SITES EXIST ON THIS SITE, IN THE EVENT GRAVE SITES ARE DISCOVERED DURING CONSTRICTION, THE OWNER AND ENGINEER MUST BE NOTIFIED IMMEDIATELY. SHOULD GRAVE SITES BE FOUND THEY WILL BE PROTECTED IN ACCORDANCE WITH THE STATE LAW.
22. MAINTENANCE OF ALL STORM WATER MANAGEMENT FACILITIES SHALL BE THE RESPONSIBILITY OF THE HAPPY CREEK POA.
23. MAINTENANCE OF THE PROPOSED SANITARY PUMP STATION SHALL BE THE RESPONSIBILITY OF THE HAPPY CREEK POA.
24. FINAL DESIGN OF THIS DEVELOPMENT HAS BEEN DONE IN CONFORMANCE TO THE RECOMMENDATIONS OF THE GEOTECHNICAL REPORT PREPARED BY ECS MID-ATLANTIC, LLC, DATED 10/05/2018.
25. STORMWATER MANAGEMENT FOR THE SITE HAS BEEN GRANDFATHERED UNDER THE COMMON PLAN OF SUBDIVISION UNDER 9VAC25-870-48 (GRANDFATHERING) AND SUBJECT TO THE PART IIC (99VAC25-870-93 et seq.) TECHNICAL CRITERIA OF THIS CHAPTER. STORMWATER MANAGEMENT HAS BEEN PROVIDED/DESIGNED IN ACCORDANCE WITH THE "VIRGINIA STORMWATER MANAGEMENT HANDBOOK (VSMH) FIRST EDITION 1999" BY UTILIZING SWM/BMP POND 1 AND ADEQUATE OUTFALLS.

GENERAL SPECIFICATIONS:

1. UNLESS OTHERWISE NOTED OR SHOWN HEREIN, ALL MATERIALS AND METHODS OF CONSTRUCTION SHALL BE SUPPLIED AND INSTALLED IN STRICT CONFORMANCE WITH THE RULES, SPECIFICATIONS AND/OR REGULATIONS CONTAINED IN:
   A. THE VIRGINIA DEPARTMENT OF TRANSPORTATION, ROAD & BRIDGE SPECIFICATIONS AS AMENDED TO DATE.
   B. THE VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK, LATEST EDITION.
   C. THE TOWN OF FRONT ROYAL MUNICIPAL CODE.
   D. THE TOWN OF FRONT ROYAL SANITATION AUTHORITY STANDARDS.
   E. THE DEPARTMENT OF JUSTICE FEDERAL REGISTER IMPLEMENTING TITLE III OF THE AMERICANS WITH DISABILITIES ACT, PUBLIC LAW 101-336 FOR NONDISCRIMINATION ON THE BASIS OF DISABILITY BY PUBLIC ACCOMMODATION.
2. ALL CONSTRUCTION SHALL COMPLY WITH THE LATEST U.S. DEPARTMENT OF LABOR OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION RULES AND REGULATIONS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTMENTS AND/OR RECONSTRUCTION OF ALL UTILITY COVER (MANHOLE FRAMES AND COVERS, VALVE BOX COVERS, ETC.) TO MATCH THE FINISHED GRADES OF THE AREAS EFFECTED BY THE CONSTRUCTION.
4. THE CONTRACTOR MUST HAVE THE APPROVED CONSTRUCTION DRAWINGS IN POSSESSION PRIOR TO THE START OF CONSTRUCTION. AT LEAST ONE (1) COPY OF THE APPROVED PLANS, WITH REVISIONS, MUST BE KEPT ON-SITE AT ALL TIMES.
5. ALL UTILITIES NOTED TO BE RELOCATED OR REMOVED SHALL BE AT THE DEVELOPERS EXPENSE, TO INCLUDE ALL POLES AND STRUCTURES AS REQUIRED. ALL POLES REQUIRED TO BE RELOCATED MUST BE MOVED PRIOR TO CONSTRUCTION.
6. CONTROLLED FILLS SHALL BE COMPACTED TO MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT PER STANDARD PROCTOR AASHTO-T99, ASTM-D698 OR VTM-1 AS APPLICABLE. DENSITY SHALL BE CONFIRMED AND CERTIFIED BY A QUALIFIED AND REGISTERED PROFESSIONAL ENGINEER.
7. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS PRIOR TO CONSTRUCTION. AN ENTRANCE PERMIT SHALL BE OBTAINED FROM THE VIRGINIA DEPARTMENT OF TRANSPORTATION FOR ANY WORK WITHIN DEDICATED RIGHT-OF-WAYS OR FOR ANY TEMPORARY AND/OR PERMANENT ENTRANCE OFF OF A STATE MAINTAINED ROADWAY.
8. THE CONTRACTOR AND/OR OWNER SHALL OBTAIN A GRADING PERMIT FROM THE WARREN COUNTY BUILDING AND INSPECTIONS DEPARTMENT PRIOR TO COMMENCEMENT OF ANY LAND DISTURBING ACTIVITIES.
9. THE CONTRACTOR SHALL NOTIFY THE VIRGINIA DEPARTMENT OF TRANSPORTATION, THE TOWN OF FRONT ROYAL AND THE WATER AND SEWER AUTHORITY A MINIMUM OF THREE DAYS PRIOR TO CONSTRUCTION OF ANY IMPROVEMENTS SUBJECT TO INSPECTION AND/OR MAINTENANCE BY SAID AGENCIES.
10. STORM SEWER AND CULVERT PIPE SHALL BE REINFORCED CONCRETE PIPE CONFORMING TO THE LATEST EDITION OF A.A.S.H.T.O. DESIGNATION M170. UNLESS OTHERWISE NOTED AND/OR SPECIFIED HEREIN ALL STORM SEWER AND CULVERT PIPE SHALL BE CLASS THREE, WALL B
11. REFER TO THE LATEST EDITION OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION ROAD AND BRIDGE STANDARDS FOR CONSTRUCTION DETAILS NOT SHOWN OR CONTAINED HEREIN.
12. UNLESS OTHERWISE NOTED HEREIN V.D.O.T. STANDARD IS-1 SHAPING SHALL BE APPLIED TO THE INVERTS OF ALL DRAINAGE STRUCTURES.
13. UNLESS OTHERWISE NOTED OR SHOWN HEREIN ALL COMMERCIAL/RESIDENTIAL STREET ENTRANCES SHALL BE CONSTRUCTED IN ACCORDANCE WITH V.D.O.T. STANDARD CG-11.
14. ALL STRIPING AND SIGNAGE SHOWN HEREIN IS TO BE SUPPLIED AND INSTALLED IN CONFORMANCE WITH THE SPECIFICATIONS AND/OR REQUIREMENTS CONTAINED IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS & HIGHWAYS (M.U.T.C.D.) AND THE VIRGINIA SUPPLEMENTS THERE TO.
15. STRIPING AND SIGNAGE PLANS (AS REQUIRED) SHALL BE SUBMITTED AND APPROVED BY THE VIRGINIA DEPARTMENT OF TRANSPORTATION PRIOR TO SUBMISSION OF AN ENTRANCE PERMIT APPLICATION.

FINAL SUBDIVISION PLAN FOR HAPPY CREEK KNOLLS SECTION 4

HAPPY CREEK MAGISTERIAL DISTRICT
WARREN COUNTY. VIRGINIA



VICINITY MAP
SCALE: 1"=1000'

OWNER:
RAMSEY INC.
508 COMMERCE AVENUE
FRONT ROYAL, VIRGINIA 22630
(540) 635-5637

DEVELOPER
RAMSEY INC.
508 COMMERCE AVENUE
FRONT ROYAL, VIRGINIA 22630
(540)635-5637

MISS UTILITY

CALL "MISS UTILITY" AT 1-800-552-7001, 48 HOURS PRIOR TO THE START OF WORK. THE EXCAVATOR MUST NOTIFY ALL PUBLIC UTILITY COMPANIES WITH UNDER GROUND FACILITIES IN THE AREA OF PROPOSED EXCAVATION AND HAVE THOSE FACILITIES LOCATED BY THE UTILITY COMPANIES PRIOR TO COMMENCING EXCAVATION. THE EXCAVATOR IS RESPONSIBLE FOR COMPLIANCE WITH REQUIREMENTS OF TOWN OF FRONT ROYAL, VIRGINIA CODES AND REGULATIONS.

NOTICE REQUIRED

CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION OR BLASTING AT LEAST TWO (2) WORKING DAYS, BUT NOT MORE THAN TEN (10) WORKING DAYS, PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION. NAMES AND TELEPHONE NUMBERS OF THE OPERATORS OF UNDERGROUND UTILITY LINES APPEAR BELOW. THESE NUMBERS SHALL ALSO BE USED TO SERVE IN AN EMERGENCY CONDITION.

WATER/SEWER: TOWN OF FRONT ROYAL - DEPARTMENT OF PUBLIC UTILITIES
800 CROSBY ROAD
FRONT ROYAL, VIRGINIA 22630
(540) 635-7819

PHONE: SPRINT
450 REMOUNT ROAD
FRONT ROYAL, VIRGINIA 22630
(540) 635-3197

POWER: TOWN OF FRONT ROYAL - ELECTRIC DEPARTMENT
1101 MANASSAS AVENUE
FRONT ROYAL, VIRGINIA 22630
(540) 635-3027

MISS UTILITY: (800) 552-7001

SITE AND ZONING DATA

1. THE PROPERTY DELINEATED HEREON IS LOCATED ON WARREN COUNTY TAX ASSESSMENT MAP 20A2 ((13)) PARCEL G.
2. THE SUBJECT PROPERTY CONTAINS 541.330 SQUARE FEET OR 12.4272 ACRES OF LAND BE THE SAME MORE OR LESS.
3. THE SITE IS CURRENTLY ZONED R-1 AND IS BEING ADMINISTERED UNDER THE TOWN OF FRONT ROYAL ZONING ORDINANCE.
   - MINIMUM LOT SIZE: 10,000 SF
   - REQUIRED YARD SETBCKS:
     - FRONT: 35'
     - SIDE: 15'/10' (25' TOTAL)
     - REAR: 30'
   - LOT COVERAGE: 30% MAX
   - MAX BUILDING HT: 35'
   - REQ. PARKING: 2 SPACES/DWELLING UNIT
4. THE FOLLOWING "APPROVED LAND DEVELOPMENT APPLICATIONS" WHICH PRECEDE THIS APPLICATION ARE ASSOCIATED WITH THIS PROJECT:
   A. HAPPY CREEK KNOLLS - SECTION II APPROVED
   B. HAPPY CREEK KNOLLS - SECTION III APPROVED
5. THE PROPERTY SHOWN HEREON IS NOT IN A 100-YEAR FLOODPLAIN. IT LIES IN ZONE "X" (UN-SHADED)(AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOODPLAIN) AS SHOWN ON FEMA FLOOD INSURANCE RATE MAP FOR TOWN OF FRONT ROYAL VIRGINIA, WARREN COUNTY, COMMUNITY-PANEL NUMBER 51067 0003 B, EFFECTIVE DATE JULY 15, 1988.
6. COMMON OPEN SPACE AREAS ARE TO BE DEDICATED TO AND MAINTAINED BY A HOME OWNERS' ASSOCIATION.
7. WATER AND SEWER SERVICES ARE TO BE PROVIDED BY THE TOWN OF FRONT ROYAL DEPARTMENT OF PUBLIC UTILITIES.

CONTINUED ON SHEET 2

SHEET INDEX

1	COVER SHEET
2	DETAILS, TYPICAL SECTIONS, & SOILS MAP
3	SCHEMATIC PLAN
4	GEOMETRIC PLAN
4A	UTILITY PLAN
5	GRADING PLAN
6	GRADING PLAN
7	PLAN AND PROFILE - HAPPY RIDGE DRIVE
8	PLAN AND PROFILE - HAPPY RIDGE DRIVE
9	PLAN AND PROFILE - HAYMAKER LANE
10	STORM SEWER PROFILES
11	STORM SEWER PROFILES & COMPUTATIONS
11A	STORM SEWER DETAILS & COMPUTATIONS
12	SANITARY SEWER PROFILES AND COMPUTATIONS
13	PUMP STATION PLAN & DETAILS
14	PUMP STATION SPECIFICATIONS
15	PUMP STATION ELECTRICAL NOTES & CONTROL DIAGRAM
16	PUMP STATION ELECTRICAL SITE PLAN
17	PUMP STATION ELECTRICAL SPECS & DETAILS
18	PRE-DEVELOPMENT DRAINAGE DIVIDES
19	POST-DEVELOPMENT DRAINAGE DIVIDES
20	POND 1 DETAILS AND COMPUTATIONS
21	OUTFALL HYDROLOGY
22	POND HYDROLOGY
22A	BMP MAP, COMPUTATIONS AND NARRATIVE
23	EROSION AND SEDIMENT CONTROL - PHASE I
24	EROSION AND SEDIMENT CONTROL - PHASE II
25	EROSION AND SEDIMENT CONTROL NARRATIVE
26	EROSION AND SEDIMENT CONTROL COMPUTATIONS AND DETAILS
27	LANDSCAPE AND LIGHTING PLAN
28	LANDSCAPE DETAILS
29	FIRE HYDRANT LOCATION AND SIGNAGE PLAN
30	TOWN OF FRONT ROYAL WATER AND SEWER DETAILS
31	VDOT STORM AND PAVEMENT DETAILS
32	VDOT STORM AND PAVEMENT DETAILS
33	VDOT STORM AND PAVEMENT DETAILS

SURVEYOR'S CERTIFICATE:
I HEREBY CERTIFY THAT THE LAND SHOWN IN THIS FINAL SUBDIVISION PLAN IS A PORTION OF THE LAND CONVEYED TO RAMSEY INC., BY DEEDS DATED MAY 29, 2001 AND NOVEMBER 6, 2001 OF RECORD IN THE WARREN COUNTY CIRCUIT COURT CLERK'S OFFICE IN INSTRUMENT # 010004122 AND 010008722.

PAUL SWARTZ, L.S. #002701

OWNER'S CERTIFICATE:
THE PLATTING OR DEDICATION OF THE FOLLOWING FINAL SUBDIVISION PLAN FOR THE RESUBDIVISION OF A PORTION OF HAPPY CREEK KNOLLS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE DESIRES OF THE UNDERSIGNED OWNERS, PROPRIETORS AND TRUSTEES, IF ANY.

REVISION BLOCK

NO.	REVISION	DATE
1	SHEETS 1, 3-4A, 6-8, & 27-29 - COUNTY COMMENTS	10/01/2019

APPROVAL BLOCK

ALL TOWN REAL ESTATE TAXES HAVE BEEN PAID IN FULL

DIRECTOR OF FINANCE — DATE
REVIEWED AND APPROVED BY THE TOWN OF FRONT ROYAL

DIRECTOR OF PLANNING AND ZONING — DATE

TOWN COUNCIL — DATE

DIRECTOR OF ENVIRONMENTAL SERVICES — DATE

DIRECTOR OF ENERGY SERVICES — DATE

Bowman CONSULTING
Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

COVER SHEET
HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS
DATE	DESCRIPTION

GC DESIGN	MCW DRAWN	CHKD
SCALE	H: AS SHOWN V:	
JOB No. 1602-02-016		
DATE JULY 19, 2019		
FILE No. 1602-D-CP-005		

SHEET 1 OF 33

Cad file name: P:\1602 - happy creek knolls sec 3\1602-04-001 (eng)\engineering\engineering plans\Sheets\1602-D-CP-001-COV.dwg

STANDARD LEGEND

EXISTING	DESCRIPTION	PROPOSED
350	INDEX CONTOUR	350
352	INTERMEDIATE CONTOUR	352
EX. E.P.	EDGE OF PAVEMENT	PROP. E.P.
EX. C & G	CURB AND GUTTER	CG-6
	TRANSITION FROM CG-6R TO CG-6	CG-6R CG-6
	PROPOSED HEADER CURB	
	PROPERTY LINE	
	DEPARTING PROPERTY LINE	
	LOT LINE	
	RIGHT-OF-WAY	
	CENTERLINE	
	FLOOD PLAIN	
	CLEARING AND GRADING	
	TREE LINE	
	FLOW LINE OF SWALE	
	STREAM	
	OVERLAND RELIEF PATHWAY	X
X X X X	FENCE LINE	X X X
	EASEMENT	
EX 8" W/M	WATER LINE	8" DIP W/M
W EX. W/V	WATER VALVE	W
	REDUCER	W
EX 8" SAN	SANITARY SEWER	8" SAN
EX 18" RCP	STORM SEWER	18" RCP
	CABLE TV	CATV E
E E E E	ELECTRIC SERVICE	E E E
T T T T	TELEPHONE SERVICE	T T T
G G G G	GAS LINE	G G G
+ 25.32	SPOT ELEVATION	+25.32
	UTILITY POLE	
	SIGN	
MH 1	SANITARY SEWER IDENTIFIER	1
EX 1	STORM DRAIN IDENTIFIER	1
E	EASEMENT IDENTIFIER	W
	WATER METER	
	FIRE HYDRANT	
	PARKING INDICATOR INDICATES THE NUMBER OF TYPICAL PARKING SPACES	25
	STREET LIGHT	
	VEHICLES PER DAY (TRAFFIC COUNT)	200 VPD
	TEST PIT LOCATION RECOMMENDED/REQUIRED	TP
	CRITICAL SLOPE SLOPES TO BE STABILIZED PURSUANT TO VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK	★
	HANDICAP RAMP (CG-12) DENOTES LOCATION OF STD VDOT CG-12 AND/OR JURISDICTIONAL STANDARD RAMP CONSTRUCTION	
	DENOTES CLEAR SIGHT TRIANGLE	
PINE EX 5" 15" OAK	TREE	
	BENCHMARK	BM #1 TRV #1 ELEV=101.62
	ASPHALT TRAIL	
	CONCRETE SIDEWALK	
	END WALLS	
	END SECTIONS	
	STOP SIGN	
	STREET SIGN	
OHE	OVERHEAD ELECTRIC	OHE
OHT	OVERHEAD TELEPHONE	OHT
VAN	HANDICAP PARKING SPACE (VAN)	VAN
	RIP RAP	

EASEMENT LEGEND

- (IE) DENOTES INGRESS/EGRESS EASEMENT
- (SS) DENOTES SANITARY SEWER EASEMENT
- (SD) DENOTES STORM DRAIN EASEMENT
- (SW) DENOTES SIDEWALK EASEMENT
- (PA) DENOTES PRIVATE ACCESS EASEMENT
- (W) DENOTES WATER MAIN EASEMENT
- (SI) DENOTES SIGHT DISTANCE EASEMENT
- (TR) DENOTES TRAIL EASEMENT
- (LS) DENOTES LANDSCAPE EASEMENT

NOTE: ALL EASEMENTS ARE PERMANENT UNLESS SPECIFICALLY NOTED AS TEMPORARY.

VDOT GENERAL NOTES
Revised 1/31/19

1. These plans were prepared in accordance with the requirements of (select one):
   ☒ VDOT Secondary Street Acceptance Requirements (SSAR 24VAC-30-92 effective December 31, 2014 and VDOT Road Design Manual Appendix B1). Schematic street layout and computations of Connectivity Index are provided with these plans per 24VAC30-92-60.
   ☐ VDOT Secondary Street Acceptance Requirements (SSAR 24VAC-30-92 effective December 31, 2014 and VDOT Road Design Manuel Appendix B1). Schematic street layout with phasing diagram for street acceptance are provided with these plans per 24VAC30-92-60.
   ☐ VDOT Secondary Street Acceptance Requirements (SSAR 24VAC-30-92 effective December 31, 2014 and VDOT Road Design Manual Appendix B2 as approved for use in designated high density development areas). Schematic street layout with phasing diagram for street acceptance are provided with these plans per 24VAC30-92-60.
2. Methods and materials used shall conform to the current county/town and VDOT standards and specifications.
3. All utilities, including all poles, are to be relocated at the developer's expense, prior to construction.
4. Open cutting of paved or surface treated roads is not permitted. All utilities which will be placed under existing streets are to be bored or jacked. Any exceptions, due to extenuating circumstances, are to be addressed at the permit stage.
5. Any type of reverse curb (spill curb, CG-6 with a revered slope, etc.) and transition to these curbs shall not be used with the public right of way.
6. The developer is responsible for eny damage to existing roads and utilities which occur as a result of project construction within or contiguous to the existing right of way.
7. A smooth grade shall be maintained from the centerline of the existing road to the proposed edge of pavement to preclude the forming of false gutters and/or the ponding of any water in the roadway.
8. Standard guardrails and/or handrails shall be installed at hazardous locations as designated during the field review by the county/town inspector or VDOT.
9. The developer is responsible for all traffic control. The developer shall submit a signing, striping and/or signalization plan to the VDOT Land Development Section a minimum of thirty days prior to permit application. The developer shall not commence construction of any pavement course without an approved striping plan.
10. The pavement design is based on an assumed CBR value of 10 (use a CBR value of 6 in Loudoun Co.). Soil tests of subgrade must be submitted for the actual determination of the required thickness of the pavement including layers of asphalt and subbase prior to subbase placement.
11. All untreated aggregate used in base or subbase courses shall be 21B, except on roads with an ADT of 1000 vpd or less, where 21A aggregate may be used. When 21B aggregate is used, UD-4 underdrains must be provided.
12. A 4" (min.) layer of stone is required beneath curb and gutter (may be shown on typical section in lieu of a note).
13. Additional ditch linings or siltation and erosion control measures shall be provided, at the developer's expense, as determined necessary by VDOT and/or the county/town during field review. All costs shall be assumed by the developer.
14. The entire surface of the roadway (old and new portions) shall be overlaid and re-striped as required by VDOT personnel. Overlay of existing pavement shall be a minimum of 1.25" depth; any costs associated with pavement overlay, or the milling of existing pavement to obtain required depth, shall be assumed by the developer.
15. The developer is responsible for the design and construction of any traffic signal installation or modification which will be necessary as a result of the development of this site.
16. All right of way dedicated to public use shall be clear and unencumbered.
17. The county/town shall obtain a permit for all sidewalks within the right of way that do not qualify for VDOT maintenance.
18. Traffic control devices or advisory signs, such as multiway stops, speed limits, Watch for Children, Pedestrian Traffic etc., shall not be installed unless specifically shown on these plans or a VDOT approved plan revision. A speed study certified by a professional engineer should be submitted for VDOT approval prior to the street acceptance for any road to be posted other than the statutory speed limit. Should unapproved signs be noted at the time of VDOT inspection, the road acceptance process shall be terminated immediately and not recommenced until a determination is made regarding the approval of any additional signs. Immediate removal of such signs shall not negate the need for the submission of a revision.
19. Landscaping and irrigation systems shall not be installed within the public right of way except as shown on these plans or a VDOT approved revision.
20. Beginning July 1, 2009 all Land Use Permit applications are required to provide at least one (1) person who, at a minimum, is verified by VDOT in Basic Work Zone Traffic Control for all permitted activities within state maintained right of way which involves installing, maintaining, or removing work zone traffic control devices. This person shall be responsible for the placement, maintenance and removal of all work zone traffic control devices.

HAPPY CREEK KNOLLS SECTION 4 ENVIRONMENTAL IMPACT STATEMENT

HAPPY CREEK KNOLLS SECTION 4 IS THE FINAL PHASE OF THE HAPPY CREEK KNOLLS SUBDIVISION AS PLATTED IN 2002. CONTAINING APPROXIMATELY 12.4272 ACRES, HAPPY CREEK KNOLLS SECTION 4 IS THE FINAL PARCEL TO BE DEVELOPED IN AN OVERALL DEVELOPMENT OF 96 ACRES. THE HAPPY CREEK KNOLLS SUBDIVISION AND ODEN RIDGE SUBDIVISION AS DEVELOPED BY RAMSEY INC. HAS INCLUDED THE CONSTRUCTION AND PLANNED CONSTRUCTION OF 235 SINGLE FAMILY HOMES. A PORTION OF THE OVERALL DEVELOPMENT IS PART OF THE WARREN COUNTY INTERMEDIATE SCHOOL SITE, THE LEACH RUN PARKWAY AND ADJACENT TO THE IMMANENT DEVELOPMENT AND CONSTRUCTION OF THE NEW WARREN MEMORIAL HOSPITAL, AND ADJACENT TO A 90 ACRE SITE ZONED FOR PLANNED NEIGHBORHOOD DEVELOPMENT.

THE TOPOGRAPHY IS ROLLING WITH A VARIETY OF SOILS AS DEPICTED ON THE SOILS MAP. HAPPY CREEK KNOLLS SECTION 4 SLOPES RANGE FROM BEING FLAT TO 2:1 EXISTING GRADES. PROPOSED GRADES DO NOT EXCEED 2:1 SLOPES. OVER LOT GRADING IS MINIMIZED IN THE PROPOSED DEVELOPMENT OF HAPPY CREEK KNOLLS DEVELOPMENT PLANS THROUGH THE USE OF SITE SPECIFIC ADAPTIVE HOUSING. FURTHER EXPLAINED BY PROPOSING FINAL GRADES IN CONJUNCTION WITH EXISTING GRADES THAT ARE MINIMALLY ADJUSTED TO ACCOMMODATE HOUSE CONSTRUCTION AS OPPOSED TO GRADING THE LOT TO FIT A HOUSE THAT WOULD REQUIRE EXTENSIVE GRADING, EXCESSIVELY STEEP DRIVEWAYS AND/OR RETAINING WALLS. AN EXAMPLE OF ADAPTIVE HOUSE CONSTRUCTION WOULD BE THE CONSTRUCTION OF A SPLIT FOYER HOUSE ON A LOT THAT HAS A POSITIVE GRADE FROM THE STREET, WHEREBY THE MAIN ENTRANCE IS ON THE LOWER LEVEL OF THE HOUSE WITH STEPS TO THE SECOND LEVEL AND THE SECOND LEVEL (MAIN LIVING LEVEL) EXITING ON GRADE TO THE REAR (BACK YARD) OF THE HOUSE.

HAPPY CREEK KNOLLS SECTION 4 HAS BEEN ALTERED TOPOGRAPHICALLY DURING THE CONSTRUCTION OF VARIOUS PUBLIC PROJECTS. SUITABLE STRUCTURAL FILL WAS NEEDED FOR THE CONSTRUCTION OF SAMUELS PUBLIC LIBRARY AND WAS OBTAINED FROM HAPPY CREEK KNOLLS SECTION 4 WITH PROPER TESTING AND PERMITS. OVERBURDEN WAS GENERATED FROM THE HAPPY CREEK ROAD IMPROVEMENT PROJECT. WITH PROPER TESTING AND PERMITS THE EXCESS ROCK, DIRT, AND APPROVABLE FILL COMPONENTS WERE PLACED ON THE PROPERTY AND CERTIFIED FOR BOTH APPROPRIATE USE AND COMPACTION FOR RESIDENTIAL HOUSE CONSTRUCTION.

DURING THE PREVIOUSLY PERMITTED LAND DISTURBING ACTIVITIES ON HAPPY CREEK KNOLLS SECTION 4 THERE WERE NO PHYSICAL OR GEOLOGIC FEATURES OBSERVED THAT WOULD QUALIFY AS RESTRICTING FACTORS IN THE FINAL DEVELOPMENT OF THE PROPERTY FOR SINGLE FAMILY RESIDENTIAL USE. FACTORS LACKING PRESENCE INCLUDE BUT ARE NOT LIMITED TO: WET LANDS, RARE SPECIES OF ANIMALS OR FAUNA, PROTECTED SIGNIFICANT VEGETATIVE GROWTH, SINKHOLES, UNUSUAL GEOLOGIC ROCK OR SOIL FORMATIONS.

THE SINGLE MOST INVASIVE ACTIVITY PROPOSED IN THE DEVELOPMENT OF HAPPY CREEK KNOLLS SECTION 4 IS THE REDESIGN AND RECONSTRUCTION OF THE EXISTING STORM WATER MANAGEMENT POND. THE STORM WATER MANAGEMENT POND WAS DESIGNED AND CONSTRUCTED AS A STORM WATER MANAGEMENT DEVICE IN CONJUNCTION WITH THE DEVELOPMENT HAPPY CREEK KNOLLS SECTION 3 IN 2006. IT WAS LATER RECALCULATED AND ADJUSTED TO RECEIVE A PORTION OF THE STORM WATER RUN-OFF FROM HAPPY CREEK KNOLLS SECTION 2 TO FACILITATE THE PLACEMENT OF THE ABOVE REFERENCE OVERBURDEN FROM THE HAPPY CREEK ROAD IMPROVEMENT PROJECT. THE FACT THAT THE POND ALREADY EXISTS AND IS BEING MODIFIED CREATES THE LEAST INVASIVE IMPACT POSSIBLE TO SITE AS WELL AS THE ENVIRONMENT. THE STORM WATER MANAGEMENT AREA AS REQUIRED BY THE TOWN OF FRONT ROYAL WILL BE MAINTAINED BY THE NOW EXISTING HAPPY CREEK KNOLLS PROPERTY OWNERS ASSOCIATION.

IN THAT HAPPY CREEK KNOLLS SECTION 4 IS PRIMARILY AN OPEN GRASSED AREA THERE WILL BE A MINIMAL IMPACT ON THE EXISTING TREE CANOPY. THROUGH THE PROPOSED LANDSCAPING PORTION OF THE FINAL DEVELOPMENT PLAN THE NET CHANGE WILL LIKELY RESULT IN A GREATER NUMBER OF TREES ON THE SITE THAN CURRENTLY EXISTS.

AIR QUALITY WILL BE MINIMALLY IMPACTED THROUGH THE USE OF ENERGY EFFICIENT HEAT PUMPS AND LP (LIQUEFIED PROPANE) GAS FURNACES. AS DICTATED BY EXISTING BUILDING CODES AND CONSTRUCTION STANDARDS, THE CURRENT HOME CONSTRUCTION ENERGY PACKAGE RESULTS IS LOWER ENERGY CONSUMPTION AND THEREFORE LESS DEMAND ON ENERGY SERVICES AND LESS MEASURABLE POLLUTION.

ALL HOUSES WILL BE CONNECTED TO THE PUBLIC SERVICES AS PROVIDED BY THE TOWN OF FRONT ROYAL, THEREFORE RESULTING IN MINIMAL IMPACT ON THE GROUND WATER TABLE, AS IMPACTED BY THE DRILLING OF PRIVATE WELLS, OR THE INSTALLATION AND MAINTENANCE OF PRIVATE INDIVIDUAL SEPTIC DISPOSAL SYSTEMS.

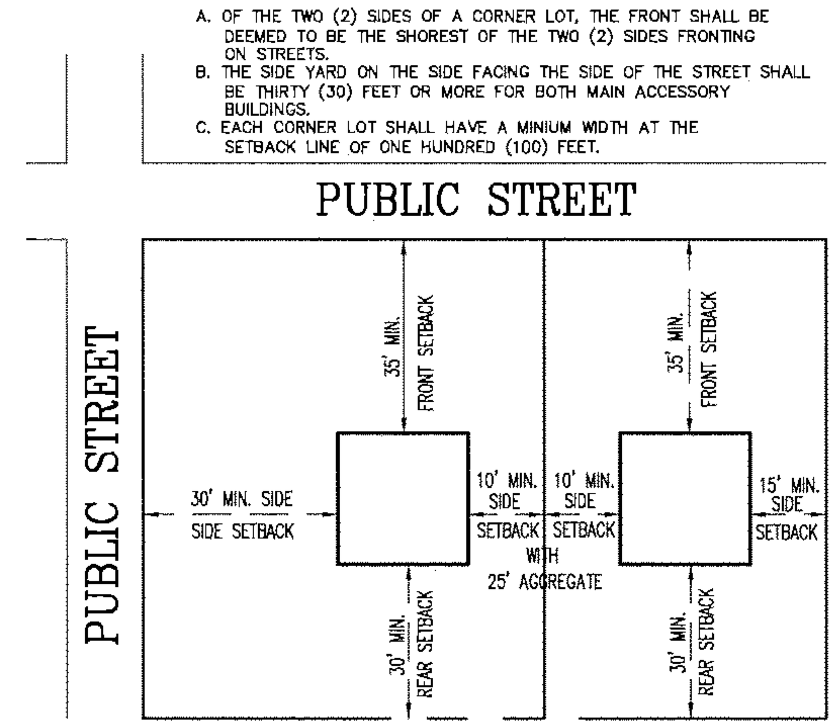
AS, IDENTIFIED ON USGS MAPPING, HAPPY CREEK KNOLLS SECTION 4 IS NOT CONTAINED IN, OR ABOUT TO ANY 100 YEAR FLOOD WAYS, FLOODPLAIN, OR FLOOD ZONES.

TOWN OF FRONT ROYAL GENERAL NOTES

1. FOR TECHNICAL SPECIFICATIONS AND DETAILS REFER TO THE TOWN OF FRONT ROYAL WATER AND SEWER STANDARDS AND SPECIFICATIONS, LATEST EDITION. ALL CONSTRUCTION SHALL BE IN ACCORDANCE TO THESE SPECIFICATIONS. ANY DEVIATIONS OR CHANGES SHALL BE SUBMITTED IN WRITING TO THE TOWN FOR SUPPLEMENTAL APPROVAL. INSPECTIONS SHALL BE PERFORMED BY THE DEPARTMENT OF PUBLIC WORKS. CONTACT: DIRECTOR OF PUBLICWORKS AT (540) 635-7819 OR FAX (540) 635-8973.
2. LOCATIONS OF UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFYING THE EXACT LOCATION, VERTICALLY AND HORIZONTALLY, OF THE UTILITIES PRIOR TO ANY EXCAVATION OR CONSTRUCTION. THE CONTRACTOR SHALL CONTACT "MISS UTILITY" AND ALL APPLICABLE UTILITY COMPANIES FOR CLEARANCE PRIOR TO EXCAVATION. CONTRACTOR WILL BE RESPONSIBLE FOR ADHERING TO THE COMMONWEALTH OF VIRGINIA UNDERGROUND UTILITY DAMAGE PREVENTION ACT, CHAPTER 10, TITLE 56 OF THE CODE OF VIRGINIA.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING AND MAINTAINING ALL EROSION AND SEDIMENT CONTROL MEASURES NECESSARY DURING CONSTRUCTION IN ACCORDANCE WITH CURRENT STATE AND LOCAL REGULATIONS. DISTURBED AREA SHALL NOT REMAIN DENUDED FOR MORE THAN (7) CALENDAR DAYS. DURING CONSTRUCTION, ALL STORM SEWER INLETS SHALL BE PROTECTED BY INLET PROTECTION, MAINTAINED AND MODIFIED AS REQUIRED BY CONSTRUCTION PROCESS. CONTRACTOR SHALL CONTACT THE COUNTY BUILDING INSPECTION OFFICE AT (540) 636-9973 PRIOR TO SCHEDULE INSPECTIONS.
4. THE CONTRACTOR SHALL PROVIDE ADEQUATE MEANS OF CLEANING MUD FROM TRUCKS AND/OR OTHER EQUIPMENT PRIOR TO ENTERING PUBLIC STREETS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CLEAN STREETS, ALLAY DUST, AND TO TAKE WHATEVER MEASURES NECESSARY TO ENSURE THAT THE STREETS ARE MAINTAINED IN A CLEAN, MUD AND DUST FREE CONDITION AT ALL TIMES.
5. ANY STREET OR UTILITIES DAMAGED BY CONTRACTOR OR SUB-CONTRACTOR SHALL BE SOLE RESPONSIBILITY OF THE PRIMARY CONTRACTOR AND PROPERLY AND IMMEDIATELY REPAIRED BYTHE CONTRACTOR. SUCH REPAIRS SHALL BE TO THE ORIGINALCONDITION AND SHALL BE TO THE SATISFACTION OF THE TOWN INSPECTOR.
6. ALL PLASTIC SANITARY SEWER PIPE SHALL BE 8" DIAMETER S.D.R. 35, UNLESS OTHERWISE NOTED. PIPE BEDDING SHALL BE DETERMINED BY FIELD CONDITIONS AND TOWN SPECIFICATIONS.
7. SANITARY SEWER STRUCTURES SHALL BE PRE-CAST CONCRETE OR ACCEPTABLE EQUIVALENT APPROVED BY THE TOWN OF FRONT ROYAL'S PUBLIC WORKS DEPARTMENT.
8. ALL PROPOSED WATER MAINS, HYDRANT BRANCHES AND FIRE SUPPRESSION LINES SHALL BE CLASS 52 DUCTILE IRON PIPE WITH A MINIMUM OF 42" COVER UNLESS OTHERWISE NOTED.
9. ALL 2" AND SMALLER WATER SERVICES SHALL BE TYPE "K" COPPER PIPE. SOLDERED JOINTS ON BURIED LINES ARE NOT ACCEPTABLE.
10. ALL PRECAST CONCRETE STRUCTURES SHALL BE MINIMUM 4D00 PSI AND 28 DAYS WITH BITUMINOUS COATING.
11. THE UNAUTHORIZED USE OF WATER WITHOUT DUE COMPENSATION IS ILLEGAL. NO PERSON SHALL CONNECT TO OR DO ANY WORK ON THAT PORTION OF THE SYSTEM OWNED BY THE TOWN UNLESS WRITTEN AUTHORIZATION IS RECEIVED PRIOR TO COMMENCING WORK.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ACQUIRING ALL NECESSARY PERMITS BEFORE ANY CONSTRUCTION BEGINS.
13. THE CONTRACTOR IS RESPONSIBLE FOR ADJUSTMENT OF ALL UTILITY BOXES, VAULTS OR OTHER APPURTENANCES TO NEW FINISHED GRADE ELEVATIONS.
14. CONTRACTOR TO RELOCATE ALL SIGNS AND UTILITIES REQUIRED FOR THIS WORK.
15. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE TRUE LOCATION AND DEPTH OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO ANY EXCAVATION OR CONSTRUCTION.
16. SANITARY SERVICE LATERALS AND CLEAN OUTS SHALL BE CONSTRUCTED AS SPECIFIED IN NOTE #1.
17. ALL CONSTRUCTION SHALL CONFORM TO ZONING AND CONSTRUCTION REQUIREMENTS OF THE TOWN OF FRONT ROYAL. ALL WATER AND SANITARY SEWER INSTALLATIONS SHALL BE INSPECTED BY THE TOWN OF FRONT ROYAL.
18. CONSTRUCTION SHALL CONFORM TO THE AMERICAN WITH DISABILITIES ACT (ADA) REOUIREMENTS. CURB RAMPS SHALL BE PLACED WHERE ALL SIDEWALKS MEET CURBS.
19. CONSTRUCTION LIMITS SHALL BE PROPERTY LINES OR AS INDICATED BY PLAN REQUIREMENTS.
20. ANY PLANNED DISRUPTIONS OF OR TIE INS TO EXISTING UTILITIES SHALL BE APPROVED AND . COORDINATEDWITH THE APPROPRIATE UTILITY OWNER. WITH EXCEPTION OF EMERGENCIES, THERE SHALL BE A MINIMUM NOTIFICATION OF 24 HOURS NOTICE GIVEN BY THE CONTRACTOR TO ALL RESIDENTIAL, COMMERCIAL AND INDUSTRIAL UTILITY USERS AFFECTED BY UTILITY INTERRUPTIONS.
21. ELECTRIC SERVICE TO BE IN COMPLIANCE WITH ENERGY SERVICES CONDUIT POLICY, TFR CODE 12-1 TFR CODE 70-50.1

NOTE: FRONT SHALL BE THE SHORTEST SIDE PER TOWN OF FRONT ROYAL MUNICIPAL CODE SECTION 175-18.

A. OF THE TWO (2) SIDES OF A CORNER LOT, THE FRONT SHALL BE DEEMED TO BE THE SHOREST OF THE TWO (2) SIDES FRONTING ON STREETS.
B. THE SIDE YARD ON THE SIDE FACING THE SIDE OF THE STREET SHALL BE THIRTY (30) FEET OR MORE FOR BOTH MAIN ACCESSORY BUILDINGS.
C. EACH CORNER LOT SHALL HAVE A MINIUM WIDTH AT THE SETBACK LINE OF ONE HUNDRED (100) FEET.



SINGLE FAMILY DETACHED TYPICAL SET BACKS
(NOT TO SCALE)

ROADWAY NOTES:

1.) SUBBASE DEPTH IS BASED ON A C.B.R. VALUE OF 6, BASED ON AN ACTUAL DETERMINATION PER SOILS TESTS (OR) AN ESTIMATE WHICH WILL BE REVISED ONCE THE SOIL TESTS OF SUBGRADE ARE PREFORMED.

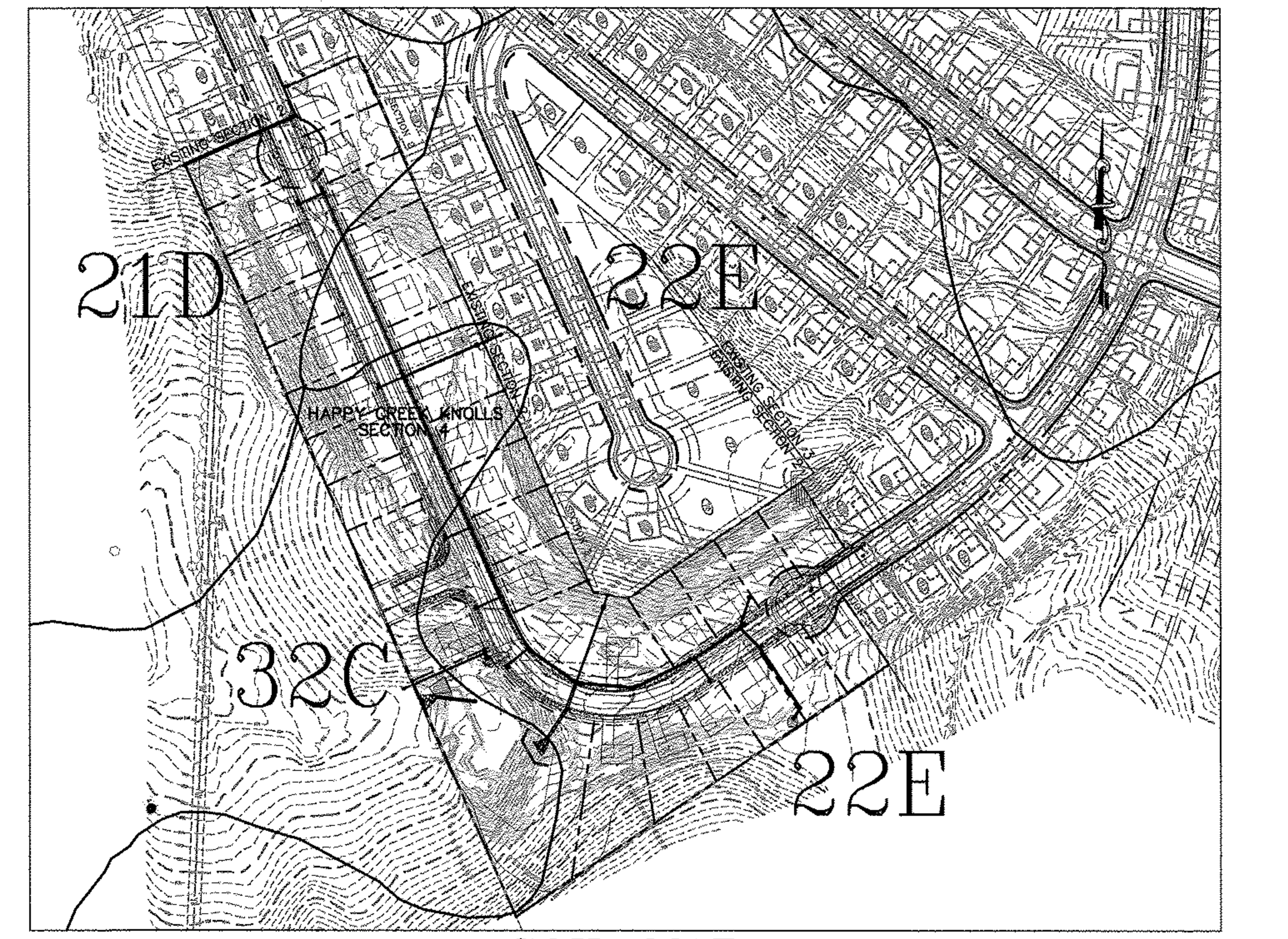
2.) A SMOOTHING GRADE SHALL BE MAINTAINED FROM THE CENTERLINE OF THE EXISTING ROAD TO THE PROPOSED CURB AND GUTTER, TO PRECLUDE THE FORMING OF FALSE GUTTERS AND/OR THE PONDING OF ANY WATER ON THE ROADWAY.

3.) STANDARD GUARDRAIL AND HANDRAIL SHALL BE INSTALLED AT HAZARDOUS LOCATIONS AS DESIGNATED DURING FINAL FIELD INSPECTIONS.

4.) * SHOULDER TO BE WIDENED WHERE GUARD RAIL IS REQUIRED.

5.) SIDEWALKS AND TRAILS SHALL BE CONSTRUCTED ON A 4" THICK LAYER OF NUMBER 57 STONE.

6.) FOR DITCH & SHOULDER ROADWAY SECTIONS THE BACK SLOPE OF THE DITCH SHALL EXTEND UP AT A SLOPE OF 3:1 FOR A DISTANCE EOUAL TO THE DEPTH OF THE DITCH ASSOCIATED WITH THE FRONT SLOPE.



SOIL MAP
SCALE: 1"=200'

SITE AND ZONING DATA (CONTINUED)

HAPPY CREEK KNOLLS SECTION 4 LOT TABULATION		
LOT #	LOT AREA (FT^2)	LOT AREA (ACRES)
1	10,374.97	0.238
2	10,371.85	0.238
3	10,368.73	0.238
4	10,921.77	0.251
5	13,409.14	0.308
6	20,632.84	0.474
7	13,026.39	0.299
8	10,545.86	0.242
9	10,563.41	0.243
10	10,580.96	0.243
11	10,598.51	0.243
12	10,616.06	0.244
13	10,633.61	0.244
14	10,651.16	0.245
15	10,668.71	0.245
16	10,795.67	0.248
17	10,795.42	0.248
18	10,794.86	0.248
19	10,794.29	0.248
20	10,793.73	0.248
21	10,793.17	0.248
22	10,792.60	0.248
23	10,792.04	0.248
24	10,791.47	0.248
25	10,790.91	0.248
26	10,790.35	0.248
27	12,859.23	0.295
28	13,073.76	0.300
29	10,790.24	0.248
30	10,790.00	0.248
31	10,790.00	0.248
32	10,790.00	0.248
33	12,987.73	0.298
Total	374,769.43	**8.604**

TABULATION	
TOTAL SITE AREA	12.43 Acres
TOTAL DEVELOPED AREA	12.43 Acres
TOTAL DISTURBED AREA	11.90 Acres
TOTAL LOT AREA	8.60 Acres
TOTAL ON-SITE STREET AREA	2.28 Acres
TOTAL ON-SITE OPEN SPACE	0.00 Acres
STORMWATER MANAGEMENT FACILITY	1.55 Acres
TOTAL ON-SITE RESIDUE	0.00 Acres

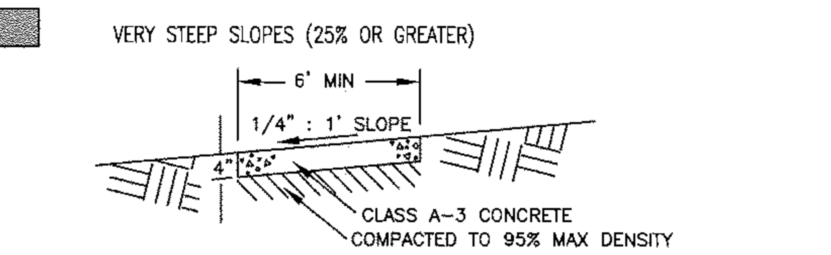
SOILS DESCRIPTIONS

TYPE	NAME	GROUP	SLOPE	CLASS	K-FACTOR
32C	MYERSVILLE AND MONTALTA	C	7-15%	VI	0.43
22E	LEW VERY STONY LOAM	B	25-65%	VII	0.32
21D	LEW CHANNERY LOAM	B	7-25%	VI	0.32

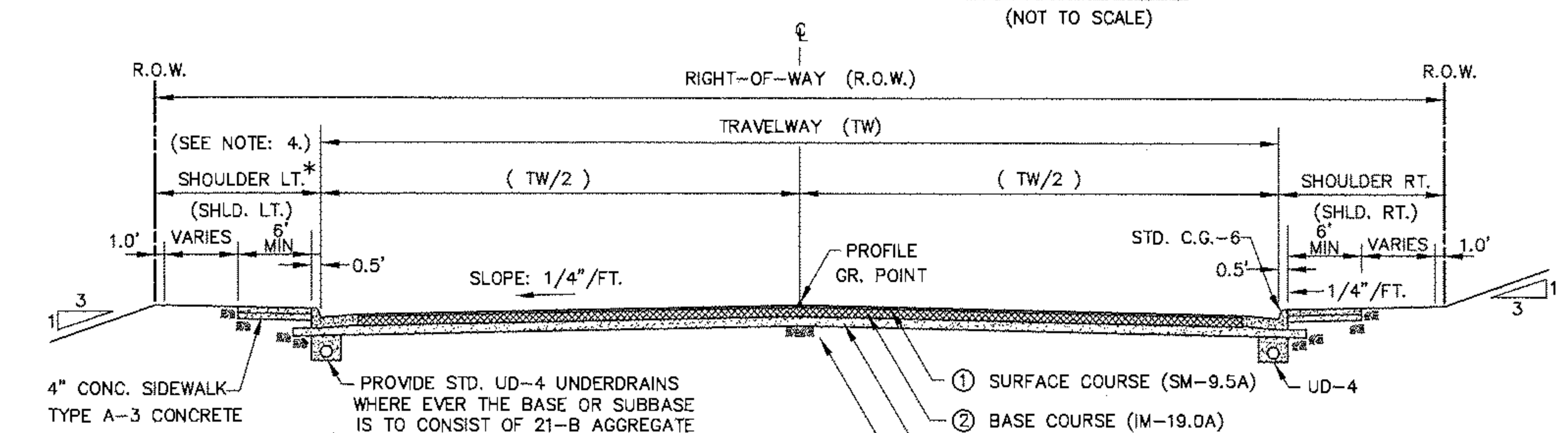
(78B) DENOTES SOIL TYPE

MODERATELY STEEP SLOPES (15%-25% SLOPE)

VERY STEEP SLOPES (25% OR GREATER)



TYPICAL SECTION SIDEWALK
(NOT TO SCALE)



TYPICAL CURB AND GUTTER PUBLIC STREET SECTION
NOT TO SCALE

STREET NAME	CLASSIFICATION/TERRAIN	ADT (10x#LOTS)	DESIGN SPEED	①	②	③	④	R.O.W.	TW.	MEDIAN	SHLD. (LT.)	SHLD. (RT.)
HAPPY RIDGE DRIVE	URBAN COLLECTOR/ROLLING	330	25	1 1/2"	3"	8"	N/A	60'	40'	N.A.	10.0'	10.0'
HAYMAKER LANE	STUB/SLOPE	N/A	25	1 1/2"	3"	8"	N/A	60'	40'	N.A.	10.0'	10.0'

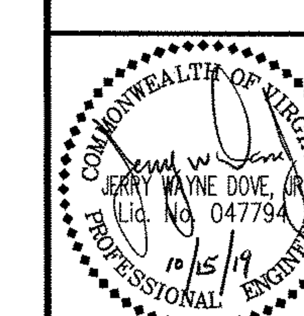
NOTE: NO TIA WAS PREFORMED FOR THIS SUBDIVISION

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

DETAILS, TYPICAL SECTIONS, & SOILS MAP
HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA



PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS
DATE	DESCRIPTION

GC DESIGN	MCW DRAWN	CHKD

SCALE H: AS SHOWN V:

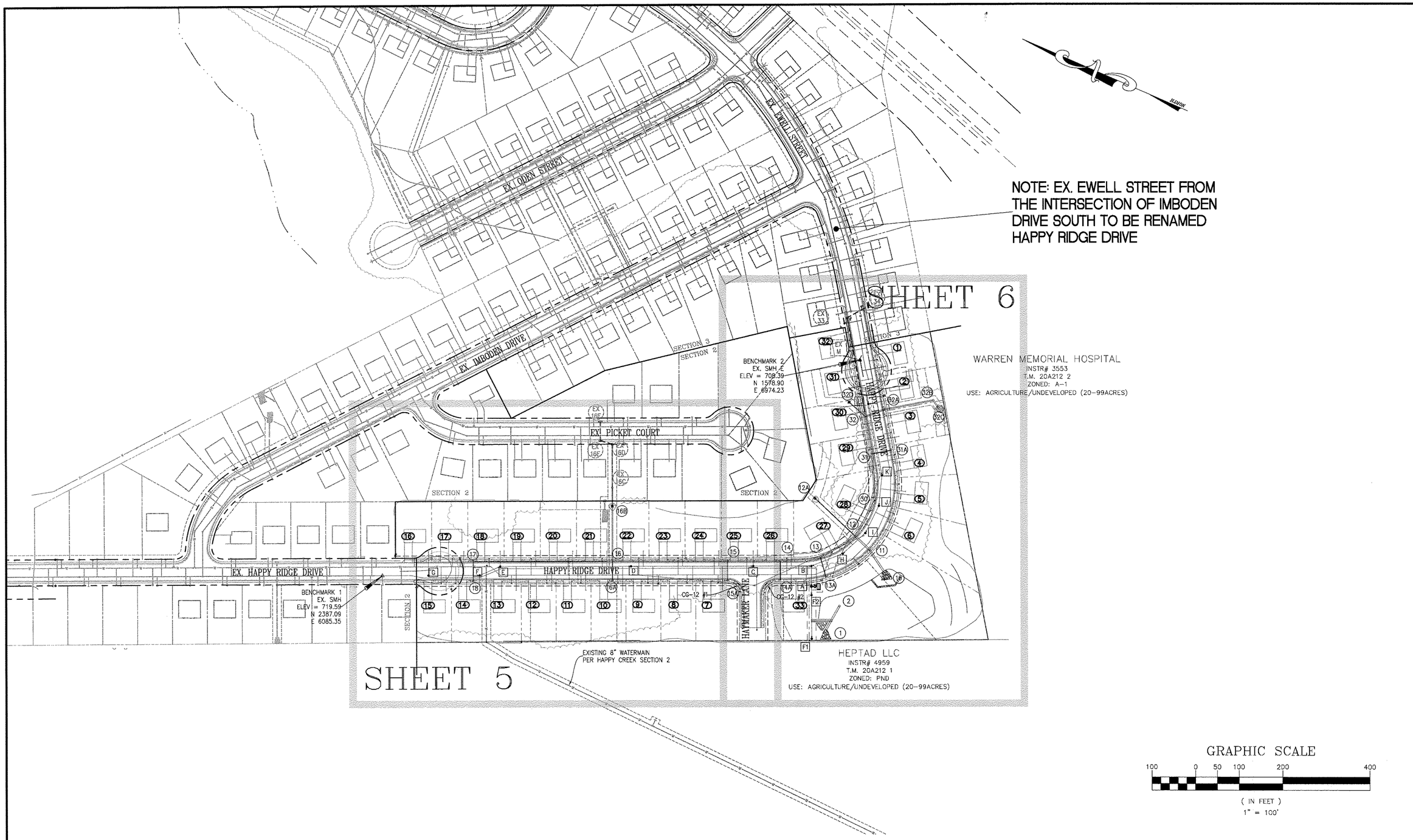
JOB No. 1602-02-016

DATE JULY 19, 2019

FILE No. 1602-D-CP-005

SHEET 2 OF 33

Cad file name: P:\1602 - happy creek knolls sec 3\1602-04-001 (eng)\engineering\engineering plans\Sheets\1602-D-CP-001-DET.dwg



GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1" = 100'

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com
© Bowman Consulting Group, Ltd.

SCHEMATIC PLAN

HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
WARREN COUNTY, VIRGINIA
TOWN OF FRONT ROYAL

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION
GC DESIGN	MCW DRAWN / CHKD
SCALE	H: 1"=100' V:
JOB No. 1602-02-016	
DATE JULY 19, 2019	
FILE No. 1602-D-CP-005	

SHEET 3 OF 33

Cad file name: P:\1602 - Happy Creek Knolls Sec. 4\1602-04-001 (DWG)\Engineering\Engineering Plans\Sheets\1602-D-CP-005-SCHM.dwg

NOTE: EX. EWELL STREET FROM THE INTERSECTION OF IMBODEN DRIVE SOUTH TO BE RENAMED HAPPY RIDGE DRIVE

WARREN MEMORIAL HOSPITAL
INSTR# 3553
T.M. 20A212 2
ZONED: A-1
USE: AGRICULTURE/UNDEVELOPED (20-99ACRES)

HEPTAD LLC
INSTR# 4959
T.M. 20A212 1
ZONED: PND
USE: AGRICULTURE/UNDEVELOPED (20-99ACRES)

TEST PIT REQUIRED

CONTRACTOR TO VERIFY HORIZONTAL AND VERTICAL LOCATION AND ELEVATION OF UTILITIES. CONTRACTOR TO NOTIFY BCG OF ANY DISCREPANCIES. CONTRACTOR TO SCHEDULE TEST PITS AND UTILITY MARKING WELL IN ADVANCE OF CONSTRUCTION. BCG WILL NOT BE RESPONSIBLE FOR DELAYS DUE TO CONTRACTOR'S INABILITY TO SCHEDULE THIS NECESSARY WORK.

*NOTE: PUMP STATION MAY BE ELIMINATED IF AN ON GRADE ALTERNATIVE ROUTE IS APPROVED.

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

GEOMETRIC PLAN

HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
WARREN COUNTY, VIRGINIA
TOWN OF FRONT ROYAL

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047796
10/5/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION
GC	MCW
DESIGN	DRAWN
SCALE	H: 1"=50' V:
JOB No. 1602-02-016	
DATE JULY 19, 2019	
FILE No. 1602-D-CP-005	
SHEET 4 OF 33	

Cad file name:K:\1602 - Happy Creek Knolls Sec 3\1602-01-00 (MW)\Engineering\Front\Sheets\1602-D-CP-001.dwg

NOTE: EX. EWELL STREET FROM THE INTERSECTION OF IMBODEN DRIVE SOUTH TO BE RENAMED HAPPY RIDGE DRIVE

NORTH

WARREN MEMORIAL HOSPITAL
INSTR# 3553
T.M. 20A212 2
ZONED: A-1
USE: AGRICULTURE/UNDEVELOPED (20-99ACRES)

HEPTAD LLC
INSTR# 4959
T.M. 20A212 1
ZONED: PND
USE: AGRICULTURE/UNDEVELOPED (20-99ACRES)

EX. IMBODEN DRIVE
EX. EWELL STREET
EX. PICKET COURT
HAPPY RIDGE DRIVE
HAYMAKER LANE
EX. HAPPY RIDGE DRIVE
SECTION 2
SECTION 3

LEGEND

- PROPOSED STREET LIGHT
- PROPOSED TRANSFORMER
- PROPOSED JUNCTION BOX
- PROPOSED 4" MAIN CONDUIT
- PROPOSED 4" SUB FEED
- EXISTING JUNCTION BOX
- EXISTING 4" MAIN CONDUIT
- EXISTING 4" SUB FEED

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

UTILITY PLAN
HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
WARREN COUNTY, VIRGINIA
TOWN OF FRONT ROYAL

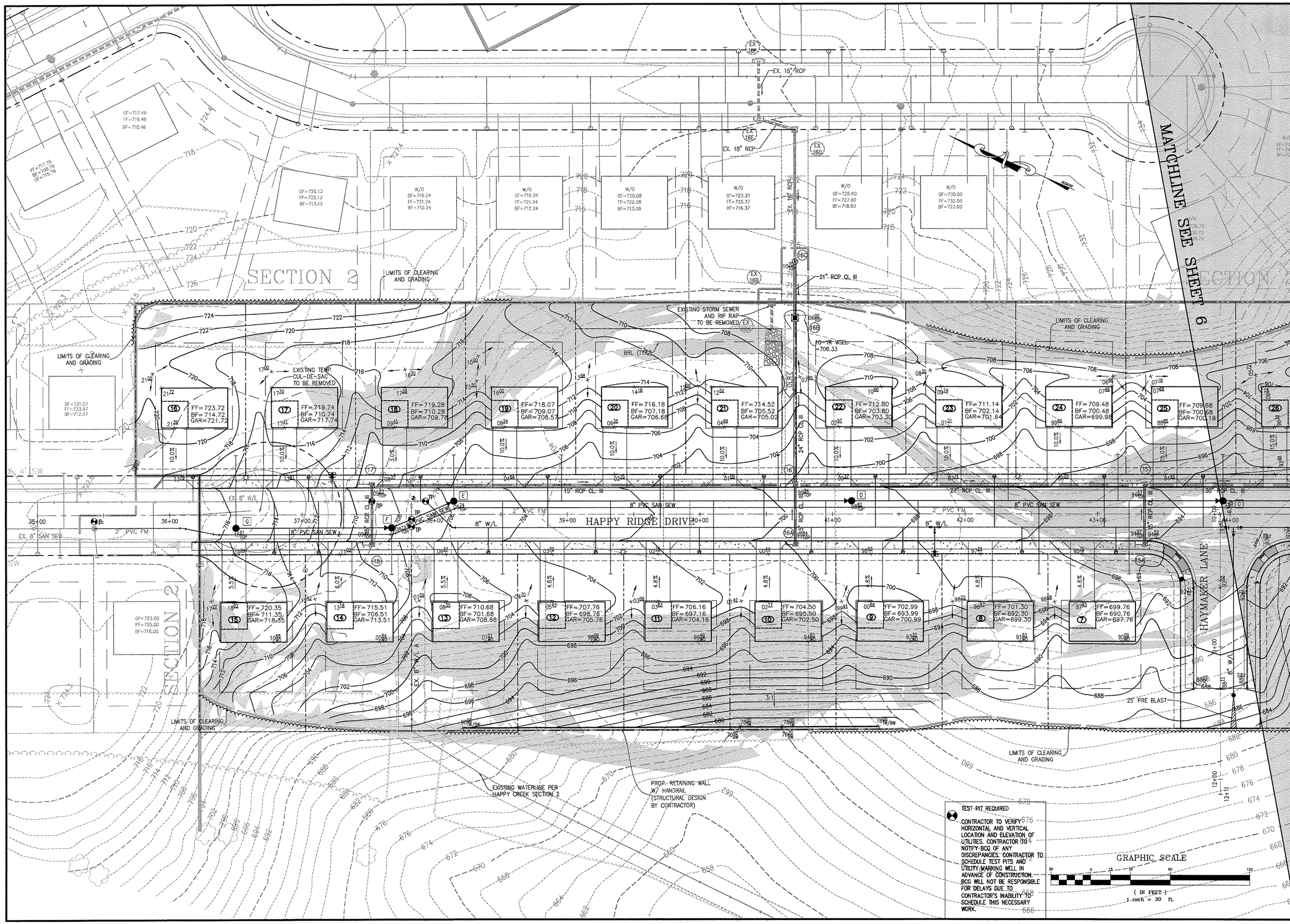
COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC DESIGN	MCW DRAWN	CHKD
SCALE	H: 1"=50' V:	
JOB No.	1602-02-016	
DATE	JULY 19, 2019	
FILE No.	1602-D-CP-005	
SHEET	4A OF 33	

Cad file name: P:\1602 - Happy Creek Knolls Sec 3\1602-04-001 (360)\Engineering\Engineering Plans\Sheets\1602-D-CP-001-UUP.dwg



Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

GRADING PLAN

HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN

WARREN COUNTY, VIRGINIA

TOWN OF FRONT ROYAL

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047796
PROFESSIONAL ENGINEER
10/15/19

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC	MCW	
DESIGN	DRAWN	CHKD

SCALE H: 1"=30' V:

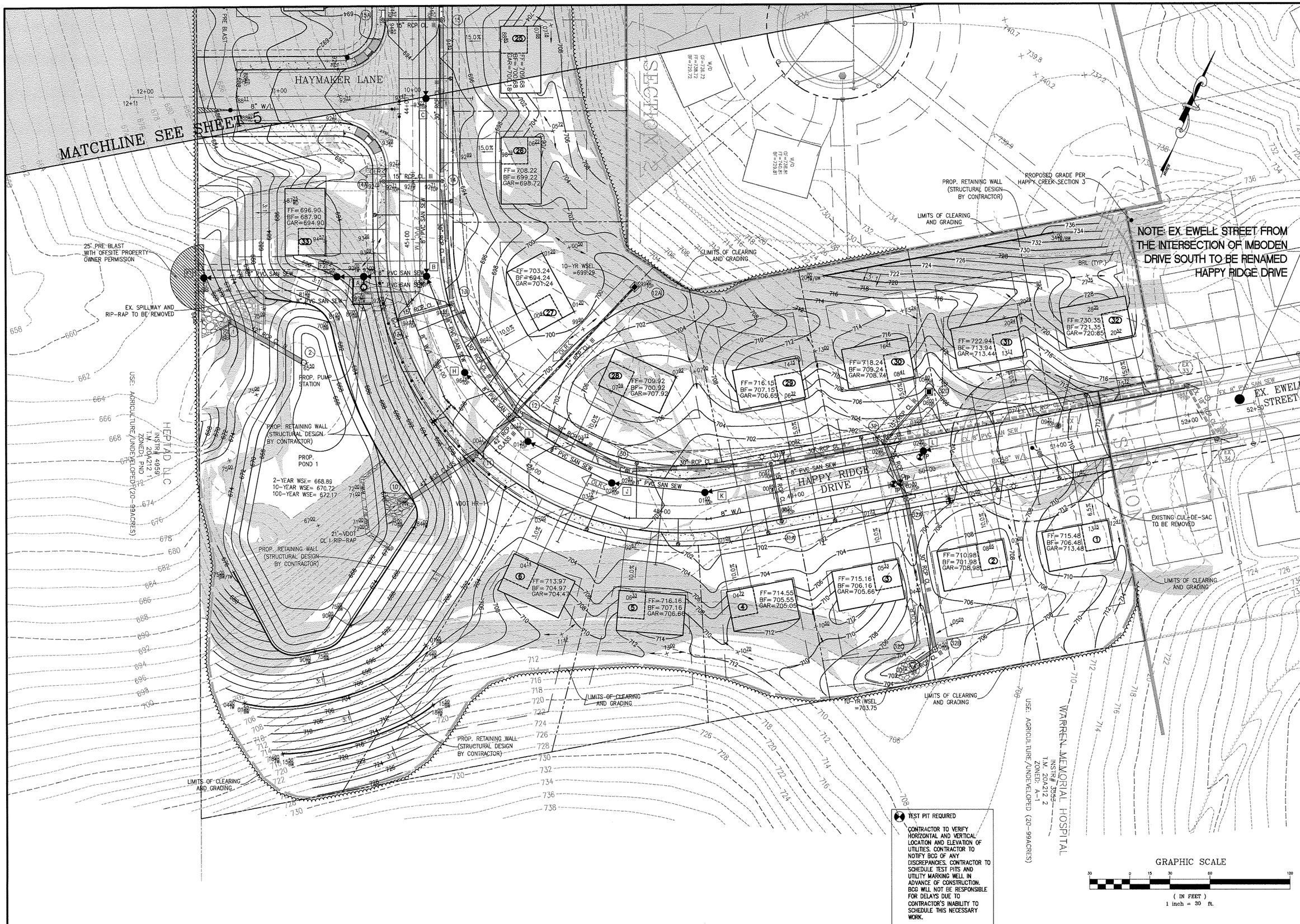
JOB No. 1602-02-016

DATE JULY 19, 2019

FILE No. 1602-D-CP-005

SHEET 5 OF 33

Cad file name: J:\1602 - Happy Creek, Phase Sec 4\1602-D-CP-001 (grd) (Mcwilliams)\grading plans\Sheet 5 1602-D-CP-001.dwg



Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com
© Bowman Consulting Group, Ltd.

GRADING PLAN

HAPPY CREEK KNOLLS SECTION 4

FINAL SUBDIVISION PLAN

TOWN OF FRONT ROYAL

WARREN COUNTY, VIRGINIA

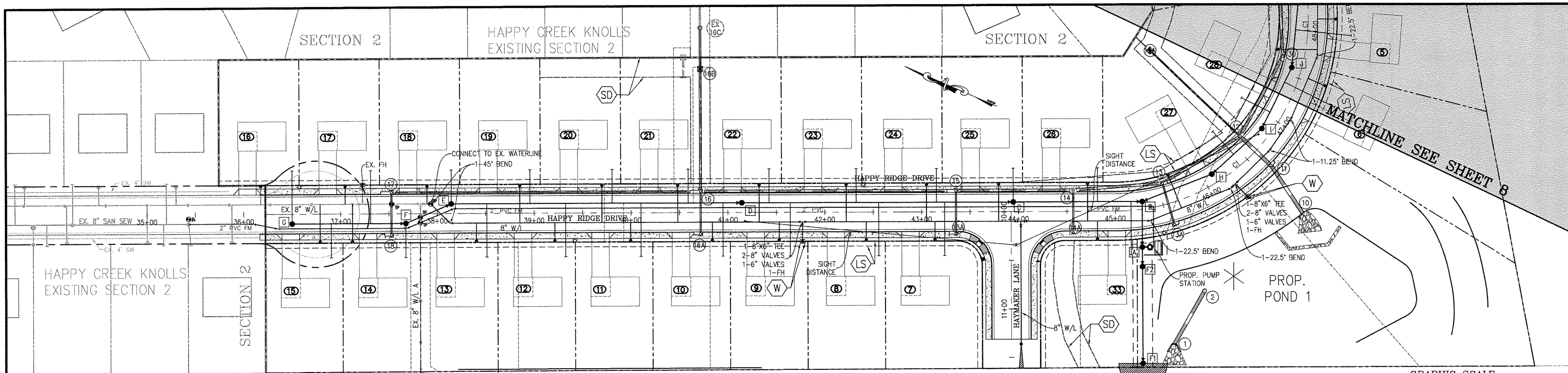
COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC DESIGN	MCW DRAWN	CHKD
SCALE	H: 1"=30' V:	
JOB No. 1602-02-016		
DATE JULY 19, 2019		
FILE No. 1602-D-CP-005		
SHEET 6 OF 33		

Cad file name: F:\1602 - Happy Creek Knolls Sec. 3\1602-D-CP-005.dwg



HAPPY RIDGE DRIVE

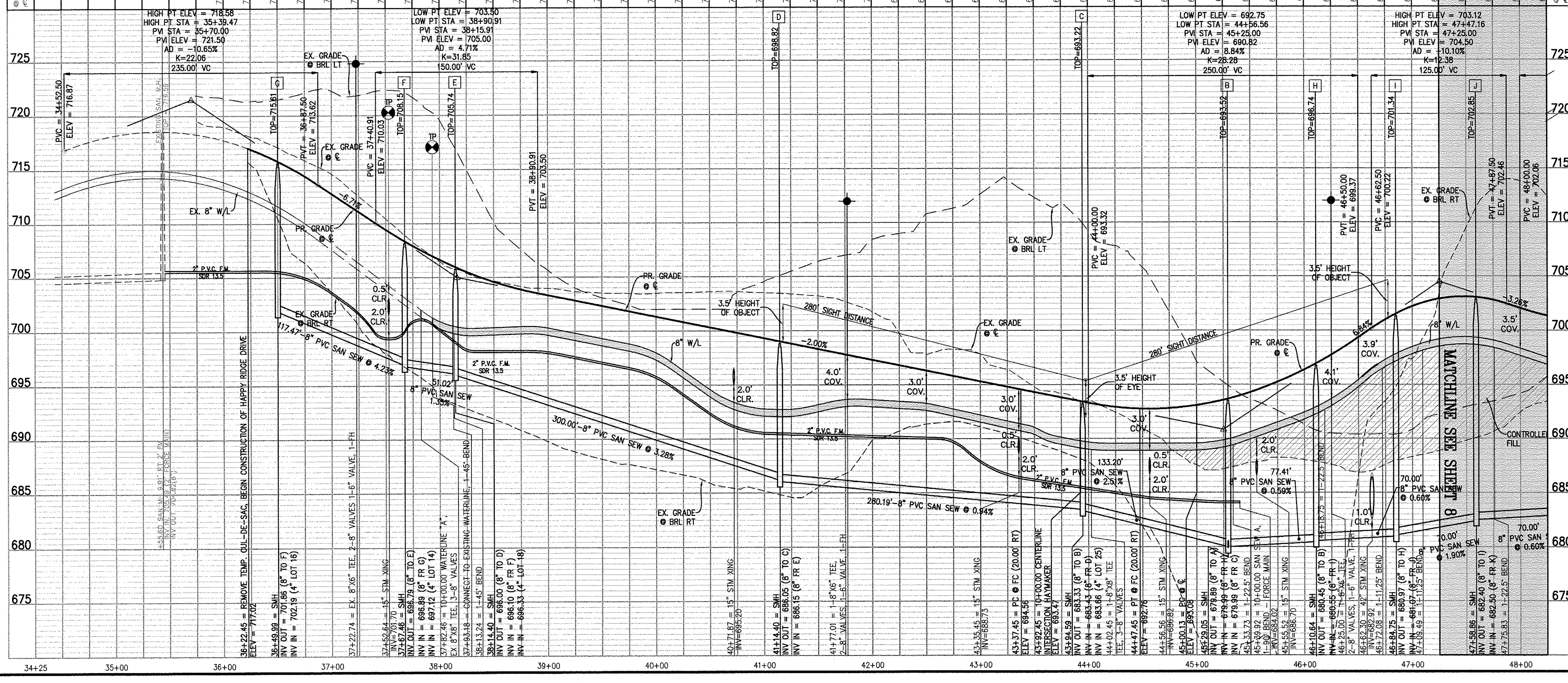
RIGHT-OF-WAY WIDTH 60'
DESIGN SPEED 25 MPH
SUPER ELEVATION: NA

ROADWAY CENTERLINE CURVE TABLE						
CURVE	LENGTH	RADIUS	DELTA	TANGENT	CHORD	CHORD DIRECTION
C1	351.00'	200'	100° 33' 77"	240.71	307.66	S 73° 49' 40" E

NOTE: PROPOSED PUMP STATION MAY BE ELIMINATED IF AN ON GRADE ALTERNATIVE ROUTE IS APPROVED

GRAPHIC SCALE
(IN FEET)
1 inch = 50 ft.

PROP GRADE @ TC					718.52	718.26	717.71	716.88	715.77	714.38	712.74	711.06	709.39	707.89	706.57	705.46	704.54	703.82	703.28	702.78	702.28	701.78	701.28	700.78	700.28	699.78	699.28	698.78	698.28	697.78	697.28	696.78	696.28	695.78	695.28	694.78	693.67	693.32	692.89	692.58	692.72	692.77	693.05	693.54	694.26	695.19	696.35	697.73	699.33	700.97	702.18	702.88	703.07	702.76	702.02	701.32	PROP GRADE @ TC
PROP GRADE @ ℄	716.77	717.64	718.23	718.53	718.56	718.30	717.75	716.92	715.81	714.42	712.78	711.10	709.44	707.93	706.62	705.50	704.58	703.86	703.32	702.82	702.32	701.82	701.32	700.82	700.32	699.82	699.32	698.82	698.32	697.82	697.32	696.82	696.32	695.82	695.32	694.82	694.32	693.82	693.32	692.93	692.76	692.81	693.09	693.58	694.30	695.23	696.39	697.77	699.37	701.02	702.22	702.92	703.12	702.81	702.06	701.36	PROP GRADE @ ℄
EX GRADE @ ℄							719.00	718.07	717.09	715.89	714.61	712.55	710.46	708.29	706.47	705.40	704.66	704.15	703.96	703.64	703.51	703.47	703.46	703.54	703.62	703.63	703.50	703.39	703.20	702.68	701.74	699.75	697.85	698.28	697.85	696.40	694.79	694.20	693.49	692.43	690.93	689.08	687.55	687.16	687.76	688.23	688.01	687.57	686.85	687.58	688.32	688.88	689.82	690.65	692.45	693.49	EX GRADE @ ℄



TP TEST PIT REQUIRED

CONTRACTOR TO VERIFY HORIZONTAL AND VERTICAL LOCATION AND ELEVATION OF UTILITIES. CONTRACTOR TO NOTIFY BCG OF ANY DISCREPANCIES. CONTRACTOR TO SCHEDULE TEST PITS AND UTILITY MARKING WELL IN ADVANCE OF CONSTRUCTION. BCG WILL NOT BE RESPONSIBLE FOR DELAYS DUE TO CONTRACTOR'S INABILITY TO SCHEDULE THIS NECESSARY WORK.

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

PLAN AND PROFILE – HAPPY RIDGE DRIVE

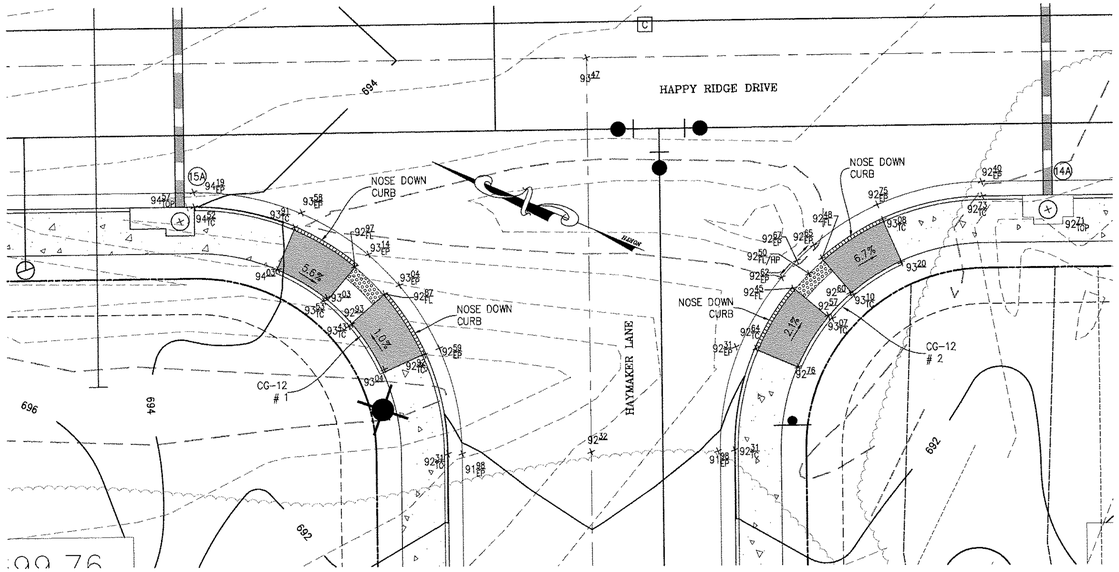
HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS
DATE	DESCRIPTION

GC DESIGN	MCW DRAWN	CHKD
SCALE	H: 1"=50' V: 1"=5'	
JOB No. 1602-02-016		
DATE JULY 19, 2019		
FILE No. 1602-D-CP-005		
SHEET 7 OF 33		

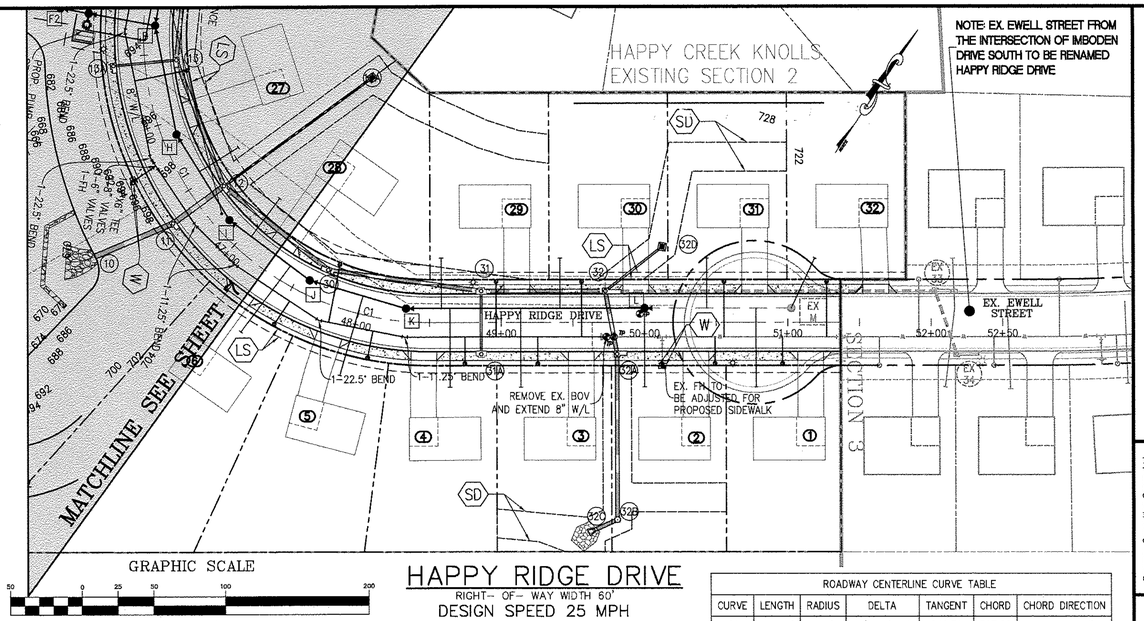
Cad file name:P:\1602 – Happy Creek Knolls Sec 3\1602-04-001 (ENG)\Engineering\Engineering Plans\Sheets\1602-D-CP-001-HAPPY RIDGE-RDP.dwg



GRAPHIC SCALE

(IN FEET)
1 inch = 1 ft.

DETAILED CG-12 GRADING



GRAPHIC SCALE

(IN FEET)
1 inch = 50 ft.

HAPPY RIDGE DRIVE

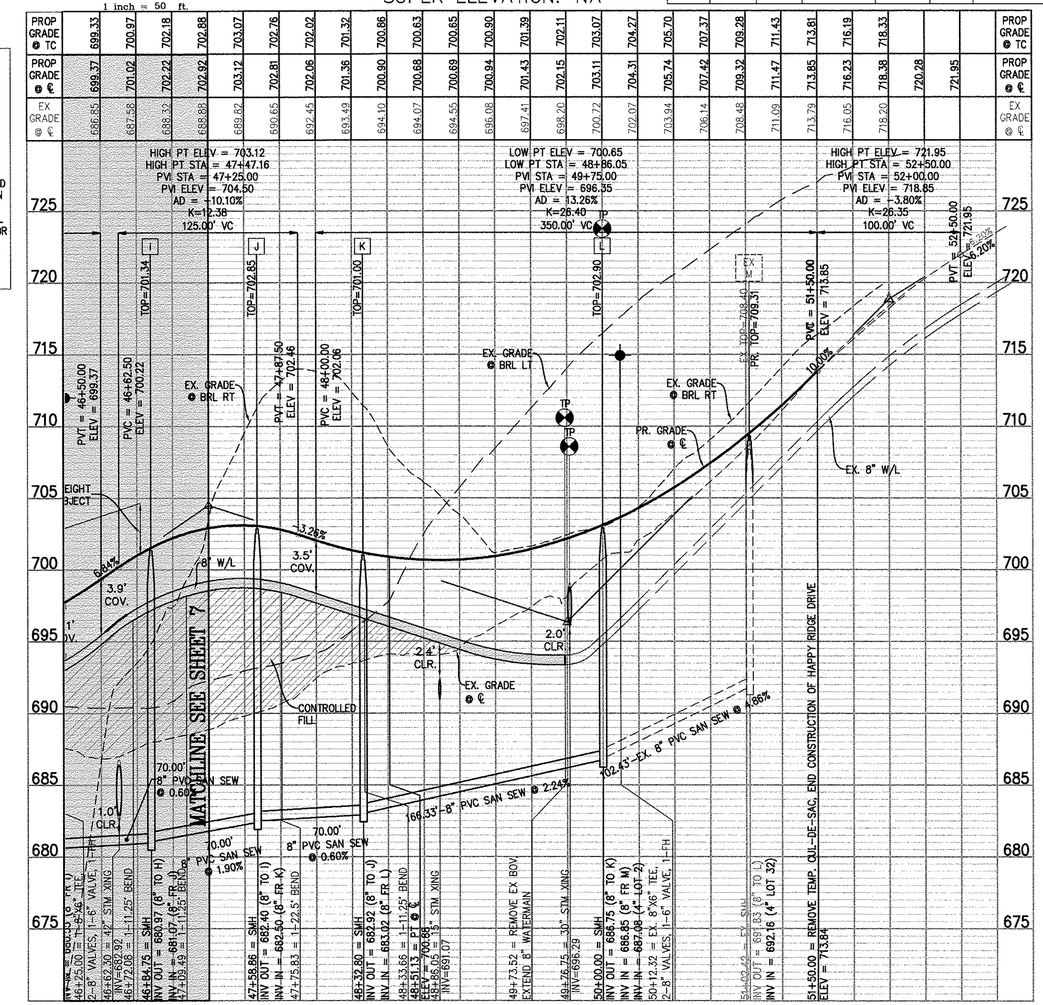
RIGHT-OF-WAY WIDTH 50'
DESIGN SPEED 25 MPH
SUPER ELEVATION: NA

ROADWAY CENTERLINE CURVE TABLE

CURVE	LENGTH	RADIUS	DELTA	TANGENT	CHORD	CHORD DIRECTION
C1	351.00'	200'	100° 33' 77"	240.71	307.66	S 73° 49' 40" E

TP — TEST PIT REQUIRED

CONTRACTOR TO VERIFY HORIZONTAL AND VERTICAL LOCATION AND ELEVATION OF UTILITIES. CONTRACTOR TO NOTIFY BCG OF ANY DISCREPANCIES. CONTRACTOR TO SCHEDULE TEST PITS AND UTILITY MARKING WELL IN ADVANCE OF CONSTRUCTION. BCG WILL NOT BE RESPONSIBLE FOR DELAYS DUE TO CONTRACTOR'S INABILITY TO SCHEDULE THIS NECESSARY WORK.



Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com
© Bowman Consulting Group, Ltd.

PLAN AND PROFILE – HAPPY RIDGE DRIVE

HAPPY CREEK KNOLLS SECTION 4

FINAL SUBDIVISION PLAN

WARREN COUNTY, VIRGINIA

TOWN OF FRONT ROYAL

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

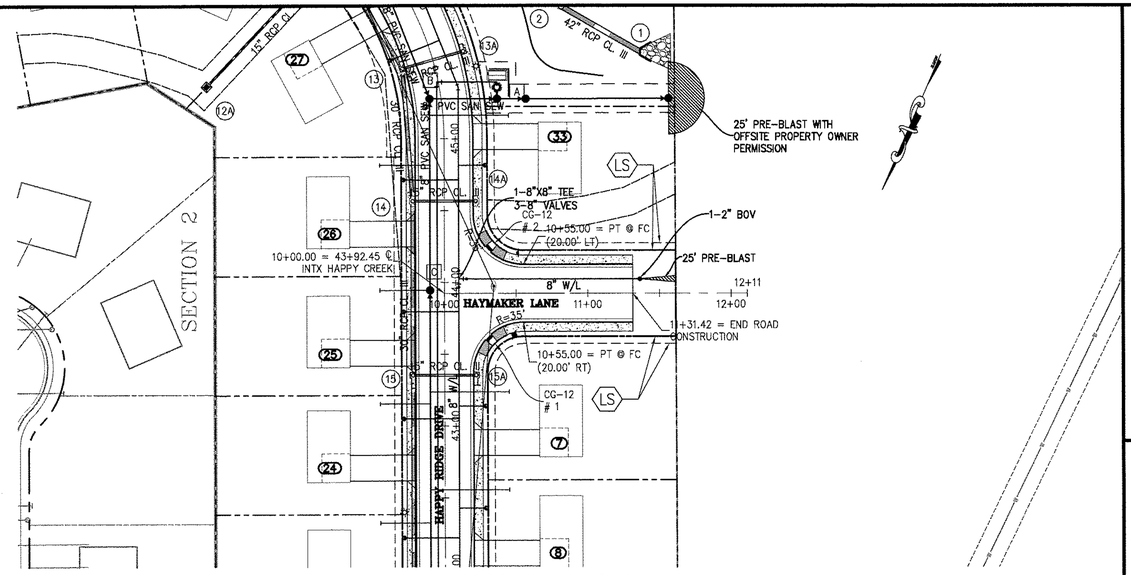
GC	MCW	CHKD
DESIGN	DRAWN	
SCALE	H: 1"=50' V: 1"=5'	

JOB No. 1602-02-016

DATE JULY 19, 2019

FILE No. 1602-D-CP-005

SHEET 8 OF 33



HAYMAKER LANE

RIGHT- OF- WAY WIDTH 60'

DESIGN SPEED 25 MPH

SUPER ELEVATION: NA

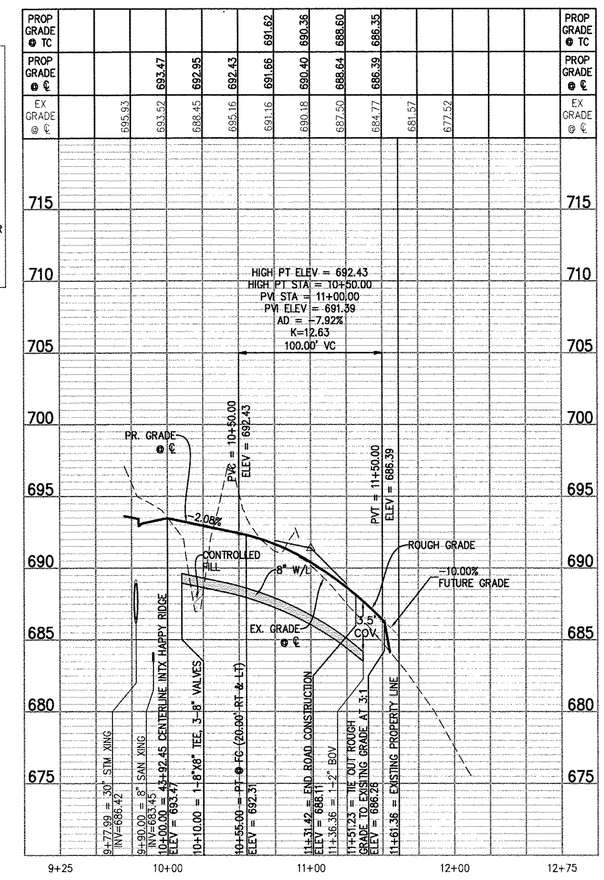
GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

TP TEST PIT REQUIRED

CONTRACTOR TO VERIFY HORIZONTAL AND VERTICAL LOCATION AND ELEVATION OF UTILITIES. CONTRACTOR TO NOTIFY BCG OF ANY DISCREPANCIES. CONTRACTOR TO SCHEDULE TEST PITS AND UTILITY MARKING WELL IN ADVANCE OF CONSTRUCTION. BCG WILL NOT BE RESPONSIBLE FOR DELAYS DUE TO CONTRACTOR'S INABILITY TO SCHEDULE THIS NECESSARY WORK.



Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com
© Bowman Consulting Group, Ltd.

PLAN AND PROFILE – HAYMAKER LANE

HAPPY CREEK KNOLLS SECTION 4

FINAL SUBDIVISION PLAN

TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
LIC. NO. 047794
PROFESSIONAL ENGINEER
7/15/19

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC DESIGN	MCW DRAWN	CHKD
SCALE	H: 1"=50' V: 1"=5'	

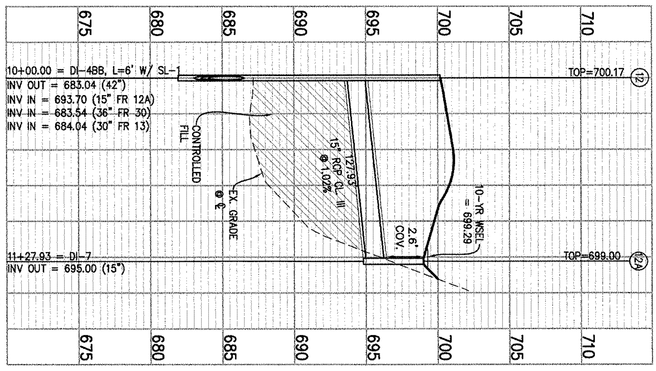
JOB No. 1602-02-016

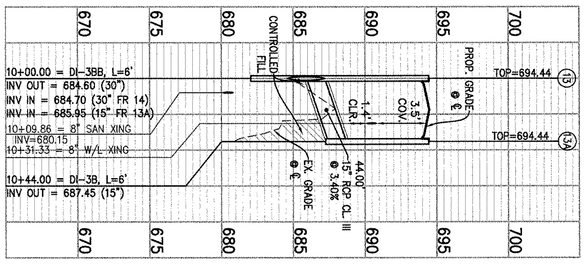
DATE JULY 19, 2019

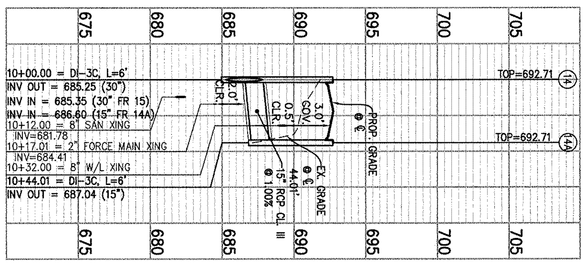
FILE No. 1602-0-CP-005

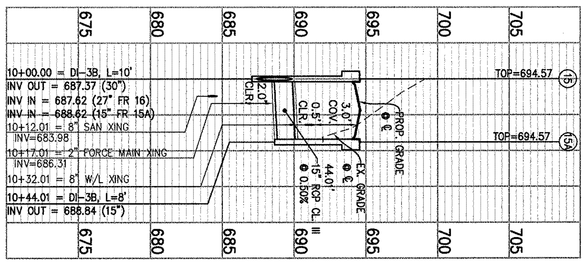
SHEET 9 OF 33

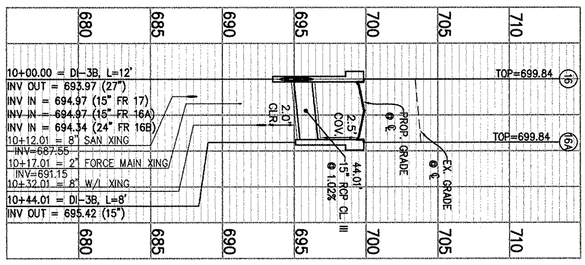
Cad file name: J:\1602 - Happy Creek Knolls Sec 3\1602-04-001 (Utility)\Engineering\Plans\Sheets\1602-0-CP-005-HAYMAKER-SDP.dwg

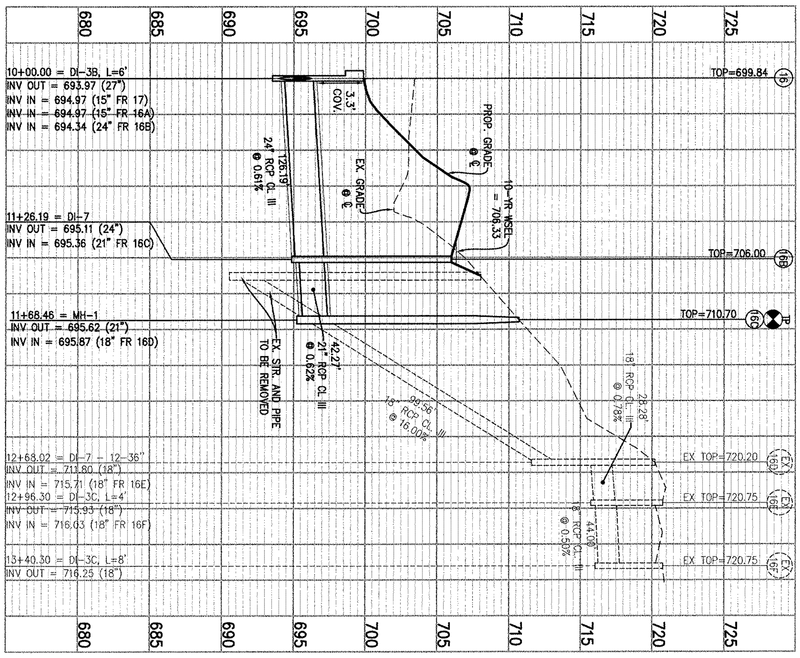






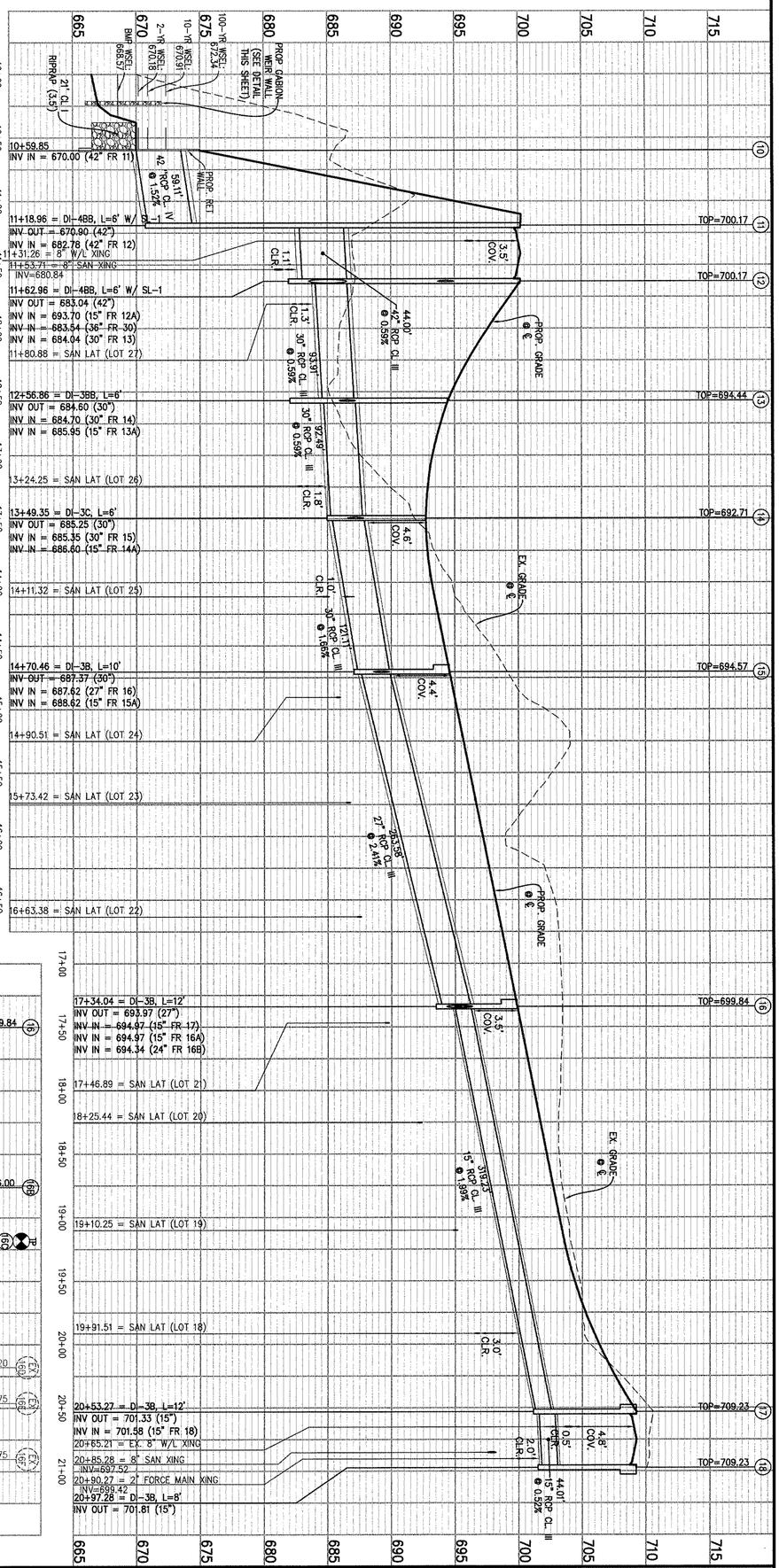






TP TEST PIT REQUIRED

CONTRACTOR TO VERIFY HORIZONTAL AND VERTICAL LOCATION AND ELEVATION OF UTILITIES. CONTRACTOR TO NOTIFY BOC OF ANY DISCREPANCIES. CONTRACTOR TO SCHEDULE TEST PITS AND UTILITY MARKING WELL IN ADVANCE OF CONSTRUCTION. BOC WILL NOT BE RESPONSIBLE FOR DELAYS DUE TO CONTRACTOR'S INABILITY TO SCHEDULE THIS NECESSARY WORK.



STORM SEWER PROFILES

HAPPY CREEK KNOLLS

SECTION 4

FINAL SUBDIVISION PLAN

TOWN OF FRONT ROYAL — WARREN COUNTY, VIRGINIA

DATE	DESCRIPTION
07/24/19	COUNTY SUBMISSION
07/07/19	COUNTY COMMENTS

COMMONWEALTH OF VIRGINIA — BRYAN W. CONE — LIC. NO. 047794 — PROFESSIONAL ENGINEER

DESIGN GC · DRAWN MCW · CHKD DMO · SCALE H: 1"=50' V: 1"=5' · JOB No. 1602-02-016 · DATE JULY 19, 2019 · FILE No. 1602-D-CP-005

SHEET 10 OF 33

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

Bowman CONSULTING

Cad file name: P:\1602 - Happy Creek Knolls Sec 3\1602-04-001 (Eng)\Engineering\Engineering Plans\Sheets\1602-D-CP-001-SDP.dwg

STORM INLET COMPUTATIONS

Inlet No.			Runoff to Inlet							Curb / Sump Inlet Computations															Runoff Intercepted					
Inlet Structure No.	Inlet Type	Length (ft)	Drainage Area (ac)	C	CA	Sum CA	I (in/hr)	Q, increm (cfs)	Q, carryover (cfs)	Qt, gutter (cfs)	S, gutter (ft/ft)	Sx, cross slope (ft/ft)	T, spread (ft)	W (ft)	W/T	Sw (ft/ft)	SwSx	Eo	a (in)	Sw = a/(12W)	Se (ft/ft) = Sx + SwEo	Lt (ft)	P, eff length (ft)	Lt/Lt	d (ft)	E	h (ft)	Q intercepted	dh	Qb, carryover (cfs)	d, sump (ft)	T, spread at sag (ft)	Remarks
14	DI-3C	6	0.83	0.48	0.40		4.00	1.59	0.00	1.59	0.00	0.0208	–	2.00	–	0.08	4.00	–	–	–	–	–	9.60	–	0.00	–	0.46	1.59	0.00	0.00	0.20	3.51	Sag
14	DI-3C	6	0.40	0.48	0.19		4.00	0.77	0.00	0.77	0.02	0.0208	3.15	2.00	0.63	0.08	4.00	–	–	–	–	–	–	–	0.19	–	–	–	–	–	–	–	Left
14	DI-3C	6	0.43	0.48	0.21		4.00	0.83	0.00	0.83	0.07	0.0208	1.88	2.00	1.07	0.08	4.00	–	–	–	–	–	–	–	0.16	–	–	–	–	–	–	–	Right
14A	DI-3C	6	0.10	0.84	0.08		4.00	0.34	0.00	0.34	0.00	0.0208	–	2.00	–	0.08	4.00	–	–	–	–	–	9.60	–	0.00	–	0.46	0.34	0.00	0.00	0.07	0.84	Sag
14A	DI-3C	6	0.02	0.84	0.02		4.00	0.07	0.00	0.07	0.02	0.0208	0.93	2.00	2.16	0.08	4.00	–	–	–	–	–	–	–	0.08	–	–	–	–	–	–	–	Left
14A	DI-3C	6	0.08	0.84	0.07		4.00	0.27	0.00	0.27	0.07	0.0208	1.23	2.00	1.62	0.08	4.00	–	–	–	–	–	–	–	0.10	–	–	–	–	–	–	–	Right
31	DI-3CC	6	0.40	0.54	0.22		4.00	0.86	0.00	0.86	0.00	0.0208	–	2.00	–	0.08	4.00	–	–	–	–	–	9.60	–	0.00	–	0.46	0.86	0.00	0.00	0.13	1.58	Sag
31	DI-3CC	6	0.20	0.54	0.11		4.00	0.43	0.00	0.43	0.03	0.0208	1.69	2.00	1.18	0.08	4.00	–	–	–	–	–	–	–	0.14	–	–	–	–	–	–	–	Left
31	DI-3CC	6	0.20	0.54	0.11		4.00	0.43	0.00	0.43	0.10	0.0208	1.37	2.00	1.46	0.08	4.00	–	–	–	–	–	–	–	0.11	–	–	–	–	–	–	–	Right
31A	DI-3CC	6	1.09	0.54	0.59		4.00	2.35	0.00	2.35	0.00	0.0208	–	2.00	–	0.08	4.00	–	–	–	–	–	9.60	–	0.00	–	0.46	2.35	0.00	0.00	0.26	6.34	Sag
31A	DI-3CC	6	1.00	0.54	0.54		4.00	2.16	0.00	2.16	0.03	0.0208	5.76	2.00	0.35	0.08	4.00	–	–	–	–	–	–	–	0.24	–	–	–	–	–	–	–	Left
31A	DI-3CC	6	0.09	0.54	0.05		4.00	0.19	0.00	0.19	0.10	0.0208	1.02	2.00	1.97	0.08	4.00	–	–	–	–	–	–	–	0.08	–	–	–	–	–	–	–	Right
18	DI-3B	8	0.26	0.66	0.17	–	4.00	0.69	0.00	0.69	0.06	0.0208	1.78	2.00	1.12	0.08	4.00	1.00	3.50	0.15	0.17	8.09	–	0.99	0.15	1.00	0.46	0.69	0.32	0.00	–	–	
17	DI-3B	12	0.59	0.60	0.35	–	4.00	1.42	0.00	1.42	0.06	0.0208	3.30	2.00	0.61	0.08	4.00	0.98	3.50	0.15	0.16	11.09	–	1.08	0.19	1.00	0.46	1.42	0.42	0.00	–	–	
16A	DI-3B	8	0.50	0.66	0.33	–	4.00	1.32	0.00	1.32	0.02	0.0208	4.91	2.00	0.41	0.08	4.00	0.89	3.50	0.15	0.15	8.06	–	0.99	0.23	1.00	0.46	1.32	0.49	0.00	–	–	
16	DI-3B	12	0.92	0.66	0.61	–	4.00	2.43	0.00	2.43	0.02	0.0208	7.06	2.00	0.28	0.08	4.00	0.74	3.50	0.15	0.13	11.43	–	1.05	0.27	1.00	0.46	2.43	0.59	0.00	–	–	
15A	DI-3B	8	0.39	0.66	0.26	–	4.00	1.03	0.00	1.03	0.02	0.0208	4.09	2.00	0.49	0.08	4.00	0.94	3.50	0.15	0.16	7.05	–	1.13	0.21	1.00	0.46	1.03	0.46	0.00	–	–	
15	DI-3B	10	0.87	0.54	0.47	–	4.00	1.88	0.00	1.88	0.02	0.0208	6.13	2.00	0.33	0.08	4.00	0.81	3.50	0.15	0.14	9.84	–	1.02	0.25	1.00	0.46	1.88	0.55	0.00	–	–	
12	DI-4BB	6	0.10	0.72	0.07	–	4.00	0.29	0.00	0.29	0.03	0.0208	1.46	2.00	1.37	0.08	4.00	1.00	3.50	0.15	0.17	4.60	–	1.30	0.12	1.00	0.46	0.29	0.26	0.00	–	–	
11	DI-4BB	6	0.12	0.72	0.09	–	4.00	0.35	0.00	0.35	0.03	0.0208	1.56	2.00	1.28	0.08	4.00	1.00	3.50	0.15	0.17	4.97	–	1.21	0.13	1.00	0.46	0.35	0.28	0.00	–	–	
13A	DI-3B	6	0.08	0.84	0.07	–	4.00	0.27	0.00	0.27	0.04	0.0208	1.37	2.00	1.46	0.08	4.00	1.00	3.50	0.15	0.17	4.75	–	1.28	0.11	1.00	0.46	0.27	0.25	0.00	–	–	
13	DI-3BB	6	0.20	0.60	0.12	–	4.00	0.48	0.00	0.48	0.04	0.0208	1.70	2.00	1.18	0.08	4.00	1.00	3.50	0.15	0.17	6.06	–	0.99	0.14	1.00	0.46	0.48	0.31	0.00	–	–	
30	DI-4AA (sump)	2.5	0.02	0.72	0.01	–	4.00	0.06	0.00	0.06	0.01	0.0208	0.99	2.00	2.02	0.08	–	–	–	–	–	–	6.10	–	0.08	–	0.46	0.06	0.18	0.00	0.04	0.47	
32	DI-3BB	12	0.62	0.60	0.49	–	4.00	1.97	0.00	1.97	0.02	0.0208	7.93	2.00	0.25	0.08	4.00	0.69	3.50	0.15	0.12	10.36	–	1.16	0.29	1.00	0.46	1.97	0.63	0.00	–	–	
32A	DI-3B	8	0.43	0.60	0.26	–	4.00	1.03	0.00	1.03	0.02	0.0208	4.37	2.00	0.46	0.08	4.00	0.93	3.50	0.15	0.16	6.78	–	1.18	0.22	1.00	0.46	1.03	0.47	0.00	–	–	

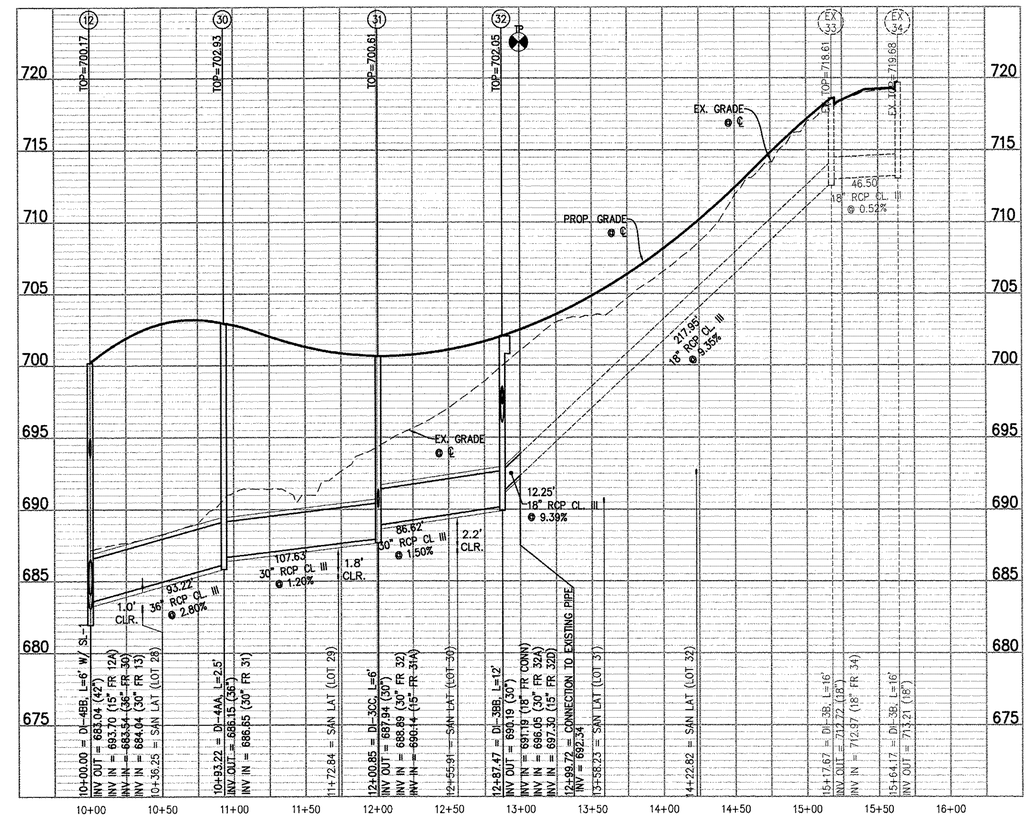
STORM SEWER CALCULATIONS

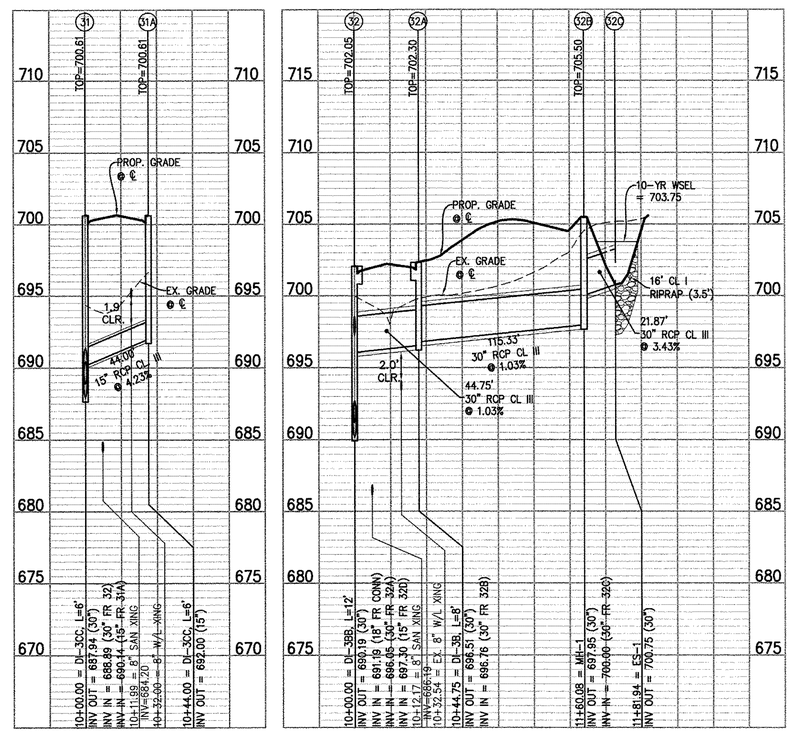
From Point	To Point	Drain Area "A" (acres)	Runoff Coeff., C	CA Increment	CA Accumulated	Inlet Time (min)	Rainfall (in/hr)	Runoff, Q (cfs)	Upper End Inv	Lower End Inv	Pipe Length (ft)	Slope (ft/ft)	Dia (in)	Capacity (cfs)	Velocity Full Flow (fps)	Velocity Partial Flow (fps)	Flow Time (sec.)	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(16)	(17)	(18)
18	17	0.26	0.66	0.17	0.17	5.0	6.70	1.14	701.81	701.58	44.01	0.0052	15	4.66	3.8	3.1	14.0	
17	16	0.59	0.60	0.35	0.52	5.2	6.61	3.44	701.33	694.97	319.23	0.0199	15	9.11	7.5	6.9	46.1	
EX16F	EX16E	1.08	0.54	0.58	0.58	5.0	6.70	3.89	716.25	716.03	44.00	0.0050	18	7.42	4.2	4.3	10.3	EXISTING STORM SEWER
EX16E	EX16D	0.84	0.54	0.45	1.03	5.2	6.64	6.84	715.93	715.71	28.28	0.0078	18	9.26	5.3	5.7	4.9	EXISTING STORM SEWER
EX16D	16C	0.00	0.00	0.00	1.03	5.3	6.61	6.81	711.80	695.87	99.56	0.1600	18	41.99	23.9	17.5	5.7	EXISTING STORM SEWER
16C	16B	0.00	0.00	0.00	1.03	5.3	6.57	6.77	695.62	695.36	42.27	0.0062	21	12.43	5.2	5.3	8.0	
16B	16	1.81	0.45	0.81	1.84	5.5	6.53	12.01	695.11	694.34	126.19	0.0061	24	17.68	5.6	6.1	20.8	
16A	16	0.50	0.66	0.33	0.33	5.0	6.70	2.21	695.42	694.97	44.01	0.0102	15	6.52	5.3	4.8	9.1	
15A	15	0.39	0.66	0.26	0.26	5.0	6.70	1.74	688.84	688.62	44.01	0.0050	15	4.56	3.7	3.5	12.7	
14A	14	0.10	0.84	0.08	0.08	5.0	6.70	0.54	687.04	686.60	44.01	0.0100	15	6.45	5.3	3.2	13.8	
13A	13	0.08	0.84	0.07	0.07	5.0	6.70	0.47	687.45	685.95	44.00	0.0341	15	11.91	5.3	3.1	14.2	
12A	12	1.34	0.48	0.64	0.64	5.0	6.70	4.29	695.00	693.70	127.93	0.0102	15	6.50	5.3	5.7	22.5	
16	15	0.92	0.66	0.61	3.30	5.8	6.41	21.14	693.97	687.62	263.58	0.0241	27	48.11	12.1	11.7	22.5	
15	14	0.87	0.54	0.47	4.03	6.2	6.28	25.32	687.37	685.35	121.11	0.0167	30	53.03	10.8	10.7	11.3	
14	13	0.83	0.48	0.40	4.51	6.4	6.22	28.07	685.25	684.70	92.49	0.0059	30	31.67	6.5	7.3	12.7	
13	12	0.20	0.60	0.12	4.70	6.6	6.16	28.94	684.60	684.04	93.91	0.0060	30	31.71	6.5	7.3	12.8	
32D	32	0.35	0.60	0.21	0.21	5.0	6.70	1.41	697.55	697.30	50.31	0.0050	15	4.55	3.7	3.3	15.4	
32C	32B	16.17	0.36	5.82	5.82	10.0	5.28	30.75	700.75	700.00	21.87	0.0343	30	76.04	15.5	14.7	1.5	
32B	32A	0.00	0.00	0.00	5.82	10.0	5.28	30.72	697.95	696.76	115.33	0.0103	30	41.71	8.5	9.3	12.4	
32A	32	0.43	0.60	0.26	6.08	10.2	5.23	31.82	696.51	696.05	44.75	0.0103	30	41.63	8.5	9.4	4.8	
32	31	0.82	0.60	0.49	7.47	10.3	5.22	38.97	690.19	688.89	86.62	0.0150	30	50.31	10.3	11.3	7.6	
31A	31	1.09	0.54	0.59	0.59	5.0	6.70	3.95	692.00	690.14	44.00	0.0423	15	13.27	8.7	8.1	5.5	
EX34	EX33	0.73	0.57	0.42	0.42	5.0	6.70	2.81	713.21	712.97	46.50	0.0052	18	7.54	4.3	4.0	11.7	Existing Storm Sewer
EX33	CONN	0.47	0.57	0.27	0.69	5.2	6.63	4.57	712.72	692.34	217.95	0.0935	18	32.10	18.2	12.9	16.9	Existing Storm Sewer
CONN	32	0.00	0.00	0.00	0.69	5.5	6.53	4.50	692.34	691.19	12.25	0.0939	18	32.17	18.3	12.9	1.0	
31	30	0.40	0.54	0.22	8.28	10.4	5.19	42.98	687.94	686.65	107.63	0.0120	30	44.96	9.2	8.7	12.3	
30	12	0.02	0.72	0.01	8.29	10.6	5.15	42.68	686.15	683.54	93.22	0.0280	36	111.80	8.5	9.2	10.1	
12	11	0.10	0.72	0.07	13.70	10.8	5.11	70.07	683.04	682.78	44.00	0.0059	42	77.51	8.1	9.1	4.8	
11	10	0.12	0.72	0.09	13.79	10.9	5.10	70.31	670.90	670.00	59.11	0.0152	42	124.42	12.9	13.3	4.4	

NOTE: 1. ALL INLETS TO EMPLOY IS-1 INLET SHAPING

TP TEST PIT REQUIRED

CONTRACTOR TO VERIFY HORIZONTAL AND VERTICAL LOCATION AND ELEVATION OF UTILITIES. CONTRACTOR TO NOTIFY BCG OF ANY DISCREPANCIES. CONTRACTOR TO SCHEDULE TEST PITS AND UTILITY MARKING WELL IN ADVANCE OF CONSTRUCTION. BCG WILL NOT BE RESPONSIBLE FOR DELAYS DUE TO CONTRACTOR'S INABILITY TO SCHEDULE THIS NECESSARY WORK.





Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

STORM SEWER PROFILES & COMPUTATIONS

HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
WARREN COUNTY, VIRGINIA
TOWN OF FRONT ROYAL

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047791
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS

07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC MCW
DESIGN DRAWN CHKD
SCALE H: 1"=50' V: 1"=5'
JOB No. 1602-02-016
DATE JULY 19, 2019
FILE No. 1602-D-CP-005

SHEET 11 OF 33

Cad file name: P:\1602 - Happy Creek Knolls Sec 4\1602-04-001 (DWG)\Engineering\Plans\Sheets\1602-D-CP-005-SSP.dwg

GRATE INLET DESIGN COMPUTATIONS

STRUCTURE #	TYPE	AREA (Ac.)	"C"	"I" (in/hr)	GRATE DESIGN FLOW (cfs)	AREA$_{50}$ (sf)	PERIM$_{50}$ (ft)	DEPTH (ft)	REMARKS
12A	DI-7 TYPE 2	1.34	0.48	6.70	4.31	2.00	9.42	0.29	
16B	DI-7 TYPE 2	1.81	0.45	6.70	5.46	2.00	9.42	0.33	
32D	DI-1	0.35	0.60	6.70	1.41	1.17	6.75	0.17	

NOTE: GRATE COMPUTATIONS ASSUME 50% CLOGGING

PIPE OUTLET PROTECTION

Outfall	10-Year Discharge (cfs)	10-Year Velocity (fps)	Outlet Pipe D_o (in)	Required as per VESCH Std. & Spec. 3.18 L_a (ft)	W (ft)	Provided $3*D_o$ (ft)	L_a (ft)	W (ft)	Remarks
* 10	70.31	12.95	42	21	24.5	10.5	21	26	CL I RIPRAP
* 1	45.96	6.89	42	21	24.5	10.5	21	26	CL I RIPRAP

NOTE: 1) Flows and Velocities are calculated using the Rational Method and Mannings Formula.
*A minimum tailwater condition was used to calculate apron lengths.
**A maximum tailwater condition was used to calculate apron lengths.

HYDRAULIC GRADE LINE COMPUTATIONS

INLET NUMBER	OUTLET WATER SURFACE ELEV.	D_o	Q_o	L_o	S_{fo} (%)	H_f	JUNCTION LOSS V_o	H_o	Q_i	V_i	Q_iV_i	$V_i^2/2g$	H_j	ANGLE	H_A	H_t	$1.3H_t$	$0.5H_t$	FINAL H	INLET WATER SURFACE ELEVATION	RIM ELEV.
11	672.80	42	70.3	59	0.49	0.29	13.3	0.690	70.1	9.1	639.6	1.29	0.45	0	0.00	1.14	–	0.57	0.86	673.66	700.17
12	685.58	42	70.1	44	0.48	0.21	9.1	0.323	–	–	–	–	0.00	0	0.00	0.32	–	0.16	0.37	685.95	700.17
13	686.04	30	28.9	94	0.50	0.47	7.3	0.209	28.1	7.3	204.8	0.83	0.29	0	0.00	0.50	–	0.25	0.71	686.75	694.44
14	686.75	30	28.1	92	0.47	0.43	7.3	0.207	25.3	10.7	270.8	1.78	0.62	0	0.00	0.83	–	0.41	0.84	687.60	692.71
15	687.60	30	25.3	121	0.38	0.46	10.7	0.444	21.1	11.7	247.9	2.14	0.75	0	0.00	1.19	–	0.60	1.05	688.65	694.57
16	689.42	27	21.1	264	0.46	1.22	11.7	0.534	3.4	6.9	23.8	0.74	0.26	0	0.00	0.79	–	0.40	1.62	695.01	699.84
17	695.97	15	3.4	319	0.28	0.90	6.9	0.186	1.1	3.1	3.6	0.15	0.05	0	0.00	0.24	0.31	0.16	1.06	701.86	709.23
18	702.58	15	1.1	44	0.03	0.01	3.1	0.038	–	–	–	–	0.00	0	0.00	0.04	0.05	0.03	0.04	702.62	709.23
12A	694.70	15	4.3	128	0.44	0.56	5.7	0.125	–	–	–	–	0.00	0	0.00	0.13	0.16	0.08	0.64	695.74	699.00
13A	686.95	15	0.5	44	0.01	0.00	3.1	0.037	–	–	–	–	0.00	0	0.00	0.04	0.05	0.02	0.03	687.68	694.44
14A	687.60	15	0.5	44	0.01	0.00	3.2	0.040	–	–	–	–	0.00	0	0.00	0.04	0.05	0.03	0.03	687.63	692.71
15A	689.62	15	1.7	44	0.07	0.03	3.5	0.047	–	–	–	–	0.00	0	0.00	0.05	0.06	0.03	0.06	689.68	694.57
16A	695.97	15	2.2	44	0.12	0.05	4.8	0.090	–	–	–	–	0.00	0	0.00	0.09	0.12	0.06	0.11	696.08	699.84
16B	695.94	24	12.0	126	0.28	0.35	6.1	0.143	6.8	5.3	35.8	0.43	0.15	0	0.00	0.29	0.38	0.19	0.55	696.49	706.00
EX16D	697.73	18	6.8	160	0.42	0.42	17.5	1.191	6.8	5.7	39.3	0.51	0.18	0	0.00	1.37	–	0.69	1.10	712.21	720.20
EX16E	716.91	18	6.8	28	0.42	0.12	5.7	0.128	3.9	4.3	16.6	0.28	0.10	0	0.00	0.23	0.29	0.15	0.27	717.18	720.75
EX16F	717.23	18	3.9	44	0.14	0.06	4.3	0.070	–	–	–	–	0.00	0	0.00	0.07	0.09	0.05	0.11	717.34	720.75
30	687.80	36	42.7	93	0.41	0.38	9.2	0.330	43.0	8.7	375.1	1.18	0.41	0	0.00	0.74	–	0.37	0.75	688.55	702.93
31	688.65	30	43.0	108	1.09	1.18	8.7	0.296	39.0	11.3	441.7	1.99	0.70	0	0.00	0.99	–	0.50	1.67	690.40	700.61
32	690.89	30	39.0	87	0.90	0.78	11.3	0.499	4.5	12.9	58.0	2.57	0.90	0	0.00	1.40	–	0.70	1.48	692.37	702.05
CONN	692.39	18	4.5	12	0.18	0.02	12.9	0.643	4.6	12.9	59.0	2.59	0.91	0	0.00	1.55	–	0.77	0.80	693.19	0.00
EX33	693.54	18	4.6	218	0.19	0.41	12.9	0.647	2.8	4.0	11.2	0.24	0.09	0	0.00	0.73	0.95	0.48	0.89	713.10	718.61
EX34	714.17	18	2.8	47	0.07	0.03	4.0	0.061	–	–	–	–	0.00	0	0.00	0.06	0.08	0.04	0.07	714.24	719.68
31A	691.14	15	4.0	44	0.37	0.16	8.1	0.252	–	–	–	–	0.00	0	0.00	0.25	0.33	0.16	0.33	692.53	700.61
32A	698.05	30	31.8	45	0.60	0.27	9.4	0.340	30.7	9.3	285.8	1.34	0.47	0	0.00	0.81	–	0.41	0.67	698.72	702.30
32B	698.76	30	30.7	115	0.56	0.64	9.3	0.336	30.8	14.7	451.7	3.35	1.17	0	0.00	1.51	–	0.75	1.40	700.16	709.41
32C	702.00	30	30.8	22	0.56	0.12	14.7	0.838	–	–	–	–	0.00	0	0.00	0.84	1.09	0.54	0.67	703.75	0.00

Culvert Calculator Report
End Section 32C

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	0.00 ft	Headwater Depth/Height	1.20
Computed Headwater Elev.	703.75 ft	Discharge	30.75 cfs
Inlet Control HW Elev.	703.68 ft	Tailwater Elevation	0.00 ft
Outlet Control HW Elev.	703.75 ft	Control Type	Entrance Control

Grades

Upstream Invert	700.75 ft	Downstream Invert	700.00 ft
Length	21.67 ft	Constructed Slope	0.034294 ft/ft

Hydraulic Profile

Profile	S2	Depth, Downstream	1.38 ft
Slope Type	Steep	Normal Depth	1.11 ft
Flow Regime	Supercritical	Critical Depth	1.89 ft
Velocity Downstream	11.11 ft/s	Critical Slope	0.006636 ft/ft

Section

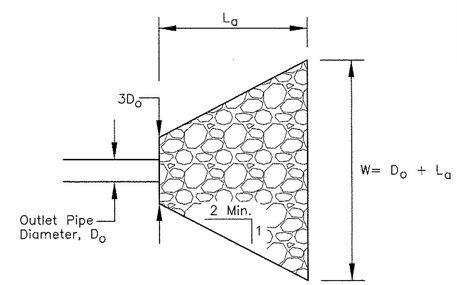
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	2.50 ft
Section Size	30 inch	Rise	2.50 ft
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	703.75 ft	Upstream Velocity Head	0.93 ft
Ke	0.20	Entrance Loss	0.19 ft

Inlet Control Properties

Inlet Control HW Elev.	703.68 ft	Flow Control	Transition
Inlet Type	Groove end projecting	Area Full	4.9 ft²
K	0.00450	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	3
C	0.03170	Equation Form	1
Y	0.69000		



TYPICAL RIP RAP DESIGN
(NOT TO SCALE)

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

STORM SEWER DETAILS & COMPUTATIONS
HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
WARREN COUNTY, VIRGINIA
TOWN OF FRONT ROYAL

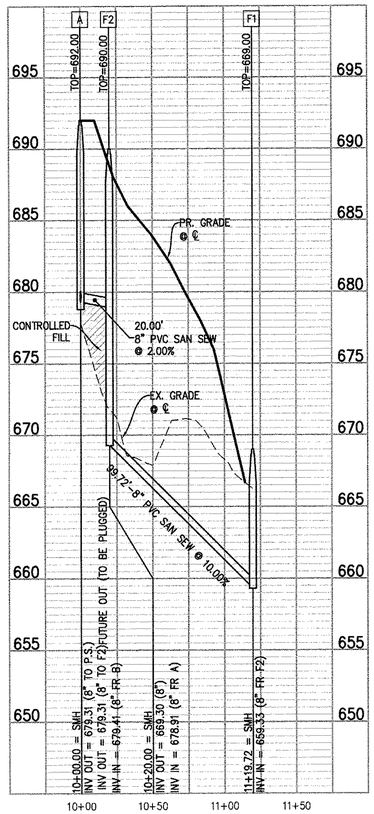
COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047796
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

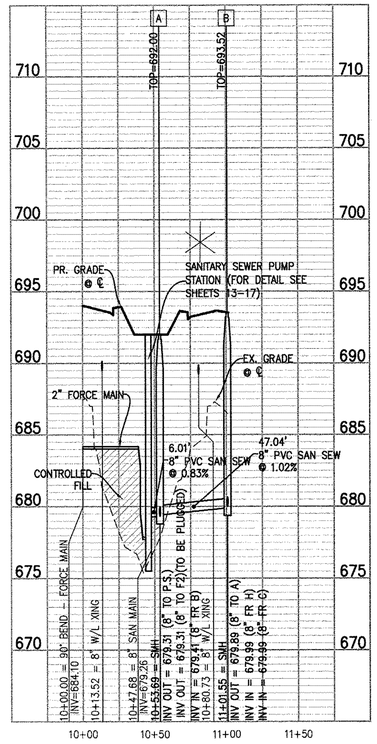
DATE	DESCRIPTION

GC DESIGN	MCW DRAWN	CHKD
SCALE	H: 1"=50' V: 1"=5'	
JOB No. 1602-02-016		
DATE JULY 19, 2019		
FILE No. 1602-D-CP-005		
SHEET 11A OF 33		

Cad file name: \1602 - happy creek knolls sec 3\1602-02-016 (cpg)\engineering\drawings\sheets\1602-D-CP-005.dwg



San Sew B PROFILE VIEW

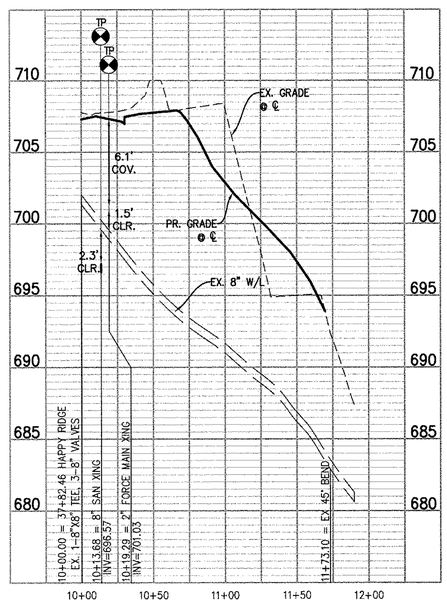


San Sew A PROFILE VIEW

NOTE: PROPOSED PUMP STATION MAY BE ELIMINATED IF AN ON GRADE ALTERNATIVE ROUTE IS APPROVED

TP — TEST PIT REQUIRED

CONTRACTOR TO VERIFY HORIZONTAL AND VERTICAL LOCATION AND ELEVATION OF UTILITIES. CONTRACTOR TO NOTIFY BCG OF ANY DISCREPANCIES. CONTRACTOR TO SCHEDULE TEST PITS AND UTILITY MARKING WELL IN ADVANCE OF CONSTRUCTION. BCG WILL NOT BE RESPONSIBLE FOR DELAYS DUE TO CONTRACTOR'S INABILITY TO SCHEDULE THIS NECESSARY WORK.



WATERLINE A PROFILE VIEW

SANITARY SEWER COMPUTATIONS

Manhole Number From	Manhole Number To	Average Daily Flow By Residential Units: Inc. Units	Total Units	Flow (gpd)	Flow Million Gallons Per Day: Incr.	Total Ave. Daily Flow	Peak Flow Factor	Peak Flow	Pipe Run Manning's "N" Value .012: Length (ft)	Dia. (in)	Slope (%)	Upper Invert	Lower Invert	Capacity of Pipe (Full): MGD	CFS	Velocity (fps)	Proportional Pipe Flow: Flow (gpd)	Depth (ft)	Vel. (fps)	Remarks
EX. M	L	3	3	1050	0.0011	0.0011	13.70	0.014	102.43	8	4.86%	691.83	686.85	1.7165	2.66	7.61	0.01	0.04	2.45	
L	K	5	8	2800	0.0018	0.0028	11.41	0.032	166.33	8	2.24%	686.75	683.02	1.1657	1.80	5.17	0.03	0.07	2.38	
K	J	1	9	3150	0.0004	0.0032	11.16	0.035	70.00	8	0.60%	682.92	682.50	0.6030	0.93	2.67	0.06	0.10	1.55	
J	I	2	11	3850	0.0007	0.0039	10.75	0.041	70.00	8	1.90%	682.40	681.07	1.0730	1.66	4.76	0.04	0.09	2.43	
I	H	1	12	4200	0.0004	0.0042	10.57	0.044	70.00	8	0.60%	680.97	680.55	0.6030	0.93	2.67	0.07	0.12	1.65	
H	B	0	12	4200	0.0000	0.0042	10.57	0.044	77.41	8	0.59%	680.45	679.99	0.6001	0.93	2.66	0.07	0.12	1.64	
G	F	3	3	1050	0.0011	0.0011	13.70	0.014	117.47	8	4.23%	701.86	696.89	1.6012	2.48	7.10	0.01	0.04	2.33	
F	E	1	4	1400	0.0004	0.0014	12.99	0.018	51.02	8	1.35%	696.79	696.10	0.9053	1.40	4.01	0.02	0.06	1.69	
E	D	8	12	4200	0.0028	0.0042	10.57	0.044	300.00	8	3.28%	696.00	686.15	1.4108	2.18	6.25	0.03	0.08	3.01	
D	C	6	18	6300	0.0021	0.0063	9.80	0.062	280.19	8	0.94%	686.05	683.43	0.7528	1.16	3.34	0.08	0.12	2.12	
C	B	3	21	7350	0.0011	0.0074	9.52	0.070	133.20	8	2.51%	683.33	679.99	1.2327	1.91	5.46	0.06	0.10	3.13	
B	A	0	33	11550	0.0000	0.0116	8.75	0.101	47.04	8	1.02%	679.89	679.41	0.7864	1.22	3.49	0.13	0.16	2.54	
A	PUMP STATION	0	33	11550	0.0000	0.0116	8.75	0.101	6.01	8	0.83%	679.31	679.26	0.7100	1.10	3.15	0.14	0.16	2.36	
A	F2	0	33	11550	0.0000	0.0116	8.75	0.101	20.00	8	2.00%	679.31	678.91	1.1009	1.70	4.88	0.09	0.13	3.23	
F2	F1	0	33	11550	0.0000	0.0116	8.75	0.101	99.72	8	10.00%	669.30	659.33	2.4614	3.81	10.91	0.04	0.09	5.68	

SANITARY LATERAL TABLE

Lot Number	Station	Manhole From	Manhole To	Slope ft/ft	Length ft.	Inv@ Main	Inv@ Conn.	Riser Sta	Risers Ft.	Inv@ Begin Riser	Inv@ End Riser	Inv@ End Of Lateral	Lat To Back Of House ft.	Inv@ House	BF Elev Ft.	Δ Ft.	Remarks
32	1+02.43	L	EX M	0.0208	38.58	691.83	692.16	0+21.81	11.00	692.61	703.84	703.96	73.0	705.48	721.35	15.87	
1	0+77.81	L	EX M	0.0208	55.00	690.63	691.88	0+40.00	9.00	692.72	701.90	702.03	70.0	703.48	706.48	3.00	
31	0+43.43	L	EX M	0.0208	35.00	688.96	690.21	0+20.00	9.00	690.63	699.81	699.94	67.0	701.33	713.94	12.61	
2	1+66.33	K	L	0.0208	55.00	686.75	687.08	0+40.00	9.00	687.91	697.10	697.22	76.0	698.80	701.98	3.18	
30	1+07.45	K	L	0.0208	35.00	685.43	686.68	0+20.00	9.00	687.10	696.28	696.41	81.0	698.09	709.24	11.15	
3	0+80.06	K	L	0.0208	55.00	684.82	686.07	0+40.00	9.00	686.90	696.08	696.21	73.0	697.73	706.16	8.44	
4	0+30.54	K	L	0.0208	55.00	683.70	684.95	0+40.00	9.00	685.79	694.97	695.10	60.0	696.35	705.55	9.21	
29	0+24.65	K	L	0.0208	35.00	683.57	684.82	0+20.00	9.00	685.24	694.43	694.55	81.0	696.24	707.15	10.92	
5	0+38.73	J	K	0.0208	57.78	682.73	683.98	0+43.00	9.00	684.88	694.06	694.18	60.0	695.43	707.16	11.73	
6	0+53.18	I	J	0.0208	57.58	682.08	683.33	0+43.00	9.00	684.22	693.41	693.53	60.0	694.78	704.97	10.20	
28	0+19.05	I	J	0.0208	33.00	681.43	682.68	0+20.00	10.00	683.10	693.31	693.37	85.0	695.14	700.92	5.79	
16	1+17.47	F	G	0.0208	55.00	701.86	702.19	0+40.00	6.00	703.02	709.15	709.33	76.0	710.91	714.72	3.81	
15	0+77.00	F	G	0.0208	35.00	700.15	701.40	0+20.00	4.00	701.81	705.90	706.13	73.0	707.64	711.35	3.71	
17	0+36.32	F	G	0.0208	55.00	698.43	699.68	0+40.00	5.00	700.51	705.61	705.82	75.0	707.38	710.74	3.36	
14	0+51.02	E	F	0.0208	35.00	696.79	697.12	0+20.00	4.00	697.54	701.62	701.85	71.0	703.32	706.51	3.19	
18	3+00.00	D	E	0.0208	35.00	696.00	696.33	0+20.00	6.00	696.75	702.87	703.06	75.0	704.62	710.28	5.67	
13	2+63.26	D	E	0.0208	55.00	694.79	696.04			0.00	0.00	697.19	74.0	698.73	701.68	2.96	
19	2+18.74	D	E	0.0208	35.00	693.33	694.58	0+20.00	5.00	695.00	700.10	700.31	74.0	701.85	709.07	7.22	
12	1+81.87	D	E	0.0208	55.00	692.12	693.37			0.00	0.00	694.52	75.0	696.08	698.76	2.69	
20	1+33.93	D	E	0.0208	35.00	690.55	691.80	0+20.00	7.00	692.21	699.36	699.53	75.0	701.09	707.18	6.10	
11	1+04.10	D	E	0.0208	55.00	689.57	690.82			0.00	0.00	691.96	73.0	693.48	697.16	3.68	
21	0+55.38	D	E	0.0208	35.00	687.97	689.22	0+20.00	8.00	689.63	697.80	697.95	72.0	699.44	705.52	6.08	
10	0+19.51	D	E	0.0208	55.00	686.79	688.04			0.00	0.00	689.18	74.0	690.72	695.50	4.78	
22	2+52.06	C	D	0.0208	35.00	685.79	687.04	0+20.00	8.00	687.45	695.62	695.76	70.0	697.22	703.80	6.58	
9	2+30.14	C	D	0.0208	55.00	685.58	686.83	0+40.00		0.00	0.00	687.98	70.0	689.43	693.99	4.56	
23	1+62.10	C	D	0.0208	35.00	684.95	686.20	0+20.00	7.00	686.61	693.76	693.92	75.0	695.48	702.14	6.66	
8	1+38.91	C	D	0.0208	55.00	684.73	685.98			0.00	0.00	687.12	75.0	688.68	692.30	3.62	
24	0+79.19	C	D	0.0208	35.00	684.17	685.42	0+20.00	6.00	685.84	691.96	692.15	75.0	693.71	700.48	6.77	
7	0+71.00	C	D	0.0208	55.00	684.09	685.34			0.00	0.00	686.49	71.0	687.96	690.76	2.80	
25	1+33.20	B	C	0.0208	35.00	683.33	683.66	0+20.00	6.00	684.08	690.20	690.39	75.0	691.95	700.68	8.74	
26	0+46.20	B	C	0.0208	35.00	681.15	682.40	0+26.00	4.00	682.94	687.02	687.13	77.0	688.73	699.22	10.50	
33	0+11.49	B	C	0.0208	55.00	680.28	681.53			0.00	0.00	682.67	76.0	684.25	687.90	3.65	
27	0+30.39	H	I	0.0208	32.00	680.73	681.98		6.00	681.98	688.11	688.65	92.0	690.56	694.24	3.68	
	ALL LATERALS ARE 4" PVC DR25																

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

SANITARY SEWER PROFILES AND COMPUTATIONS

HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
WARREN COUNTY, VIRGINIA
TOWN OF FRONT ROYAL

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/16/19
PROFESSIONAL ENGINEER

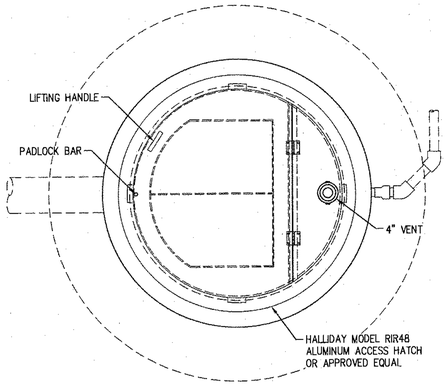
PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC	MCW	CHKD
DESIGN	DRAWN	
SCALE	H: 1"=50' V: 1"=5'	
JOB No. 1602-02-016		
DATE JULY 19, 2019		
FILE No. 1602-D-CP-005		
SHEET 12 OF 33		

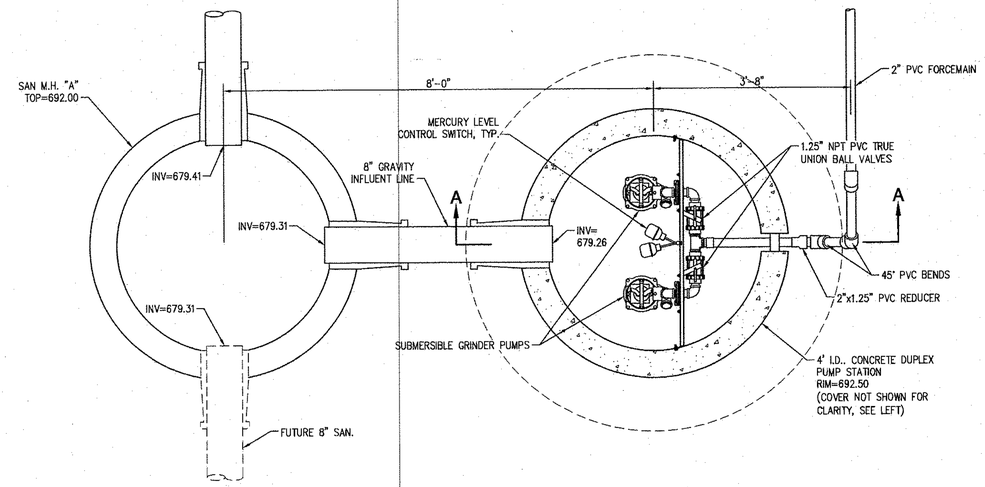
Cad file name: P:\1602 - Happy Creek Knolls Sec 4\1602-04-001 (DMV)\Engineering\Engineering Plans\Sheets\1602-D-CP-005-SSP.dwg

✳ NOTE: PUMP STATION MAY BE ELIMINATED IF AN ON GRADE ALTERNATIVE ROUTE IS APPROVED.



PUMP STATION COVER PLAN

SCALE: 3/4"=1'



PUMP STATION PLAN

SCALE: 3/4"=1'

Model: Steelworx Two Post Gable Shelter, 6' x 12'
Model # GA-0612-SW-2P

Manufacturing Mission: To provide all prefabricated components and installation instructions for a 6' wide (measured from eave to eave) by 12' long free standing bolt together, tubular steel constructed shelter kit.

Design Criteria: Structure shall be designed for a 20 lb live load and a 100 mph wind load capacity, but can be designed based on specific site requirements upon request . All structural members are ASTM A-500 U.S. grade B steel. Welded connection plates shall be ASTM A-36 hot rolled steel. All welding performed to latest AWS standards by ASTM Certified welders and provided in accordance to same.

Tubular Steel Columns and Beams: Standard columns shall be 6" x 6" tubular steel welded to base plate (footing design provided separately). Main support beams are 6" x 4" and purlins are 6" x 3". All framing connections are done using A325 grade bolts within concealed access openings from above and will later be concealed by the roofing. All roof framing shall be flush against the roof decking to eliminate the possibility of bird nesting. Steel sizes are preliminary and may change upon final engineering based on actual site conditions and load requirements (site specific engineering shall be an additional cost).

Roofing: 24 Ga. pre-cut steel panels with Kynar 500 finish in a variety of colors with white underside. Standard roof slope is a 4/12 pitch with a eave height of 7'-2". Also available with 6/12 or 8/12 pitch roof. Attached to decking with exposed fasteners painted to match roof.

Frame Finish: All steel framework will receive a corrosion protective TGIC Polyester powder coat, electro-statically applied and cured at 400°F. A large selection of standard colors are available.

Foundation: All columns need to be anchored to concrete footings. Columns can be surface mounted with anchor bolts at or below finish slab elevation or they can be embedded directly into the footing. Optional base plate covers are available at an additional cost.

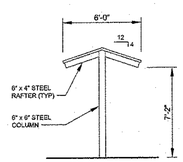
Hardware: All structural hardware and roofing fasteners shall be provided.

Warranty: 10 years against manufacturer defects.

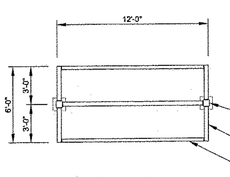
Not Included: Concrete work of any kind, unloading of product and installation.

Additional Options:

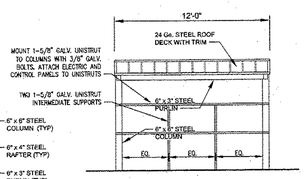
- Flexibility of Design Such as: Height and Pitch
- Additional Engineering
- Variety of Colors
- Decorative Railings, Lattice, Braces, Trim, etc.
- Cupolas and Rooftop Accs.
- Column Style Variations
- Lexan Wind Screens
- Tongue & Groove Roof Decking
- Asphalt Shingles, Standing Seam, Cedar Shake, or Clay Tile Roofing
- Composite Finished Ceiling
- Solar Panels & Solar Lighting
- Site Furnishings and Accs.



SIDE ELEVATION
SCALE: NTS



FRAMING PLAN
SCALE: NTS



FRONT ELEVATION
SCALE: NTS

COVERWORX
Recreational Architecture
A Division of Ross & Barr Inc.

11500 East 9 Mile Road
Warren, MI 48089
Office: (586) 498-1088
Fax: (586) 754-9150
Toll Free: (800) 657-6118
Email: info@coverworx.net
www.CoverWorx.net

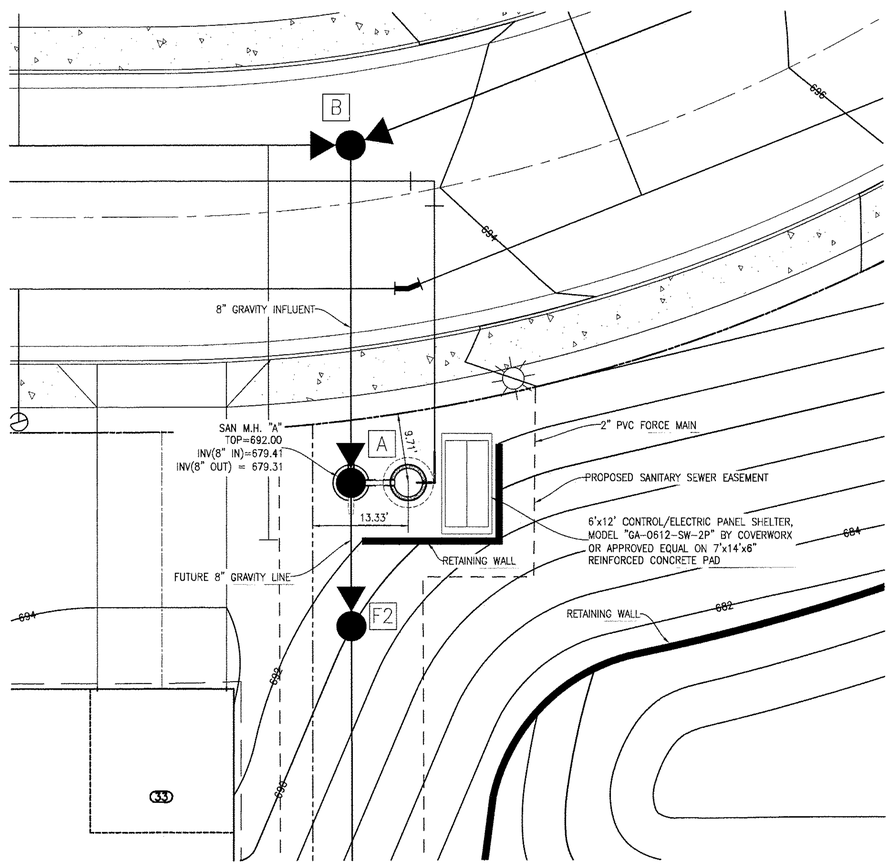
Steelworx Two Post Gable Shelter - 6' x 12'

Model: GA-0612-SW-2P

DESIGN SPECIFICATIONS

SHELTER SPEC. & DETAIL

NOT TO SCALE



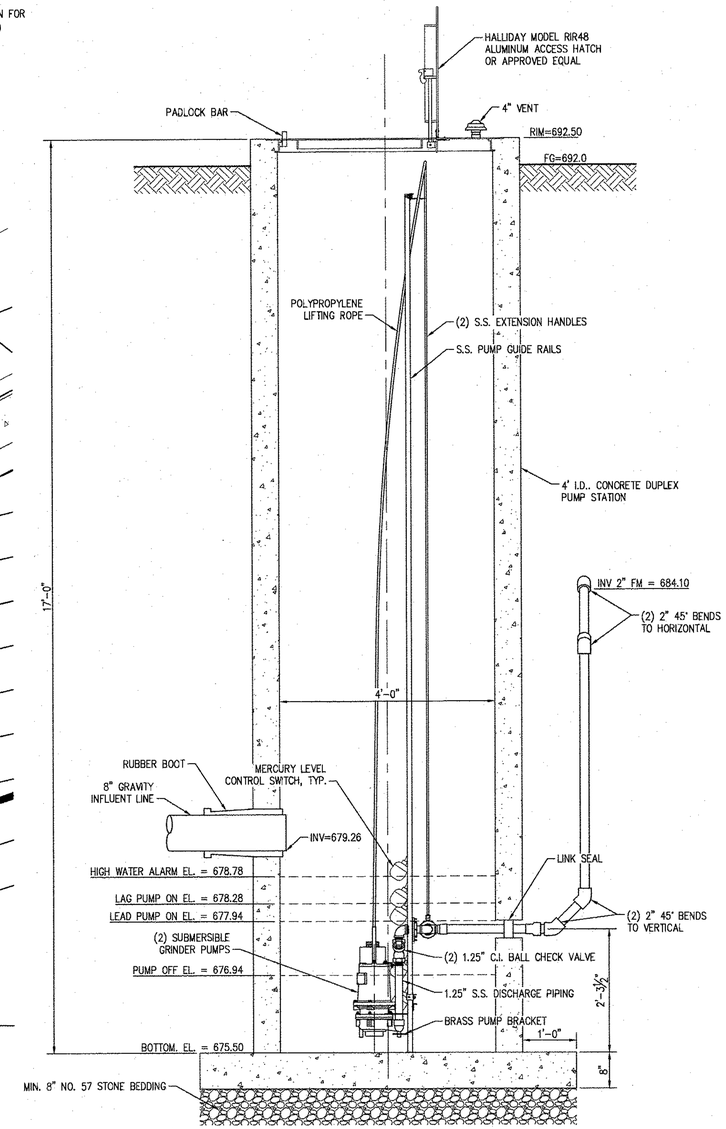
PUMP STATION SITE PLAN

SCALE: 1"=10'

GRAPHIC SCALE

10 0 5 10 20 40

(IN FEET)
1 inch = 10 ft.



SECTION A-A

SCALE: 3/4"=1'

Bowman CONSULTING

Bowman Consulting Group, Ltd.
Winchester Office
124 East Cork Street
Winchester, Virginia 22601
Phone: (540) 722-2343
Fax: (540) 722-5050
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

PUMP STATION PLAN & DETAILS
HAPPY CREEK KNOLLS
SECTION 4
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
JESSICA M. KWIATKOWSKI
Lic. No. 036766
4/18/18
PROFESSIONAL ENGINEER

PLAN STATUS

DATE	DESCRIPTION

TCW DESIGN	DWD DRAWN	JMK CHKD
SCALE	H: AS NOTED V: N/A	
JOB No. 1602-04-001		
DATE APRIL, 2018		
FILE No. 1602-D-CP-04-001		
SHEET 13 OF 31		

Cad file name: N:\Work - Happy Creek Knolls\Section 4\Phase 1\Pump Station\Engineering\Plans\1602-D-CP-04-PS04.dwg

SECTION 01010–SUMMARY OF WORK

PART 1 – GENERAL
1.01 SECTION INCLUDES
A. PROJECT SUMMARY.
B. PROJECT LOCATION AND GENERAL INFORMATION.
C. CONTRACTOR USE OF SITE.
1.02 PROJECT SUMMARY
A. ABBREVIATED WRITTEN SUMMARY: BRIEFLY, AND WITHOUT FORCE AND EFFECT UPON CONTRACT DOCUMENTS, THE WORK OF CONTRACT CAN BE SUMMARIZED AS FOLLOWS:
1. THE PROJECT INCLUDES THE INSTALLATION OF ONE WASTEWATER PUMP STATION FOR A SUBDIVISION IN THE TOWN OF FRONT ROYAL, IN WARREN COUNTY, VIRGINIA. THE PUMP STATION INCLUDES A WET WELL, DUPLEX SUBMERSIBLE PUMPS, DISCHARGE PIPING, FORCE MAIN PIPING, AND ALL ASSOCIATED EQUIPMENT, PIPING, VALVES AND ELECTRICS.
1.03 LOCATION
A. THE HAPPY CREEK KNOLLS, SECTION 3 SUB–DIVISION WILL BE LOCATED TO THE WEST SIDE OF HAPPY CREEK ROAD, BETWEEN HAPPY RIDGE DRIVE, AND EWELL STREET. THE PUMP STATION WILL BE LOCATED WITHIN THE TOWN OF FRONT ROYAL.
B. EXTENT OF THE SITE IS SHOWN ON THE DRAWINGS.
1.04 TIME OF COMPLETION
THE PROJECT SHALL BE COMPLETED WITHIN THE SCHEDULE SPECIFIED IN THE BID FORM.
1.05 SURVEYING
PROVIDE FIELD STAKEOUT OF STRUCTURES AND CUT SHEETS FOR UTILITIES. THE OWNER WILL PROVIDE HORIZONTAL AND VERTICAL CONTROL.
1.06 CONTRACTOR USE OF SITE
A. THE CONTRACTOR SHALL LIMIT THE USE OF PREMISES FOR WORK AND STORAGE. THE CONTRACTOR SHALL LIMIT THE STAGING AREA WITHIN THE LIMITS OF DISTURBANCE, AS INDICATED ON FORMAL SITE PLAN DRAWINGS BY BOWMAN CONSULTING GROUP, LTD.
B. THE CONTRACTOR SHALL COORDINATE THE USE OF PREMISES UNDER DIRECTION OF ENGINEER.
C. THE CONTRACTOR SHALL PROVIDE SITE SAFETY AND SECURITY FOR PROJECT SITE, INCLUDING OWNER–FURNISHED EQUIPMENT THAT MAY BE STORED AT SITE.
D. THE CONTRACTOR SHALL OBTAIN AND PAY FOR USE OF ANY ADDITIONAL STORAGE OR WORK AREAS REQUIRED.
END OF SECTION

SECTION 02560–PIPING SYSTEMS

PART 1 – GENERAL
1.01 SUMMARY
THIS SECTION SPECIFIES THE REQUIREMENTS FOR ALL PIPING SYSTEMS TO BE INSTALLED AS PART OF THIS PROJECT.
1.02 GENERAL REQUIREMENTS
THE DRAWINGS SHOW THE GENERAL LAYOUT AND DO NOT NECESSARILY REFLECT THE EXACT LOCATION OF THE VARIOUS ITEMS. ACCORDINGLY, THE CONTRACTOR SHALL NOT SCALE THE PLANS, BUT SHALL ACQUAINT HIMSELF WITH THE EXTENT AND CHARACTER OF THE WORK REQUIRED AND ITS RELATION TO THE WORK UNDER OTHER ITEMS. IT IS THE INTENTION OF THE DRAWINGS AND SPECIFICATIONS TO PROVIDE COMPLETE AND WORKABLE PIPING SYSTEMS; ANY MISCELLANEOUS VALVES AND FITTINGS REQUIRED FOR PROPER COMPLETION OF THE WORK SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
PART 2– PRODUCTS
2.01 ALL MATERIAL SHALL BE AS FOLLOWS UNLESS OTHERWISE NOTED ON THE DRAWINGS
A. ALL FORCEMAIN PIPING TO THE TERMINAL MANHOLE SHALL BE PVC–C900 SDR 21.
B. ALL YARD PIPING NOT SPECIFIED SHALL BE DUCTILE IRON.
2.02 GRAVITY SEWERAGE LINES
A. PIPING SHALL BE POLYVINYL CHLORIDE PVC PLASTIC GRAVITY SEWER PIPE WITH INTEGRAL WALL BELL AND SPIGOT JOINTS. PIPE SHALL BE MANUFACTURED FROM AN APPROVED PVC COMPOUND CONFORMING TO ASTM F679 AND WALL THICKNESS T–1.
B. JOINTS, FITTINGS, AND GASKETS
1. INTEGRAL BELL WITH ELASTIC GASKETED JOINT THAT FORMS A WATERTIGHT SEAL WHEN COMPRESSED RADIALLY ON THE PIPE SPIGOT INSIDE THE BELL.
2. JOINTS SHALL CONFORM TO ASTM D3212.
3. FITTINGS SHALL BE PVC COMPONENTS CONFORMING TO ASTM D1784.
4. GASKETS SHALL CONFORM TO ASTM F477.
2.03 FORCE MAIN PIPING AND APPURTENANCES
ALL FORCE MAIN PIPING SHALL BE AS SPECIFIED BELOW.
A. PVC C–900
1. SHALL BE AWWA C–900 SDR21 CONFORMING TO ASTM D1784.
2. JOINTS SHALL BE PUSH ON TYPE IN COMPLIANCES WITH ASTM D3139 WITH ELASTOMERIC GASKET JOINTS MEETING ASTM F477.
3. FITTINGS SHALL BE MECHANICAL JOINT CLASS 350 DUCTILE IRON FITTINGS CONFORMING TO ANSI 21.20, COATED TO MATCH DUCTILE IRON PIPE.
B. SLEEVE TYPE COUPLINGS: MECHANICAL JOINT CAST IRON SOLID SLEEVES SHALL BE USED FOR BELOW GRADE RESTRAINED COUPLING.
C. HARDWARE: ALL HARDWARE, SUCH AS NUTS AND BOLTS, NOT SPECIFIED ABOVE SHALL BE STAINLESS STEEL.
2.04 VALVES
A. PLUG VALVES
PLUG VALVES SHALL BE CAST IRON ECCENTRIC PLUG VALVES AS MANUFACTURED BY DEZURIK FIGURE 10D OR APPROVED EQUAL. PLUGS SHALL BE OF ASTM A126 CLASS B CAST IRON IN COMPLIANCE WITH AWWA C504, SECTION 2.2. VALVES SHALL HAVE HEAVY-DUTY STAINLESS–STEEL BEARINGS, RESILIENT PLUG FACINGS WITH NEOPRENE OR HYCAR, NON-RISING STEM HAND-WHEEL OPERATOR, AND WELDED-IN CORROSION RESISTANT NICKEL SEAT. VALVES SHALL BE CAPABLE OF HANDLING WASTEWATER.
B. CHECK VALVES
CHECK VALVES 4" AND LARGER SHALL MEET THE REQUIREMENTS OF C506 AND SHALL BE CUSHIONED SWING TYPE VALVES CONSTRUCTED OF CAST IRON OR STEEL BODY WITH A STAINLESS STEEL RESILIENT SEAT RING, NON–CORROSIVE SHAFT THAT EXTENDS THROUGH THE BODY FOR ATTACHING WEIGHT AND LEVER, AND COMPLETELY NON–CORROSIVE CUSHION CHAMBER. VALVES SHALL BE FLANGED WITH 125# RATED FLANGES. VALVES SHALL BE GOLDEN–ANDERSON FIGURE 250–D. THEY SHALL HAVE A PRESSURE RATING OF 200 PSI WITH CLASS 125 FLANGES.
C. AIR RELEASE VALVES
AIR RELEASE VALVES SHALL BE 2" MODEL VM–301 AS, VALMATIC AIR RELEASE VALVE, WITH STAINLESS STEEL BACKWASH KIT. ALL HARDWARE SHALL BE STAINLESS STEEL.
2.05 RESTRAINED JOINTS AND COUPLINGS
A. DUCTILE IRON RESTRAINED JOINT RETAINER GLANDS SHALL BE AS MANUFACTURED BY EBAA IRON SALES, INC., "MEGALUG" SERIES 1100 OR APPROVED EQUAL.
B. DUCTILE IRON RESTRAINED COUPLINGS SHALL BE AS MANUFACTURED BY EBAA IRON SALES, INC., MEGA–COUPLING SERIES 3800 OR APPROVED EQUAL.
C. RESTRAINTS FOR C900 PVC PIPES AT DUCTILE IRON FITTINGS SHALL BE SERIES 15PF0D AS MANUFACTURED BY EBAA IRON, INC.
2.06 PIPE SUPPORTS
A. PIPE SUPPORTS SHALL BE PROVIDED WHERE SHOWN ON THE DRAWINGS; WHERE SPECIFIED OR INDICATED; AND AS REQUIRED TO SUPPORT THE WEIGHT OF PIPE, LIQUID, AND ANY ANTICIPATED THRUST.
B. THE MAXIMUM DISTANCE BETWEEN SUPPORTS SHALL BE 8 FEET UNLESS INDICATED OTHERWISE, EXCEPT THE MAXIMUM DISTANCE BETWEEN SUPPORTS SHALL NOT EXCEED THAT RECOMMENDED BY THE PIPE MANUFACTURER.
C. PIPE SUPPORTS SHALL BE STAINLESS STEEL SADDLE STANDON MODEL S92 AS MANUFACTURED BY MATERIAL RESOURCES, INC. OR AN APPROVED EQUAL.
D. THE CONTRACTOR SHALL PROVIDE METAL PIPE HANGERS, INSERTS, STRUTS, STRUCTURAL MEMBERS, BRACKETS, PLATES, ANCHORS, AND OTHER SUPPORTS AS REQUIRED.
2.07 PIPE SLEEVES, WALL PIPES
A. PIPE SLEEVES SHALL BE INSTALLED WHERE PIPING PASSES THROUGH WALLS OR SLABS.
B. SLEEVES FOR PIPES THREE INCHES AND LARGER, SLEEVES BELOW GRADE, AND SLEEVES INTO TANKS CONTAINING LIQUID SHALL BE HDPE SLEEVES WITH A COMPRESSIBLE RUBBER GASKET. NO SLEEVES SHALL BE INSTALLED THROUGH STRUCTURAL BEAMS OR JOINTS UNLESS THE INSTALLATION IS SPECIFICALLY SHOWN OR APPROVED.
C. SLEEVES SHALL BE FASTENED SECURELY IN FLOORS AND WALLS SO THEY WILL NOT BE DISPLACED WHEN CONCRETE IS POURED OR WHEN OTHER CONSTRUCTION IS BUILT AROUND THEM, AND SHALL BE PROTECTED TO PREVENT CONCRETE, PLASTER, OR OTHER MATERIALS FROM BEING FORCED INTO THE SPACE BETWEEN THE PIPE AND SLEEVE. WALL SLEEVES SHALL FINISH FLUSH WITH FINISH LINE. THE BOTTOM OF FLOOR SLEEVES SHALL BE SET FLUSH WITH THE UNDERSIDE OF THE SLAB BELOW, THE TOP EXTENDING 3/4 INCH ABOVE THE FINISHED FLOOR.
2.08 PIPE SEALS
A. CONTRACTOR SHALL DETERMINE THE REQUIRED INSIDE DIAMETER OF EACH INDIVIDUAL WALL OPENING OR SLEEVE BEFORE ORDERING, FABRICATING OR INSTALLING. THE INSIDE DIAMETER OF EACH WALL OPENING SHALL BE SIZED AS RECOMMENDED BY THE MANUFACTURER TO FIT THE PIPE AND TO ASSURE A WATERTIGHT JOINT.
B. CONTRACTOR SHALL FAMILIARIZE HIS INSTALLING PERSONNEL WITH MANUFACTURER'S INSTRUCTION BULLETIN FOR THE PROPER PROCEDURE FOR INSTALLING AND TIGHTENING THE SEAL TO PROVIDE A WATERTIGHT PIPE PENETRATION.
C. UNLESS OTHERWISE NOTED, SEALS SHALL BE LINK–SEAL MODULAR EPDM SEAL ASSEMBLIES AS MANUFACTURED BY PSI–THUNDERLINE/LINK–SEAL.
D. SEAL ASSEMBLIES SHALL BE PROVIDED WITH STAINLESS STEEL NUTS AND BOLTS.
PART 3 – EXECUTION
3.01 GENERAL
A. HANDLING AND STORING MATERIALS
1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFE AND PROPER DELIVERY, UNLOADING, STORAGE AND HANDLING OF MATERIALS FURNISHED BY HIM AND INTENDED FOR THE WORK UNTIL IT HAS BEEN INCORPORATED IN THE COMPLETE PROJECT.
2. PROPER CARE AND PROTECTION SHALL BE EXERCISED IN HANDLING PIPE, FITTINGS AND OTHER ACCESSORIES IN UNLOADING FROM DELIVERY TRUCKS. THE PIPE SHALL BE LIFTED BY HOISTS AND SLID OR ROLLED ON SKIDWAYS IN SUCH A MANNER AS TO AVOID SHOCK. UNDER NO CIRCUMSTANCES SHALL THE PIPE BE DROPPED. PIPE MUST NOT BE SKIDDED OR ROLLED AGAINST PIPE ALREADY ON THE GROUND.
3. MATERIALS SHALL BE STORED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
B. EXCAVATING AND BACKFILLING
1. CONTRACTOR SHALL REMOVE EXCAVATING OF ANY AND ALL MATERIALS ENCOUNTERED IN THE COURSE OF EXCAVATING FOR ALL UNDERGROUND UTILITY SYSTEMS. AFTER THE WORK IS IN PLACE, BACKFILL WITH SATISFACTORY MATERIALS AS SPECIFIED IN SECTION 02200. ALL PIPING SHALL BE ENTIRELY BACKFILLED WITH SUITABLE MATERIAL.
a. PROVIDE ALL NECESSARY PUMPING REQUIRED TO KEEP EXCAVATION RELATIVELY FREE FROM WATER FROM ANY SOURCE AT ALL TIMES. PROVIDE ALL NECESSARY SHORING REQUIRED FOR THE PROTECTION OF EXCAVATIONS, EXISTING UTILITIES AND WORKMEN.
b. 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 NIGHT.
c. AFTER INSTALLATION AND INSPECTION OF PIPING AND EQUIPMENT HAVE BEEN COMPLETE, BACK FILL ALL EXCAVATIONS CAREFULLY. PLACE BACKFILL IN 6–INCH LAYERS AND COMPACT TO NOT LESS THAN 95% OF THE MAXIMUM DENSITY AT OPTIMUM MOISTURE + 2%. COMPACTION UNDER PAVED AREAS SHALL BE NOT LESS THAN 95% OF MAXIMUM DENSITY AT OPTIMUM MOISTURE + 2%. MAXIMUM DENSITY SHALL BE DETERMINED BY COMPACTION TEST ASTM D698 (STANDARD PROCTOR). BACKFILL MATERIALS SHALL MEET REQUIREMENTS OF SECTION 02200.
d. EXERCISE SPECIAL CARE IN BACKFILLING TRENCHES IN WHICH SEWERS ARE LAID TO GUARD AGAINST DISTURBING THE JOINTS. SUCH BACKFILLING SHALL BE PLACED EVENLY IN 6–INCH LAYERS AND CAREFULLY COMPACTED.
e. REMOVE AND DISPOSE OF ANY MATERIAL NOT USED FOR BACKFILL.
f. PLASTIC MARKING TAPE SHALL BE OF PLASTIC MATERIAL WITH INTEGRAL WIRES, FOIL BACKING OR OTHER MEANS TO ENABLE DETECTION BY A METAL DETECTOR WHEN THE TAPE IS BURIED UP TO THREE FEET (3') DEEP. THE TAPE SHALL HAVE THE WORDS "SEWER LINE BELOW" IN CONTRASTING LETTERS REPEATED CONTINUOUSLY. THE TAPE SHALL BE OF A TYPE SPECIFICALLY MANUFACTURED FOR MARKING AND LOCATING UNDERGROUND UTILITIES. THE METALLIC CORE OF THE TAPE SHALL BE ENCASED IN A PROTECTIVE JACKET OR PROVIDED WITH OTHER MEANS TO PROTECT IT FROM CORROSION.
g. PLASTIC MARKING TAPE SHALL BE PLACED DIRECTLY ABOVE THE FORCE MAIN AT A DEPTH OF TWO (2.0) FEET BELOW THE NORMAL GROUND ELEVATION. THE TAPE SHALL BE LAID FLAT IN A CONTINUOUS MANNER WITHOUT KINKS, KNOTS OR OTHER IRREGULARITIES WHICH MAY INTERFERE WITH THE PROPER PERFORMANCE OF THE TAPE.
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 OR ROCK, EXISTING CONCRETE OR BRICK OF EXISTING BUILDING FOUNDATION, FOOTINGS, ABANDONED UTILITY PIPING, WIRES, STRUCTURES, 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 MANHOLES, CATCH BASINS, AND SEWER PIPING AND BACKFILLED WITH A SUITABLE MATERIAL AS SPECIFIED.
C. SEPARATION OF WATER AND SEWER LINES
1. PARALLEL INSTALLATION:
a. NORMAL CONDITIONS: WATER LINES SHALL BE AT LEAST 10 FEET HORIZONTALLY FROM A SEWER OR SEWER MANHOLE WHENEVER POSSIBLE, AND THE DISTANCE SHALL BE MEASURED EDGE–TO–EDGE.
b. UNUSUAL CONDITIONS: WHEN LOCAL CONDITIONS PREVENT A HORIZONTAL SEPARATION OF AT LEAST 10 FEET, THE WATER LINE MAY BE CLOSER TO A SEWER OR SEWER MANHOLE PROVIDED THAT THE WATER MAIN IS IN A SEPARATE TRENCH LOCATED ON ONE SIDE OF THE SEWER, AND:
c. THE BOTTOM OF THE WATER LINE IS AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER.
2. WHERE THIS VERTICAL SEPARATION CANNOT BE OBTAINED, THE SEWER SHALL BE CONSTRUCTED OF AWWA C900 OR C905 APPROVED WATER PIPE PRESSURE–TESTED IN PLACE TO A MINIMUM 30 PSI WITHOUT LEAKAGE PRIOR TO BACKFILLING. THE SEWER MANHOLE SHALL BE OF WATERTIGHT CONSTRUCTION AND TESTED IN PLACE WITHOUT LEAKAGE.
3. CROSSING:
a. NORMAL CONDITIONS: WATER LINES CROSSING OVER SEWERS SHALL BE AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE WATER LINE AND THE TOP OF THE SEWER.
b. UNUSUAL CONDITIONS: WHEN LOCAL CONDITIONS PREVENT A VERTICAL SEPARATION DESCRIBED IN CROSSING, NORMAL CONDITIONS, PARAGRAPH ABOVE, THE FOLLOWING CONSTRUCTION SHALL BE USED:
1) SEWERS PASSING OVER OR UNDER WATER LINES SHALL BE CONSTRUCTED OF THE MATERIALS DESCRIBED IN PARALLEL INSTALLATION, UNUSUAL CONDITIONS, PARAGRAPH 3.01.C.2 ABOVE.
2) WATER LINES PASSING UNDER SEWERS SHALL, IN ADDITION, BE PROTECTED BY PROVIDING:
a) A VERTICAL SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE SEWER AND THE TOP OF THE WATER LINE.
b) ADEQUATE STRUCTURE SUPPORT FOR THE SEWERS TO PREVENT EXCESSIVE DEFLECTION OF THE JOINTS AND SETTLING ON THE BREAKING WATER LINE.
c) THAT THE LENGTH OF THE WATER LINE BE CENTERED AT THE POINT OF THE CROSSING SO THAT JOINTS SHALL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.
4. CONTRACTOR SHALL OBTAIN APPROVAL FROM ENGINEER PRIOR TO INSTALLATION OF ANY WATER LINE CROSSING UNDER A SEWER LINE.
D. THRUST RESTRAINT OF PRESSURE PIPING SYSTEMS
ALL MECHANICAL JOINTS SHALL BE RESTRAINED WITH MEGA LUG RESTRAINING GLANDS OR EQUAL. RESTRAINED JOINTS SHALL ALSO BE USED ON ONE PIPE JOINT IN BOTH DIRECTIONS OF EACH FITTING. SEE VIRGINIA'S DEPARTMENT OF ENVIRONMENTAL QUALITY: SEWAGE COLLECTION AND TREATMENT REGULATIONS FOR DETAILS.
3.02 GRAVITY SEWERAGE PIPING
A. LAYING OF SEWER PIPE SHALL BE ACCOMPLISHED TO LINE AND GRADE IN THE TRENCH ONLY AFTER IT HAS BEEN DEWATERED AND THE FOUNDATION AND/OR BEDDING HAS BEEN PREPARED. MUD, SILT, GRAVEL, AND OTHER FOREIGN MATERIALS SHALL BE KEPT OUT OF THE PIPE AND OFF THE JOINTING SURFACES.
B. BEDDING SHALL BE SHAPED SO THAT THE ENTIRE LENGTH OF PIPE WILL HAVE FULL BEARING. NO BLOCKING OF ANY KIND SHALL BE USED TO ADJUST THE PIPE TO GRADE.
C. ALL PIPE AND FITTINGS SHALL BE CAREFULLY LOWERED INTO THE TRENCH IN SUCH A MANNER AS TO PREVENT DAMAGE TO PIPE OR COATINGS. UNDER NO CIRCUMSTANCES SHALL PIPE MATERIALS BE DROPPED OR DUMPED INTO THE TRENCH.
D. 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 PIPES SHALL BE LAID TO CONFORM TO THE PRESCRIBED LINE AND GRADE SHOWN ON THE DRAWINGS, WITHIN THE LIMITS THAT FOLLOW. AT LEAST THREE BATTERBOARDS SHALL BE MAINTAINED IN POSITION DURING ALL PIPE LAYING OPERATIONS, UNLESS A LASER BEAM IS USED.
E. VARIANCE FROM ESTABLISHED LINE AND GRADE SHALL NOT BE GREATER THAN 1/32 OF AN INCH PER INCH OF PIPE DIAMETER AND NOT TO EXCEED ½ INCH, PROVIDED THAT ANY SUCH VARIATION DOES NOT RESULT IN A LEVEL OR REVERSE SLOPING INVERT; PROVIDED ALSO, THAT VARIATION IN THE INVERT ELEVATION BETWEEN ADJOINING ENDS OF PIPE, DUE TO NONCONCENTRICITY OF JOINT SURFACE AND PIPE INTERIOR SURFACES, DOES NOT EXCEED 1/64 INCH PER INCH OF PIPE DIAMETER, OR ½ INCH MAXIMUM.
F. THE SEWER PIPE, UNLESS OTHERWISE APPROVED BY THE ENGINEER, SHALL BE LAID UP GRADE FROM POINT OF CONNECTION OF THE EXISTING SEWER OR FROM A DESIGNATED STARTING POINT. THE SEWER PIPE SHALL BE INSTALLED WITH THE BELL END FORWARD OR UPGRADE. WHEN PIPE LAYING IS NOT IN PROGRESS THE FORWARD END OF THE PIPE SHALL BE KEPT TIGHTLY CLOSED WITH TEMPORARY PLUG.
G. THE PIPE SHALL BE FITTED AND MATCHED SO THAT UNITS WILL FORM A SMOOTH, UNIFORM INVERT.
H. PRIOR TO JOINING THE PIPE, ALL SURFACES OF THE PIPE TO BE JOINED AND 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 MATERIALS AS THE WORK PROGRESSES. AT THE END OF THE WORKDAY, THE LAST PIPE LAID SHALL BE BLOCKED TO PREVENT CREEP, AND CLOSED WITH TIGHT FITTING COVER.
I. TRENCHES SHALL BE CAREFULLY FILLED USING SELECT BACKFILL MATERIALS IN SIX–INCH LAYERS TO A DEPTH OF 12–INCHES ABOVE THE TOP OF THE PIPE. EACH LAYER SHALL BE EVENLY SPREAD; THE MOISTURE CONTENT BROUGHT TO NEARLY OPTIMUM CONDITIONS; AND THEN COMPACTED TO A DENSITY THAT IS NOT LESS THAN 95% OF MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT.
J. THE REMAINDER OF THE TRENCH SHALL BE FILLED USING CONTROLLED FILL, PLACED IN LAYERS NOT EXCEEDING SIX–INCHES, AND COMPACTED WHILE AT A MOISTURE CONTENT NEAR THE OPTIMUM AND TO A DENSITY THAT IS NOT LESS THAN 90% OF THE MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT.
K. ALL SANITARY SEWER MAINS ARE REQUIRED TO PASS THE FOLLOWING TESTS TO INSURE THERE WILL BE NEITHER EXFILTRATION NOR INFILTRATION:
1. GRAVITY MAINS
a. EXFILTRATION AND LAMPING TESTS: ALL GRAVITY MAINS.
b. DEFLECTION TESTING: PVC GRAVITY MAINS ONLY.
2. FORCE MAINS:
a. EXFILTRATION: ALL FORCE MAINS.
3. NO TESTING BY THE ENGINEER SHALL BE CONDUCTED UNTIL THE REQUIREMENTS PROVIDED IN THE RECORD PLAN SECTION ARE MET.
4. ALL SANITARY SEWER MAINS SHALL BE COLOR TELEVISED (AFTER HAVING BEEN FLUSHED WITH WATER) PRIOR TO ACCEPTANCE BY THE OWNER.
3.03 FORCE MAIN PIPING AND APPURTENANCES
A. LAYING OF FORCE MAIN SHALL BE ACCOMPLISHED IN THE TRENCH ONLY AFTER IT 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. BEDDING SHALL BE SHAPED SO THAT THE ENTIRE LENGTH OF PIPE WILL HAVE FULL BEARING. NO BLOCKING OF ANY KIND SHALL BE USED TO ADJUST THE PIPE TO GRADE.
C. ALL PIPE AND FITTINGS SHALL BE CAREFULLY LOWERED INTO THE TRENCH IN SUCH A MANNER AS TO PREVENT DAMAGE TO PIPE OR COATINGS. UNDER NO CIRCUMSTANCES SHALL PIPE MATERIALS BE DROPPED OR DUMPED INTO THE TRENCH.
D. 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 PIPES SHALL BE LAID TO CONFORM TO THE PRESCRIBED LINE AND GRADE SHOWN ON THE DRAWINGS.
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 TO 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 WORKDAY, THE LAST PIPE LAID SHALL BE BLOCKED TO PREVENT CREEP, AND CLOSED WITH TIGHT FITTING COVER.
3.04 YARD PIPING AND APPURTENANCES
A. SERVICE LINE AND YARD PIPING SHALL BE TESTED AT NOT LESS THAN 1–1/2 TIMES WORKING PRESSURE FOR 2 HOURS. PRESSURE SHALL BE INCREASED IN 50–PSI INCREMENTS AND EACH JOINT INSPECTED BETWEEN INCREMENTS. TEST PRESSURE SHALL BE HELD FOR ONE HOUR; DECREASE TO 0 PSI. TEST PRESSURE SHALL BE SLOWLY ACHIEVED AGAIN AND HELD FOR ONE MORE HOUR. NO LEAKAGE IS ALLOWED. REMAKE LEAKING JOINTS WITH NEW MATERIALS AND REPEAT TEST UNTIL LEAKAGE IS WITHIN ABOVE LIMITS. TESTING PROCEDURES SHOULD CONFORM TO THE SCAT REGULATIONS.
B. SERVICE LINE PIPING SHALL BE CLEANED AND DISINFECTED AS FOLLOWS:
- NEW WATER PIPING SHALL BE PURGED AND DISINFECTED IN ACCORDANCE WITH AWWA C600 AND C651.
- PIPING SHALL BE FILLED WITH A WATER/CHLORINE SOLUTION CONTAINING AT LEAST 50 PARTS PER MILLION OF CHLORINE. ISOLATE (VALVE OFF) THE SYSTEM OR PART THEREOF AND ALLOW TO STAND FOR 24 HOURS.
- PIPING SHALL BE DRAINED AND REFILLED WITH A WATER/CHLORINE SOLUTION CONTAINING AT LEAST 200 PARTS PER MILLION OF CHLORINE AND ISOLATE AND ALLOWED TO STAND FOR 3 HOURS.
- FOLLOWING THE ALLOWED STANDING TIME, THE PIPING SHALL BE FLUSHED WITH CLEAN, POTABLE WATER UNTIL CHLORINE RESIDUAL IS AT AN ACCEPTABLE LEVEL.

3.05 REMOVAL OF ALL AIR
CONTRACTOR IS RESPONSIBLE FOR THE REMOVAL OF ALL AIR AFTER TESTING AND TIE IN OF ALL PIPELINES.
END OF SECTION

SECTION 03400–PRE–CAST CONCRETE STRUCTURES

PART 1 – GENERAL
1.01 SUMMARY
THIS SECTION SPECIFIES THE REQUIREMENTS FOR THE PRE–CAST CONCRETE MANHOLES, AND WET WELL TO BE PROVIDED AS PART OF THIS PROJECT. PRE–CAST CONCRETE STRUCTURES ARE TO BE DELIVERED AND PLACED ON PREPARED STONE FOUNDATION IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. THE STRUCTURES ARE TO BE PROVIDED WILL ALL NECESSARY OPENINGS AS SPECIFIED IN CONFORMANCE WITH MANUFACTURER'S STRUCTURAL REQUIREMENTS.
1.02 QUALITY CONTROL
A. MANUFACTURER SHALL PROVIDE CERTIFIED CALCULATIONS THAT THE CONCRETE STRUCTURES AND REINFORCEMENT IS ADEQUATELY DESIGNED FOR THE STRUCTURE DIMENSIONS AND DEPTHS SPECIFIED.
B. PRE–CAST STRUCTURES SHALL CONFORM TO ACI AND PCI STANDARDS. MANUFACTURER SHALL BE A MEMBER OF PCI.
C. PRE–CAST STRUCTURES SHALL CONFORM TO ALL APPLICABLE BUILDING CODES.
1.03 SUBMITTALS
A. SHOP DRAWINGS OF THE STRUCTURES SHALL BE SUBMITTED TO THE ENGINEER PRIOR TO DELIVERY PER SECTION 01300 SHOP DRAWINGS AND PRODUCT DATA SUBMITTALS.
B. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING:
1. DETAILED DRAWINGS
2. DESIGN CRITERIA
3. DESIGN CALCULATIONS SEALED BY A PROFESSIONAL ENGINEER LICENSED IN NEW JERSEY.
4. LIFTING AND INSTALLATION PROCEDURES
PART 2 – PRODUCTS
2.01 GENERAL
A. PUMP STATION WET WELL SHALL BE A PRE–CAST CONCRETE STRUCTURE AS MANUFACTURED BY AMERICAST, ROTONDO PRECAST, CONTRACTORS PRECAST CORPORATION, HANSON PIPE AND PRODUCTS, OR APPROVED EQUAL.
B. PRE–CAST CONCRETE STRUCTURES SHALL MEET REQUIREMENTS OF ASTM C913 EXCEPT THAT THE MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI USING TYPE II OR III CEMENT.
C. THE STRUCTURES SHALL HAVE AN EXTENDED BASE CONFORMING TO ASTM C913 EXCEPT THAT THE MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI USING TYPE II OR III CEMENT.
D. EXTERIOR SHALL BE COATED WITH A BITUMASTIC SEALER APPLIED WITH TWO COATS, WITH A MINIMUM OF 7 MILS PER DRY COAT.
E. STRUCTURES SHALL BE ADEQUATE TO WITHSTAND HYDROSTATIC AND SOIL BEARING PRESSURE LOADINGS AS INDICATED ON DESIGN DRAWINGS.
F. STRUCTURES SHALL BE FURNISHED WITH PRE–CAST FLAT SLAB TOPS CONFORMING TO ASTM C913 WITH ALUMINUM ACCESS DOORS AND APPURTENANCES IN ACCORDANCE WITH DESIGN DRAWINGS. THE ACCESS DOORS SHALL BE INTEGRALLY CAST INTO THE TOP AT THE PLACE OF MANUFACTURER. THE ACCESS DOORS SHALL BE AASHTO H20 RATED AS MANUFACTURED BY BILCO OR APPROVED EQUAL. A PADLOCK HASP FOR OWNER–SUPPLIED PADLOCK SHALL BE PROVIDED.
G. TONGUE AND GROOVE JOINTS OF THE PRE–CAST SECTIONS SHALL BE SEALED WITH A RUBBER GASKET CONFORMING TO ASTM C913 AND A MINIMUM OF TWO CONTINUOUS BEADS OF PRE–FORMED BUTYL MASTIC.
H. PIPE CONNECTORS SHALL BE LINK SEAL FLEXIBLE PIPE CONNECTORS MEETING ASTM C923 AND INSTALLED BY THE STRUCTURE MANUFACTURER.
PART 3 – EXECUTION
3.01 STRUCTURES SHALL BE SET LEVEL TO PREVENT SETTLEMENT.
3.02 THE PUMP STATION WET WELL SHALL BE LEAK TESTED FOR A MINIMUM OF 48 HOURS PRIOR TO BACKFILLING. LEAK TESTING SHALL INCLUDE FILLING TANK WITH CLEAN WATER AND MEASURING WATER LEVELS. THERE SHALL BE NO LEAKAGE FROM TANK. CONTRACTOR SHALL PROVIDE THE WATER NECESSARY TO COMPLETE THE LEAK TEST.
END OF SECTION

SECTION 11200–PUMP STATION

PART 1 – GENERAL
1.01 SUMMARY
THIS SECTION SPECIFIES THE REQUIREMENTS FOR THE PUMP STATION.
1.02 QUALITY CONTROL
PUMPS AND CONTROL PANEL SHALL BE SUPPLIED BY A SOLE SOURCE.
1.03 SUBMITTALS
TWO (2) COPY OF SHOP DRAWINGS OF ALL STRUCTURES AND EQUIPMENT SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL, AS WELL AS ONE (1) ELECTRONIC COPY. INFORMATION SHALL INCLUDE DIMENSIONS, CAPACITY, MATERIAL, FINISH, GUARANTEE, ETC.
A. CONTROL PANEL SUBMITTAL SHALL INCLUDE A LIST OF EQUIPMENT, PRODUCT LITERATURE ON THE EQUIPMENT, FORMAL LADDER DIAGRAMS WITH PROPER ANNOTATIONS, AND PANEL ELEVATIONS SHOWING FRONT MOUNTED (OR INNER DOOR) EQUIPMENT LAYOUT.
B. TWO (2) COPIES OF A COMPLETE OPERATIONS MANUAL FOR ALL EQUIPMENT, INCLUDING DETAIL DRAWINGS, MAINTENANCE INSTRUCTIONS AND OTHER PERTINENT DATA SHALL BE COMPILED AND SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL BEFORE ACCEPTANCE OF THE FACILITY.
1.04 CONTROL SUMMARY
THE FOLLOWING IS THE OPERATING SEQUENCE FOR THE PUMP STATION:
A. THE PUMPS SHALL BE CONTROLLED BY A CONTROL SYSTEM AS MANUFACTURED BY BARNES, LIBERTY, OR APPROVED EQUAL. PUMP OPERATION IS BASED ON WET WELL LEVELS. THE CONTROLLER OPERATES FROM FOUR (4) FLOAT SWITCHES AND GENERATES THE HIGH LEVEL ALARM. LOCAL ALARMS ARE DISPLAYED ON AN ANNUNCIATION SYSTEM LOCATED ON THE CONTROL PANEL INNER DOOR. PUMP STATUS AND ALARMS ARE SENT TO THE OPERATOR VIA AN AUTODIALER LOCATED AT THE PUMP CONTROL PANEL. STARTING OF THE PUMPS SHALL BE DELAYED BY 30 SECONDS FOR THE LEAD PUMP AND 60 SECONDS FOR THE LAG PUMP TO REDUCE STARTING CURRENT ON THE GENERATOR.
B. PUMPS ARE TO OPERATE IN A LEAD– LAG MODE, WHERE PUMPS ALTERNATE AS LEAD PUMP AND LAG PUMP WHEN CONTROLLED BY THE CONTROL PANEL. UPON THE RISE OF WASTEWATER IN THE BASIN TO THE "LEAD PUMP ON" LEVEL, THE LEAD PUMP SHALL ENERGIZE. WHEN THE LEVEL FALLS TO THE "PUMPS OFF" LEVEL, THE PUMP SHALL STOP. IF THE LEAD PUMP CANNOT HANDLE THE FLOW OR FAILS TO OPERATE, THE LEVEL WILL RISE TO THE "LAG PUMP ON" LEVEL, AT WHICH TIME THE LAG PUMP SHALL BE ENERGIZED. THE PUMPS SHALL ALTERNATE BETWEEN LEAD AND LAG AFTER EACH PUMP CYCLE. IF THE LEAD AND LAG PUMPS CANNOT HANDLE THE FLOW, OR FAIL TO OPERATE, THE LEVEL WILL RAISE TO THE "HIGH" LEVEL, AT WHICH TIME THE ALARM LIGHT AND HORN WILL BE ENERGIZED.
SHOULD A POWER FAILURE OCCUR, THE PUMP CONTROL LOGIC SHALL STAGGER PUMP STARTING TO PREVENT MULTIPLE PUMPS FROM STARTING AT ONCE. THE LEAD PUMP STARTING SHALL BE DELAYED BY 30 SECONDS AND THE LAG PUMP STARTING SHALL BE DELAYED BY 60 SECONDS OR AS DETERMINED BY THE GENERATOR MANUFACTURER TO REDUCE INRUSH CURRENT TO ACCEPTABLE LEVELS.

C. FOUR FLOAT SWITCHES ARE INSTALLED IN THE WET WELL TO OPERATE THE CONTROLLER. THE FLOAT SWITCHES PROVIDE HIGH LEVEL ALARM, (AUDITABLE/VISUAL ALARMS/ALARM TO AUTODIALER); LAG PUMP ON; LEAD PUMP ON; AND PUMP OFF.
PART 2 – PRODUCTS
2.01 PUMPS
A. CONTRACTOR SHALL PROVIDE AND INSTALL TWO BARNES SUBMERSIBLE GRINDER XP – 3C PUMPS OR APPROVED EQUAL.
B. HAPPY CREEK WASTEWATER PUMPS
1. PUMPS SHALL BE BARNES GRINDER XP – 3C PUMPS, MODEL XSGV2022L, OR APPROVED EQUAL.
2. PUMPS SHALL BE PROVIDED WITH 2 HP, 230 V, 3 PHASE, 60 HZ, 3450 RPM MOTORS, WITH AN IMPELLER DIAMETER OF 4.75 INCHES.
3. OPERATING POINTS:
a. DESIGN POINT: 23 GPM @ 59.84' TDH
b. OPERATING POINT: 23 GPM @ 59.9' TDH
c. SHUT OFF HEAD: 76.4 FEET (MINIMUM)
C. SEALS
TYPE 21, DUAL MECHANICAL SEAL CONSTRUCTION MOUNTED IN TANDEM, SHALL PROTECT THE MOTOR. PRIMARY SEAL SHALL BE SILICON / CARBIDE. SECONDARY SEAL SHALL BE SILICON / CARBIDE. THE SEAL FACE SHALL BE LAPPED TO A FLATNESS OF ONE LIGHT BAND. A DOUBLE ELECTRODE SHALL BE MOUNTED IN THE SEAL CHAMBER TO DETECT WATER ENTERING THE CHAMBER THROUGH THE LOWER SEAL. WATER IN THE CHAMBER SHALL CAUSE A RED LIGHT TO TURN ON AT THE CONTROL BOX. THIS SIGNAL SHALL NOT STOP THE MOTOR, BUT SHALL ACT AS A WARNING ONLY, INDICATING SERVICE IS REQUIRED.
D. POWER CHORD
THE MOTOR POWER CHORD SHALL BE 10 GA. SOW/SOWA OR SOOW. THE CABLE SHALL BE SEALED AT THE MOTOR ENTRANCE BY MEANS OF A RUBBER COMPRESSION WASHER AND COMPRESSION NUT. AN EPOXY FILLED TUBE SHALL SEAL THE OUTER CABLE JACKET AND INDIVIDUAL LEADS TO PREVENT WATER FROM ENTERING THE MOTOR HOUSING. INDIVIDUAL CONDUCTOR STRANDS SHALL BE SOLDERED WITHIN THE EPOXY SEAL. CORDS SHALL WITHSTAND A PULL OF 300 POUNDS.
E. PUMP REMOVAL SYSTEM
1. THE PUMP'S DESIGN SHALL ALLOW FOR REMOVAL AND REINSTALLATION OF THE PUMP WITHOUT THE NEED FOR PERSONNEL TO ENTER THE CONFINED SPACE OF THE WET WELL AND WITHOUT THE REMOVAL OF BOLTS, NUTS OR OTHER FASTENERS.
2. THE ENTIRE WEIGHT OF THE PUMPING UNITS SHALL BE CARRIED BY THE DISCHARGE ASSEMBLY AND THE DISCHARGE CONNECTION ELBOW WITH METAL–TO–METAL CONTACT BETWEEN THE PUMP AND DISCHARGE FLANGE AND THE DISCHARGE CONNECTION ELBOW.
3. PUMPS SHALL BE PROVIDED WITH QUICK DISCONNECT/AUTO–COUPLING ASSEMBLY, REQUIRED DISCHARGE FITTINGS TO MATE–UP TO THE DISCHARGE ELBOW, LIFTING BRACKET, AND ALL HARDWARE NECESSARY FOR LIFTING OF THE PUMP USING AN EXISTING BOOM TRUCK.
4. SEALING OF THE DISCHARGE INTERFACE BY MEANS OF A DIAPHRAGM, O–RING, OR OTHER DEVICES SHALL NOT BE PERMITTED
5. EACH PUMP SHALL BE PROVIDED WITH AN OVERSIZED STAINLESS–STEEL LIFTING BRACKET MOUNTED BY THE MANUFACTURER.
F. PUMP CONSTRUCTION
1. MAJOR STATIC COMPONENTS (PUMP CASING, INTERMEDIATE HOUSING AND MOTOR HOUSING) SHALL BE OF AT MINIMUM ASTM A48 CLASS 30 GRAY CAST IRON WITH SMOOTH SURFACES DEVOID OF BLOW HOLES AND OTHER IRREGULARITIES.
2. THE SYSTEM SHALL CONSIST OF STATIONARY CUTTER RING AND ROTARY IMPELLER, EACH MANUFACTURED IN ACCORDANCE WITH THE MANUFACTURE SPECIFICATIONS.
3. THE IMPELLER, WHICH IS THE ROTATING EXPOSED PIECE, SHALL BE OF 85–5–5–5 BRONZE. THE IMPELLER DESIGN SHALL BE A RECESSED, SEMI–VORTEX, MULTI–VANE DESIGN, WITH PUMP OUT VANES.
4. ALL EXPOSED FASTENERS SHALL BE ASTM A 276 TYPE 304 STAINLESS STEEL. ALL EXPOSED BOLTS AND NUTS SHALL BE 304 STAINLESS STEEL.
5. THE PUMP'S CAST IRON COMPONENTS SHALL BE COATED WITH AT MINIMUM A TWO–COMPONENT EPOXY FINISH HAVING AT MINIMUM 83% SOLIDS BY VOLUME. THIS COATING SHALL BE NON–TOXIC AND APPROVED FOR WASTEWATER APPLICATIONS.
6. MATING SURFACES BETWEEN COMPONENTS WHERE WATERTIGHT INTEGRITY IS CRITICAL SHALL BE MACHINED AND FITTED WITH NITRILE RUBBER OR VITON O–RINGS. BECAUSE THESE ARE CRITICAL PASSAGES AND FLAME PATHS, NO SECONDARY SEALING COMPOUNDS, GREASES, OR OTHER DEVICES SHALL BE USED.
2.02 SUBMERSIBLE PUMP CABLES
A. PUMP CABLES SHALL BE STW–A, WATER RESISTANT 600V, 60°C, CABLES SUPPLIED BY THE PUMP SYSTEM SUPPLIER.
B. THE POWER CORD ASSEMBLIES SHALL BE CONNECTED TO THE PUMP CONTROLLER MOTOR LEADS UTILIZING ISCO TERMINAL BLOCKS.
2.03 HOIST
A HALLIDAY PORTABLE HOIST, MODEL D2B36D CAPABLE OF 1,000 LBS, OR APPROVED EQUAL SHALL BE PROVIDED.
2.04 FLOAT SWITCHES
FLOATS SHALL BE BARNES MERCURY LEVEL CONTROL SWITCHES, WITH MINIMUM OF 25 FEET OF CABLE, EACH, OR APPROVED EQUAL. FOUR (4) FLOATS SHALL BE PROVIDED. THE FLOAT SWITCH WIRING EXTERNAL OF THE CONTROL PANEL SHALL BE INTRINSICALLY SAFE.

2.05 AUTODIALER
AUTODIALER SHALL BE A RACO VERBATIM AUTODIALER, OR APPROVED EQUAL. SEE SHEE 17 FOR REQUIRED INPUTS, PER SECTION 16483.

PART 3 – EXECUTION
3.01 WARRANTY
THE EQUIPMENT SUPPLIER SHALL WARRANTY THE EQUIPMENT FOR A PERIOD OF TWO (2) YEARS FROM THE DATE OF START–UP.
3.02 TESTING, START–UP, AND OPERATOR TRAINING
A. ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND TESTED UNDER OPERATING CONDITIONS TO ENSURE THAT THE EQUIPMENT IS WORKING PROPERLY.
B. REPRESENTATIVES OF THE PUMPING EQUIPMENT AND CONTROL PANEL MANUFACTURERS SHALL SUBMIT WRITTEN VERIFICATION THAT THE EQUIPMENT IS INSTALLED PROPERLY AND IS WORKING CORRECTLY PRIOR TO INSPECTIONS. THE ENGINEER AND THE CONTROL PANEL SUPPLIER SHALL BE PRESENT WHEN EQUIPMENT IS TESTED. CONTRACTOR IS RESPONSIBLE FOR SCHEDULING AND NOTIFYING ALL PARTIES FOR TESTING.
C. ALL PIPES SHALL BE PRESSURE AND LEAK TESTED IN PER SECTION 02560 PIPING SYSTEMS.
D. THE MANUFACTURER SHALL PROVIDE TWO (2) DAYS OF OPERATOR TRAINING ON–SITE, FOR UP TO TWO (2) OPERATORS. ALL TRAVEL EXPENSES AND LODGING ARE TO BE PROVIDED BY THE MANUFACTURER.
END OF SECTION

Bowman
CONSULTING

Bowman Consulting Group, Ltd.
Winchester Office
124 East Cork Street
Winchester, Virginia 22601
Phone: (540) 722-2343
Fax: (540) 722-5080
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

PUMP STATION SPECIFICATIONS
HAPPY CREEK KNOLLS
SECTION 4
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
JESSICA M. KWIATKOWSKI
Lic. No. 036766
4/18/18
PROFESSIONAL ENGINEER

PLAN STATUS

DATE	DESCRIPTION

TCW DESIGN	DWD DRAWN	JMK CHKD
SCALE	H: N/A V: N/A	
JOB No. 1602-04-001		
DATE APRIL, 2018		
FILE No. 1602-D-CP-04-001		

SHEET 14 OF 31

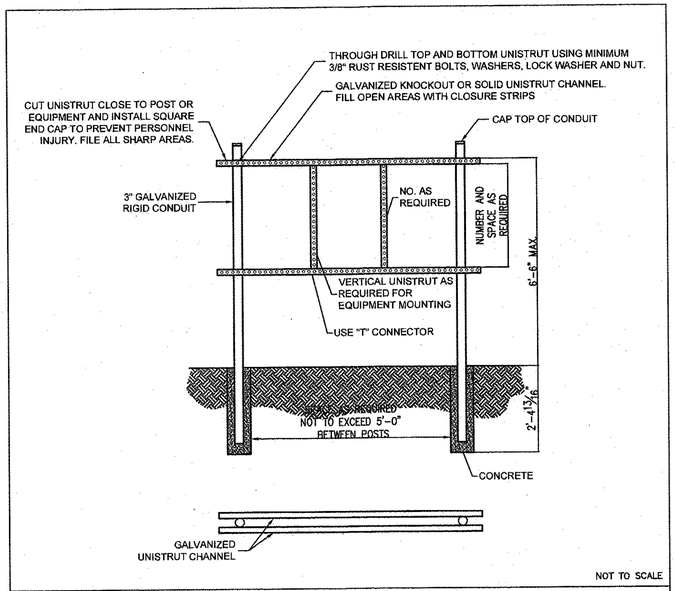
Cad file name: P:\001602 – Happy Creek Knolls\001602-02-016 (ENG) – Pump Station\Engineering\Engineering Plans\1602-02-016-PSTA.dwg

NOTES:

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE 2014 NATIONAL ELECTRICAL CODE, CONSTRUCTION AND PROFESSIONAL SERVICES MANUAL 2013 REVISION 0, AND THE VIRGINIA UNIFORM STATEWIDE BUILDING CODE 2012 INCLUDING VIRGINIA CONSTRUCTION CODE.
2. COORDINATE LOCATION OF EQUIPMENT WITH CIVIL AND MECHANICAL DRAWINGS.
3. WIRE SIZES AND CONDUIT SIZES SHOWN ARE BASED ON COPPER.
4. PROVIDE CONDUIT AND WIRE FROM CONTROL AND COMMUNICATIONS DEVICES AS REQUIRED FOR SYSTEM OPERATION.
5. REVIEW DRAWINGS AND SPECIFICATIONS BEFORE BIDDING. SUBMIT QUESTIONS REGARDING ANY DEFICIENCIES OR DISCREPANCIES BEFORE BIDS. FAILURE TO ASK FOR CLARIFICATION WILL NOT BE CONSIDERED AS JUSTIFICATION FOR A CHANGE ORDER.
6. ITEMS LISTED IN THE SYMBOL TABLE ARE PROPOSED. COORDINATE EXACT REQUIREMENTS FOR WIRING AND OVERCURRENT PROTECTION DEVICES WITH REQUIREMENTS FOR EQUIPMENT ACTUALLY PROVIDED AND APPROVED.
7. PROVIDE A GROUND CONDUCTOR IN ALL BRANCH CIRCUITS SIZED ACCORDING TO THE OVERCURRENT PROTECTION DEVICE.
8. LIGHT EQUIPMENT MOUNTED OUTDOORS SHALL BE MOUNTED ON STAINLESS STEEL, KINDORF OR UNISTRUT. HEAVY EQUIPMENT MOUNTED OUTDOORS SHALL BE MOUNTED ON A WELDED STEEL FRAME CONSTRUCTED OF A-36, 6" x 2" x 1/4" CHANNEL STEEL. HOT DIP GALVANIZE THE FABRICATED FRAME PRIOR TO INSTALLATION. INSTALL THE FRAME EMBEDDED IN 18" DIA. x 3' DEEP BORED POST HOLES FILLED WITH CONCRETE.
9. CONDUIT, WIRE AND CABLE SIZES SHOWN FOR CONTROL AND COMMUNICATIONS EQUIPMENT ARE FOR BIDDING PURPOSES ONLY. PROVIDE WIRE SIZES AND TYPES AS REQUIRED BY EQUIPMENT MANUFACTURERS. COORDINATE CONDUIT SIZES WITH WIRE NUMBER AND SIZE REQUIREMENTS.
10. MAIN CIRCUIT BREAKER/MAIN FUSED DISCONNECT SWITCH SHALL BE SERVICE ENTRANCE LABELED WITH A PERMANENT LABEL.
11. LABEL ALL MEANS OF DISCONNECT INDICATING THE SOURCE CIRCUIT AND EQUIPMENT THEY SERVE. INCLUDE THIS INFORMATION ON LABELS FOR ENCLOSED CIRCUIT BREAKERS, PANELBOARDS, CONTROLLERS, MOTOR CONTROLLERS AND AUTOMATIC TRANSFER SWITCHES.
12. ITEMS LISTED IN SCHEDULES ARE RATED BASED ON TYPICAL UNITS. COORDINATE EXACT CIRCUIT BREAKER RATINGS (MOP OR MOCP) AND BRANCH CIRCUIT REQUIREMENTS (MCA) WITH EQUIPMENT ACTUALLY PROVIDED AND APPROVED.
13. SEAL ALL PENETRATIONS THROUGH TANK WALLS.
14. PROVIDE ELECTRICAL SHOCK AND ARC FLASH WARNING LABELS ON ALL NEW ELECTRICAL EQUIPMENT IN ACCORDANCE WITH NEC ARTICLE 110.16. ON EQUIPMENT MOUNTED OUTDOORS, LABELS SHALL BE APPLIED INSIDE THE OUTER DOOR ON THE PROTECTIVE OUTER COVER OF ENCLOSED CIRCUIT BREAKERS, DISCONNECT SWITCHES, ETC.
15. IDENTIFY GROUND CABLES USING GREEN TAPE OR GREEN COLORED INSULATION.
16. PROVIDE CONDUIT AND WIRE FROM CONTROL AND COMMUNICATIONS DEVICES AS REQUIRED FOR SYSTEM OPERATION.
17. PROVIDE A TVSS AT THE MAIN CIRCUIT BREAKER.

ABBREVIATIONS:

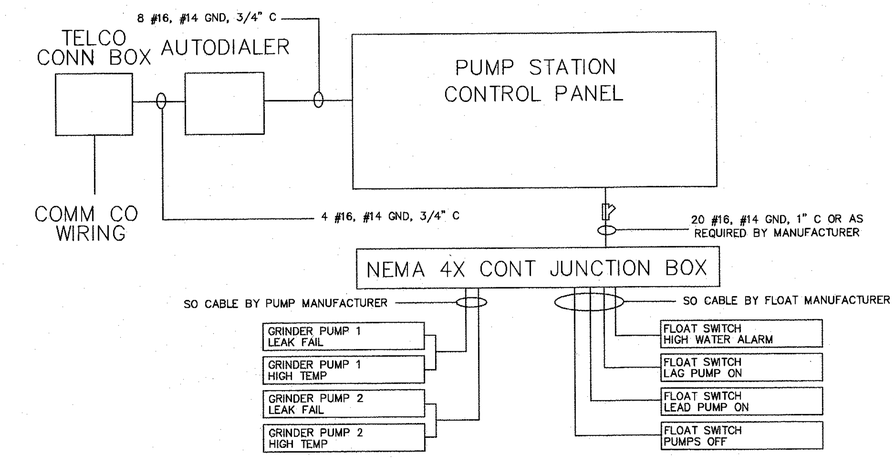
A	AMPS
AFG	ABOVE FINISHED GRADE
BLDG	BUILDING
C	CONDUIT
CLWL	CLEARWELL
CONT	CONTROL, CONTROLLER, CONTROL PANEL
DISC SW	DISCONNECT SWITCH
DIST	DISTRIBUTION
(E)	EXISTING TO REMAIN
ECB	ENCLOSED CIRCUIT BREAKER
EG	EQUIPMENT GROUND
EQPT	EQUIPMENT
EXST	EXISTING – MODIFY AS REQUIRED
GEC	GROUND ELECTRODE CONDUCTOR
GFCI	GROUND FAULT CURRENT INTERRUPTING
GND	GROUND
MCB	MAIN ENCLOSED CIRCUIT BREAKER
MIN	MINIMUM
PNL	PANEL
PNLBD	PANELBOARD
SE	SERVICE ENTRANCE
TK	TANK
TYP	TYPICAL
WCR	WITHSTAND AND CLOSE RATING
WP	WEATHERPROOF
XFMR	TRANSFORMER



TYPICAL OUTDOOR EQUIPMENT MOUNTING FRAME

SYMBOLS

- (J) JUNCTION BOX
- RECEPTACLE, NEMA 5-20R. MOUNT 16" AFF. PROVIDE A GFCI TYPE RECEPTACLE WITH A WEATHERPROOF, IN-USE COVER WHEN MOUNTED OUTDOORS. DUPLEX.
- BRANCH CIRCUIT WIRING. 2 #12 THHN, #12 GROUND, 3/4" CONDUIT UNLESS OTHERWISE NOTED. TICK MARKS, WHEN USED, INDICATE NUMBER OF GROUNDED AND UNGROUNDED CONDUCTORS IF OTHER THAN 2 #12.
- GROUND CONNECTION
- (M)X MOTOR. HORSEPOWER, "X," AS INDICATED. SEE DETAIL THIS SHEET
- 200 A/2P, 150 A — FUSED DISCONNECT SWITCH – ONE-LINE DIAGRAM EXAMPLE SWITCH RATING AND FUSE RATING AS INDICATED.
- XP YY/ZZ 3R — DISCONNECT SWITCH – PLAN VIEW EXAMPLE "XP" INDICATES NUMBER OF POLES, "ZZ" INDICATES SWITCH RATING AND "YY" INDICATES FUSE RATING AS INDICATED. "NF" INDICATES NON-FUSED.
- 150/2 CIRCUIT BREAKER. ONE-LINE DIAGRAM EXAMPLE CIRCUIT BREAKER CURRENT RATING AND NUMBER OF POLES AS INDICATED.
- N E — MANUAL TRANSFER SWITCH – ONE-LINE DIAGRAM EXAMPLE. NUMBER OF POLES, SWITCH AMP RATING AND VOLTAGE RATING AS INDICATED. "N" INDICATES CONNECTION TO NORMAL SOURCE. "E" INDICATES CONNECTION TO GENERATOR SOURCE.
- PANELBOARD – PLAN VIEW EXAMPLE. SEE PANELBOARD SCHEDULE FOR DETAILS. 240/120 V. CURRENT RATING AS INDICATED.
- HORN, NEMA 4X, PROVIDE WITH PUMP CONTROL PANEL
- FLASHING ALARM, NEMA 4X, PROVIDE WITH PUMP CONTROL PANEL
- (E1) DUPLEX GRINDER PUMP CONTROLLER, 240/120 V.
- (M)2 SUBMERSIBLE GRINDER PUMP, 230 V, FLA= 15, SINGLE PHASE, 2 HP, TYP OF 2.
- S SWITCH, 120 V, 15 A, SPST BROWN.
- EXPLOSION-PROOF INTRINSICALLY SAFE SEALING FITTING
- RECEPTACLE, NEMA 5-20 R. PROVIDE CAST WEATHERPROOF BOX AND WEATHERPROOF, HEAVY DUTY, IN-USE, COVER.



PUMP STATION CONTROL DIAGRAM

NOT TO SCALE

Tidewater Engineering
248 Unser Dr. Chesapeake, VA 23322
P: 757.876.1780 email: powersp@verizon.net

Bowman CONSULTING

Bowman Consulting Group, Ltd.
Winchester Office
124 East Cork Street
Winchester, Virginia 22601
Phone: (540) 722-2343
Fax: (540) 722-5080
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

PUMP STATION ELECTRICAL NOTES & CONTROL DIAGRAM

HAPPY CREEK KNOLLS
SECTION 4

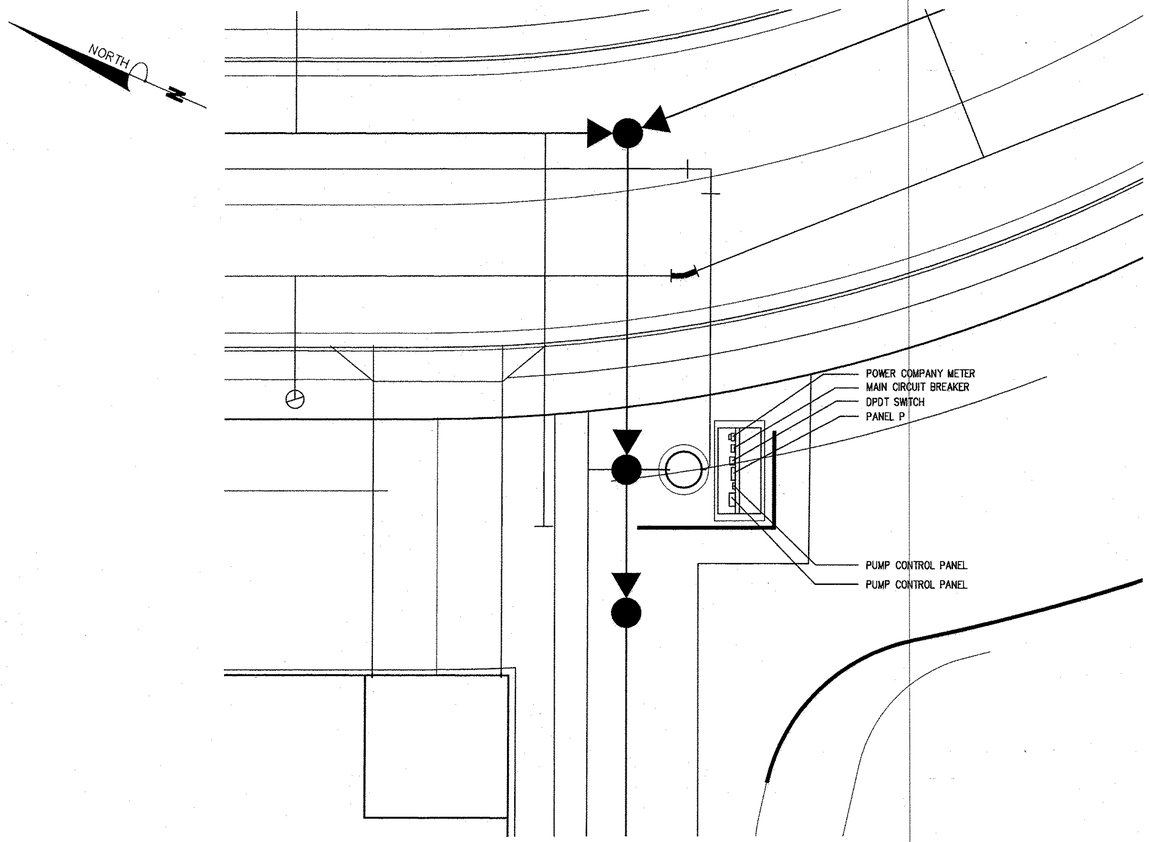
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
PAUL L. POWERS
Lic. No. 20620
4/18/18
PROFESSIONAL ENGINEER

PLAN STATUS	
DATE	DESCRIPTION

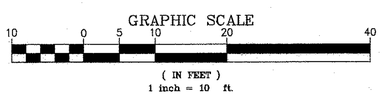
PLP DESIGN	PLP DRAWN	PLP CHKD
SCALE	H: AS NOTED V: N/A	
JOB No.	1602-04-001	
DATE	APRIL, 2018	
FILE No.	1602-D-CP-04-001	
SHEET	15 of 31	

Cad file name: P:\1602 - Happy Creek Knolls\1602-D-CP-04-001.dwg - Cary Solution\Engineering\Engineering Plans\1602-D-CP-04-001.dwg



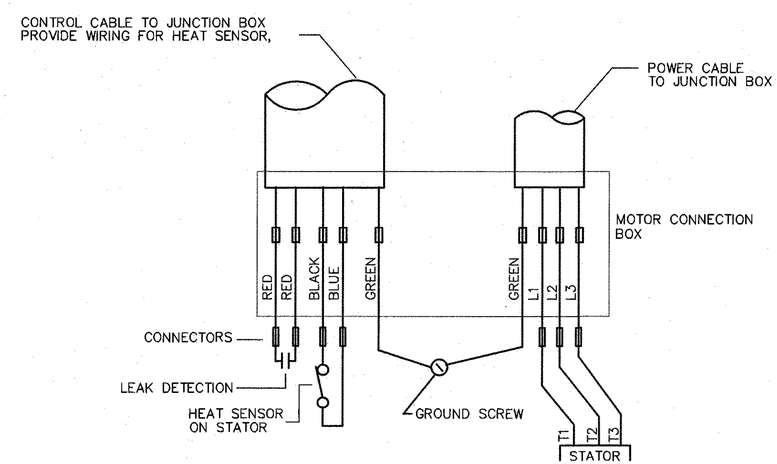
PUMP STATION ELECTRICAL SITE PLAN

SCALE: 1"=10'



PANEL	VOLTAGE	240/120			SN		YES				MAIN BRKR SIZE	
P	PHASE	1			GND BUS		YES				MAIL LUG ONLY	200
	WIRE	3			MOUNTING		SURFACE				BRKR MIN KAIC	22 SEE NOTE 5
LOAD DESCRIPTION		LOAD AMPS A	LOAD AMPS B	CB TRIP	CKT NO.	PH	CKT NO.	CB TRIP	LOAD AMPS A	LOAD AMPS B	LOAD DESCRIPTION	
AUTODIALER		2		20	1	A	2	70	30	30	PUMP CONTROL PANEL	
RECEPTACLE			2	20	3	B	4					
SPARE			3	20	5	A	6	15			SPARE	
SPARE		1		20	7	B	8	30			SPARE	
SPARE		0	0	40	9	A	10	30			SPARE	
					11	B	12	30			SPARE	
CONNECTED LOAD	LEFT SIDE AMPS	3	5						30	30	RIGHT SIDE AMPS	
	RIGHT SIDE AMPS	30	30									
	TOTAL AMPS	33	35									

1. PROVIDE BREAKERS IN SPACES AS INDICATED.
2. PROVIDE BOLT-IN STYLE BREAKERS.
3. PROVIDE NEMA 3R ENCLOSURE
4. PROVIDE GFCI TYPE CIRCUIT BREAKERS FOR ALL CONVENIENCE RECEPTACLES.
5. COORDINATE FAULT CURRENT RATING WITH POWER UTILITY.



SUBMERSIBLE PUMP WIRING DETAIL

SCALE: NONE

Tidewater Engineering
248 Unser Dr.
P: 757.876.1780
Chesapeake, VA 23322
email: powersp@verizon.net

Bowman CONSULTING

Bowman Consulting Group, Ltd.
Winchester Office
124 East Cork Street
Winchester, Virginia 22601

Phone: (540) 722-2343
Fax: (540) 722-5080
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

PUMP STATION ELECTRICAL SITE PLAN

HAPPY CREEK KNOLLS
SECTION 4

TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
PAUL L. POWERS
Lic. No. 20620
4/18/18
PROFESSIONAL ENGINEER

PLAN STATUS	
DATE	DESCRIPTION

PLP	PLP	PLP
DESIGN	DRAWN	CHKD

SCALE	H: AS NOTED V: N/A
JOB No.	1602-04-001
DATE	APRIL, 2018
FILE No.	1602-D-CP-04-001
SHEET	16 OF 31

Cad file name: Y:\W0602 - Happy Creek Knolls\W0602-02-018 (DN) - Happy Creek Knolls\Engineering\Plans\1602-02-018-PSPA-L1.dwg

ELECTRICAL SPECIFICATIONS

SECTION 16100

1. PROVIDE NECESSARY LABOR, EQUIPMENT, ETC. FOR WORK INDICATED AND REQUIRED FOR A COMPLETE INSTALLATION. MATERIALS SHALL BE NEW, APPROVED & LABELED BY U.L. WHEREVER STANDARDS HAVE BEEN ESTABLISHED BY THAT AGENCY.
2. WORK SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, APPLICABLE LOCAL CODES AND ORDINANCES.
3. VISIT THE SITE PRIOR TO BID TO DETERMINE THE EXTENT OF WORK. LACK OF KNOWLEDGE OF EXISTING CONDITIONS WILL NOT BE CONSIDERED A BASIS FOR CHANGE OR RELIEVE THE CONTRACTOR OF ANY OBLIGATION TO FULFILL THE CONTRACT.
4. COORDINATE WORK UNDER THIS SECTION WITH OTHER TRADES INVOLVED. COORDINATE ALL REQUIRED CONNECTIONS AND CIRCUITS WITH EQUIPMENT REQUIREMENTS. FAILURE TO INCLUDE REQUIREMENTS FOR EQUIPMENT FURNISHED BY OTHERS WILL NOT BE CONSIDERED AS JUSTIFICATION FOR A CHANGE ORDER. WHERE ITEMS OR COMPONENTS REQUIREMENTS ARE NOT CLEAR, ASK FOR CLARIFICATION BEFORE SUBMITTING BID. FAILURE TO SEEK CLARIFICATION WILL NOT BE CONSIDERED AS JUSTIFICATION FOR CONTRACT PRICE ADJUSTMENT.
5. SUBMIT PRODUCT DATA, SHOP DRAWINGS AND SCALED EQUIPMENT LAYOUT DRAWINGS FOR APPROVAL BEFORE ORDERING EQUIPMENT OR ROUGHING IN CONDUIT.
6. PROVIDE EQUIPMENT FROM MANUFACTURERS AS INDICATED ON DRAWINGS. WHERE EQUIPMENT IS NOT SPECIFICALLY IDENTIFIED, CONTRACTOR MAY SUBMIT SUITABLE EQUIPMENT FROM A MANUFACTURER THAT MEETS THE FUNCTION AND IS RATED FOR THE APPLICATION AND LOCATION.

SECTION 16110

1. WORK SHALL BE IN CONDUIT, RUN CONDUIT EXPOSED.
2. CONDUIT SHALL BE GALVANIZED RIGID CONDUIT. MINIMUM SIZE CONDUIT SHALL BE 1/2" WITH LARGER SIZES AS REQUIRED BY THE N.E.C. CONDUITS UNDERGROUND SHALL BE PVC COATED GALVANIZED RIGID STEEL. RUN EXPOSED CONDUITS PARALLEL & PREPENDICULAR TO THE STRUCTURE & PROVIDE ADEQUATE SUPPORTS. FITTINGS SHALL BE THREADED TYPE.

SECTION 16120

1. WIRE AND CABLE SHALL BE 600 VOLT, MINIMUM AWG NO. 12 , WIRE SHALL BE COPPER TYPE "THWN". TERMINATIONS AND CONNECTIONS SHALL BE RATED FOR THE TYPE WIRE USED. WHERE ALUMINUM CONDUCTORS ARE PERMITTED TO BE SUBSTITUTED FOR COPPER CONDUCTORS, INCREASE SIZE OF CONDUIT IN ACCORDANCE WITH NEC.

SECTION 16142

1. EQUIPMENT CONNECTIONS:
   A. PROVIDE WIRING & CONNECTIONS FOR POWER AND CONTROL CIRCUITS REQUIRED FOR EQUIPMENT INSTALLED AS PART OF THIS SUBCONTRACT.
   B. PROVIDE FLEXIBLE CONDUIT FOR FINAL CONNECTIONS TO MOTORS, TRANSFORMERS OR OTHER VIBRATING EQUIPMENT.

SECTION 16143

1. WIRING DEVICES SHALL BE SPECIFICATION GRADE. COLORS AS SPECIFIED BY ARCHITECT. CHARACTERISTICS SHALL BE AS INDICATED ON THE DRAWINGS. PROVIDE STAINLESS STEEL PLATES SERIES 93000 FOR TYPE DEVICES INDICATED. TAG EACH RECEPTACLE, JUNCTION BOX, LIGHTING FIXTURE, ETC. WITH SELF STICK PLASTIC, RAISED WHITE LETTER LABEL. LABELS SHALL INDICATE PANEL AND CIRCUIT NUMBER AND SHALL BE ON INSIDE OF PLATE.

SECTION 16470

1. PANELBOARDS SHALL BE AS INDICATED ON DRAWINGS. MOUNT TO EQUIPMENT FRAME. COVERS AND HINGED DOOR OVER BREAKERS WITH LOCKS KEYED ALIKE. BREAKERS SHALL BE BOLT-TO-BUS TYPE. ENCLOSURES SHALL BE MINIMUM 20" WIDE. PROVIDE IN EACH PANELBOARD A TYPED WRITTEN DIRECTORY INDICATING LOAD SERVED. PROVIDE NEMA 3R ENCLOSURES.
   PANELBOARD AND CIRCUIT BREAKERS SHALL BE RATED ACCORDING TO AVAILABLE FAULT CURRENT FROM THE ELECTRICAL UTILITY. SUBMIT FAULT CURRENT FROM UTILITY ALONG WITH PRODUCT DATA AND SHOP DRAWINGS.

SECTION 16170

1. ENCLOSED CIRCUIT BREAKERS SHALL BE NEMA 3R AND SHALL BE RATED ACCORDING TO AVAILABLE FAULT CURRENT FROM THE ELECTRICAL UTILITY. SUBMIT FAULT CURRENT FROM UTILITY ALONG WITH PRODUCT DATA AND SHOP DRAWINGS.
2. MANUAL TRANSFER SWITCH SHALL BE NEMA 3R AND SHALL BE 3 POLES. WIRE SUCH THAT ALL CONNECTIONS (GROUNDED AND UNGROUNDED CONDUCTORS) ARE BROKEN. PROVIDE PROVISIONS (CONDUIT, JUNCTION BOX, ETC.) FOR FUTURE CONNECTIONS OF TEMPORARY GENERATOR.

SECTION 16452

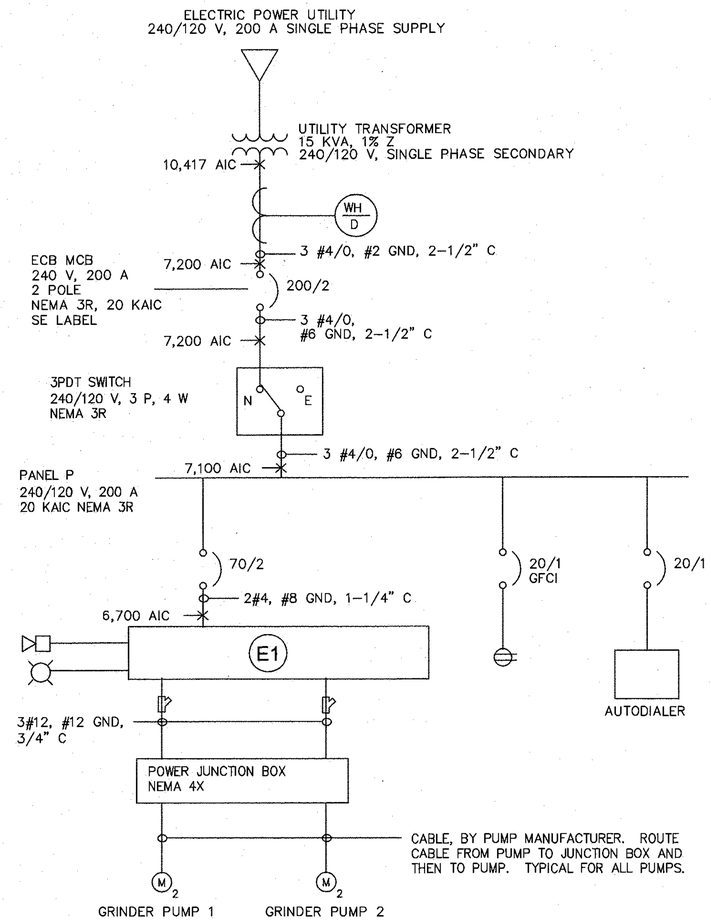
1. PROVIDE GROUNDING AND GROUND CONDUCTORS FOR ALL CIRCUITS AND EQUIPMENT. PROVIDE SEPARATE GREEN GROUNDING CONDUCTOR IN ALL CIRCUITS (WHETHER SHOWN OR NOT) FOR NEW WORK.
2. PAINT EXPOSED METAL ENCLOSURES, CONDUIT, ETC. TO MATCH ADJACENT SURROUNDING SURFACES.

SECTION 16482

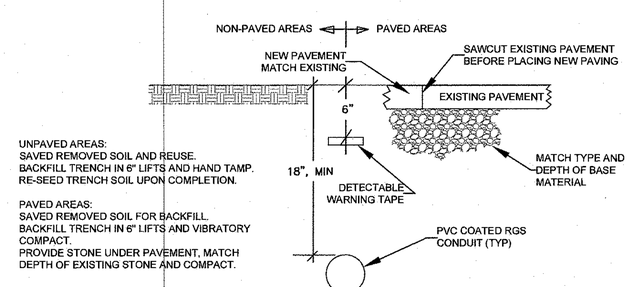
1. PROVIDE A DUPLEX PUMP CONTROL PANEL, LIBERTY AE SERIES, BARNES STEALTH OR APPROVED EQUAL. PUMP CONTROL PANEL SHALL BE RATED TO OPERATE TWO, 2 HP, SINGLE PHASE GRINDER PUMPS. CONTROL PANEL SHALL INCLUDE AN ALTERNATOR TO ALTERNATE LEAD/LAG FUNCTION OF PUMPS WITH EACH START FROM THE LOW LIQUID LEVEL/PUMPS OFF. PROVIDE FOUR FLOAT SWITCHES WITH CABLE AS REQUIRED. FLOAT SWITCHES AND CONTROLS SHALL BE CONFIGURED AS FOLLOWS: CONTROL PANEL SUMMARY IS REFERENCED IN SECTION 11200 1.04
   A. HIGH WATER ALARM
   B. LAG PUMP ON
   C. LEAD PUMP ON
   D. LOW WATER – ALL PUMPS OFF
2. PROVIDE ALARM RELAYS/CONTACTS, POWER AND WIRING FOR THE FOLLOWING EQUIPMENT/FUNCTIONS:
   A. HIGH WATER ALARM – TO CONTROL PANEL STROBE
   B. HIGH WATER ALARM – TO CONTROL PANEL HORN
   C. HIGH WATER ALARM – TO AUTODIALER
   D. PUMP SEAL FAILURE – TO AUTODIALER
   E. PUMP HIGH TEMPERATURE – TO AUTODIALER
3. PROVIDE THE FOLLOWING EQUIPMENT WITHIN THE CONTROL PANEL ENCLOSURE:
   A. SINGLE PHASE, CAPACITOR START, STARTERS RATED FOR THE PUMPS
   B. THERMAL MAGNETIC CIRCUIT BREAKER FOR EACH STARTER RATED FOR THE MOTOR
   C. OVERLOAD RELAYS FOR EACH STARTER
   D. ELECTRO-MECHANICAL ALTERNATOR
   E. PUMP RUN INDICATORS
   F. ELAPSED TIME METERS
   G. HOA SWITCHES FOR EACH PUMP
   H. HIGH PUMP TEMPERATURE PROTECTION
   I. PUMP LEAK SEAL PROTECTION
4. INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. PUMP CONTROL PANEL SHALL BE RATED TO OPERATE TWO, 2 HP, SINGLE PHASE GRINDER PUMPS. CONTROL PANEL SHALL INCLUDE AN ALTERNATOR TO ALTERNATE LEAD/LAG FUNCTION OF PUMPS WITH EACH START FROM THE LOW LIQUID LEVEL. INSTALLATION FROM THE WET WELL TO THE CONTROL PANEL SHALL BE INTRINSICALLY SAFE.

SECTION 16483

1. PROVIDE AN AUTODIALER TO REPORT ALARMS FROM THE PUMP CONTROL PANEL. THE AUTODIALER SHALL BE RATED FOR 120 VAC INPUT. THE AUTODIALER SHALL INCLUDE AN INTERNAL BATTERY TO REPORT ALARMS IN EVENT OF A SYSTEM POWER FAILURE. THE AUTODIALER SHALL REPORT THE FOLLOWING ALARMS:
   A. HIGH WATER ALARM
   B. PUMP SEAL FAILURE
   C. PUMP OVER TEMPERATURE

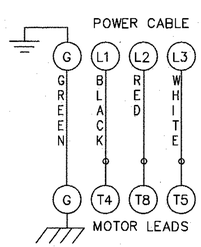


ONE-LINE DIAGRAM



TYPICAL CONDUIT TRENCHING DETAIL

NOT TO SCALE



POWER CABLE	MOTOR LEAD NUMBER
GREEN (GROUND)	GREEN
WHITE	5 (COMMON)
BLACK	4 (RUN)
RED	8 (START)

PUMP WIRING DIAGRAM FOR BARNES SUBMERSIBLE SINGLE PHASE GRINDER PUMPS. MODIFY WIRING AS REQUIRED FOR OTHER MANUFACTURERS.

SINGLE PHASE 200/230 VOLT AC PUMP WIRING

Tidewater Engineering
248 Unser Dr. Chesapeake, VA 23322
P: 757.876.1780 email: powersp@verizon.net

Bowman CONSULTING
Bowman Consulting Group, Ltd.
Winchester Office
124 East Cork Street
Winchester, Virginia 22601
Phone: (540) 722-2343
Fax: (540) 722-5080
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

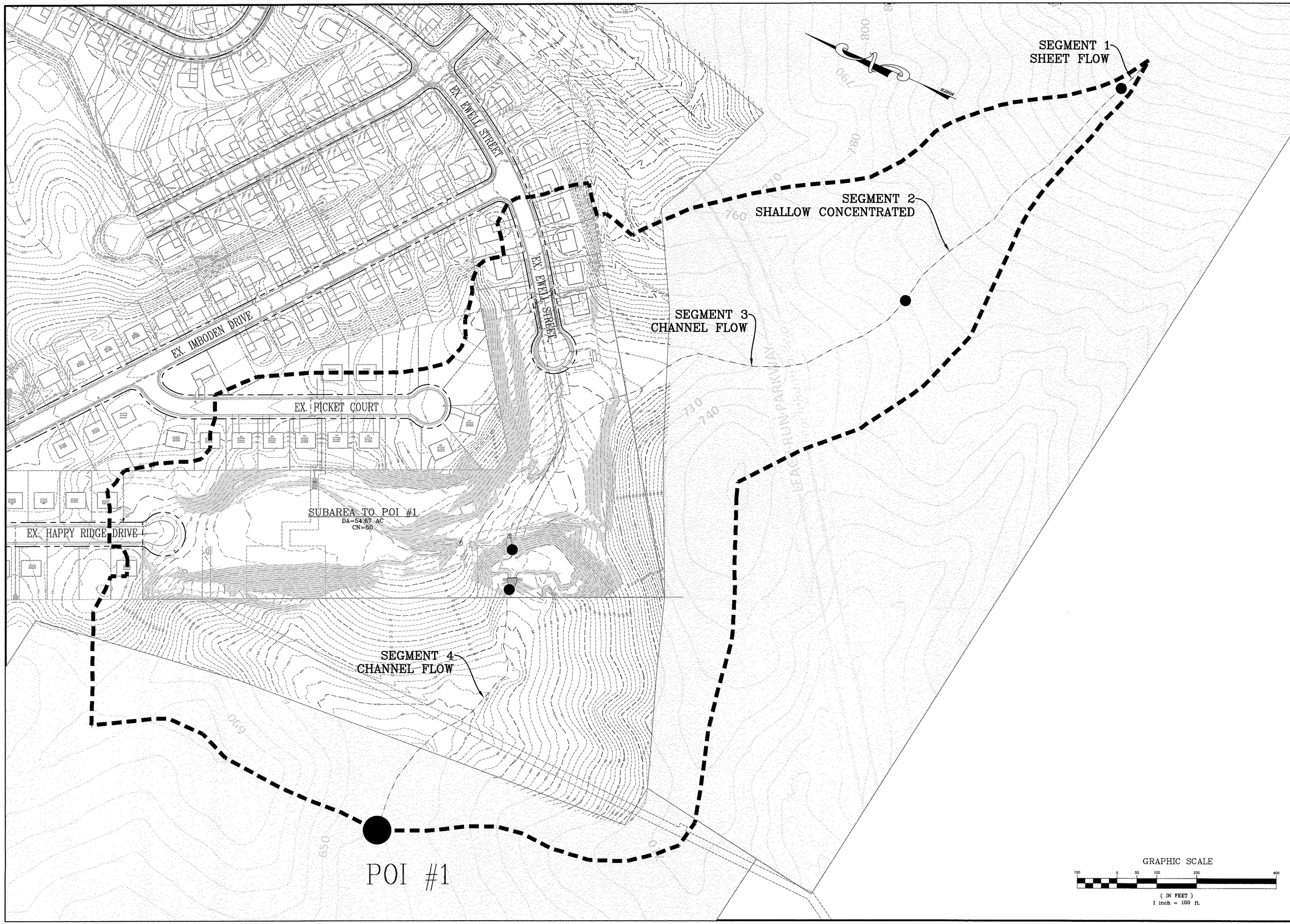
PUMP STATION ELECTRICAL SPECS & DETAILS
HAPPY CREEK KNOLLS
SECTION 4
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
PAUL L. POWERS
Lic. No. 20620
4/18/18
PROFESSIONAL ENGINEER

PLAN STATUS	
DATE	DESCRIPTION

PLP	PLP	PLP
DESIGN	DRAWN	CHKD
SCALE	H: AS NOTED V: N/A	
JOB No.	1602-04-001	
DATE	APRIL, 2018	
FILE No.	1602-D-CP-04-001	
SHEET	17 OF 31	

Cad file name:P:\0\0602 - Happy Creek Knolls\0602-02-016 (BIG) - Pump Station\Engineering\Engineering Plans\0602-02-016-PS14.dwg



Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com
© Bowman Consulting Group, Ltd.

PRE-DEVELOPMENT DRAINAGE DIVIDES

HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN

TOWN OF FRONT ROYAL
WARREN COUNTY, VIRGINIA

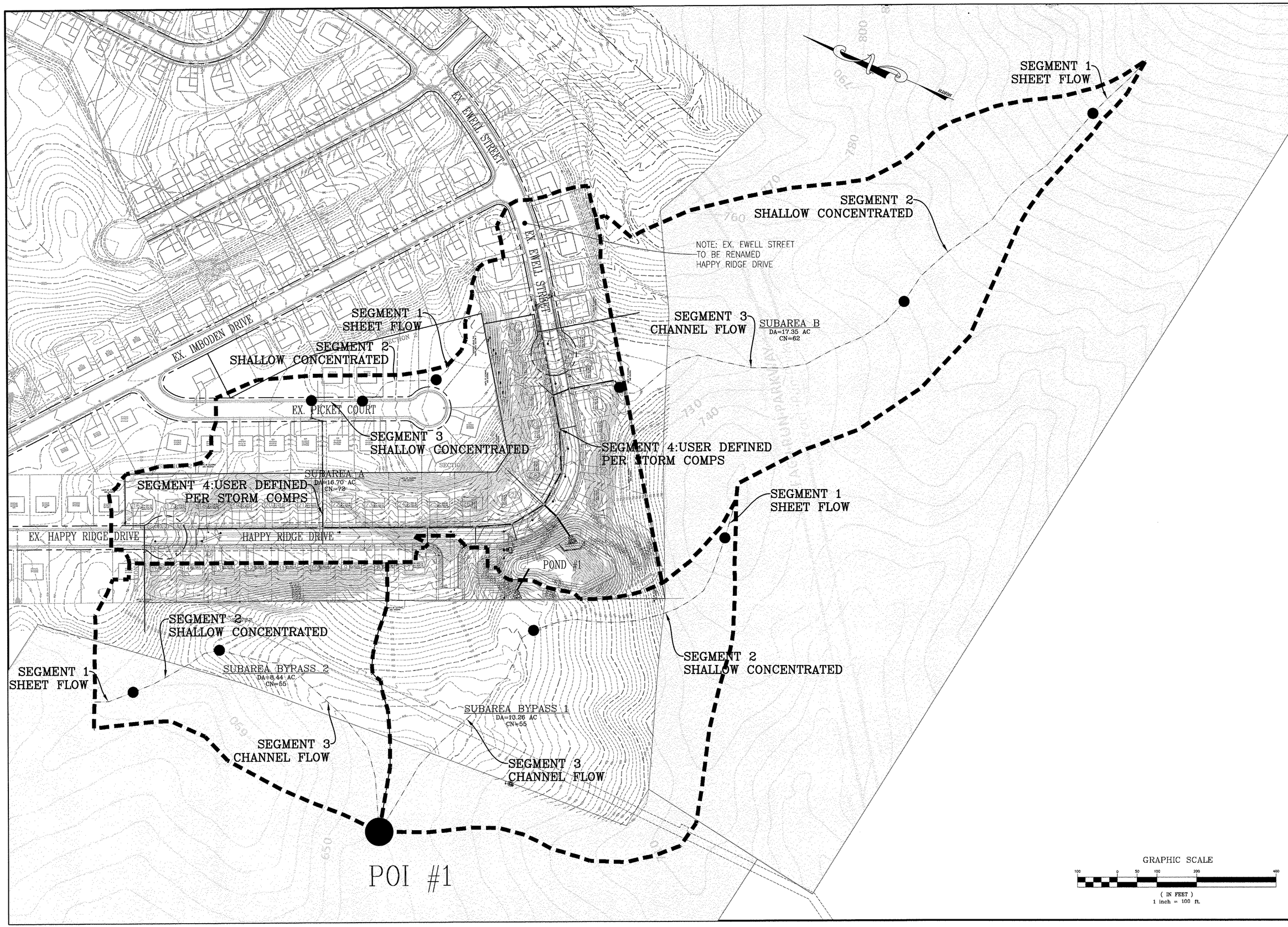
COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047796
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC	MCW	
DESIGN	DRAWN	CHKD
SCALE	H: 1"=100' V:	
JOB No. 1602-02-016		
DATE JULY 19, 2019		
FILE No. 1602-D-CP-005		
SHEET 18 OF 33		

Cad file name:P:\1602 - happy creek south sec 3\1602-04-01 (eng)\engineering plans\sheets\1602-D-CP-005-004.dwg



Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com
© Bowman Consulting Group, Ltd.

POST-DEVELOPMENT DRAINAGE DIVIDES

HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN

TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

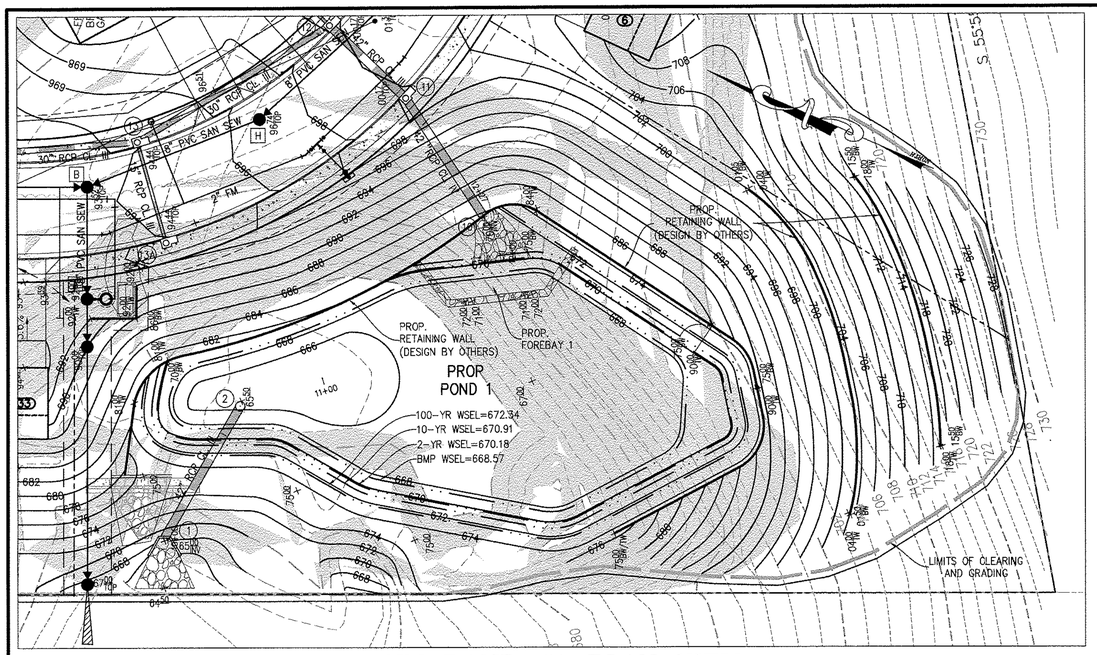
COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC DESIGN	MCW DRAWN	CNKD
SCALE	H: 1"=100' V:	
JOB No. 1602-02-016		
DATE JULY 19, 2019		
FILE No. 1602-D-CP-005		

SHEET 19 OF 33



SWM POND #1 PLAN VIEW
(SCALE: 1"=30')

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

GENERAL SPECIFICATIONS FOR S.W.M. DAM AND FACILITY

1. AREAS UNDER THE EMBANKMENT AND ANY STRUCTURAL WORKS SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL, ROOTS OR OTHER OBJECTIONAL MATERIAL.
2. THE SUITABILITY AND ACCEPTABILITY OF ALL FILL MATERIAL WILL BE DETERMINED BY REGULAR PERIODIC SOIL ANALYSIS AND COMPACTION TESTS, WHICH SHALL BE MADE BY A QUALIFIED GEOTECHNICAL ENGINEER
3. TESTS FOR SOIL ANALYSIS, MOISTURE CONTENT, AND COMPACTION ARE TO BE CONDUCTED IN ACCORDANCE WITH THE LATEST APPLICABLE ASTM STANDARDS AND SPECIFICATIONS.
4. MATERIALS USED FOR THE IMPERVIOUS CORE AND CUT-OFF TRENCH, IF REQUIRED, SHALL BE COMPRISED OF ONE OF THE FOLLOWING SOILS AS DESIGNATED BY THE UNIFIED SOIL SYSTEM: SC, CL, OR ML, HAVING A MINIMUM PLASTICITY INDEX OF 8 WITH A MINIMUM OF 45% PASSING THE NO. 200 SIEVE AND A MAX. OF 5 % RETAINED ON THE NO. 4 SIEVE.
5. THE EMBANKMENT MAY BE CONSTRUCTED AS A HOMOGENOUS EMBANKMENT DAM USING ACCEPTABLE MATERIAL CLASSIFIED ML, CL, SC, OR CC SOILS PER ASTM D-2487. IN ADDITION TO THESE MATERIALS, SOILS CLASSIFIED CH AND MH MAY BE USED AS COMPACTED EMBANKMENT FILL BELOW THE UPPER 5 FEET OF THE SLOPES. SOILS CLASSIFIED AS SM OR GM PER ASTM D-2487 OR SUITABLE FILL MAY BE USED FOR EMBANKMENT IN THE DOWNSTREAM HALF OF THE EMBANKMENT.
6. COMPACTION SHALL BE NOT LESS THAN 95% OF THE MAXIMUM DRY DENSITY FOR THE GIVEN EMBANKMENT MATERIAL AS DETERMINED BY USE OF THE STANDARD PROCTOR METHOD PER ASTM T-99 OR ASTM D-698.
7. THE FILL SHALL BE CONSTRUCTED IN 8" LOOSE LIFTS AND SHALL BE CONTINUOUS OVER THE ENTIRE LENGTH OF THE FILL SO THAT SMOOTH HORIZONTAL PLANES ARE NOT BUILT INTO THE FILL STRUCTURE. SMOOTH HORIZONTAL PLANES CAN BE AVOIDED BY SCARIFYING OR USE OF SHEEPS-FOOT ROLLERS.
8. THE EMBANKMENT SHALL BE CONSTRUCTED TO A MINIMUM ELEVATION 5% HIGHER THAN THE DESIGNED HEIGHT TO ALLOW FOR SETTLEMENT WHEN MECHANICAL COMPACTORS ARE USED FOR CONSTRUCTION.
9. IF SUFFICIENT ACCEPTABLE MATERIAL IS NOT AVAILABLE ON THE SITE TO PROPERLY COMPLETE THE FILL, THE CONTRACTOR IS RESPONSIBLE FOR ACQUIRING ACCEPTABLE BORROW MATERIAL.
10. THE STORM WATER MANAGEMENT FACILITY IS TO BE MAINTAINED AS FOLLOWS:
    (A) THE STORM WATER MANAGEMENT FACILITY SHALL BE INSPECTED ON A SEMI-ANNUAL BASIS AND AFTER ANY STORM WHICH CAUSES THE CAPACITY OF THE FACILITY TO BE EXCEEDED. ANY TRASH AND/OR DEBRIS WITHIN THE FACILITY SHALL BE REMOVED AND PROPERLY DISPOSED OF. INSPECTION REPORTS ARE TO BE MAINTAINED BY THE HOME OWNERS ASSOCIATION.
    (B) THE STORM WATER MANAGEMENT FACILITY SHALL BE PERIODICALLY CLEANED OUT (EVERY 5-10 YEARS) DEPENDING ON SEDIMENT LOADING, SO AS TO REESTABLISH THE ORIGINAL CONTOURS WITHIN THE EXISTING WET POND AND OTHER AREAS. ALL EXCAVATED AND/OR DREDGED MATERIAL SHALL BE PLACED IN COMMON OPEN SPACE AS DESIGNATED BY THE HAPPY CREEK KNOLLS SEC II HOME OWNERS ASSOCIATION. THE DISPOSAL AREA SHALL HAVE APPROPRIATE E & S CONTROLS AND SHALL BE IMMEDIATELY SEEDED AND STABILIZED.

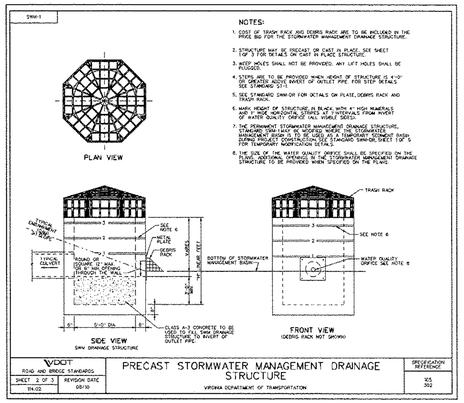
DETAIL NOTES:

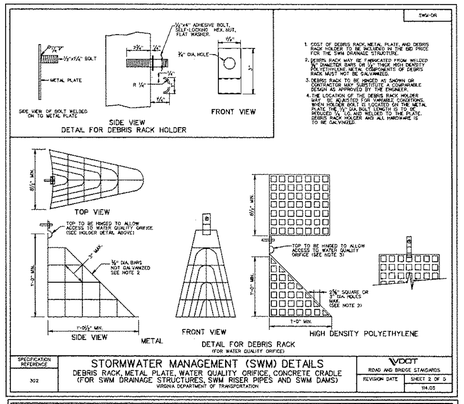
THE PURPOSE OF THESE PLANS IS TO PROVIDE THE BASIC DIMENSIONS REQUIRED TO CONTROL THE CONSTRUCTION OF THE COMBINATION PRINCIPAL & EMERGENCY SPILLWAY.

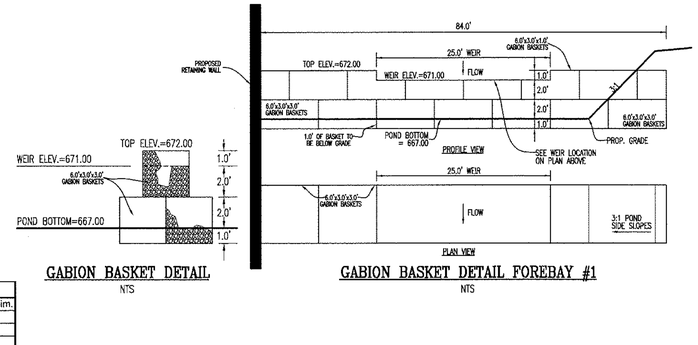
1. ALL OTHER WALL, SPILLWAY AND FOOTING DIMENSIONS AND/OR THICKNESS, AS WELL AS REINFORCEMENT, BUOYANCY CALCULATIONS AND THE METHOD OF JOINING THE VARIOUS STRUCTURAL ELEMENTS ARE SUBJECT TO DESIGN BY A PROFESSIONAL STRUCTURAL ENGINEER.
2. CONSTRUCTION AND CONTRACTION JOINTS ARE TO BE PROVIDED AS REQUIRED BY THE LATEST EDITION OF THE ACI CODE.
3. SUBGRADE PREPARATION AND BEDDING REQUIREMENTS FOR ALL STRUCTURAL ELEMENTS ARE SUBJECT TO DESIGN BY A PROFESSIONAL GEOTECHNICAL ENGINEER.
4. PRECAST CONCRETE IS TO ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI. CAST IN PLACE CONCRETE IS TO BE VDOT CLASS A3.
5. REINFORCING STEEL SHALL BE IN ACCORDANCE WITH ASTM A-615 (REINFORCING BARS).
6. ALL EXPOSED EDGES SHALL BE CHAMFERED 3/4".
7. ALL MATERIALS AND METHODS OF CONSTRUCTION SHALL BE IN STRICT CONFORMANCE TO THE LATEST VDOT STANDARDS AND SPECIFICATIONS.
8. FOOTING DEPTHS SHOWN ARE MINIMUMS. ALL FOOTINGS ARE TO EXTEND DOWN TO SUITABLE BEARING MATERIAL AS DIRECTED BY THE GEOTECHNICAL ENGINEER.

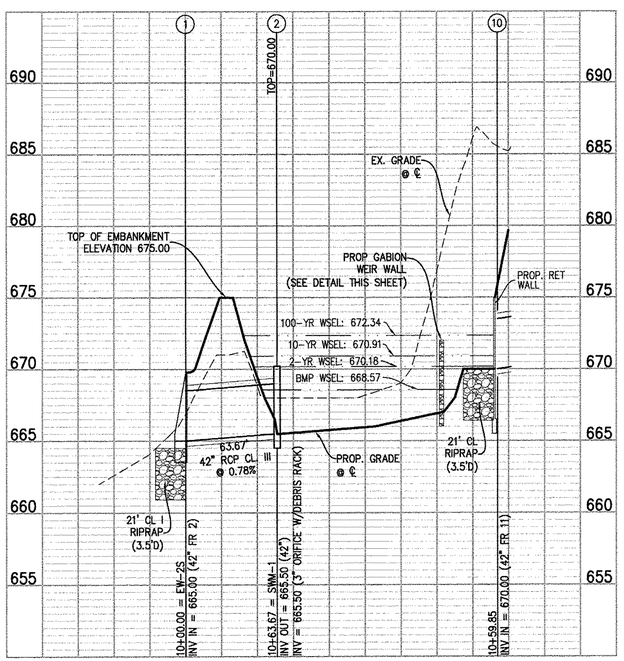
GENERAL NOTES:

1. IMPERVIOUS CORE IS TO BE CONSTRUCTED FROM SOILS CLASSIFIED AS ML, CL, OR SC PER ASTM D-2487 COMPACTED TO 95% PER ASTM D-698.
2. THE CUT OFF TRENCH (IF REQUIRED) SHALL EXTEND A MINIMUM OF 5' BELOW SUBGRADE OR TO REFUSAL.
3. DESIGN AND CONSTRUCTION OF THE PROPOSED DAM IS SUBJECT TO RECOMMENDATIONS AND INSPECTION BY A QUALIFIED GEOTECHNICAL ENGINEER.









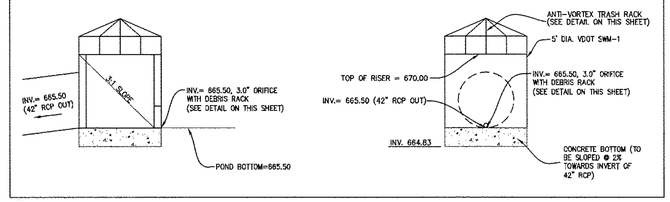
SWM POND #1 PROFILE VIEW
SCALE: HORZ 1"=50' VERT 1"=5'

POND: BUOYANCY CALCULATIONS - SWM POND 1				
			Equation Variables	VDOT Dim.
Riser Inside Dia=	5	FT	(Rd)	D
Riser Wall Thick=	0.50	FT	(Rw)	X
Riser Outside Dia=	6.00	FT	(RD)	D+2X
Riser Height=	4.5	FT	(Rh)	
Base Diameter=	6.00	FT	(Bd)	D+2X
Base Thickness=	0.67	FT	(Bt)	Y
Volume of Soil	0	CF	(Vs)	
VOLUME OF CONCRETE IN BASE (Vb) =				
	18.94	CF		
VOLUME OF CONCRETE IN RISER (Vr)				
	38.88	CF		
WEIGHT OF CONCRETE RISER & BASE =				
	12721	lbs.		
WATER VOLUME DISPLACED BY RISER (Vd)				
	127.23	CF		
BUOYANT FORCE (BF) = Vd * 62.4 lb/CF =				
	7939	lbs		
FACTOR OF SAFETY =	1.60			
VSMH Page 3.02-23	Must be Greater than 1.25			

POND 1 OUTFALL STRUCTURE DETAIL

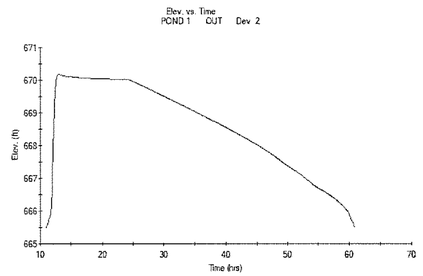
NOT TO SCALE

STORM	Q(cfs)	WSEL
BMP:	0.41	668.57
2 YEAR:	4.21	670.18
10 YEAR:	45.96	670.91
100 YEAR:	116.30	672.34

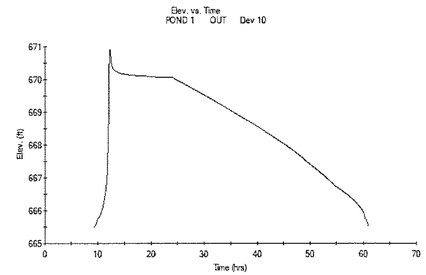


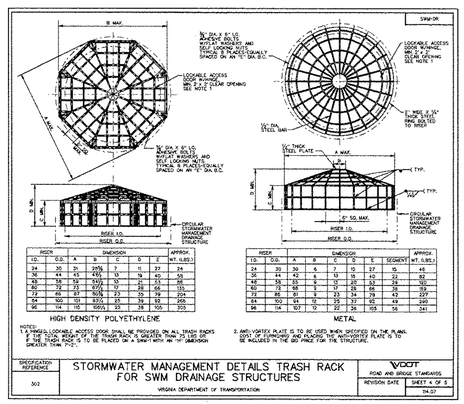
POND #1 OUTFLOW HYDROGRAPH

2-YR HYDROGRAPH



10-YR HYDROGRAPH





Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

POND 1 DETAILS AND COMPUTATIONS

HAPPY CREEK KNOLLS SECTION 4

FINAL SUBDIVISION PLAN

WARREN COUNTY, VIRGINIA

TOWN OF FRONT ROYAL

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047796
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS

DATE	DESCRIPTION
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

GC	MCW
DESIGN	DRAWN
CHKD	
SCALE	H: AS SHOWN V:
JOB No.	1602-02-016
DATE	JULY 19, 2019
FILE No.	1602-D-CP-005

SHEET 20 OF 33

Cad file name: P:\1602 - Happy Creek Knolls Sec 4\1602-02-005\dwg\engineering\plans\construction\1602-02-005-POND1.dwg

PRE-DEVELOPMENT

Type.... Master Network Summary
Name.... Watershed
File.... P:\1602 - Happy Creek Knolls Sec 3\1602-04-001 (ENG)\Engineering\Design Documents\POND PACK.PPW

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Front Royal

Return Event	Total Depth in	Rainfall Type	RNF ID
Dev 10	5.1000	Synthetic Curve	TypeII 24hr
Dev 2	3.5000	Synthetic Curve	TypeII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
PRE DEV	AREA	100	15.186		12.1000	186.40		
PRE DEV	AREA	10	6.196		12.1000	69.41		
PRE DEV	AREA	2	2.422		12.1500	21.51		
*PRE POI 1	JCT	100	15.186		12.1000	186.40		
*PRE POI 1	JCT	10	6.196		12.1000	69.41		
*PRE POI 1	JCT	2	2.422		12.1500	21.51		

Type.... Tc Calcs
Name.... PRE DEV

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n .4000
Hydraulic Length 100.00 ft
2yr, 24hr P 3.0500 in
Slope .200000 ft/ft

Avg.Velocity .19 ft/sec

Segment #1 Time: .1459 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length 766.00 ft
Slope .169000 ft/ft
Unpaved

Avg.Velocity 6.63 ft/sec

Segment #2 Time: .0321 hrs

Segment #3: Tc: Kirpich (PA)

Hydraulic Length 1308.00 ft
Slope .930500 ft/ft
Multiplier 1.000 (Tc Adjustment)

Avg.Velocity 64.42 ft/sec

Segment #3 Time: .0056 hrs

Segment #4: Tc: TR-55 Channel

Flow Area 40.7000 sq.ft
Wetted Perimeter 37.30 ft
Hydraulic Radius 1.09 ft
Slope .102000 ft/ft
Mannings n .4000
Hydraulic Length 740.00 ft

Avg.Velocity 1.26 ft/sec

Segment #4 Time: .1630 hrs

Total Tc: .3467 hrs

Type.... Runoff CN-Area
Name.... PRE DEV

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Existing Area to POI 1	60	54.670			60.00

COMPOSITE AREA & WEIGHTED CN ---> 54.670 60.00 (60)

POST-DEVELOPMENT

File.... P:\1602 - Happy Creek Knolls Sec 3\1602-04-001 (ENG)\Engineering\Design Documents\POND PACK.PPW

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Front Royal

Return Event	Total Depth in	Rainfall Type	RNF ID
Dev 10	5.1000	Synthetic Curve	TypeII 24hr
Dev 2	3.5000	Synthetic Curve	TypeII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
BYPASS AREA 1	AREA	100	3.077		12.1000	39.24		
BYPASS AREA 1	AREA	10	1.138		12.1000	12.53		
BYPASS AREA 1	AREA	2	.382		12.1500	2.62		
BYPASS AREA 2	AREA	100	1.958		12.0000	31.61		
BYPASS AREA 2	AREA	10	.725		12.0500	10.40		
BYPASS AREA 2	AREA	2	.243		12.0500	2.41		
POND 1	IN POND	100	11.682		12.0500	147.83		
POND 1	IN POND	10	5.339		12.0500	64.72		
POND 1	IN POND	2	2.451		12.1000	26.79		
POND 1	OUT POND	100	11.683		12.1500	116.30	672.34	2.038
POND 1	OUT POND	10	5.339		12.2000	45.96	670.91	1.394
POND 1	OUT POND	2	2.451		13.0000	4.21	670.18	1.092
*POST POI 1	JCT	100	16.717		12.0500	178.69		
*POST POI 1	JCT	10	7.202		12.2000	60.43		
*POST POI 1	JCT	2	3.077		12.9500	5.39		
POST SUBAREA A	AREA	100	6.539		12.1000	75.05		
POST SUBAREA A	AREA	10	3.169		12.1500	36.03		
POST SUBAREA A	AREA	2	1.561		12.1500	16.95		
POST SUBAREA B	AREA	100	5.144		12.0000	80.51		
POST SUBAREA B	AREA	10	2.170		12.0500	32.51		
POST SUBAREA B	AREA	2	.890		12.0500	11.77		

Type.... Tc Calcs
Name.... BYPASS AREA 1

TIME OF CONCENTRATION CALCULATOR
Segment #1: Tc: TR-55 Sheet

Mannings n .4000
Hydraulic Length 100.00 ft
2yr, 24hr P 3.5000 in
Slope .200000 ft/ft

Avg.Velocity .20 ft/sec

Segment #1 Time: .1362 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length 594.16 ft
Slope .117800 ft/ft
Unpaved

Avg.Velocity 5.54 ft/sec

Segment #2 Time: .0298 hrs

Segment #3: Tc: TR-55 Channel

Flow Area 40.7000 sq.ft
Wetted Perimeter 37.30 ft
Hydraulic Radius 1.09 ft
Slope .102000 ft/ft
Mannings n .4000
Hydraulic Length 651.12 ft

Avg.Velocity 1.26 ft/sec

Segment #3 Time: .1434 hrs

Total Tc: .3095 hrs

Type.... Tc Calcs
Name.... BYPASS AREA 2

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n .4000
Hydraulic Length 100.00 ft
2yr, 24hr P 3.5000 in
Slope .200000 ft/ft

Avg.Velocity .20 ft/sec

Segment #1 Time: .1362 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length 244.00 ft
Slope .081960 ft/ft
Unpaved

Avg.Velocity 4.62 ft/sec

Segment #2 Time: .0147 hrs

Segment #3: Tc: Kirpich (PA)

Hydraulic Length 683.00 ft
Slope .043900 ft/ft
Multiplier 1.000 (Tc Adjustment)

Avg.Velocity 12.05 ft/sec

Segment #3 Time: .0157 hrs

Total Tc: .1667 hrs

Type.... Tc Calcs
Name.... POST SUBAREA A

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n .4000
Hydraulic Length 100.00 ft
2yr, 24hr P 3.5000 in
Slope .020000 ft/ft

Avg.Velocity .08 ft/sec

Segment #1 Time: .3422 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length 205.00 ft
Slope .039000 ft/ft
Unpaved

Avg.Velocity 3.19 ft/sec

Segment #2 Time: .0179 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length 129.00 ft
Slope .031000 ft/ft
Paved

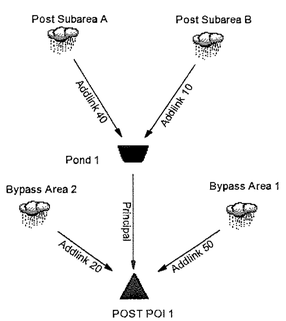
Avg.Velocity 3.58 ft/sec

Segment #3 Time: .0100 hrs

Segment #4: Tc: User Defined

Segment #4 Time: .0333 hrs

Total Tc: .4034 hrs



Type.... Tc Calcs
Name.... POST SUBAREA B

TIME OF CONCENTRATION CALCULATOR

Segment #1: Tc: TR-55 Sheet

Mannings n .4000
Hydraulic Length 100.00 ft
2yr, 24hr P 3.5000 in
Slope .200000 ft/ft

Avg.Velocity .20 ft/sec

Segment #1 Time: .1362 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length 766.00 ft
Slope .169000 ft/ft
Unpaved

Avg.Velocity 6.63 ft/sec

Segment #2 Time: .0321 hrs

Segment #3: Tc: Kirpich (PA)

Hydraulic Length 806.00 ft
Slope .093050 ft/ft
Multiplier 1.000 (Tc Adjustment)

Avg.Velocity 18.22 ft/sec

Segment #3 Time: .0123 hrs

Segment #4: Tc: User Defined

Segment #4 Time: .0133 hrs

Total Tc: .1939 hrs

Type.... Runoff CN-Area
Name.... BYPASS AREA 1

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Area 2	55	13.260			55.00

COMPOSITE AREA & WEIGHTED CN ---> 13.260 55.00 (55)

Type.... Runoff CN-Area
Name.... BYPASS AREA 2

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Area 2	55	8.440			55.00

COMPOSITE AREA & WEIGHTED CN ---> 8.440 55.00 (55)

Type.... Runoff CN-Area
Name.... POST SUBAREA A

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Single Family 1/4 Acre	72	16.700			72.00

COMPOSITE AREA & WEIGHTED CN ---> 16.700 72.00 (72)

Type.... Runoff CN-Area
Name.... POST SUBAREA B

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Area A Offsite	62	17.350			62.00

COMPOSITE AREA & WEIGHTED CN ---> 17.350 62.00 (62)

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com
© Bowman Consulting Group, Ltd.

OUTFALL HYDROLOGY
HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
WARREN COUNTY, VIRGINIA
TOWN OF FRONT ROYAL

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC	MCW	CHKD
DESIGN	DRAWN	
SCALE	H: N/A V: N/A	

JOB No. 1602-02-016
DATE JULY 19, 2019
FILE No. 1602-D-CP-005

Cad file name: P:\1602 - Happy creek knolls sec 3\1602-04-001 (eng)\engineering\engineering plans\sheets\1602-D-CP-005-POND.dwg

ORIFICE DESIGN: DRAWDOWN COMPUTATIONS

VSMH METHOD #1

Retention Basin II BMP Volume Provided	=	22922.71	ft^3
Retention Basin BMP Elevation	=	668.57	ft
BMP Orifice Elevation	=	665.50	ft
Hmax =	=	3.07	ft
Q_{avg} = BMP Volume/(30 * 3,600)	=	0.21	cfs
Qmax = 2 x Q_{avg}	=	0.42	cfs
a = Q_{avg}/(0.6 * (2*32.2 * H)^0.5)	=	0.05	ft^2
Qmax = 2 x Q_{avg}	=	0.10	cfs
a = Q_{avg}/(0.6 * (2*32.2 * H)^0.5)	=	0.03	ft^2
a = Q_{avg}/(0.6 * (2*32.2 * H)^0.5)	=	0.03	ft^2
d = 12 * ((4 * a)/π))^0.5	=	3.04	in

Use 3.00" Orifice with 8" Perforated HDPE Pipe
to prevent clogging - estimated orifice size

SEDIMENT FOREBAY COMPUTATIONS

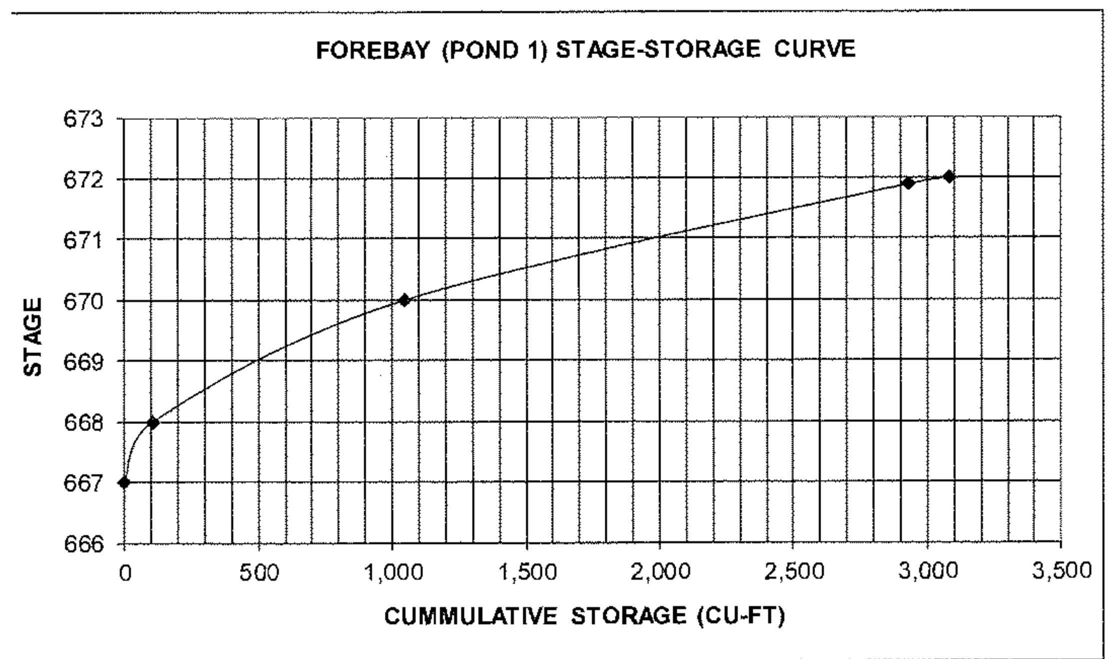
(0.25 / 12) (3.14) (43560) = 2850 CU-FT (TARGET)

(0.1 / 0.25) (Target) = 1140 CU-FT (MINIMUM)

PROVIDED VOLUME = 2927 CU-FT

FOREBAY STAGE STORAGE (POND 1)

Elevation (ft)	Area (SQ FT)	Incremental Vol (CU-FT)	Cumulative Vol(CU-FT)
667.00	0.00	0	0
668.00	322.81	108	108
670.00	636.52	942	1049
671.89	1399.64	1877	2927
672.00	1424.09	155	3082



ADEQUATE OUTFALL NARRATIVE

PROJECT DESCRIPTION

HAPPY CREEK KNOLLS, SECTION 4 CONSIST OF CONSTRUCTION OF 33 SINGLE FAMILY DETACHED UNITS AND THEIR ASSOCIATED INFRASTRUCTURE ON APPROXIMATELY 12.43 ACRES. THE ENTIRE SECTION DRAINS APPROXIMATELY 2,200 FT TO THE WEST TOWARDS A TRIBUTARY OF LEACH RUN.

ADEQUATE OUTFALL (POI #1)

HAPPY CREEK KNOLLS, SECTION 4 OUTFALLS TO THE WEST INTO AN EXISTING NATURAL STREAM CHANNEL THAT MEANDERS APPROXIMATELY 2,200 FEET TOWARDS A TRIBUTARY OF LEACH RUN. ADEQUATE OUTFALL FOR THE SITE HAS BEEN PROVIDED BY DETAINING THE POST-DEVELOPMENT 2-YEAR (5.39 CFS) AND 10-YEAR (60.43 CFS) STORM EVENT SUCH THAT IT IS EQUAL TO OR LESS THAN THE PRE-DEVELOPMENT 2-YEAR (21.51 CFS) AND 10-YEAR (69.41 CFS) STORM EVENT. FOR DETAILED COMPUTATIONS, SEE "MASTER NETWORK SUMMARY" ON SHEET 21.

```
Type.... Outlet Input Data
Name.... Outlet 1

                 REQUESTED POND WS ELEVATIONS:

                   Min. Elev.=    665.50 ft
                   Increment =       .10 ft
                   Max. Elev.=    675.00 ft

          ***********************************************
                        OUTLET CONNECTIVITY
          ***********************************************

           ---> Forward Flow Only (UpStream to DnStream)
           ---> Reverse Flow Only (DnStream to UpStream)
          <---> Forward and Reverse Both Allowed

        Structure          No.        Outfall    E1, ft     E2, ft
----------   ------   ----       -------  ---------  ---------
     Stand Pipe             R0    --->    C0      670.000    675.000
     Orifice-Circular       00    --->    C0      665.500    675.000
     Culvert-Circular       C0    --->    TW      665.500    675.000
     Weir-XY Points         W0    --->    TW      672.800    675.000
     TW SETUP, DS Channel
```

```
Type.... Outlet Input Data
Name.... Outlet 1

               OUTLET STRUCTURE INPUT DATA


               Structure ID      = R0
               Structure Type    = Stand Pipe
               ------------------------------------
               # of Openings     =         1
               Invert Elev.      =    670.00 ft
               Diameter          =    5.0000 ft
               Orifice Area      =   19.6350 sq.ft
               Orifice Coeff.    =      .600
               Weir Length       =     15.71 ft
               Weir Coeff.       =     3.330
               K, Reverse        =     1.000
               Mannings n        =     .0130
               Kev,Charged Riser =      .000
               Weir Submergence  = No


               Structure ID      = 00
               Structure Type    = Orifice-Circular
               ------------------------------------
               # of Openings     =         1
               Invert Elev.      =    665.50 ft
               Diameter          =     .2500 ft
               Orifice Coeff.    =      .600


               Structure ID      = C0
               Structure Type    = Culvert-Circular
               ------------------------------------
               No. Barrels       =         1
               Barrel Diameter   =    3.5000 ft
               Upstream Invert   =    665.50 ft
               Dnstream Invert   =    665.00 ft
               Horiz. Length     =     63.67 ft
               Barrel Length     =     63.67 ft
               Barrel Slope      =    .00785 ft/ft

               OUTLET CONTROL DATA...
               Mannings n        =     .0130
               Ke                =     .2000  (forward entrance loss)
               Kb                =   .005885  (per ft of full flow)
               Kr                =     .2000  (reverse entrance loss)
               HW Convergence    =      .001  +/- ft

               INLET CONTROL DATA...
               Equation form     =         1
               Inlet Control K   =     .0018
               Inlet Control M   =    2.0000
               Inlet Control c   =    .02920
               Inlet Control Y   =     .7400
               T1 ratio (HW/D)   =     1.058
               T2 ratio (HW/D)   =     1.203
               Slope Factor      =     -.500

    Use unsubmerged inlet control Form 1 equ. below T1 elev.
    Use   submerged inlet control Form 1 equ. above T2 elev.

    In transition zone between unsubmerged and submerged inlet control,
    interpolate between flows at T1 & T2...
    At T1 Elev =     669.20 ft  --->  Flow =      63.00 cfs
    At T2 Elev =     669.71 ft  --->  Flow =      72.00 cfs


              Structure ID      = TW
              Structure Type    = TW SETUP, DS Channel
              ------------------------------------
              FREE OUTFALL CONDITIONS SPECIFIED

              CONVERGENCE TOLERANCES...
              Maximum Iterations=    30
              Min. TW tolerance =    .01 ft
              Max. TW tolerance =    .01 ft
              Min. HW tolerance =    .01 ft
              Max. HW tolerance =    .01 ft
              Min.  Q tolerance =    .10 cfs
              Max.  Q tolerance =    .10 cfs
```

Type.... Vol: Elev-Area
Name.... POND 1

Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	Volume (ac-ft)	Volume Sum (ac-ft)
665.50	-----	10	0	.000	.000
666.00	-----	2153	2310	.009	.009
668.00	-----	13353	20868	.319	.328
670.00	-----	16986	45399	.695	1.023
672.00	-----	20228	55750	.853	1.876
674.00	-----	23032	64845	.992	2.869
675.00	-----	24054	70623	.540	3.409

Type.... Composite Rating Curve
Name.... Outlet 1

*****COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Elev. ft	Total Q, Q cfs	Converge: TW Elev ft	Converge: Error +/-ft	Notes: Contributing Structures
665.50	.00	Free Outfall		(no Q: R0,00,C0)
665.60	.03	Free Outfall		00,C0 (no Q: R0)
665.70	.03	Free Outfall		00,C0 (no Q: R0)
665.80	.14	Free Outfall		00,C0 (no Q: R0)
665.90	.20	Free Outfall		00,C0 (no Q: R0)
666.00	.14	Free Outfall		00,C0 (no Q: R0)
666.10	.14	Free Outfall		00,C0 (no Q: R0)
666.20	.14	Free Outfall		00,C0 (no Q: R0)
666.30	.14	Free Outfall		00,C0 (no Q: R0)
666.40	.14	Free Outfall		00,C0 (no Q: R0)
666.50	.14	Free Outfall		00,C0 (no Q: R0)
666.60	.14	Free Outfall		00,C0 (no Q: R0)
666.70	.14	Free Outfall		00,C0 (no Q: R0)
666.80	.24	Free Outfall		00,C0 (no Q: R0)
666.90	.26	Free Outfall		00,C0 (no Q: R0)
667.00	.27	Free Outfall		00,C0 (no Q: R0)
667.10	.28	Free Outfall		00,C0 (no Q: R0)
667.20	.29	Free Outfall		00,C0 (no Q: R0)
667.30	.30	Free Outfall		00,C0 (no Q: R0)
667.40	.31	Free Outfall		00,C0 (no Q: R0)
667.50	.41	Free Outfall		00,C0 (no Q: R0)
667.60	.41	Free Outfall		00,C0 (no Q: R0)
667.70	.41	Free Outfall		00,C0 (no Q: R0)
667.80	.41	Free Outfall		00,C0 (no Q: R0)
667.90	.41	Free Outfall		00,C0 (no Q: R0)
668.00	.41	Free Outfall		00,C0 (no Q: R0)
668.10	.41	Free Outfall		00,C0 (no Q: R0)
668.20	.41	Free Outfall		00,C0 (no Q: R0)
668.30	.41	Free Outfall		00,C0 (no Q: R0)
668.40	.41	Free Outfall		00,C0 (no Q: R0)
668.50	.41	Free Outfall		00,C0 (no Q: R0)
668.60	.41	Free Outfall		00,C0 (no Q: R0)
668.70	.41	Free Outfall		00,C0 (no Q: R0)
668.80	.41	Free Outfall		00,C0 (no Q: R0)
668.90	.41	Free Outfall		00,C0 (no Q: R0)
669.00	.41	Free Outfall		00,C0 (no Q: R0)
669.10	.41	Free Outfall		00,C0 (no Q: R0)
669.20	.41	Free Outfall		00,C0 (no Q: R0)
669.30	.41	Free Outfall		00,C0 (no Q: R0)
669.40	.41	Free Outfall		00,C0 (no Q: R0)
669.50	.41	Free Outfall		00,C0 (no Q: R0)
669.60	.41	Free Outfall		00,C0 (no Q: R0)
669.70	.41	Free Outfall		00,C0 (no Q: R0)
669.80	.41	Free Outfall		00,C0 (no Q: R0)
669.90	.41	Free Outfall		00,C0 (no Q: R0)
670.00	.41	Free Outfall		00,C0 (no Q: R0)
670.10	2.01	Free Outfall		R0,00,C0
670.20	4.91	Free Outfall		R0,00,C0
670.30	8.99	Free Outfall		R0,00,C0
670.40	13.49	Free Outfall		R0,00,C0
670.50	18.86	Free Outfall		R0,00,C0
670.60	24.70	Free Outfall		R0,00,C0
670.70	32.55	Free Outfall		R0,00,C0
670.80	37.62	Free Outfall		R0,00,C0
670.90	44.97	Free Outfall		R0,00,C0
671.00	52.57	Free Outfall		R0,00,C0
671.10	60.51	Free Outfall		R0,00,C0
671.20	68.97	Free Outfall		R0,00,C0
671.30	77.75	Free Outfall		R0,00,C0
671.40	91.05	Free Outfall		R0,00,C0
671.50	91.93	Free Outfall		R0,00,C0
671.60	105.69	Free Outfall		R0,C0 (no Q: 00)
671.70	107.19	Free Outfall		R0,00,C0
671.80	108.65	Free Outfall		R0,00,C0
671.90	110.10	Free Outfall		R0,C0 (no Q: 00)
672.00	111.53	Free Outfall		R0,C0 (no Q: 00)
672.10	112.94	Free Outfall		R0,C0 (no Q: 00)
672.20	114.35	Free Outfall		R0,00,C0
672.30	115.70	Free Outfall		R0,00,C0
672.40	117.06	Free Outfall		R0,C0 (no Q: 00)
672.50	118.42	Free Outfall		R0,C0 (no Q: 00)
672.60	119.76	Free Outfall		R0,C0 (no Q: 00)
672.70	121.07	Free Outfall		R0,00,C0
672.80	122.38	Free Outfall		R0,00,C0
672.90	123.67	Free Outfall		R0,C0 (no Q: 00)
673.00	124.93	Free Outfall		R0,C0 (no Q: 00)
673.10	126.20	Free Outfall		R0,C0 (no Q: 00)
673.20	127.43	Free Outfall		R0,00,C0
673.30	128.67	Free Outfall		R0,00,C0
673.40	129.91	Free Outfall		R0,C0 (no Q: 00)
673.50	131.13	Free Outfall		R0,C0 (no Q: 00)
673.60	132.32	Free Outfall		R0,C0 (no Q: 00)
673.70	133.51	Free Outfall		R0,00,C0
673.80	134.71	Free Outfall		R0,00,C0
673.90	135.87	Free Outfall		R0,C0 (no Q: 00)
674.00	137.04	Free Outfall		R0,C0 (no Q: 00)
674.10	138.19	Free Outfall		R0,C0 (no Q: 00)
674.20	139.33	Free Outfall		R0,00,C0
674.30	140.45	Free Outfall		R0,00,C0
674.40	141.60	Free Outfall		R0,C0 (no Q: 00)
674.50	142.69	Free Outfall		R0,C0 (no Q: 00)
674.60	143.81	Free Outfall		R0,C0 (no Q: 00)
674.70	144.91	Free Outfall		R0,00,C0
674.80	146.00	Free Outfall		R0,00,C0
674.90	147.08	Free Outfall		R0,C0 (no Q: 00)
675.00	148.15	Free Outfall		R0,C0 (no Q: 00)

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

POND HYDROLOGY

HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS
DATE	DESCRIPTION

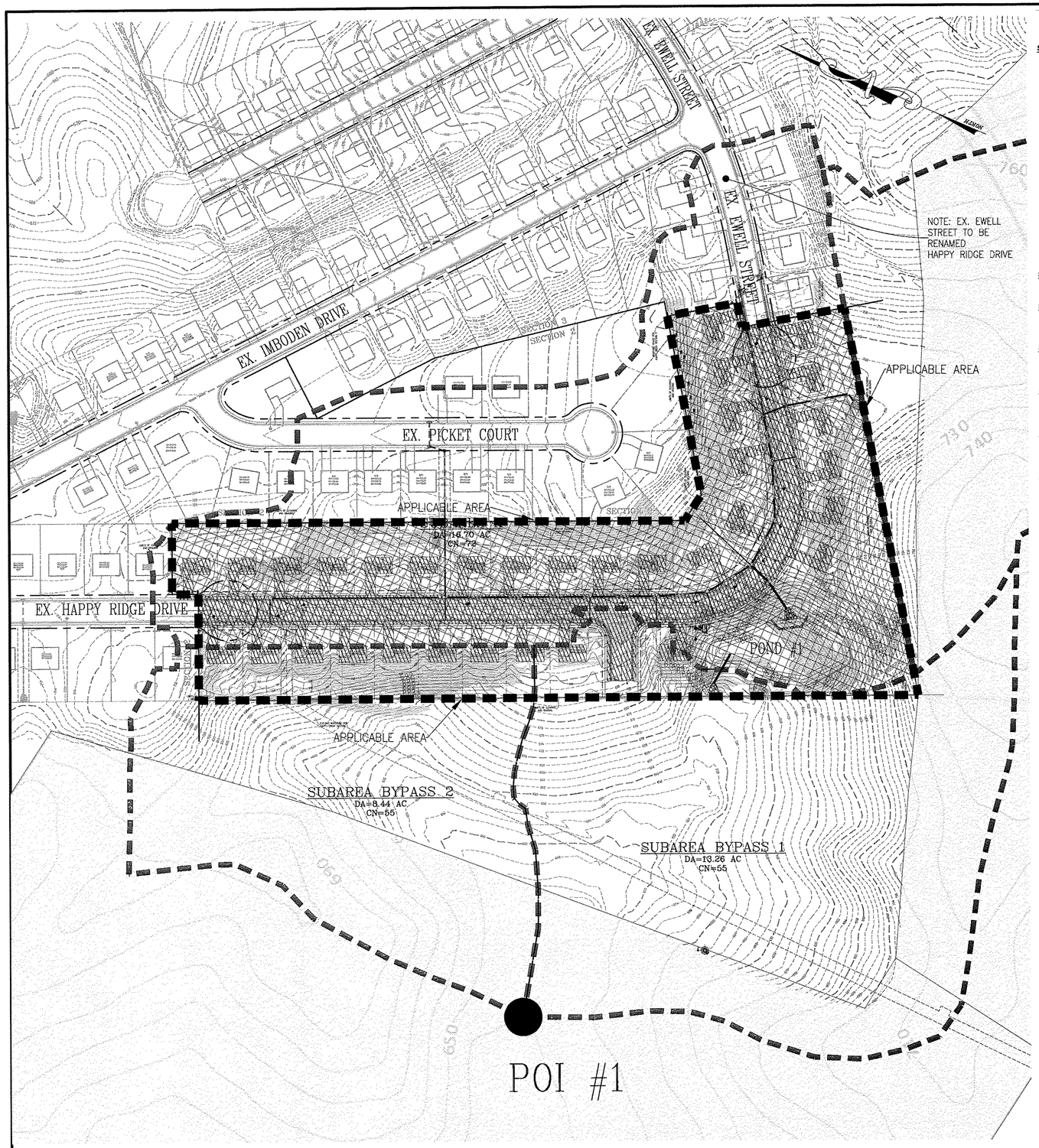
GC DESIGN	MCW DRAWN	CHKD
SCALE	H: N/A V: N/A	

JOB No. 1602-02-016

DATE JULY 19, 2019

FILE No. 1602-D-CP-005

Cad file name: P:\1602 - happy creek knolls sec 3\1602-04-001 (eng)\engineering\engineering plans\Sheets\1602-D-CP-001-POND.dwg



GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

BMP COVERAGE MAP
(SACLE: 1" = 100')

IMPERVIOUS AREA

AREA TO POND

Performance Based Water Quality Calculations - Happy Creek Knolls Section 4

STEP 1 **Determine the applicable area (A) and the post-developed impervious cover (I_{post}).**

Applicable area (A)= 12.43 Acres

Pre-development impervious cover:

Roads	0.34
Bldgs & Driveways	
Sidewalk/Trail	
Total Ex Impervious Area =	**0.34**

$I_{existing}$ = (total pre-development impervious cover ÷ A) × 100 = 16.0% utilized average land cover condition

Post-development impervious cover:

Roads	1.54
Bldgs & Driveways	1.68
Sidewalk/Trail	0.45
Total Proposed Impervious Area =	**3.67**

I_{post} = (total post-development impervious cover ÷ A) × 100 = 29.5%

STEP 2 **Determine the average land cover conditions ($I_{watershed}$) or the existing impervious cover ($I_{existing}$).**

$I_{existing}$ = 16.0%

STEP 3 **Determine the appropriate Development Situation.**

I_{post} 29.5% > $I_{existing}$ 16.0%

Situation 2 exists. The existing percent impervious cover is less than the average land cover condition.

STEP 4 **Determine the relative pre-development pollutant load (L_{pre}).**

$L_{pre(watershed)}$ = [0.05 + 0.009 × $I_{watershed}$)] × A × 2.28 **VSMH (Equation 5-16)**

= 5.50 pounds per year

STEP 5 **Determine the relative post-development pollutant load (L_{post}).**

L_{post} = [0.05 + 0.009 × I_{post})] × A × 2.28 **VSMH (Equation 5-21)**

= 8.95 pounds per year

STEP 6 **Determine the relative pollutant removal requirement (RR).**

RR = L_{post} - $L_{pre(watershed)}$

=3.45 pounds per year

STEP 7 **Identify the best management practice (BMP) for the site.**

1 Determine the required pollutant removal efficiency for the site:

EFF = (RR ÷ Lpost) × 100

= 39%

2 Select BMP(s)

Area	I_{BMP}	Eff_{BMP}	Description	Impervious Area	WQV	Required Volume	
10.03	31%	50%	Retention Basin II (4x WQV)	3.14	0.13 AC-FT	0.52 AC-FT	= 22,796 CU-FT

3 Determine the pollutant load entering the proposed BMP(s).

L_{post} = [0.05 + 0.009 × I_{BMP})] × A × 2.28 **VSMH (Equation 5-24)**

L_{BMP1} = 7.59 pounds per year

4 Calculate the pollutant load removed by the proposed BMP(s).

$L_{removed}$ = Eff_{BMP} × L_{BMP} **VSMH (Equation 5-24)**

$L_{removed/BMP1}$ = 3.79 pounds per year

5 Calculate the total pollutant load removed by the BMP(s)

$L_{removed/total}$ = $L_{removed/BMP1}$ + $L_{removed/BMP2}$ + $L_{removed\ BMP3}$ + ... **VSMH (Equation 5-25)**

$L_{removed/total}$ = 3.79 pounds per year

6 Verify compliance:

$L_{removed/total}$ 3.79 > 3.45 **OKAY**

SWM/BMP NARRATIVE

PROJECT DESCRIPTION

HAPPY CREEK KNOLLS, SECTION 4 CONSIST OF CONSTRUCTION OF 33 SINGLE FAMILY DETACHED UNITS AND THEIR ASSOCIATED INFRASTRUCTURE ON APPROXIMATELY 12.43 ACRES. THE ENTIRE SECTION DRAINS APPROXIMATELY 2,200 FT TO THE WEST TOWARDS A TRIBUTARY OF LEACH RUN.

STORMWATER MANAGEMENT

STORMWATER MANAGEMENT FOR THE SITE HAS BEEN GRANDFATHERED UNDER THE COMMON PLAN OF SUBDIVISION UNDER 9VAC25-870-48 (GRANDFATHERING) AND SUBJECT TO THE PART IIC (99VAC25-870-93 et seq.) TECHNICAL CRITERIA OF THIS CHAPTER. STORMWATER MANAGEMENT HAS BEEN PROVIDED/DESIGNED IN ACCORDANCE WITH THE "VIRGINIA STORMWATER MANAGEMENT HANDBOOK (VSMH) FIRST EDITION 1999" BY UTILIZING SWM/BMP POND 1 AND ADEQUATE OUTFALLS.

POND 1 IS LOCATED ON-SITE ADJACENT TO HAPPY RIDGE DRIVE BETWEEN LOTS 6 AND 33, APPROXIMATELY 2,200' EAST OF LEACH RUN. POND 1 WAS DESIGNED TO TREAT AND DETAIN THE 2, AND 10-YEAR POST-DEVELOPMENT STORM RUNOFF FOR THE MAJORITY OF SECTION 4. PRE-DEVELOPMENT RUNOFF AT OUTFALL "POI-1" ARE AS FOLLOWS: 2-YEAR IS 21.51 CFS, AND 10-YEAR IS 69.41 CFS. POST-DEVELOPMENT RUNOFF ARE AS FOLLOWS: 2-YEAR IS 5.39 CFS, AND 10-YEAR IS 60.43 CFS RESPECTIVELY. FOR DETAILED STORMWATER MANAGEMENT COMPUTATIONS, PLEASE REFER TO SHEETS 21 AND 22.

BEST MANAGEMENT PRACTICES

BEST MANAGEMENT PRACTICES HAS BEEN PROVIDED BY WAY OF SWM/BMP POND 1. THE SWM/BMP FACILITY WAS DESIGNED IN ACCORDANCE TO THE "VIRGINIA STORMWATER MANAGEMENT HANDBOOK (VSMH) FIRST EDITION 1999" BY UTILIZING THE PERFORMANCE BASED WATER QUALITY CALCULATIONS AS OUTLINED IN THE VSMH. THE BMP FACILITY, WHICH CONSIST OF AN RETENTION BASIN II (4xWQV) (TARGET POLLUTANT REMOVAL EFFICIENCY OF 50%) OF THE POST-DEVELOPMENT POLLUTANT RUNOFF, PROVIDES MORE THAN WHAT'S REQUIRED FOR SECTION 4. THE APPLICABLE AREA FOR SECTION 4 IS APPROXIMATELY 12.43 ACRES WITH A TOTAL POST-DEVELOPMENT IMPERVIOUS COVER OF 29.5%, WHICH IS HIGHER THAN THAN THE AVERAGE LAND COVER CONDITION IMPERVIOUSNESS OF 16%. THE 29.5% OF IMPERVIOUS COVER CONSIST OF ROAD PAVEMENTS, SIDEWALKS, DRIVEWAYS, AND ROOF TOPS. AS SHOWN IN THE PERFORMANCE BASED WATER QUALITY CALCULATION SHOWN ABOVE, THE PROPOSED BEST MANAGEMENT PRACTICES RESULTS IN A REDUCTION IN POST-DEVELOPMENT POLLUTANT DISCHARGE TO WELL BELOW PRE-DEVELOPMENT LEVELS.

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

BMP MAP, COMPUTATIONS AND NARRATIVE
HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
WARREN COUNTY, VIRGINIA
TOWN OF FRONT ROYAL

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC	MCW	
DESIGN	DRAWN	CHKD

SCALE H: 1"=100' V:

JOB No. 1602-02-016

DATE JULY 19, 2019

FILE No. 1602-D-CP-005

SHEET 22A OF 33

Cad file name: \\bcl-fs-01\cad\projects\2016\1602-02-016\dwg\engineering plans\sect4\1602-D-CP-005.dwg

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-9425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

EROSION AND SEDIMENT CONTROL – PHASE I

HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN

TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC DESIGN	MCW DRAWN
CHKD	
SCALE	H: 1"=50' V:
JOB No.	1602-02-016
DATE	JULY 19, 2019
FILE No.	1602-D-CP-005
SHEET	23 OF 33

Cad file name: J:\1602 - Happy Creek Knolls Inc. 1\1602-D-CP-001 (orig)\proposed\plans\sheets\1602-D-CP-001-23.dwg

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

EROSION AND SEDIMENT CONTROL – PHASE II

HAPPY CREEK KNOLLS SECTION 4

FINAL SUBDIVISION PLAN

WARREN COUNTY, VIRGINIA

TOWN OF FRONT ROYAL

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOWELL JR.
LIC. NO. 047794
PROFESSIONAL ENGINEER
10/15/19

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC DESIGN	MCW DRAWN / CHKD
SCALE	H: 1"=50' V:
JOB No.	1602-02-016
DATE	JULY 19, 2019
FILE No.	1602-D-CP-005

SHEET 24 OF 33

Cad file name: P:\1602 - Happy Creek Knolls Sec 3\1602-CP-005 (Dwg)\Engineering\Plans\Sheet\1602-CP-005.dwg

MINIMUM CONSTRUCTION STANDARDS

AN EROSION AND SEDIMENT CONTROL PROGRAM ADOPTED WITH THIS PLAN MUST BE CONSISTENT WITH THE VSECH FOR 4VAC50-30-40 MINIMUM STANDARDS:

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. TEMPORARY SOIL STABILIZATION SHALL BE APPLIED WITHIN SEVEN DAYS TO DENUDED AREAS THAT MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT FOR LONGER THAN 30 DAYS. PERMANENT STABILIZATION SHALL BE APPLIED TO AREAS THAT ARE TO BE LEFT DORMANT FOR MORE THAN ONE YEAR.

2. DURING CONSTRUCTION OF THE PROJECT, SOIL STOCKPILES AND BORROW AREAS SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY PROTECTION AND PERMANENT STABILIZATION OF ALL SOIL STOCKPILES ON SITE AS WELL AS BORROW AREAS AND SOIL INTENTIONALLY TRANSPORTED FROM THE PROJECT SITE.

3. A PERMANENT VEGETATIVE COVER SHALL BE ESTABLISHED ON DENUDED AREAS NOT OTHERWISE PERMANENTLY STABILIZED. PERMANENT VEGETATION SHALL NOT BE CONSIDERED ESTABLISHED UNTIL A GROUND COVER IS ACHIEVED THAT, IS UNIFORM, MATURE ENOUGH TO SURVIVE AND WILL INHIBIT EROSION.

4. SEDIMENT BASINS AND TRAPS, PERIMETER DIKES, SEDIMENT BARRIERS AND OTHER MEASURES INTENDED TO TRAP SEDIMENT SHALL BE CONSTRUCTED AS A FIRST STEP IN ANY LAND-DISTURBING ACTIVITY AND SHALL BE MADE FUNCTIONAL BEFORE UPSLOPE LAND DISTURBANCE TAKES PLACE.

5. STABILIZATION MEASURES SHALL BE APPLIED TO EARTHEN STRUCTURES SUCH AS DAMS, DIKES AND DIVERSIONS IMMEDIATELY AFTER INSTALLATION.

6. SEDIMENT TRAPS AND SEDIMENT BASINS SHALL BE CONSTRUCTED BASED UPON THE TOTAL DRAINAGE AREA TO BE SERVED BY THE TRAP OR BASIN.

   A. THE MINIMUM STORAGE CAPACITY OF A SEDIMENT TRAP SHALL BE 134 CUBIC YARDS PER ACRE OF DRAINAGE AREA AND THE TRAP SHALL ONLY CONTROL DRAINAGE AREAS LESS THAN THREE ACRES.

   B. SURFACE RUNOFF FROM DISTURBED AREAS THAT IS COMPRISED OF FLOW FROM DRAINAGE AREAS GREATER THAN OR EQUAL TO THREE ACRES SHALL BE CONTROLLED BY A SEDIMENT BASIN. THE MINIMUM STORAGE CAPACITY OF A SEDIMENT BASIN SHALL BE 134 CUBIC YARDS PER ACRE OF DRAINAGE AREA. THE OUTFALL SYSTEM SHALL, AT A MINIMUM, MAINTAIN THE STRUCTURAL INTEGRITY OF THE BASIN DURING A TWENTY-FIVE YEAR STORM OF 24-HOUR DURATION. RUNOFF COEFFICIENTS USED IN RUNOFF CALCULATIONS SHALL CORRESPOND TO A BARE EARTH CONDITION OR THOSE CONDITIONS EXPECTED TO EXIST WHILE THE SEDIMENT BASIN IS UTILIZED.

7. CUT AND FILL SLOPES SHALL BE DESIGNED AND CONSTRUCTED IN A MANNER THAT WILL MINIMIZE EROSION. SLOPES THAT ARE FOUND TO BE ERODING EXCESSIVELY WITHIN ONE YEAR OF PERMANENT STABILIZATION SHALL BE PROVIDED WITH ADDITIONAL SLOPE STABILIZING MEASURES UNTIL THE PROBLEM IS CORRECTED.

8. CONCENTRATED RUNOFF SHALL NOT FLOW DOWN CUT OR FILL SLOPES UNLESS CONTAINED WITHIN AN ADEQUATE TEMPORARY OR PERMANENT CHANNEL, FLUME OR SLOPE DRAIN STRUCTURE.

9. WHENEVER WATER SEEPS FROM A SLOPE FACE, ADEQUATE DRAINAGE OR OTHER PROTECTION SHALL BE PROVIDED.

10. ALL STORM SEWER INLETS THAT ARE MADE OPERABLE DURING CONSTRICTION SHALL BE PROTECTED SO THAT SEDIMENT-LADEN WATER CANNOT ENTER THE CONVEYANCE SYSTEM WITHOUT FIRST BEING FILTERED OR OTHERWISE TREATED TO REMOVE SEDIMENT.

11. BEFORE NEWLY CONSTRUCTED STORMWATER CONVEYANCE CHANNELS OR PIPES ARE MADE OPERATIONAL, ADEQUATE OUTLET PROTECTION AND ANY REQUIRED TEMPORARY OR PERMANENT CHANNEL LINING SHALL BE INSTALLED IN BOTH THE CONVEYANCE CHANNEL AND RECEIVING CHANNEL.

12. WHEN WORK IN A LIVE WATERCOURSE IS PERFORMED, PRECAUTIONS SHALL BE TAKEN TO MINIMIZE ENCROACHMENT, CONTROL SEDIMENT TRANSPORT AND STABILIZE THE WORK AREA TO THE GREATEST EXTENT POSSIBLE DURING CONSTRUCTION. NONERODIBLE MATERIAL SHALL BE USED FOR THE CONSTRUCTION OF CAUSEWAYS AND COFFERDAMS. EARTHEN FILL MAY BE USED FOR THESE STRUCTURES IF ARMORED BY NONERODIBLE COVER MATERIALS.

13. WHEN A LIVE WATERCOURSE MUST BE CROSSED BY CONSTRUCTION VEHICLES MORE THAN TWICE IN ANY SIX-MONTH PERIOD, A TEMPORARY VEHICULAR STREAM CROSSING CONSTRUCTED OF NONERODIBLE MATERIAL SHALL BE PROVIDED.

14. ALL APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS PERTAINING TO WORKING IN OR CROSSING LIVE WATERCOURSES SHALL BE MET.

15. THE BED AND BANKS OF A WATERCOURSE SHALL BE STABILIZED IMMEDIATELY AFTER WORK IN THE WATERCOURSE IS COMPLETED.

16. UNDERGROUND UTILITY LINES SHALL BE INSTALLED IN ACCORDANCE WITH THE FOLLOWING STANDARDS IN ADDITION TO OTHER APPLICABLE CRITERIA:

    A. NO MORE THAN 500 LINEAR FEET OF TRENCH MAY BE OPENED AT ONE TIME
    B. EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES.
    C. EFFLUENT FROM DEWATERING OPERATIONS SHALL BE FILTERED OR PASSED THROUGH AN APPROVED SEDIMENT TRAPPING DEVICE, OR BOTH, AND DISCHARGED IN A MANNER THAT DOES NOT ADVERSELY AFFECT FLOWING STREAMS OR OFF-SITE PROPERTY
    D. MATERIAL USED FOR BACKFILLING TRENCHES SHALL BE PROPERLY COMPACTED IN ORDER TO MINIMIZE EROSION AND PROMOTE STABILIZATION.
    E. RESTABILIZATION SHALL BE ACCOMPLISHED IN ACCORDANCE WITH THESE REGULATIONS.
    F. APPLICABLE SAFETY REGULATIONS SHALL BE COMPLIED WITH.

17. WHERE CONSTRUCTION VEHICLE ACCESS ROUTES INTERSECT PAVED OR PUBLIC ROADS, PROVISIONS SHALL BE MADE TO MINIMIZE THE TRANSPORT OF SEDIMENT BY VEHICULAR TRACKING ONTO THE PAVED SURFACE. WHERE SEDIMENT IS TRANSPORTED ONTO A PAVED OR PUBLIC ROAD SURFACE, THE ROAD SURFACE SHALL BE CLEANED THOROUGHLY AT THE END OF EACH DAY. SEDIMENT SHALL BE REMOVED FROM THE ROADS BY SHOVELING OR SWEEPING AND TRANSPORTED TO A SEDIMENT CONTROL DISPOSAL AREA. STREET WASHING SHALL BE ALLOWED ONLY AFTER SEDIMENT IS REMOVED IN THIS MANNER. THIS PROVISION SHALL APPLY TO INDIVIDUAL DEVELOPMENT LOTS AS WELL AS TO LARGER LAND-DISTURBING ACTIVITIES.

18. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION OR AFTER THE TEMPORARY MEASURES ARE NO LONGER NEEDED, UNLESS OTHERWISE AUTHORIZED BY THE LOCAL PROGRAM AUTHORITY. TRAPPED SEDIMENT AND THE DISTURBED SOIL AREAS RESULTING FROM THE DISPOSITION OF TEMPORARY MEASURES SHALL BE PERMANENTLY STABILIZED TO PREVENT FURTHER EROSION AND SEDIMENTATION. NO EROSION CONTROL MEASURE CAN BE CHANGED OR REMOVED WITHOUT THE PERMISSION OF THE LOUDOUN COUNTY INSPECTOR.

19. PROPERTIES AND WATERWAYS DOWNSTREAM FROM DEVELOPMENT SITES SHALL BE PROTECTED FROM SEDIMENT DEPOSITION, EROSION AND DAMAGE DUE TO INCREASES IN VOLUME, VELOCITY AND PEAK FLOW RATE OF STORMWATER RUNOFF.

20. ALL MEASURES USED TO PROTECT PROPERTIES AND WATERWAYS SHALL BE EMPLOYED IN A MANNER WHICH MINIMIZES IMPACTS ON THE PHYSICAL, CHEMICAL AND BIOLOGICAL INTEGRITY OF RIVERS, STREAMS AND OTHER WATERS OF THE STATE.

Project Description:
This project consists of the creation of 33 single family detached lots. The construction of street improvements, storm sewer, water and sanitary sewer improvements within Section 4 is on approximately 12.43 acres. Land disturbance due to this construction is approximately **11.90** acres. Sediment control for the proposed construction activities will be in accordance with the policies and requirements of the Virginia Erosion & Sediment Control Handbook. As required, this plan proposes erosion and sediment control in two separate phases. The first phase will establish the controls related to initial clearing and rough grading operations. The second phase is tailored to control sediment during the final development stage.

Existing Site Conditions:
The proposed site is covered with grass and woods. The existing slope ranges from 0% to +25%. The site drains southeast towards an exiting pond that outfalls into a stream.

Critical Areas:
Special care shall be taken to protect the existing trees, vegetation, steep slopes, existing wetlands, and the existing streams that run through the site.

Adjacent Property:
To the North is existing Happy Creek Section 3. To the east is Future Leach Run Parkway. To the west is existing Happy Creek Section 2. To the south is undeveloped farm land.

Off-site areas:
There will be no off site activities such as dump sites or borrow pits.

Soils Data:
Soils, Slopes, Class and Permeability (K Factor) see Soils Map on Sheet 2.

Erosion Control Program:
Erosion Control shall be maximized through rapid stabilization of the disturbed areas and by diverting clean water and erosive flows around or through disturbed areas in a non- erosive manner. Not more than 7 calendar days will elapse with any disturbed area remaining denuded. Temporary cover, by seeding and/or mulching, shall be applied to areas that will be exposed for a period of greater than 7 days, before permanent stabilization. Permanent cover should be provided over all disturbed areas as soon as possible upon achieving final grade, by means of seeding and mulching, sodding and pegging, paving, or as otherwise directed by the plan. Likewise, all stockpiles shall be stabilized within 7 days of achieving final grades. Utility trenches shall be seeded and mulched within 7 days after back filling to the proposed grade. All temporary diversion dikes shall be seeded and mulched immediately after construction.

Sediment Control Program:
Sediment Control shall be accomplished through rapid stabilization and by the installation of mechanical devices, as shown on the Phase I E&S Plan:

Structural Practices:
1. Temporary Construction Entrance with wash rack (CE) (STD & SPEC 3.02) and settling area. The Contractor to supply water source by connecting to existing waterline or by providing a water truck/water tank on-site for washing vehicles before entering the public road.
2. Tree Protection (TP) (STD & SPEC 3.38). A wire welded mesh fence barrier or super silt fence are to be placed around the trees and vegetated areas which will not be disturbed to protect the trees and other vegetation from construction equipment and soil compaction.
3. Silt Fence (SF) (STD & SPEC 3.05) & Super Silt Fence (SSF). Silt fence and super silt fence barriers are to be place at the indicated locations to intercept and detain small amounts of sediment laden runoff from disturbed areas from leaving the site.
4. Temporary Diversion Dikes (DD) (STD & SPEC 3.04). A system of diversion dikes to direct flow into sediment traps or basins will be installed below major graded areas. Additionally, diversion dikes will be utilized to divert clean water from entering disturbed areas.
5. Check Dams (CD) (STD & SPEC 3.20). Protection of storm channels will be provided as shown on the Erosion and Sediment Control Plans.
6. Outlet Protection (OP) (STD & SPEC 3.18). Protection of all sediment trap and basin outlets will be provided as shown on the Erosion and Sediment Control Plans.
7. Inlet Protection (IP) (STD & SPEC 3.07) & Culvert Inlet Protection (CIP) (STD & SPEC 3.08). All existing and proposed storm sewer inlets shall be protected during construction as shown on the Phase I and II Erosion and Sediment Control Plans. Sediment laden water shall be filtered before entering the storm sewer inlets.
8. Temporary Sediment Basin (SB) (STD & SPEC 3.14). A series of temporary sediment basins will be utilized to capture and treat sediment laden runoff prior to releasing from the site. See Erosion and Sediment Detail Sheets for specific design information.

Vegetative Practices:
1. Surface Roughening -Areas to be seeded shall be lightly roughened & loose to a depth of 2" to 4" prior to seeding. Areas, which have been graded and will not be stabilized immediately, may be roughened to reduce velocity until seeding takes place.
2. Top soiling (Stockpiles) -Topsoil will be stripped from areas to be graded and stockpiled for later use. Stockpile locations shall be located on-site in open space areas and to be stabilized with temporary vegetation. Silt Fences shall be included around all stockpile areas.
3. Temporary Seeding -All denuded areas that will be left dormant for extended periods of time shall be seeded with fast germinating temporary vegetation immediately following grading. Selection of the seed mixture will depend on the time of the year it is applied.
4. Erosion Control Blankets or Mulch -Erosion control blankets will be installed over fill slopes which have been brought to final grade and seeded to protect the slopes from rill and gully erosion and allow the seed to germinate properly. Mulch (straw or fiber) will be used on relatively flat areas and will be applied as a second step in the seeding operation.
5. All siltation control measures are intended to prevent sediment from encroaching into environmentally sensitive areas or onto adjacent properties and roadways. The Loudoun County Inspector has the authority to add or delete erosion and sediment controls in the field as site conditions warrant. In addition, no sediment traps or sediment basins may be removed without the prior approval of the County inspector. Sediment Control "Maintenance Program" described below.
6. Obtain County Inspector's approval prior to the removal of the remaining mechanical sediment controls.

Permanent Stabilization:
All areas disturbed by construction shall be stabilized with permanent seeding immediately following finish grading. Seeding shall be done with Kentucky 31 Tall Fescue according to Std. & Spec. 3.32, Permanent Seeding, of the Virginia Erosion and Sediment Control Handbook. Erosion control blankets will be installed over fill slopes which have been brought to final grade and have been seeded. This will protect the slopes from rill and gully erosion and allow the seed to germinate properly. Mulch (straw or fiber) will be used on relatively flat areas. In all seeding operations, seed, fertilizer and lime will be applied prior to mulching.

Streambank Stabilization:
Disturbed areas along the banks of the Floodplain shall be stabilized with vegetative streambank stabilization. Vegetation shall be done in accordance with Std. & Spec 3.22, Vegetative Streambank Stabilization of the Virginia Erosion and Sediment Control Handbook.

Stormwater Management:
Stormwater Management is to be handled by storm sewers that will collect and drain the storm water to adequate channels for ultimate conveyance to the major floodplain.

Maintenance Program:
In general all erosion and sediment control measures will be checked daily and after each significant rainfall event. The following measures will be checked in particular:
Construction Entrance: (STD & SPEC 3.02) Inspections shall be made daily for entrance integrity; required repairs shall be made immediately.
Silt Fence: (STD & SPEC 3.05) Inspections shall be made daily for fence integrity; required repairs shall be made immediately. Sediment is to be removed when deposits reach one-half the fence height.
Diversion Dikes: (STD & SPEC 3.09) Dikes shall be checked for sediment accumulation after each significant rainfall; Repair as needed.
Culvert Inlet Protection: (STD & SPEC 3.08) Inlets shall be checked for sediment accumulation as needed.
Outlet Protection: (STD & SPEC 3.18) Culvert outlets shall be checked for sediment accumulation and debris as needed.
Tree Protection: (STD & SPEC 3.38) Inspections shall be made daily for fence integrity; required repair shall be made immediately.
Sediment Basins: (STD & SPEC 3.14) Inspections shall be made regularly to the embankment to ensure that it is structurally sound and has not been damaged by erosion or construction equipment. The emergency spillway should be checked regularly to ensure that its lining is well established and erosion-resistant. The basin should be checked after each runoff-producing rainfall for sediment cleanout. When the sediment reaches the clean-out level, it shall be removed and properly disposed of.
Permanent Seeding: (STD & SPEC 3.32) Seeded areas shall be checked regularly to assure a good stand of grass is being maintained. Areas that fail to establish vegetative cover adequate to prevent rill erosion shall be re-seeded as soon as they are identified.
Mulching: (STD & SPEC 3.35) All mulched areas shall be inspected periodically, particularly after rainstorms, to check for rill erosion; Repair as needed.
Check Dams: (STD & SPEC 3.20) Check dams shall be checked for sediment accumulation after each significant rainfall. Sediment should be removed when it reaches one-half of the original height or before. Regular inspection shall be made to ensure that the center of the dam is lower than the edges. Erosion caused by high flows around the edges of the dam shall be corrected immediately.
Right-of-Way Diversion: (STD & SPEC 3.11) Inspections shall be made daily for right-of-way diversion integrity; required repairs shall be made immediately.
Utility Stream Crossing: (STD & SPEC 3.25) Inspections shall be made daily for utility stream crossing integrity; required repairs shall be made immediately.

Phasing of Land Disturbing Activities:
As-required, Sediment Control is provided through a two-phased approach.

PHASE I:
Phase I operations will include the construction needed to divert major off-site clean water and on-site drainage flows around the work area and control erosion and siltation associated with initial clearing and grading operations. As required, Phase I controls shall be established in a one (1) step process:

1. Owner to obtain a Grading Permit and a VPDES permit. Owner, Contractor, Responsible Land Disturber and Project Engineer shall attend a pre-construction meeting with the County Inspector prior to starting any land disturbing activities.
2. A wetlands permit by the US Army Corps of Engineers will be required for any wetland disturbance.
3. Install Construction Entrances (CE) as shown on phase I plan. Provide the Construction Entrances with wash rack as shown on the Phase I Plan, and establish a protected staging and equipment parking area.
4. Tree Protection will consist of either Super Silt Fence (TP/SSF) or Welded Wire Fence (TP/WWM) as shown on the Phase I Plan.
5. Install the remaining mechanical controls such as, Diversion Dikes (DD), Silt Fence (SF), Super Silt Fence (SSF) and sediment basin (SB) as shown on the Phase I Plan.
6. Install storm water bypass along with the appropriate controls, as shown on the plan.
7. Contact the County Field Manager for an E&S perimeter inspection prior to starting the clearing and grubbing of remaining site.
8. Clearing and grubbing or removal of existing vegetation must be limited within the limits of clearing, as shown on the Phase I Plan.

PHASE II:
The Phase II Sediment Control measures are intended for the final stages of site development. Phase I control measures, which are not in conflict with final construction and provide effective control, shall remain in place for final development. The Contractor and the Responsible Land Disturber shall follow the County Inspector's direction in providing additional control measures needed during the development process, to insure that sediment is prevented from polluting off-site areas, streams and/or protected on-site areas.

The following sequence of construction is suggested:

1. Rough grade the streets.
2. Install watermain and sanitary sewer. The construction of the sanitary sewer crossing a perennial stream shall be completed on a dry day. Measures shall be taken to protect the stream bed at all times.
3. Install the storm sewer system. (Conversion of sediment basins to BMP facilities must comply with the requirements listed in section 3.06 of the Virginia Stormwater Management Handbook.)
4. Construct the base pavement for the streets and permanently stabilize site by surface roughening followed by planting and seeding.
5. Install final pavement.
6. After grading is completed, remove Diversion Dikes and replace with Silt Fence only as shown on the Phase II Plan, and after obtaining County Field Manager approval.

Devices shown are to be considered as minimum erosion and sedimentation controls. Additional controls may be necessary due to contractor's phasing or other unanticipated conditions. The Erosion and Sediment Control Inspector has the right to add or remove controls as deemed necessary in the field. It is the contractor's responsibility to provide additional devices as necessary in order to control erosion and sedimentation. Erosion and sedimentation measures shall be installed and maintained in accordance with the standards and specifications in the Virginia Erosion and Sediment Control Handbook, Third Edition. The contractor is to provide adequate means of cleaning and removing all laying dust as necessary by applying either moisture, calcium chloride, or other approved materials along those sections of the project adjacent to existing dwellings or public access. Controls may be removed after the areas above them have been stabilized and with the approval of the County Inspector.

Special Care Notes:
It is the intent of this plan to preclude sediment pollution from leaving the delineated construction zones.

The Contractor and the Responsible Land Disturber shall take special care to prevent construction debris and mud from being tracked onto surrounding public and private roads. Construction traffic shall only enter and exit the construction site via designated locations, which have working construction traffic wash racks.

The Contractor and Responsible Land Disturber shall take special care to protect the existing vegetation and streams outside of the designated limits of work shown on the plans.

Additional Notes:
1. When Sediment Basins and Traps are to be used as perimeter controls:

   a. Sediment Basin Embankments - shall be constructed of proper material that will contain the appropriate moisture content to ensure that 95% compaction will be achieved. (VESCH Std. & Spec. 3.14)

   b. Sediment Basin Outfall Pipes - Fill material placed around the outfall pipe shall be accomplished in 4 inch lifts and compacted until 95% compaction is achieved. (VESCH Std. & Spec. 3.14)
   Third party geotechnical verification may be required to ensure that both of these standards and specifications are met.

   c. Sediment Traps - Fill material used for construction of sediment trap embankments shall be free of roots or other woody vegetation, organic material, large stones and other objectionable material. Sediment Trap embankments should be compacted in 6 inch layers by traversing with construction equipment. (VESCH Std. & Spec 3.13)

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

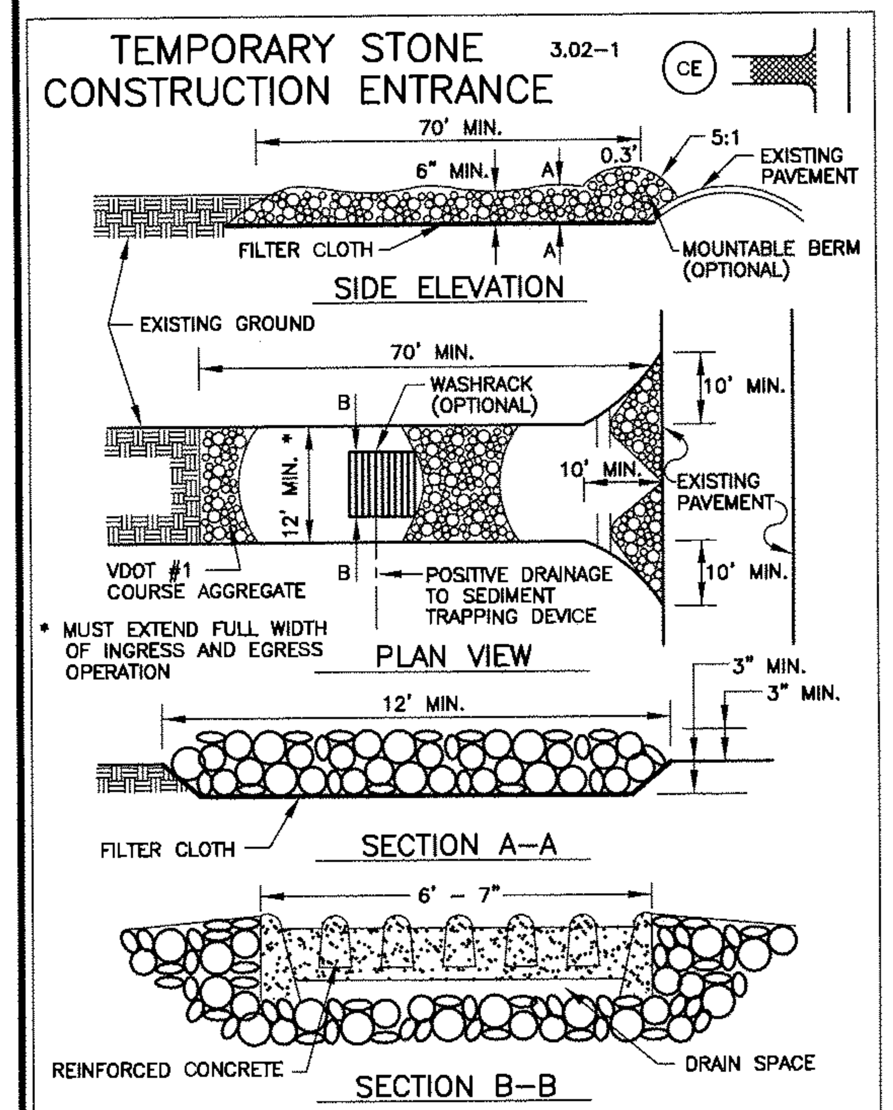
EROSION AND SEDIMENT CONTROL NARRATIVE
HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

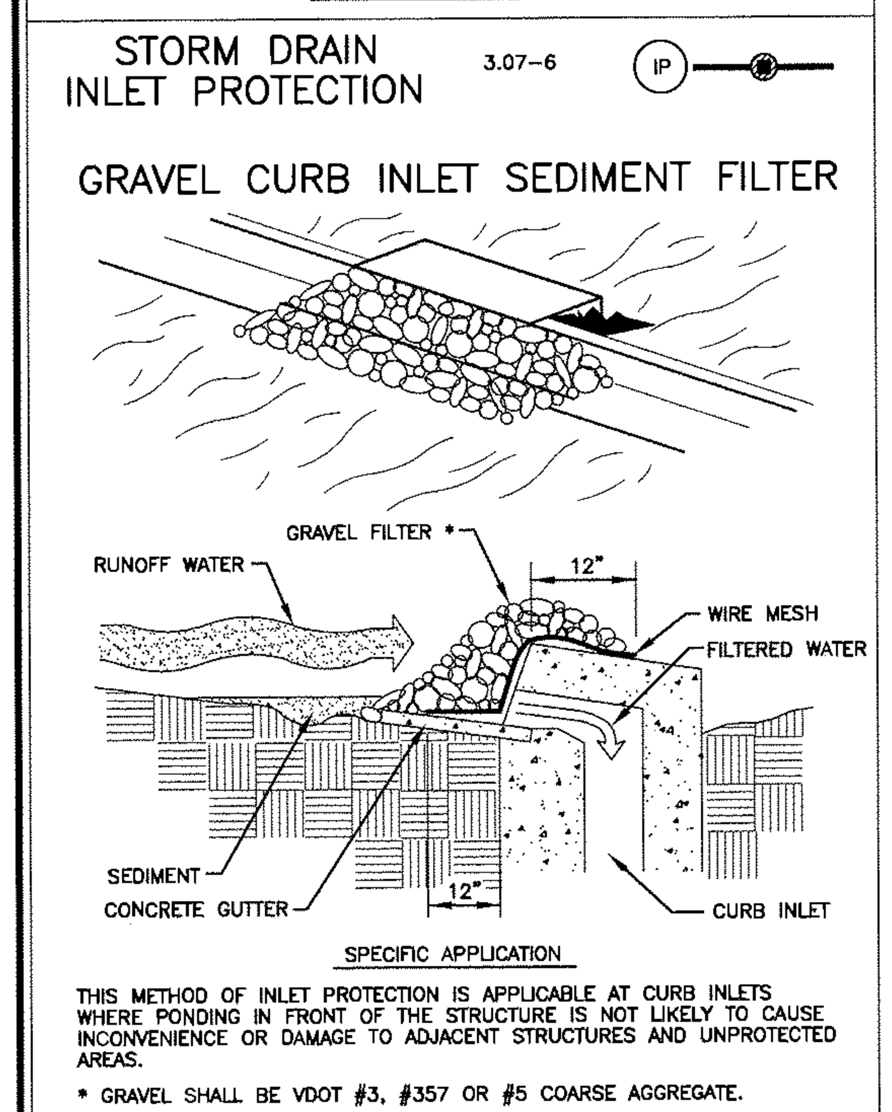
COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

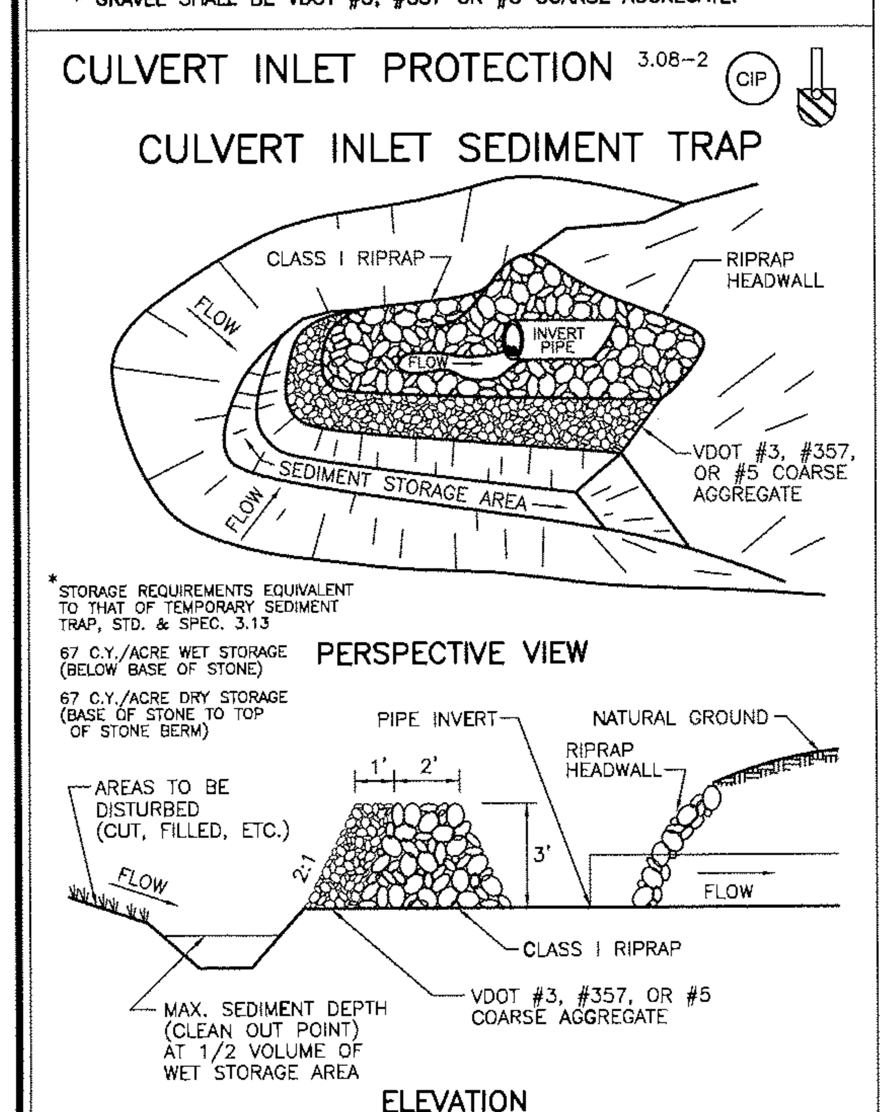
PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION
GC DESIGN	MCW DRAWN / CHKD
SCALE	H: 1"=50' V:
JOB No.	1602-02-016
DATE	JULY 19, 2019
FILE No.	1602-D-CP-005
SHEET	25 OF 33

Cad file name: P:\1602 - happy creek knolls sec 3\1602-04-001 (eng)\engineering\engineering plans\sheets\1602-D-CP-001-E30.dwg







PROJECT: HAPPY CREEK SECTION 4
BASIN # : 1 **LOCATION:**
TOTAL AREA DRAINING TO BASIN: 33.56 acres

BASIN VOLUME DESIGN
WET STORAGE:

1 MINIMUM REQUIRED VOLUME = 67 cu. yds. x TOTAL DRAINAGE AREA (ACRES)
67 cu. yds. X 33.56 acres = 2249 cu. yds.
2 AVAILABLE BASIN VOLUME = 2264.5 cu. yds. AT ELEVATION 668.80
(FROM STORAGE - ELEVATION CURVE)
3 EXCAVATE 2264.5 cu. yds. To obtain required volume
(ELEVATION CORRESPONDING TO REQUIRED VOLUME = INVERT OF DEWATERING ORIFICE)
4 AVAILABLE VOLUME BEFORE CLEANOUT REQUIRED.
33 cu. yds. X 33.56 Acres = 1107 cu. yds.
5 ELEVATION CORRESPONDING TO CLEANOUT LEVEL = 666.40
(FROM STORAGE - ELEVATION CURVE)
6 DISTANCE FROM INVERT OF THE DEWATERING ORIFICE TO CLEANOUT LEVEL = 2.40 Ft.
(MIN. = 1.0 Ft.)

DRY STORAGE:

7 MINIMUM REQUIRED VOLUME = 67 cu. yds. x TOTAL DRAINAGE AREA (ACRES).
67 cu. yds. X 33.56 Acres = 2249 cu. yds.
8 TOTAL AVAILABLE BASIN VOLUME AT CREST OF RISER = 4497.0 cu. yds.
(FROM STORAGE - ELEVATION CURVE) AT ELEVATION 672.60
S= 121,420 cu. ft.
O= 5.62 cfs
h (avg)= 1.10 Ft.
A= 1.6521 SF
d= 1.45 Ft.
9 DIAMETER OF DEWATERING ORIFICE = 18.0 IN.
10 DIAMETER OF OF FLEXIBLE TUBING = 20.0 IN.
(DIAMETER OF DEWATERING ORIFICE PLUS 2 INCHES).

PRELIMINARY DESIGN ELEVATIONS

11 CREST OF RISER = 672.60
TOP OF DAM = 675.60
DESIGN HIGH WATER = 673.36
UPSTREAM TOE OF DAM = 662.00

AA LENGTH OF FLOW (L) = 136 = 2.6
EFFECTIVE WIDTH (W_e) = 52.5
IF > 2, BAFFLES ARE NOT REQUIRED 'X'
IF < 2, BAFFLES ARE REQUIRED

RUNOFF

		AREA		"C"		I		
13	Q_2 =	**33.56**	X	**0.40**	X	**5.01**	=	**67.25** cfs
14	Q_{25} =	**33.56**	X	**0.40**	X	**7.74**	=	**103.90** cfs

(FROM CHAPTER 5)

PRINCIPAL SPILLWAY DESIGN

15 WITH EMERGENCY SPILLWAY, REQUIRED SPILLWAY CAPACITY $Q_p = Q_2$ = **N/A** cfs
(RISER & BARREL)
WITHOUT EMERGENCY SPILLWAY, REQUIRED SPILLWAY CAPACITY $Q_p = Q_{25}$ = **103.90** cfs
(RISER & BARREL)
16 WITH EMERGENCY SPILLWAY:
ASSUMED AVAILABLE HEAD (h) = **N/A** ft. (USING Q_2)
h = CREST OF EMERGENCY SPILLWAY ELEVATION - CREST OF RISER ELEVATION
WITHOUT EMERGENCY SPILLWAY:
ASSUMED AVAILABLE HEAD (h) = **0.8** ft. (USING Q_{25})
h = DESIGN HIGH WATER ELEVATION - CREST OF RISER ELEVATION
17 RISER DIAMETER (D_r) = 72 in. ACTUAL HEAD (h) = 0.8 ft.
(FROM PLATE 3.14-8)
NOTE: AVOID ORIFICE FLOW CONDITIONS.
18 BARREL LENGTH (l) = 71 ft.
HEAD (H) ON BARREL THROUGH EMBANKMENT = 6.86 ft.
(FROM PLATE 3.14-7) H = Design High Water - Center of barrel elevation
19 BARREL DIAMETER = 36 in. CMP
(PLATE 3.14-A [CORRUGATED PIPE])
20 BARREL UPSTREAM INVERT = 665.50
BARREL DOWNSTREAM INVERT = 665.00
21 TRASH RACK ANTI-VORTEX DEVICE
DIAMETER = 102 INCHES
HEIGHT = 36 INCHES
(FROM TABLE 3.14-D)

EMERGENCY SPILLWAY DESIGN

22 REQUIRED SPILLWAY CAPACITY $Q_e = Q_{25} - Q_p$ = N/A cfs
23 BOTTOM WIDTH (b) = N/A ft.
THE SLOPE OF THE EXIT CHANNEL (s) = N/A ft./foot
AND THE MINIMUM LENGTH OF THE EXIT CHANNEL (X) = N/A ft.
(FROM TABLE 3.14-C).

ANTI-SEEP COLLAR DESIGN

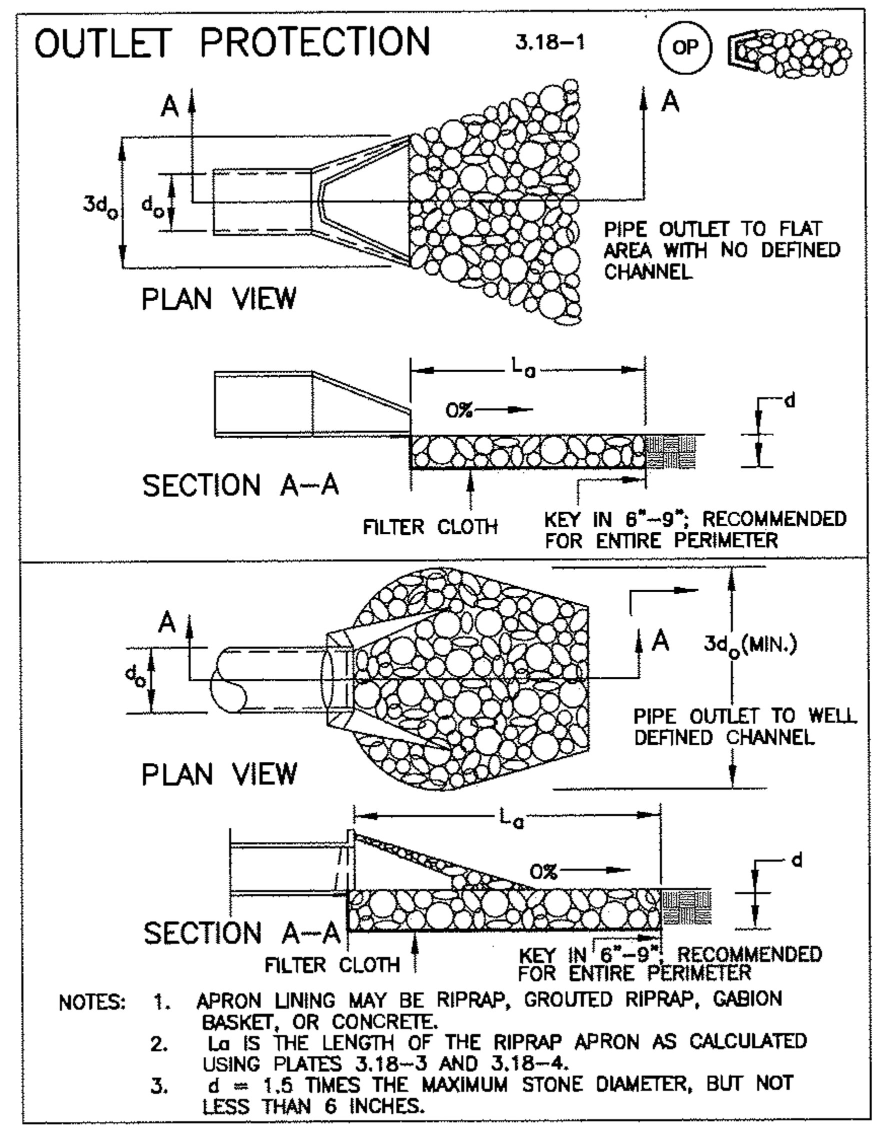
24 DEPTH OF WATER AT PRINCIPAL SPILLWAY CREST (Y) = 11.36 ft.
SLOPE OF UPSTREAM FACE OF EMBANKMENT (Z) = 3 :1
SLOPE OF PRINCIPAL SPILLWAY BARREL (S) = 0.007 ft./foot
LENGTH OF BARREL IN SATURATED ZONED (Ls) = 81.85 ft.
25 NUMBER OF COLLARS REQUIRED = 1
DIMENSIONS = 6.2X6.2
(FROM PLATE 3.14-12)

FINAL DESIGN ELEVATIONS

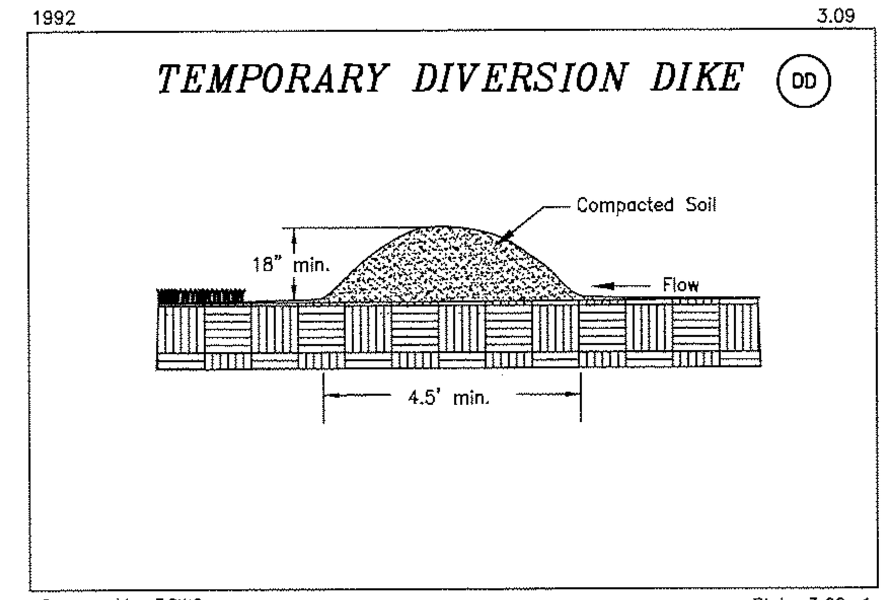
26 TOP OF DAM = 675.60
MIN. TOP of DAM WIDTH 8 ft.
EMBANKMENT SIDE SLOPE (H:V) 2:1
DESIGN HIGH WATER = 673.36
EMERGENCY SPILLWAY CREST = N/A
PRINCIPAL SPILLWAY CREST = 672.60
DEWATERING ORIFICE INVERT = 668.80
CLEANOUT ELEVATION = 666.40
ELEVATION OF UPSTREAM TOE OF DAM
OR EXCAVATED BOTTOM OF "WET STORAGE
AREA" (IF EXCAVATION WAS PERFORMED) = 662.00

Stage - Storage Curve (SB-#1)

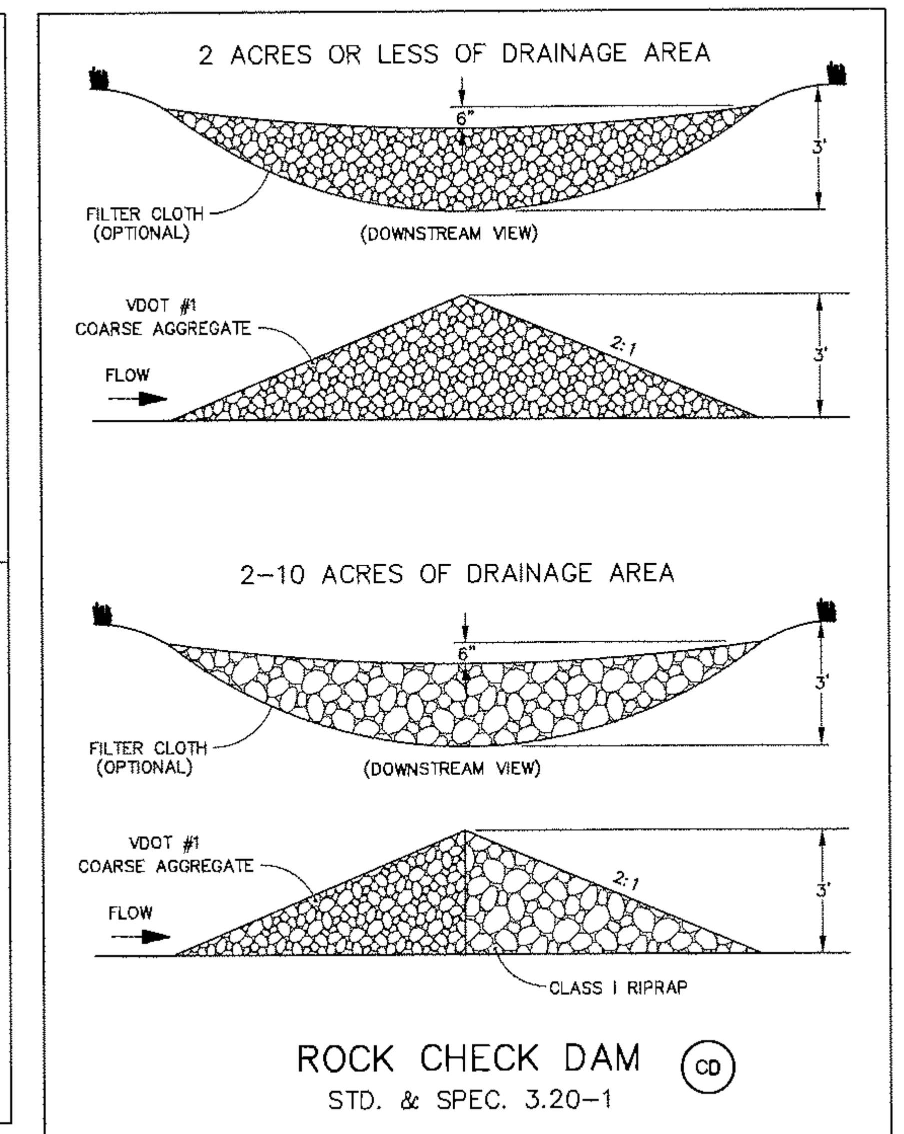
Elevation (ft)	Surface Area (ft^2)	Incremental Vol. (ft^3)	Cummulative Vol. (Yds^3)
662	5,112	0	0
664	7,137	12,192.82	451.59
666	9,355	16,442.06	1,060.55
668	12,178	21,471.05	1,855.77
670	15,479	27,591.10	2,877.67
672	18,317	33,756.21	4,127.90
673	20,295	19,297.55	4,842.62

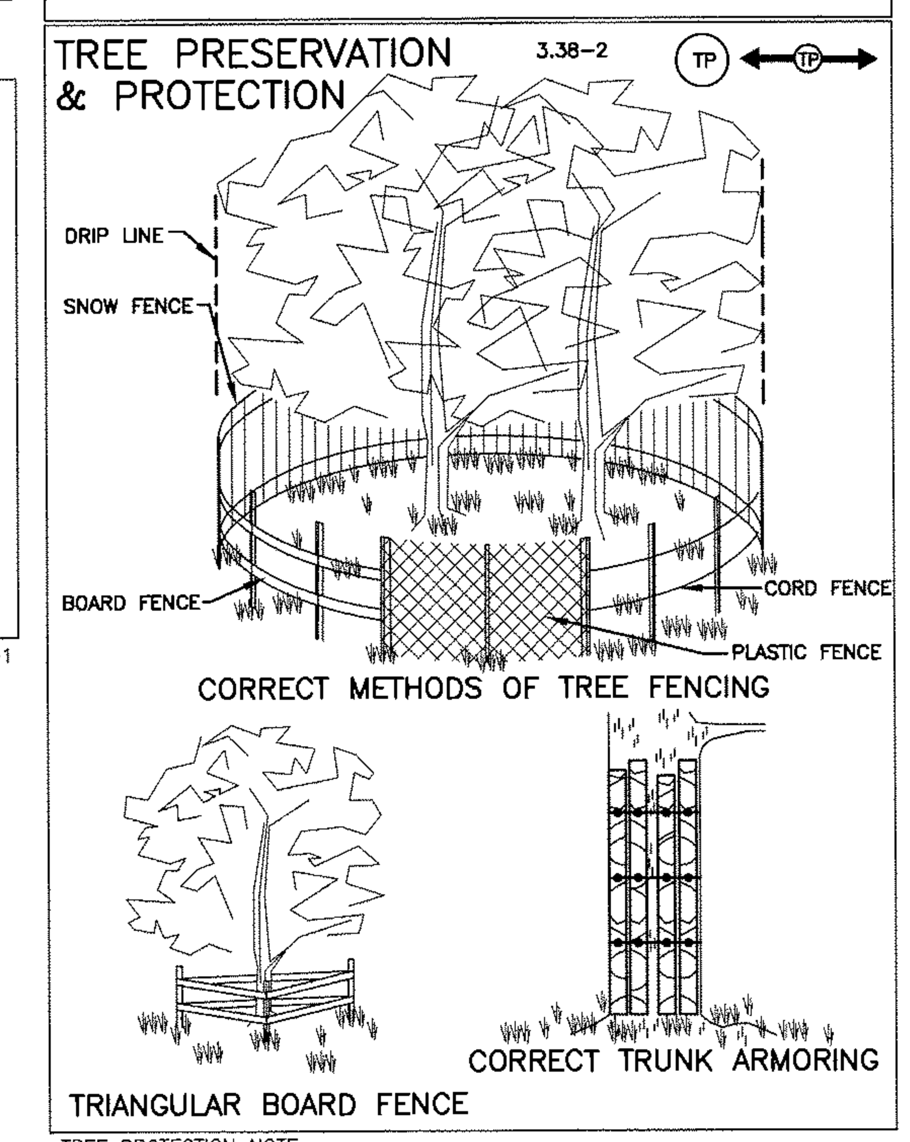


1992 3.09



Source: Va. DSWC Plate 3.09-1





TREE PROTECTION NOTE:

CONTRACTOR MAY ELECT TO UTILIZE SILT FENCE OR SAFETY FENCE IN LIEU OF SNOW FENCE TO PROTECT TREES.

Figure 3 - Super Silt Fence

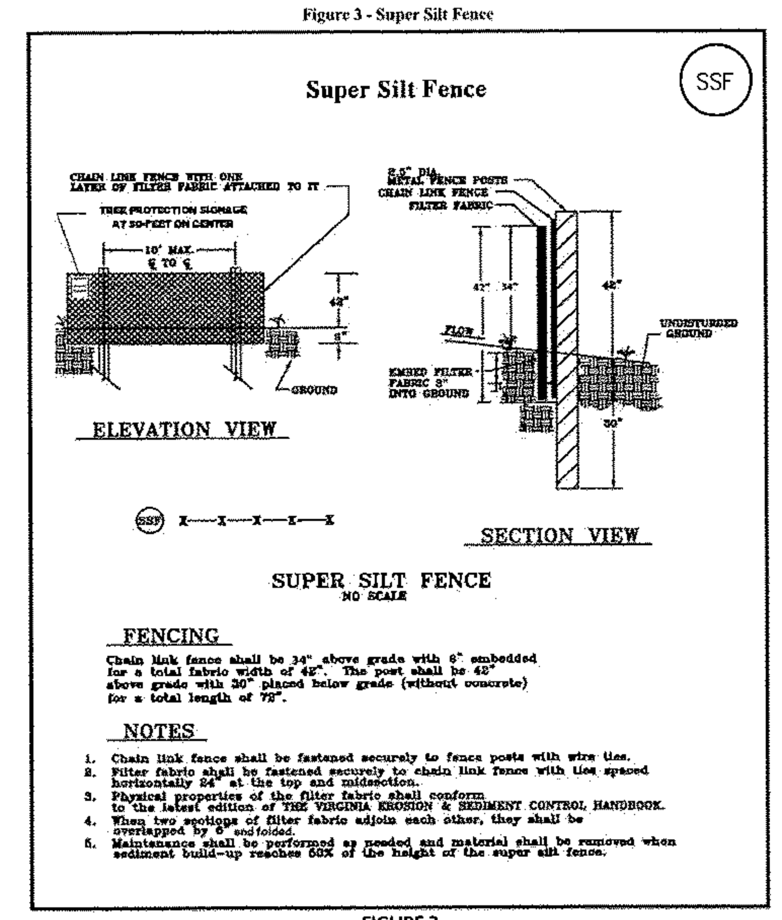
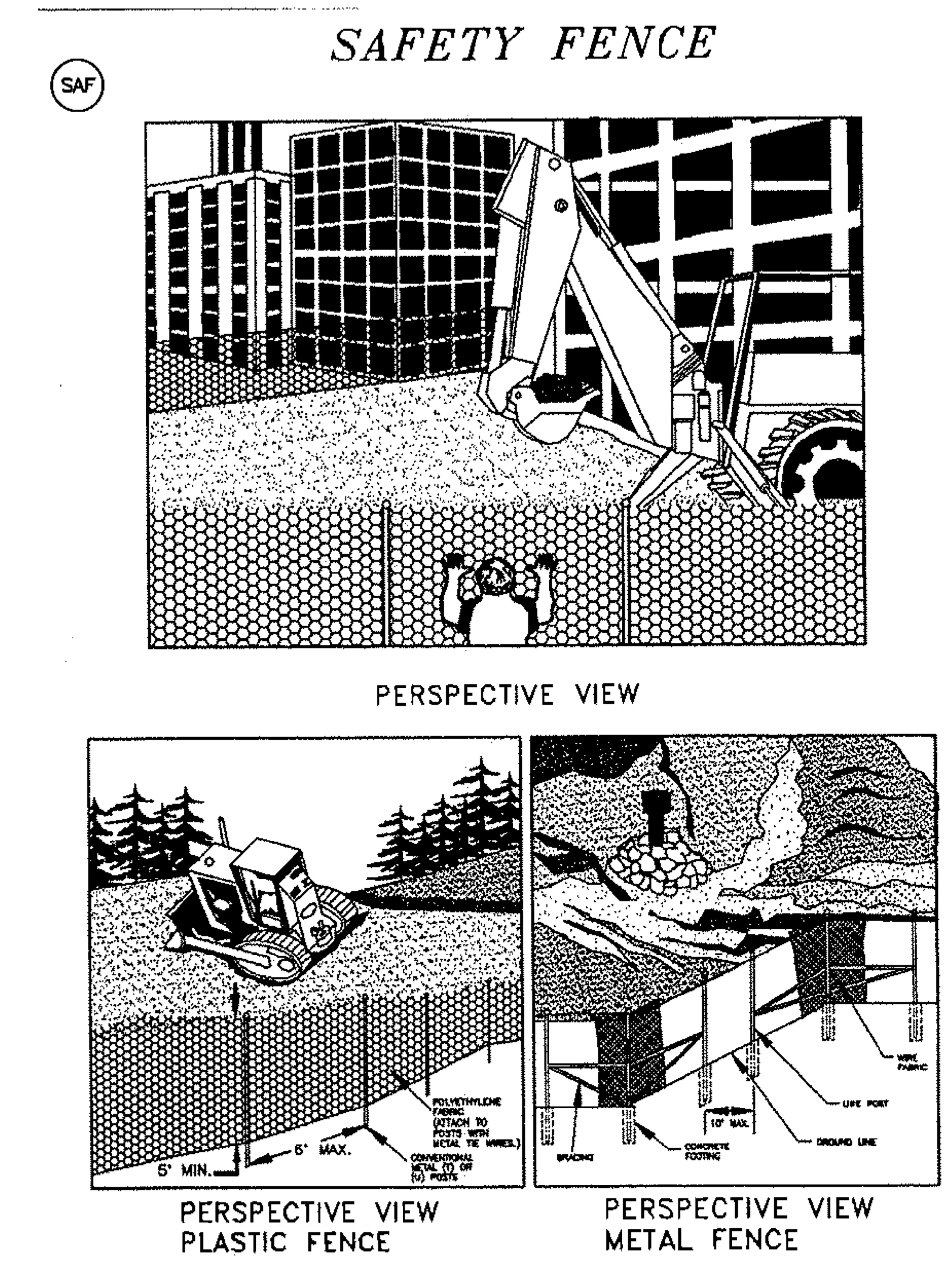
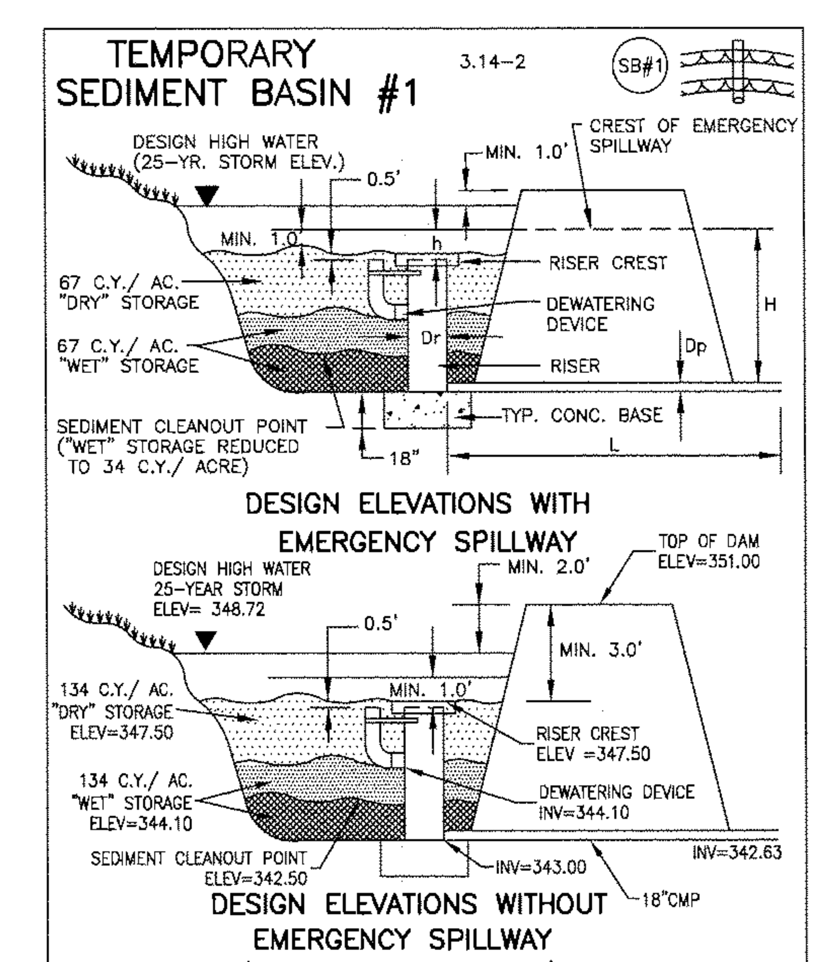


FIGURE 3
Section 7.600 Section 7.600 – Erosion and Sediment Control
Effective Date: 01/15/2018



SOILS OVERLAY INFORMATION	
MAPPING UNIT NUMBER, NAME, SCOPE AND HYDROLOGIC GROUP	SOILS CARACTERISTICS
21D–LEW CHANNERY LOAM, (7–25%) (B)	DEEP, STRONGLY SLOPING, WELL DRAINED, VERY DARK GRAYISH–BROWN CHANNERY LOAM SOIL ON SIDE SLOPES IN THE BLUE RIDGE STREAMS; K=0.17
22E–LEW VERY STONY LOAM, (25–65%) (B)	DEEP, STEEP TO VERY STEEP, WELL DRAINED, VERY DARK GRAYISH–BROWN VERY STONY LOAM SOIL ON THE SIDE SLOPES OF THE BLUE RIDGE; K=0.17
32C–LEW VERY STONY LOAM, (25–65%) (B)	DEEP, STRONGLY SLOPING, WELL DRAINED SOILS, DARK BROWN VERY STONY SILT LOAM SOIL ON THE SIDE SLOPES AND RIDGETOPS OF THE BLUE RIDGE; K=0.32



Bowman
CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

EROSION AND SEDIMENT CONTROL COMPUTATIONS AND DETAILS
HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS
DATE	DESCRIPTION

GC DESIGN	MCW DRAWN	CHKD
SCALE	H: 1"=50' V:	
JOB No. 1602-02-016		
DATE JULY 19, 2019		
FILE No. 1602-D-CP-D05		
SHEET 26 OF 33		

Cad file name: P:\1602 - happy creek knolls sec 3\1602-04-001 (eng)\engineering\engineering plans\Sheets\1602-D-CP-001-ESD.dwg

NOTE: EX. EWELL STREET FROM THE INTERSECTION OF IMBODEN DRIVE SOUTH TO BE RENAMED HAPPY RIDGE DRIVE

EX. IMBODEN DRIVE

EX. PICKET COURT

EX. EWELL STREET

HAPPY RIDGE DRIVE

HAYMAKER LANE

EX. HAPPY RIDGE DRIVE

SECTION 2

SECTION 3

PROPOSED GRADE PER HAPPY CREEK SECTION 3

LIMITS OF CLEARING AND GRADING

PROP. STREET LIGHT

PROP. 10' LANDSCAPE EASEMENT PER TC SEC. 156-7.6

STREET SIGN (TYP.)

STOP SIGN (TYP.)

PROP. POND

WARREN MEMORIAL HOSPITAL
INSTR# 3553
T.M. 20A212 2
ZONED: A-1
USE: AGRICULTURE/UNDEVELOPED (20-99ACRES)

HEPTAD LLC
INSTR# 4959
T.M. 20A212 1
ZONED: PND
USE: AGRICULTURE/UNDEVELOPED (20-99ACRES)

EXISTING WATERLINE PER HAPPY CREEK SECTION 2

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

LANDSCAPE AND LIGHTING PLAN

HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN

WARREN COUNTY, VIRGINIA

TOWN OF FRONT ROYAL

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC	MCW	CHKD
DESIGN	DRAWN	

SCALE H: 1"=50' V:

JOB No. 1602-02-016

DATE JULY 19, 2019

FILE No. 1602-D-CP-005

SHEET 27 OF 33

Cad file name:P:\1602 - Happy Creek Knoll Sec 3\1602-04-001 (Mch)\Engineering\Engineering Plans\Sheets\1602-D-CP-005.dwg

PLANTING SPECIFICATIONS

PLANTING NOTES:

1. QUALITY ASSURANCE:

A. APPLICABLE SPECIFICATIONS AND STANDARDS:

AMERICAN STANDARD FOR NURSERY STOCK, LATEST EDITION.
AMERICAN ASSOCIATION OF NURSERYMEN
LANDSCAPE CONTRACTORS ASSOCIATION.
TOWN OF FRONT ROYAL / WARREN COUNTY PREFERRED SPECIES LIST

2. SUBMITTALS: SUBMIT THE FOLLOWING TO THE OWNER'S REPRESENTATIVE PRIOR TO BEGINNING WORK:

COPIES OF MANUFACTURER'S DATA FOR ALL MATERIALS REQUIRED.
SAMPLES OF REQUIRED MULCH MATERIAL.
CHEMICAL AND MECHANICAL ANALYSIS AND SAMPLES OF ALL EXISTING SOIL, TOPSOIL, ORGANIC MATTER AND SOIL MIX TO BE USED.
PLANTING SCHEDULE SHOWING THE DATES (EARLIEST AND LATEST) PROPOSED FOR EACH TYPE OF PLANT SPECIFIED, SCHEDULE EACH TYPE OF PLANTING WITHIN THE NORMAL PLANTING SEASONS FOR SUCH WORK. INCLUDE REQUESTS FOR ANY PROPOSED CHANGES IN THE APPROVED PLANTING SEASON AND A LIST OF PROPOSED SOURCES FOR ALL PLANT MATERIALS.
LIST OF PROPOSED SOURCES FOR ALL PLANT MATERIAL.

3. DELIVERY, STORAGE AND HANDLING:

A. DELIVER PACKAGED MATERIALS IN MANUFACTURER'S UNOPENED CONTAINERS OR BUNDLES, FULLY IDENTIFIED WITH NAME, BRAND, TYPE, WEIGHT, AND ANALYSIS. STORE PACKAGED MATERIALS IN SUCH A MANNER AS TO PREVENT DAMAGE OR INTRUSION OF FOREIGN MATTER.

B. DIG BALLED AND BURLAPPED (B& B) PLANTS WITH FIRM, NATURAL BALLS OF EARTH, OF A DIAMETER NOT LESS THAN THAT SHOWN ON THE PLANT LIST NOR LESS THAN RECOMMENDED BY THE AMERICAN STANDARD FOR NURSERY STOCK, AND OF SUFFICIENT DEPTH TO INCLUDE THE FIBROUS AND FEEDING ROOTS. B&B PLANTS WILL NOT BE ACCEPTED IF THE BALL IS CRACKED OR BROKEN BEFORE OR DURING PLANTING OPERATION.

C. DELIVER TREES AND SHRUBS AFTER PREPARATIONS FOR PLANTING HAVE BEEN COMPLETED. DO NOT BEND, BIND, OR TIE TREES OR SHRUBS IN SUCH A MANNER AS TO DAMAGE BARK, BREAK BRANCHES OR DESTROY NATURAL SHAPE. IF PLANTING IS DELAYED MORE THAN 6 HOURS AFTER DELIVERY, SET TREES AND SHRUBS IN SHADE, PROTECT FROM WEATHER AND MECHANICAL DAMAGE, AND KEEP ROOTS MOIST BY HEELING-IN BARE ROOT STOCK AND COVERING PLANT BALLS WITH SOIL, PEAT MOSS OR OTHER ACCEPTABLE MATERIAL FOR BALLED STOCK. PLANTS SHALL BE KEPT WELL WATERED AND SHALL NOT REMAIN UNPLANTED FOR LONGER THAN TEN (10) DAYS AFTER DELIVERY.

D. PLANTS SHALL BE LIFTED AND HANDLED FROM THE BOTTOM OF THE BALL ONLY.

E. DO NOT REMOVE CONTAINER-GROWN STOCK FROM CONTAINERS UNTIL PLANTING TIME.

4. BEFORE PLANTING, DETERMINE THAT AREAS TO RECEIVE PLANT MATERIAL HAVE ADEQUATE SUBDRAINAGE.

A. THE LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR DRAINAGE TESTS AS NECESSARY TO IDENTIFY ANY PROBLEMS PRIOR TO BEGINNING PLANTING OPERATIONS. UPON COMMENCEMENT OF PLANTING OPERATIONS THE LANDSCAPE CONTRACTOR ASSUMES RESPONSIBILITY FOR SOIL CONDITIONS.

B. DIG PLANTING PITS TO FULL DEPTH AND DIMENSIONS INDICATED ON DRAWINGS.

C. AT BOTTOM OF PLANTING PIT, EXCAVATE RECTANGULAR PIT 12 INCHES BY 12 INCHES BY 18 INCHES DEEP. QUICKLY POUR WATER INTO SMALL PIT TO A DEPTH OF 6 INCHES (APPROXIMATELY 3-3 3/4 GALLON). NOTE TIME REQUIRED FOR WATER TO BE COMPLETELY ABSORBED. DIVIDE TIME NOTED BY 6 TO ACHIEVE AVERAGE RATE OF ABSORPTION FOR 1 INCH OF WATER. WHERE RATE OF ABSORPTION EXCEEDS 60 MINUTES PER INCH, NOTIFY OWNER IMMEDIATELY FOR DIRECTIONS ON HOW TO PROCEED.

5. PLANTING SHALL BE DONE ONLY WITHIN THE FOLLOWING DATES EXCEPT AS APPROVED BY OWNER.

A. DECIDUOUS TREES AND SHRUBS: MARCH 1 TO MAY 31 AND OCTOBER 15 TO DECEMBER 15.

B. EVERGREEN TREES, SHRUBS AND VINES: MARCH 1 TO MAY 31 AND SEPTEMBER 1 TO NOVEMBER 15.

6. ALL PLANT MATERIAL SHALL BE GUARANTEED BY THE CONTRACTOR FOR A PERIOD OF 1 YEAR FROM THE DATE FINAL ACCEPTANCE TO BE IN GOOD, HEALTHY AND FLOURISHING CONDITION.

7. MATERIALS FOR PLANTING:

A. MULCH SHALL BE DOUBLE SHREDDED HARDWOOD BARK. SUBMIT SAMPLE FOR APPROVAL. MATERIAL SHALL BE MULCHING GRADE, UNIFORM IN SIZE AND FREE FROM FOREIGN MATTER.

B. LEAF COMPOST SHALL BE SCREENED AND FREE OF TRASH.

C. COIR MESH (GEO-TEXTILE BLANKET) SHALL BE NATURAL FIBER GEO-TEXTILE WOVEN MESH COMPOSED OF 100% COIR (SPUN FROM COCONUT FIBER) YARN, CONTAINING 45% LIGNIN AND 55% CELLULOSE. OPENING IN THE MESH SHALL BE 1 INCH SQUARE (NOMINAL) BY .3 INCHES THICK. YARN COUNT PER YARD SHALL BE 42 WARP X 37 WEFT. FABRIC TENSILE STRENGTH SHALL BE 432 LB/FT X 138LB/FT

D. TWELVE-INCH HARDWOOD STAKES SHALL BE ECO-STAKES BY NORTH AMERICAN GREEN OR EQUAL.

E. FERTILIZER SHALL BE COMMERCIAL FERTILIZER FOR ORNAMENTAL TREES, SHRUBS AND GROUND COVER. FERTILIZER SHALL BE PROVIDED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE SOIL TESTS. AS A BASIS FOR BIDDING, CONTRACTORS SHALL ASSUME A FERTILIZER WITH AN ANALYSIS OF 10% NITROGEN, 6% PHOSPHORUS AND 4% POTASSIUM. THIS FERTILIZER SHALL BE GRANULAR WITH A MINIMUM OF 50% OF THE TOTAL NITROGEN IN ORGANIC FORM.

F. TOPSOIL: IF REQUIRED; SHALL BE A FERTILE, FRIABLE NATURAL LOAM, UNIFORM IN COMPOSITION, FREE OF STONES, LUMPS, PLANTS AND THEIR ROOT DEBRIS AND OTHER EXTRANEOUS MATTER OF 1" IN DIAMETER, AND CAPABLE OF SUSTAINING VIGOROUS PLANT GROWTH. TOPSOIL SHALL HAVE A PH RANGE OF 6.0 TO 6.5, WITH A PH RANGE OF 5.0 TO 5.5 FOR PLANTS REQUIRING ACID SOILS. CONTRACTOR SHALL HAVE SOIL TESTED AT AN APPROVED AGRICULTURAL LABORATORY, AND SUBMIT RESULTS AND RECOMMENDATIONS FOR ACCEPTANCE BY THE OWNER BEFORE PROVIDING TOPSOIL FOR USE.

G. COMPOSTED PINE BARK FINES SHALL BE APPROVED COMPOSTED GROUND PINE BARK, HAVING NO PARTICLE WITH A DIMENSION GREATER THAN 3/4 INCH.

H. SOIL MIX SHALL CONSIST OF 3/4 EXISTING SOIL AND 1/4 COMPOSTED PINE BARK FINES OR OTHER APPROVED ORGANIC MATTER, BY VOLUME.

8. PLANT MATERIALS (REFER TO THE PLANT LIST ON THE DRAWINGS FOR SPECIFIC TYPES AND QUANTITIES OF PLANTS):

A. PLANTS SHALL BE NURSERY GROWN IN ACCORDANCE WITH GOOD HORTICULTURAL PRACTICES. PLANTS SHALL EITHER BE OBTAINED FROM LOCAL NURSERIES AND/OR OTHERS, WHICH HAVE SOIL (HEAVY CLAY) AND CLIMATIC CONDITIONS SIMILAR TO THOSE IN THE LOCALITY OF THE PROJECT. PLANT MATERIAL GROWN IN SANDY, WELL-DRAINED SOIL WILL NOT BE APPROVED FOR THIS PROJECT.

B. PLANTS SHALL BE TRUE TO SPECIES AND VARIETY AND UNLESS SPECIFICALLY NOTED OTHERWISE, ALL PLANTS SHALL BE OF SPECIMEN QUALITY, EXCEPTIONALLY HEAVY, SYMMETRICAL, TIGHTLY-KNIT PLANTS, SO TRAINED OR FAVORED IN THEIR DEVELOPMENT AND APPEARANCE AS TO BE UNQUESTIONABLY AND OUTSTANDINGLY SUPERIOR IN FORM, NUMBER OF BRANCHES, COMPACTNESS AND SYMMETRY.

C. PLANTS SHALL BE SOUND, HEALTHY AND VIGOROUS, WELL BRANCHED AND DENSELY FOLIATED WHEN IN LEAF, FREE OF DISEASE, INSECT PESTS, EGGS OR LARVAE AND SHALL HAVE HEALTHY, WELL-DEVELOPED ROOT SYSTEMS. THEY SHALL BE FREE FROM PHYSICAL DAMAGE OR ANY CONDITIONS THAT WOULD PREVENT THRIVING HEALTH AND THE DESIRED APPEARANCE.

D. TREES, WHICH HAVE A DAMAGED OR CROOKED LEADER, OR MULTIPLE LEADERS, UNLESS SPECIFIED IN THE PLANT LIST, WILL BE REJECTED. TREES WITH ABRASION OF THE BARK, SUN SCALD, DISFIGURING KNOTS, OR PRUNING CUTS MORE THAN 1 1/4 INCH DIAMETER WHICH HAVE NOT COMPLETELY CALLUSED, WILL BE REJECTED.

9. PLANTS SHALL CONFORM TO MEASUREMENTS SPECIFIED IN THE PLANT SCHEDULES EXCEPT THAT PLANTS LARGER THAN SPECIFIED MAY BE USED IF ACCEPTABLE TO THE LANDSCAPE ARCHITECT. USE OF SUCH PLANTS SHALL NOT INCREASE THE CONTRACT PRICE. IF LARGER PLANTS ARE ACCEPTED, THE ROOT BALL SHALL BE SIZED FOR THE LARGER PLANT.

B. CALIPER MEASUREMENT: SHALL BE TAKEN AT A POINT ON THE TRUNK 6 INCHES ABOVE NATURAL GROUND LINE FOR TREES UP TO 4 INCHES DIAMETER, AND AT A POINT 12 INCHES ABOVE THE NATURAL GROUND LINE FOR TREES OVER 4 INCHES DIAMETER.

C. PLANTS SHALL BE MEASURED WHEN BRANCHES ARE IN THE NORMAL POSITION. HEIGHT AND SPREAD DIMENSIONS SPECIFIED REFER TO THE MAIN BODY OF THE PLANT AND NOT FROM BRANCH TIP TO TIP.

10. PREPARATION OF AREAS FOR PLANTING:

A. STAKE OUT ALL PLANT MATERIAL BEDS AND TREE LOCATIONS FOR APPROVAL OF LANDSCAPE ARCHITECT PRIOR TO ANY BED PREPARATION.

B. SHRUBS, SHRUB BEDS AND HEDGES ON SLOPES OF 1:3 OR LESS: LOOSEN SOIL IN THE AREA OF ENTIRE PLANT BED OR HEDGEROW TO A DEPTH OF 6 INCHES MINIMUM WITH A ROTOTILLER. ADD SOIL AMENDMENTS AND ROTOTILL AGAIN TO A DEPTH OF 6 INCHES. EXCAVATE PLANT PIT AND HEDGE TRENCHES A MINIMUM OF 12 INCHES WIDER THAN THE ROOT BALL OR BARE ROOT ON ALL SIDES. THE DEPTH SHALL BE SUFFICIENT TO ALLOW SHRUB TO SIT 2 INCHES ABOVE FINISHED GRADE.

C. SHRUB BEDS ON SLOPES OF GREATER THAN 3:1: AMEND SOIL AS ABOVE. SPREAD COIR MESH ACROSS ENTIRE AREA OF SHRUB BED IN STEEP SLOPE AREA PER MANUFACTURER'S SPECIFICATIONS. EXCAVATE PLANT PIT THROUGH COIR MESH A MINIMUM OF 12 INCHES WIDER THAN THE ROOT BALL OR BARE ROOT ON ALL SIDES. THE DEPTH SHALL BE SUFFICIENT TO ALLOW SHRUB TO SIT 2 INCHES ABOVE FINISHED GRADE.

D. GROUND COVERS AND SEASONAL PLANTINGS: LOOSEN SOIL TO A DEPTH OF 6 INCHES MINIMUM WITH A ROTOTILLER. ADD AMENDMENTS TO THE SOIL AND/OR SPECIFIED PLANTING SOIL MIX AND ROTOTILL AGAIN TO A DEPTH OF 6". INSTALL PLANTS DIRECTLY INTO PREPARED BED, AND FIRM THE SOIL MIX AROUND THEM.

E. GROUNDCOVER ON SLOPES OF GREATER THAN 3:1: AMEND SOIL AS ABOVE OR BY HAND AS REQUIRED. SPREAD LEAF COMPOST TO 2 INCHES IN DEPTH IMMEDIATELY PRIOR TO PLACING COIR MESH. SPREAD COIR MESH ACROSS ENTIRE AREA OF GROUNDCOVER BED IN STEEP SLOPE AREA PER MANUFACTURER'S SPECIFICATIONS. EACH GROUND COVER SHALL BE PLACED IN AN INDIVIDUAL PLANTING PIT PLANTED THROUGH THE BIODEGRADABLE NETTING.

F. TREES: EXCAVATE PLANT PIT WALLS VERTICAL AND SCARIFY SIDES. PLANT PIT DEPTH SHALL BE SUFFICIENT TO ALLOW 2 INCH MAXIMUM OF ROOT BALL TO BE ABOVE FINISHED GRADE. TREE PIT SHALL BE 12 INCHES WIDER THAN THE BALL ON ALL SIDES.

11. EROSION CONTROL MATERIAL AND PLANTING ON STEEP SLOPES

A. MATERIAL MEETING THE REQUIREMENTS OF THE SPECIFICATION SHALL BE INSTALLED AND MAINTAINED ON THE DESIGNATED AREAS AS SHOWN AND SPECIFIED. THE AREAS TO BE COVERED SHALL BE PREPARED AND FERTILIZED AS SPECIFIED BEFORE THE EROSION MATERIAL IS PLACED. IMMEDIATELY PRIOR TO THE PLANTING OPERATIONS, THE MATERIAL SHALL BE LAID EVENLY, SMOOTHLY AND IN CONTACT WITH THE SOIL THROUGHOUT.

B. LAY EROSION CONTROL MATERIALS WITH ONE INCH NOMINAL OPENINGS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. UNROLL IN DIRECTION OF WATER FLOW. OVERLAP SHEETS BY AT LEAST 6 INCHES. WHERE STRIPS ARE TO BE SPLICED LENGTHWISE, OVERLAP STRIPS BY 8 INCHES. UPGRADE SECTION SHALL BE ON TOP OF ALL SPLICES.

C. THE CONTRACTOR SHALL MAINTAIN AND PROTECT THE EROSION CONTROL MATERIAL UNTIL THE FINAL INSPECTION. MAINTENANCE SHALL CONSIST OF REPAIRS MADE NECESSARY BY EROSION, WIND OR ANY OTHER CAUSE. FOLLOWING THE RESTORATION OF DAMAGED AREAS UNDER PLANT AND TURF GUARANTEE AND ESTABLISHMENT REQUIREMENTS FOR APPLICABLE UNDERLYING ITEMS; THE EROSION CONTROL MATERIAL SHALL BE REPAIRED OR REPLACED TO MEET THE ORIGINAL REQUIREMENTS AND MAINTAINED UNTIL THE FINAL INSPECTION.

12. GENERAL PLANT INSTALLATION:

A. EXCAVATION: EXCAVATE ALL TREE PITS AND PLANTING AREAS TO THE WIDTH AND DEPTH SHOWN IN THE PLANTING DETAILS.

B. CENTER PLANT IN PIT AND ORIENT FOR THE BEST VISUAL EFFECT. SET PLANTS PLUMB AND HOLD RIGIDLY IN POSITION UNTIL SOIL HAS BEEN TAMPED FIRMLY AROUND ROOT BALL.

C. MIX SOIL AMENDMENTS AND FERTILIZERS WITH EXISTING SOIL IN ACCORDANCE WITH SOIL RECOMMENDATIONS FOR PLANT TYPE, BASED UPON SOIL TEST RESULTS AS APPROVED BY OWNER. DELAY MIXING OF FERTILIZER IF PLANTING WILL NOT OCCUR WITHIN A FEW DAYS.

D. BACKFILL PIT WITH PLANTING SOIL MIX AND FERTILIZER, UNTIL TWO-THIRDS FULL. TAMP AND WATER EACH LAYER THOROUGHLY TO SETTLE SOIL. AFTER SOIL SETTLES, FILL PIT WITH REMAINING PLANTING SOIL MIX, WATER AND SHAPE SURFACE SO THAT IT SLOPES TO DRAIN FROM TRUNK AND MATCHES GROUND AT EDGE OF PLANTING PIT.

E. MULCH WITHIN 48 HOURS AFTER PLANTING AND AFTER APPLYING THE PRE-EMERGENT HERBICIDE, EXCEPT GROUND COVER AREAS (WHICH SHALL HAVE ORGANIC MATERIAL PLACED BEFORE PLANTING) WITH A 2" LAYER OF MULCH IMMEDIATELY AFTER PLANTING. ALL BED LINES SHALL BE CUT WITH A SMOOTH CONSISTENT EDGE TO A MINIMUM DEPTH OF 3 INCHES. KEEP MULCH OUT OF THE CROWNS OF SHRUBS AND OFF BUILDINGS, SIDEWALKS, LIGHT STANDARDS, AND OTHER STRUCTURES.

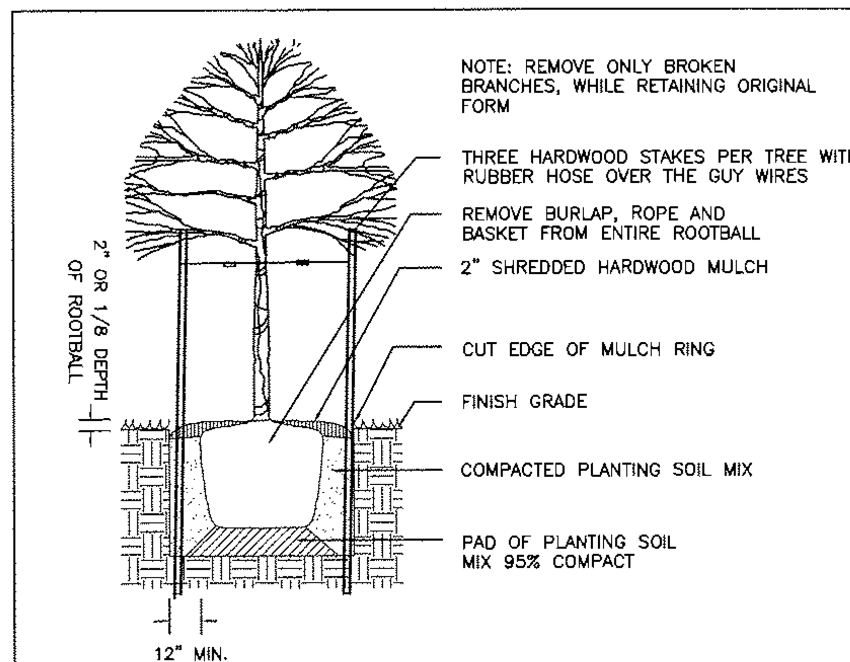
F. ALL PLANTING AREAS TO CONFORM TO SPECIFIED GRADES AFTER FULL SETTLEMENT HAS OCCURRED AND MULCH HAS BEEN APPLIED. PROVIDE SAUCERS AROUND TREE PITS AS SHOWN ON PLANTING DETAILS. REMOVE ALL TAGS, LABELS, STRINGS, ETC. FROM ALL PLANTS.

13. PERMANENT SEEDING OR SODDING FOR GRASS AREAS:

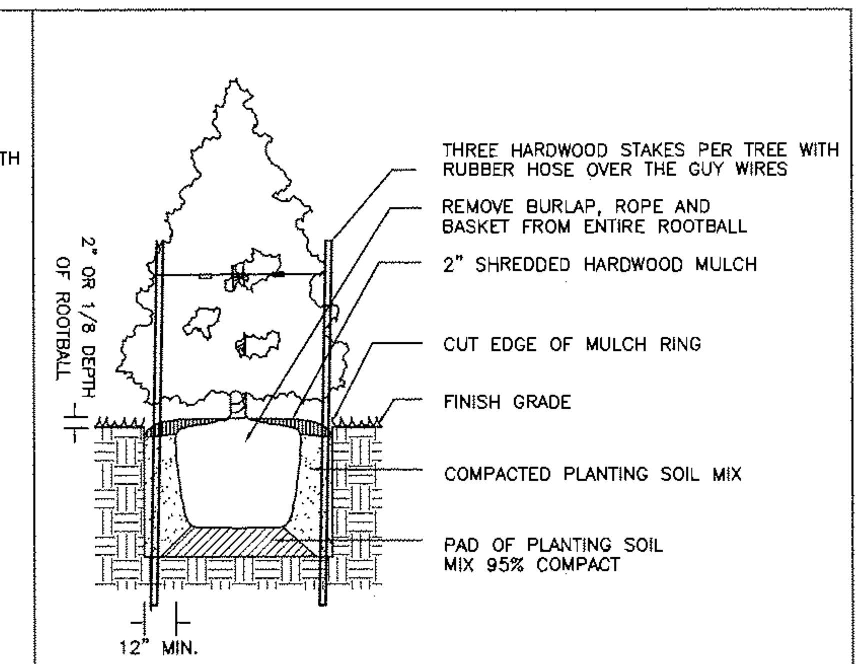
A. LAWN SEED OR SOD VARIETIES SHALL BE AN IMPROVED VARIETY TURF-TYPE TALL FESCUE BLEND. THE LANDSCAPE CONTRACTOR SHALL SELECT FROM VARIETIES APPROVED BY THE MARYLAND OR VIRGINIA DEPARTMENT OF AGRICULTURE.

B. REFER TO THE VIRGINIA DEPARTMENT OF TRANSPORTATION EROSION AND SEDIMENT CONTROL GUIDELINES, FOR GUIDELINES, SPECIFICATIONS AND INSTALLATION TECHNIQUES OF SEED AND SOD.

14. MAINTENANCE SHALL BEGIN IMMEDIATELY AFTER EACH PLANT AND LAWN AREA IS INSTALLED AND SHALL CONTINUE UNTIL 90 DAYS AFTER FINAL ACCEPTANCE OF THE LAST SECTION.



TYPICAL DECIDUOUS TREE PLANTING DETAIL



TYPICAL EVERGREEN TREE PLANTING DETAIL

TREE CANOPY CALCULATIONS (TOWN CODE SEC. 156-6.A)

GROSS SITE AREA	12.43 AC 541,451 SF	
REQUIRED CANOPY COVERAGE (20% X 541,451)	2.49 AC 108,290 SF	
EXCESS CANOPY COVERAGE FROM SECT. 2 AND 3	36,287.00 SF	
CANOPY COVERAGE PROVIDED THROUGH EVERGREEN TREES (92 TREES W/ MIN. 3" CAL.)	31,650 SF	29.23% of Required
CANOPY COVERAGE PROVIDED THROUGH (TOWN CODE SEC. 156-7A.2) STREET TREE PLANTINGS (57 TREES W/ MIN. 2" CAL.)	19,380 SF	17.90% of Required
CANOPY COVERAGE PROVIDED THROUGH TYPICAL LOT LANDSCAPING(SEE DETAIL) (33 LOTS x 2 TREES W/ MIN. 2" CALIPER REQ. PER LOT)	22,440 SF	20.72% of Required
TOTAL PROPOSED CANOPY COVERAGE	109,757 SF	101.35% of Required

*EXCESS CANOPY MAY BE UTILIZED IN FUTURE SECTIONS

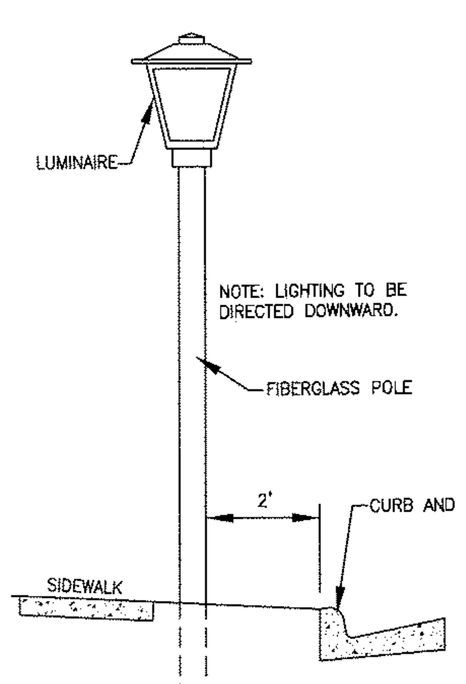
STREET TREES REQUIRED (PER TOWN CODE SEC. 156-7.2)

STREET	LINEAR FEET	LARGE TREES REQUIRED	TREES PROVIDED
HAPPY RIDGE DR	2828 LF.	1 TREE PER 50' (57)	57

PLANT SCHEDULE

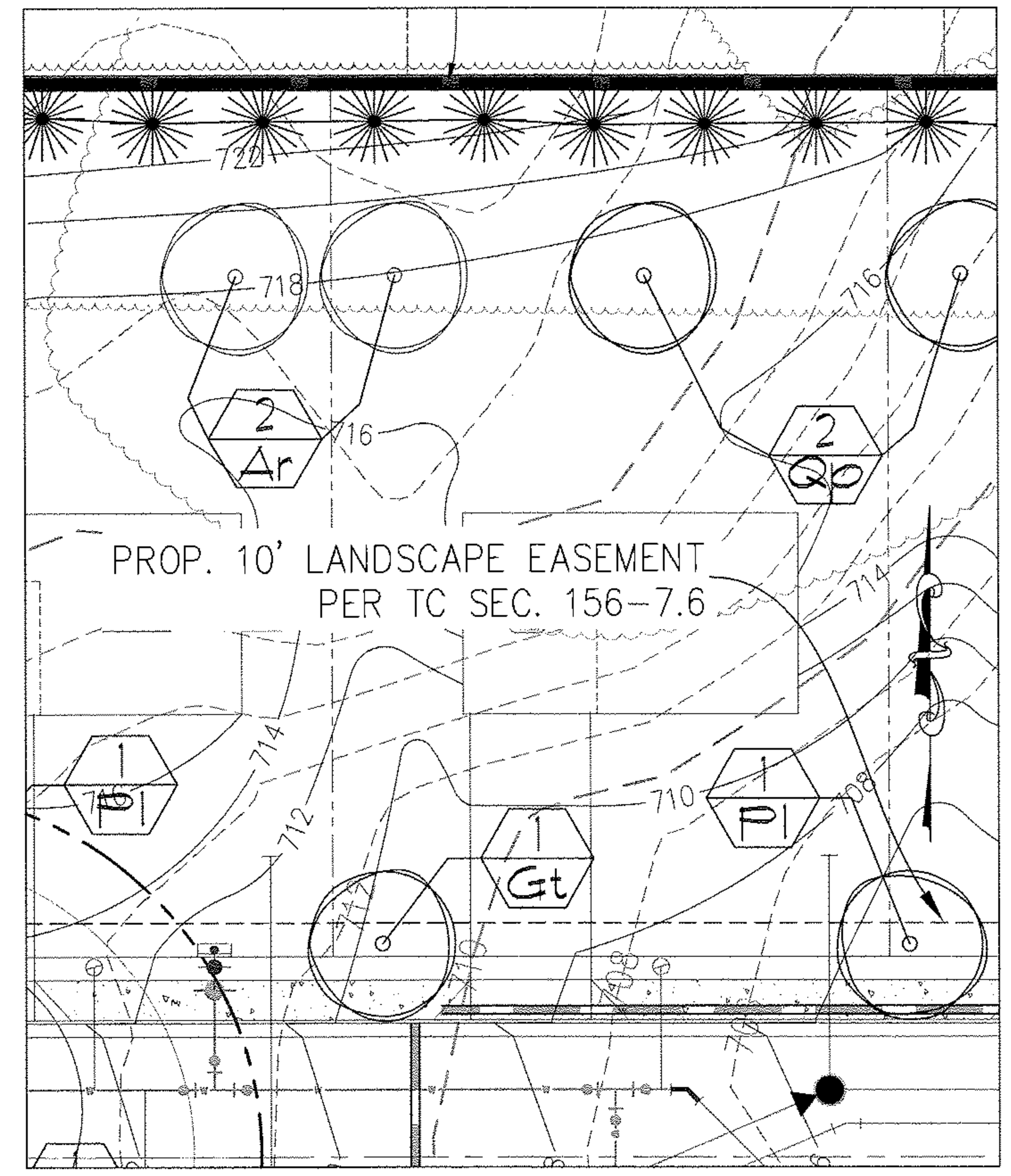
SYMBOL	KEY	Location	QNTY	BOTANICAL NAME	COMMON NAME	SIZE	REMARKS	20 YR SQ. FT.	TOTAL
(circle)	Ar	Lot	15	Acer rubrum 'Red Sunset'	Red Maple "Red Sunset"	2" cal.	B & B	340	5,100
	As		10	Acer saccharum	Sugar Maple	2" cal.	B & B	340	3,400
	Gt		19	Gleditsia triacanthos 'Inermis/Imperial'	Thronless Honey Locust	2" cal.	B & B	340	6,460
	Qp		22	Quercus palustrus	Pin Oak	2" cal.	B & B	340	7,480
	Ao	Street	16	Acer rubrum 'Bowhall'	Red Maple 'Bowhall'	2" cal.	B & B	340	5,440
	Gt		21	Gleditsia triacanthos 'Inermis/Imperial'	Thronless Honey Locust	2" cal.	B & B	340	7,140
	Pl		20	Platanus acerifolia	London Planetree	2" cal.	B & B	340	6,800
(star)	Ps	-	46	Pinus sylvestris	Scotch Pine	3" cal.	B & B	425	19,550
	Pa	-	26	Picea abies	Norway Spruce	3" cal.	B & B	300	7,800
	Po	-	20	Picea omorika	Serbian Spruce	3" cal.	B & B	215	4,300
									73,470

NOTE:
1. 20 YEAR CANOPY IS FROM THE LANDSCAPE PRESERVATION AND PLANTING GUIDE FOR THE TOWN OF FRONT ROYAL.



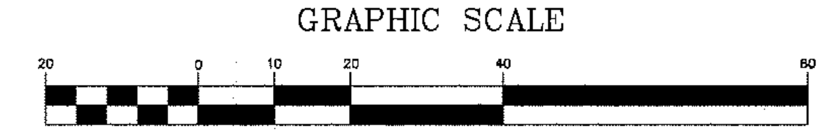
LUMINARE (MIN.)	MOUNTING HEIGHT (FEET)
5000 LUMENS	14
TYPE III REFLECTOR	COLONIAL FIXTURE

STREET LIGHT DETAIL
(NOT TO SCALE)



TYPICAL LOT LANDSCAPING
SCALE 1"=20'

GRAPHIC SCALE



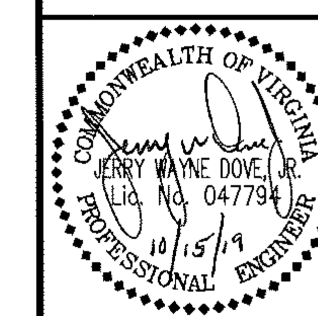
(IN FEET)
1 inch = 20 ft.

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

LANDSCAPE DETAILS
HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA



PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS
DATE	DESCRIPTION

GC	MCW	
DESIGN	DRAWN	CHKD

SCALE H: AS NOTED V:
JOB No. 1602-02-016
DATE JULY 19, 2019
FILE No. 1602-D-CP-005

Cad file name: P:\1602 - happy creek knolls sec 3\1602-04-001 (eng)\engineering\engineering plans\Sheets\1602-D-CP-001-LSP.dwg

NOTE: EX. EWELL STREET AND EX. IMBODEN DRIVE STREET NAME SIGN TO BE ADJUSTED TO INCLUDE HAPPY RIDGE DRIVE, WHICH WILL REPLACE THE EX. EWELL STREET ON THE SOUTH SIDE OF EX. IMBODEN DRIVE.

NOTE: EX. EWELL STREET FROM THE INTERSECTION OF IMBODEN DRIVE SOUTH TO BE RENAMED HAPPY RIDGE DRIVE

EX. EWELL STREET

EX. IMBODEN DRIVE

EXISTING OFFSITE FIRE HYDRANT

EXISTING OFFSITE FIRE HYDRANT

EXISTING OFFSITE FIRE HYDRANT

SECTION 3

SECTION 2

SECTION 3

EXISTING FIRE HYDRANT LOCATION TO BE ADJUSTED PER PROPOSED SIDEWALK
A NO PARKING/DRVIEWAY SIGN TO BE ADDED BEHIND

EXISTING OFFSITE FIRE HYDRANT

EX. PICKET COURT

HAPPY RIDGE DRIVE

SECTION 2

SECTION 2

EXISTING FIRE HYDRANT LOCATION TO BE ADJUSTED PER PROPOSED SIDEWALK
A NO PARKING/DRVIEWAY SIGN TO BE ADDED BEHIND

873.74'

EX. HAPPY RIDGE DRIVE

HAPPY RIDGE DRIVE

EXISTING OFFSITE FIRE HYDRANT

SECTION 2

PROPOSED FIRE HYDRANT W/ NO PARKING/DRVIEWAY SIGN

STREET SIGN (TYP)

HAYMAKER LANE

STOP SIGN (TYP)

PROPOSED FIRE HYDRANT W/ NO PARKING/DRVIEWAY SIGN

R1-1

REGULATORY SIGN DETAIL

N.T.S

FIRE LANE SIGN DETAIL

GRAPHIC SCALE

60 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

FIRE HYDRANT LOCATION AND SIGNAGE PLAN

HAPPY CREEK KNOLLS

SECTION 4

FINAL SUBDIVISION PLAN

TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

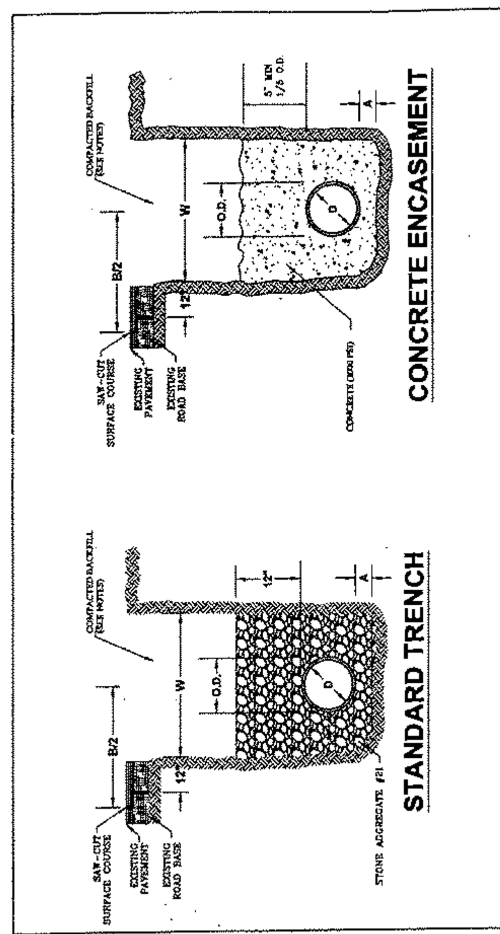
COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
Lic. No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC DESIGN	MCW DRAWN	CHKD
SCALE	H: 1"=80' V:	
JOB No. 1602-02-016		
DATE JULY 19, 2019		
FILE No. 1602-D-CP-005		
SHEET 29 OF 33		

Cad file name: P:\1602 - happy creek heath sec 3\1602-01-001 (eng)\engineering plans\Sheets\1602-D-CP-001-FLS.dwg

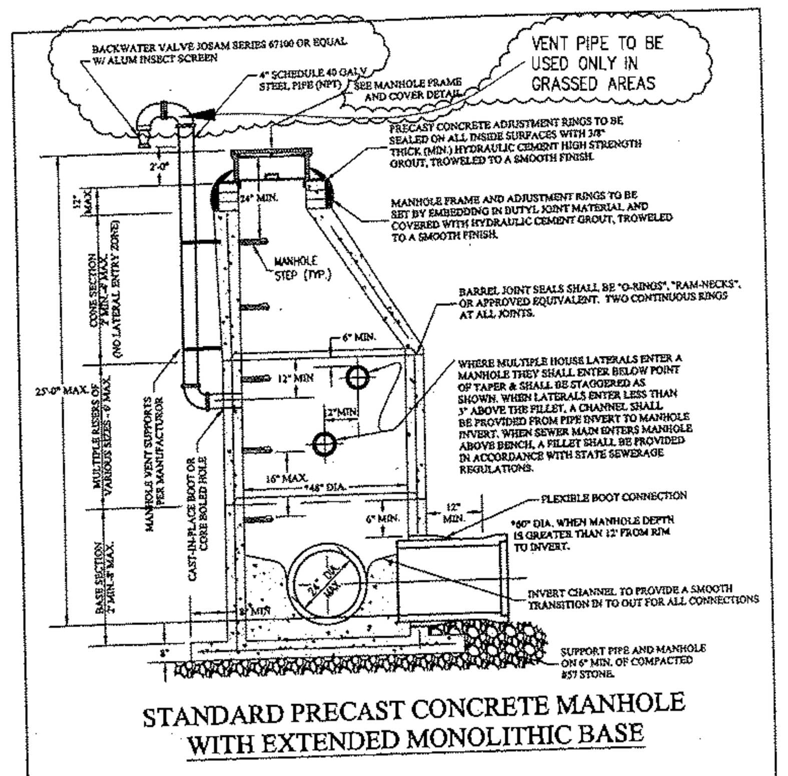


NOTES:

1.) ALL FILL MATERIAL PLACED WITHIN THE RIGHT-OF-WAY SHALL BE COMPACTED TO AT LEAST 95% OF THE MAXIMUM DRY DENSITY PER ASTM D-1557 (MODIFIED PROCTOR). ALL OTHER FILL MATERIAL SHALL BE COMPACTED TO 90% OF THE MAXIMUM DRY DENSITY.
2.) COMPACTION SHALL OCCUR IN MAXIMUM 12" LIFTS.
3.) REPLACEMENT OF PAVEMENT AND ROAD BASE SHALL BE MADE IN ACCORDANCE WITH TOWN STANDARDS.

PIPE DIAMETER	A	TRENCHES MAX W	PAVING NEW B
4"	4"	26"	62"
6"	4"	26"	62"
8"	4"	26"	62"
10"	4"	28"	64"
12"	4"	32"	68"
15"	4"	35"	71"
18"	6"	43"	79"
21"	6"	46"	82"
24"	6"	54"	90"

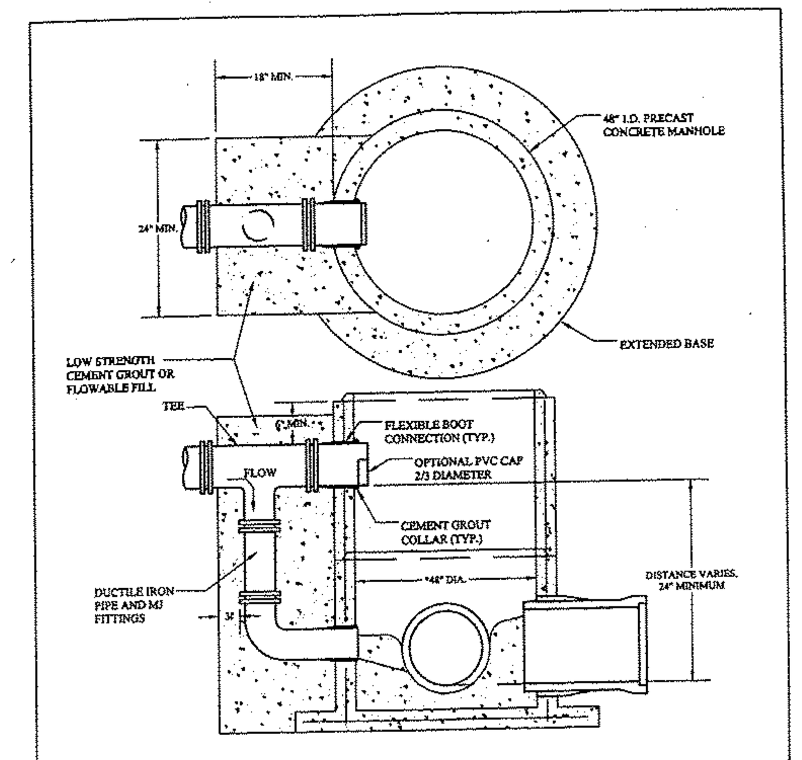
TOWN OF FRONT ROYAL
STANDARD SEWER DETAILS
TRENCH AND BEDDING DETAILS
S-1
DATE: MAY 2004
REVISION:



STANDARD PRECAST CONCRETE MANHOLE WITH EXTENDED MONOLITHIC BASE

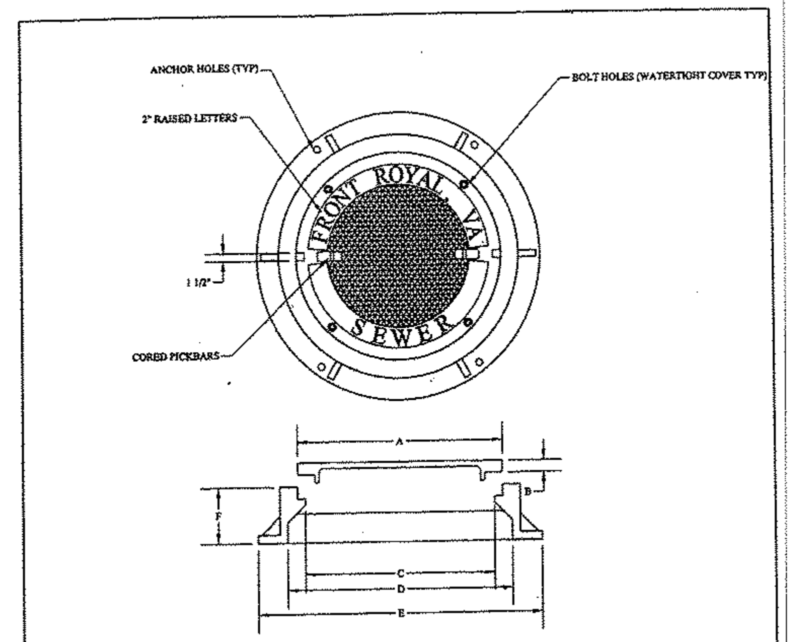
NOTES:
1. PRECAST CONCRETE MANHOLE SHALL BE IN COMPLIANCE WITH ASTM C-478.
2. MANHOLE WALLS SHALL BE 5" THICK MINIMUM FOR 48" INSIDE DIAMETER MANHOLES AND 6" MINIMUM FOR 60" DIAMETER MANHOLES.
3. MANHOLE INTERIOR WALLS SHALL RECEIVE A 10 MIL MINIMUM THICKNESS ACID RESISTANT COATING.
4. PROVIDE A MAXIMUM OF TWO LIFT HOLES PER SECTION, PLUG HOLES WITH RUBBER PLUG AND GROUT FOR A WATERTIGHT SEAL.
5. MAXIMUM OF FOUR LATERALS ALLOWED PER MANHOLE.

TOWN OF FRONT ROYAL
STANDARD SEWER DETAILS
PRE-CAST MANHOLE STANDARD DETAIL
S-5
DATE: MAY 2004
REVISION:



NOTES:
1. LOCATION OF STEPS SHALL NOT CONFLICT WITH DROP CONNECTION.
2. PROVIDE CHANNEL WITH CONTINUOUS INVERT FROM DROP CONNECTION TO INVERT OF SEWER MAIN.
3. SEE DETAIL OF STANDARD PRECAST CONCRETE MANHOLE FOR ADDITIONAL DETAILS AND REQUIREMENTS.
4. BOTTOM 90° BEND OF DROP CONNECTION SHALL BE ORIENTED AT 45° TO THE FLOWLINE OF THE MAIN CHANNEL.
5. ALL PIPING AND FITTINGS INSIDE MANHOLE SHALL BE PVC SDR 26 OR 23.5 WITH SOLVENT WELD JOINTS.
6. SEE DETAIL OF STANDARD PRECAST CONCRETE MANHOLE FOR ADDITIONAL DETAIL AND REQUIREMENTS.
7. FOR FORCE MAIN CONNECTIONS, INFLOW PIPE SHALL BE SIZED TO DECREASE VELOCITY AND PREVENT "SPLASHOVER" WITHIN MANHOLE. A MINIMUM OF 5' OF INFLOW PIPE SHALL BE INCREASED FROM REDUCER TO ASSIST IN VELOCITY REDUCTION.
8. FOR FORCE MAIN CONNECTIONS, THIS MANHOLE AND THE NEXT TWO DOWNSTREAM MANHOLES SHALL BE LINED WITH LINER APPROVED BY DEPARTMENT.

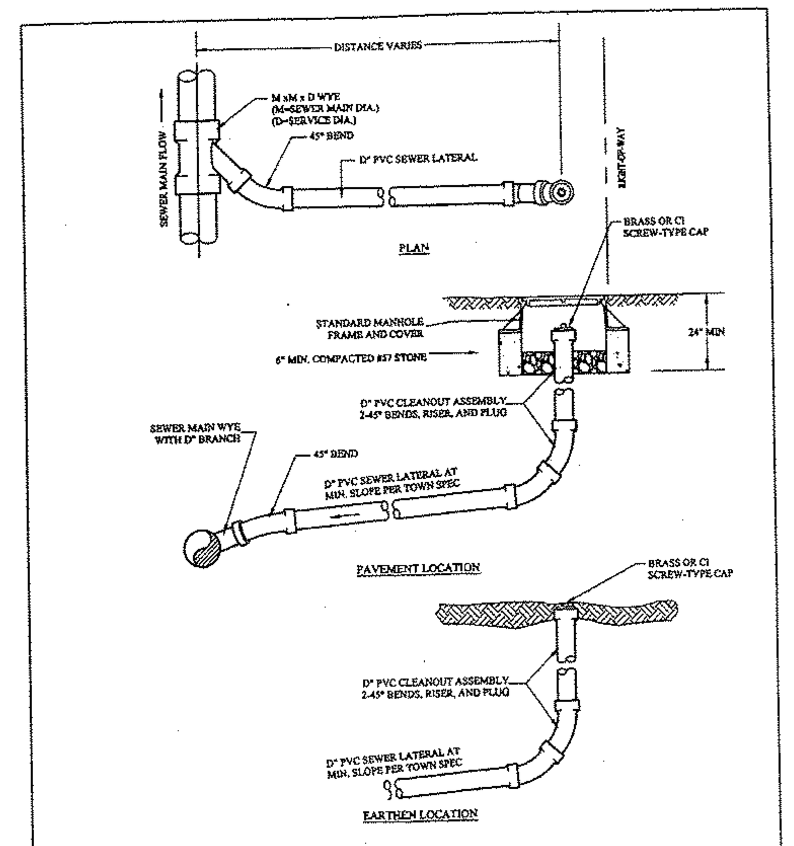
TOWN OF FRONT ROYAL
STANDARD SEWER DETAILS
EXTERIOR DROP MANHOLE STANDARD DETAIL
S-8
DATE: MAY 2004
REVISION:



CATALOG NO	A COVER Ø	B COVER THICK	C CLEAR OPENING	D FRAME OPENING	E FLANGE Ø	F HEIGHT
STANDARD						
1040 AGS	26"	1 1/2"	24"	28 1/2"	39"	7"
1045 AGS	26"	1 1/2"	24"	28 3/8"	36"	7"
WATER TIGHT						
1040 APT	26"	1 1/2"	24"	24"	39"	7"
1045 APT	26"	1 1/2"	24"	24"	36"	7"

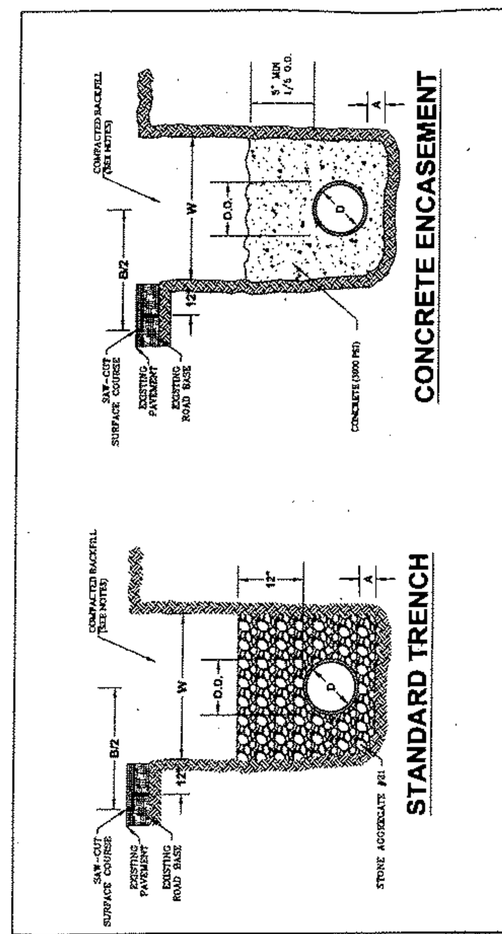
NOTE: ALL MANHOLE ASSEMBLIES SHALL BE EAST JORDAN IRON WORKS OR EQUIVALENT

TOWN OF FRONT ROYAL
STANDARD SEWER DETAILS
MANHOLE FRAME & COVER STANDARD DETAIL
S-10
DATE: MAY 2004
REVISION:



NOTES:
1. SEWER SERVICE LATERAL PIPING AND FITTINGS SHALL BE SDR 26 OR 23.5 PVC WHICH CONFORMS TO ASTM D-3034, UNLESS DEPTH DICTATES OTHERWISE.
2. NO BENDS GREATER THAN 45° SHALL BE USED IN SERVICE LATERAL CONSTRUCTION.
3. IF NO CLEANOUT IS INSTALLED, SERVICE LATERAL SHALL BE CAPPED AT A MINIMUM 36" DEPTH, WITH A TREATED 2"X4" MARKING LOCATION EXPOSED 16" WITH TOP 6" PAINTED GREEN.

TOWN OF FRONT ROYAL
STANDARD SEWER DETAILS
SERVICE LATERAL/CLEANOUT STANDARD DETAIL
S-11
DATE: MAY 2004
REVISION:

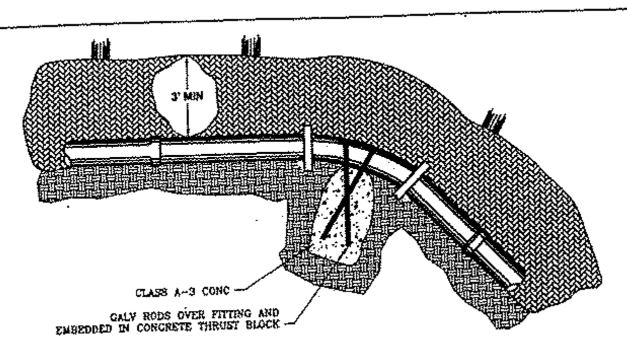


NOTES:

1.) ALL FILL MATERIAL PLACED WITHIN THE RIGHT-OF-WAY SHALL BE COMPACTED TO AT LEAST 95% OF THE MAXIMUM DRY DENSITY PER ASTM D-1557 (MODIFIED PROCTOR). ALL OTHER FILL MATERIAL SHALL BE COMPACTED TO 90% OF THE MAXIMUM DRY DENSITY.
2.) COMPACTION SHALL OCCUR IN MAXIMUM 12" LIFTS.
3.) REPLACEMENT OF PAVEMENT AND ROAD BASE SHALL BE MADE IN ACCORDANCE WITH TOWN STANDARDS.

PIPE DIAMETER	A	TRENCHES MAX W	PAVING NEW B
4"	4"	26"	62"
6"	4"	26"	62"
8"	4"	26"	62"
10"	4"	28"	64"
12"	4"	32"	68"
15"	4"	35"	71"
18"	6"	43"	79"
21"	6"	46"	82"
24"	6"	54"	90"

TOWN OF FRONT ROYAL
STANDARD WATER DETAILS
TRENCH AND BEDDING DETAILS
W-1
DATE: MAY 2004
REVISION:



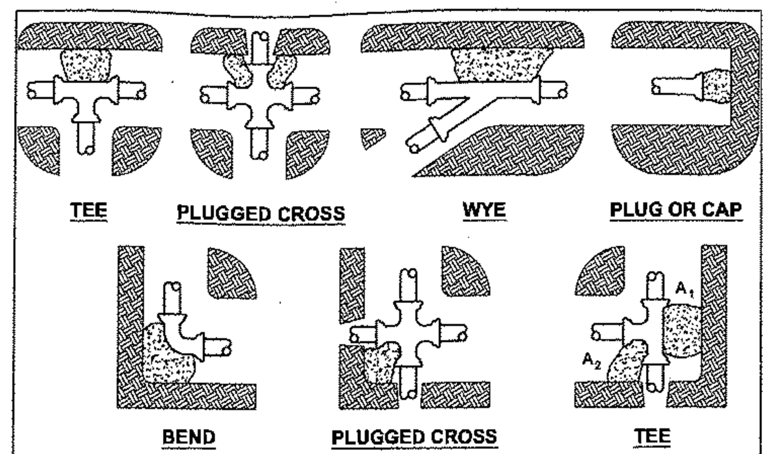
PROFILE

FITTING SIZE	ROD SIZE	NO. RODS	EMBEDMENT
12" & LESS	6	2	30"
14" - 24"	8	2	36"
33"	10	4	36"

FITTING SIZE	CONC VOLUME CU. YD. 45°	22 1/2°	11 1/4°
4"	-	-	-
6"	-	-	-
8"	1.1	-	-
10"	1.6	-	-
12"	2.8	1.2	-
14"	3.9	1.7	-
16"	5.1	2.3	0.9
18"	6.3	3.2	1.4
20"	7.7	4.0	1.8
24"	11.1	5.7	2.6
33"	24.2	12.4	5.7

NOTES:
1.) THRUST BLOCKS SHALL ONLY BE USED IF APPROVED BY DIRECTOR OF PUBLIC WORKS.
2.) KEEP CONCRETE CLEAR OF JOINT & JOINT ACCESSORIES.
3.) THRUST BLOCKS FOR VERTICAL UP BENDS SHALL BE THE SAME AS FOR HORIZONTAL BENDS.
4.) PIPE SHALL BE WRAPPED WITH 80 mil PLASTIC PRIOR TO POURING CONCRETE.

TOWN OF FRONT ROYAL
STANDARD WATER DETAILS
VERTICAL THRUST BLOCK DETAILS
W-3A
DATE: MAY 2004
REVISION:



NOTES:
1.) THRUST BLOCKS SHALL BE USED ONLY IF APPROVED BY THE DIRECTOR OF PUBLIC WORKS.
2.) CONCRETE THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
2.) KEEP CONCRETE CLEAR OF JOINT AND ACCESSORIES
3.) BEARING AREAS AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECENDENCE OVER BEARING AREAS AND BLOCKING DETAILS SHOWN ON THIS DETAIL.
4.) BEARING AREAS BASED ON TEST PRESSURE OF 200 PSI AND AN ALLOWABLE SOIL BEARING STRESS OF 3,500 PSF. TO COMPUT BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, USE THE FOLLOWING EQUATION:
BEARING AREA = (TEST PRESSURE + 200) x (3500 + SOIL BEARING PRESSURE) x (TABLE VALUE)

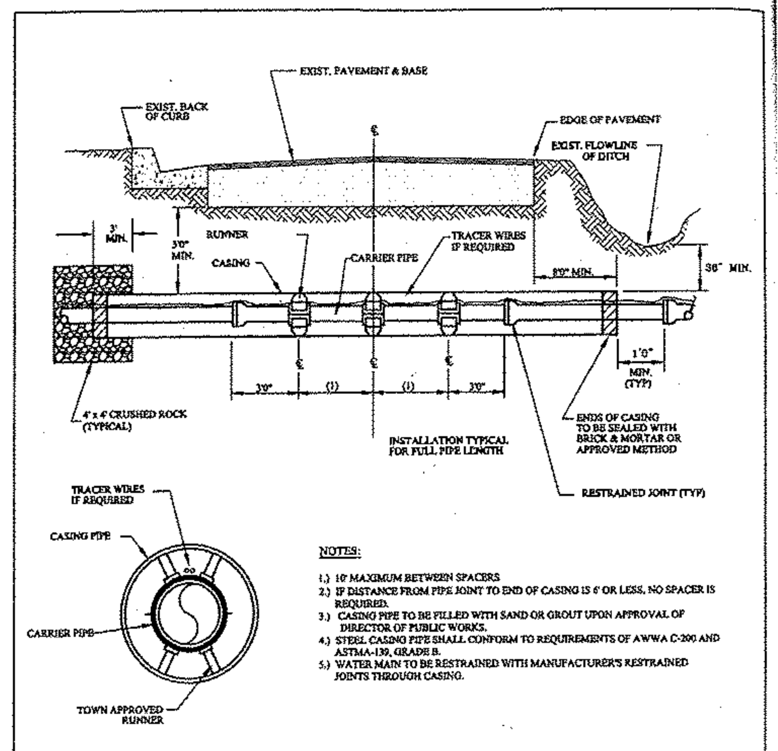
BEARING AREA OF THRUST BLOCKS IN SQ. FT.

FITTING SIZE	TEE, WYE, PLUG OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED ON RUN A_1	TEE PLUGGED ON RUN A_2	45° BEND	22 1/2° BEND	11 1/4° BEND
4"	2.1	3.0	4.3	3.0	2.0	2.0	-
6"	2.1	3.0	4.3	3.0	2.0	2.0	-
8"	3.8	5.3	7.6	5.4	2.9	2.0	2.0
10"	5.9	8.4	11.8	8.4	4.6	2.4	2.0
12"	8.5	12.0	17.0	12.0	6.6	3.4	2.0
14"	11.5	16.3	23.0	16.3	8.9	4.6	2.3
16"	15.0	21.3	30.0	21.3	11.6	6.0	3.0
18"	19.0	27.0	38.0	27.0	14.6	7.6	3.8
20"	23.5	33.3	47.0	33.3	18.1	9.4	4.7
24"	34.0	48.0	68.0	48.0	26.2	13.6	6.8

FITTING SIZE	MIN CU. YD. CONC BLOCK
3" - 8"	3/4
10" - 12"	1 1/2
16" - 24"	2

CONCRETE SHALL BE A-3 CONC. MEETING ASTM C94 REQUIREMENTS

TOWN OF FRONT ROYAL
STANDARD WATER DETAILS
HORIZONTAL THRUST BLOCK DETAILS
W-3B
DATE: MAY 2004
REVISION:



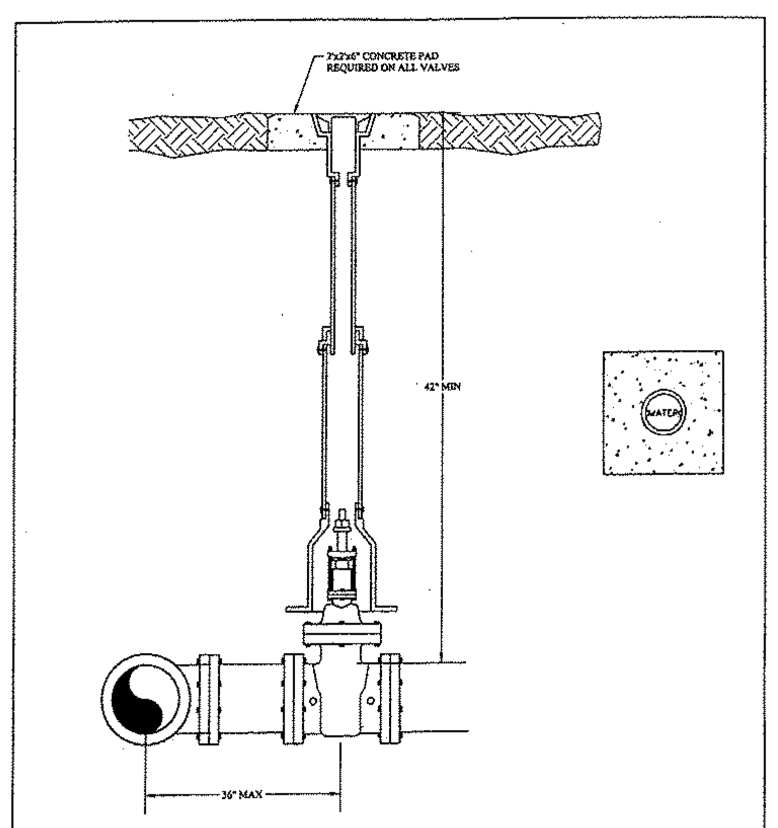
NOTES:
1.) 10' MAXIMUM BETWEEN SPACERS
2.) IF DISTANCE FROM PIPE JOINT TO END OF CASING IS 6' OR LESS, NO SPACER IS REQUIRED.
3.) CASING PIPE TO BE FILLED WITH SAND OR GROUT UPON APPROVAL OF DIRECTOR OF PUBLIC WORKS.
4.) STEEL CASING PIPE SHALL CONFORM TO REQUIREMENTS OF AWWA C-200 AND ASTMA-139, GRADE B.
5.) WATER MAIN TO BE RESTRAINED WITH MANUFACTURER'S RESTRAINED JOINTS THROUGH CASING.

CASING PIPE SIZES(IN)

	WATER MAIN	4	6	8	10	12	14	16	18	20	24	30	36
PVC	CASING	14	16	18	18	24	24	26	28	30	32	42	48
PVC	WALL THICKNESS	.250	.375	.375	.375	.375	.375	.375	.500	.500	.500	.500	.500
DI	CASING	12	14	18	20	24	26	28	30	32	36		
DI	WALL THICKNESS	.172	.250	.375	.375	.375	.375	.500	.500	.500	.500		

* SPIRAL WELDED STEEL CASING TO BE INSTALLED BY JACK & BORE UNLESS OTHERWISE APPROVED.

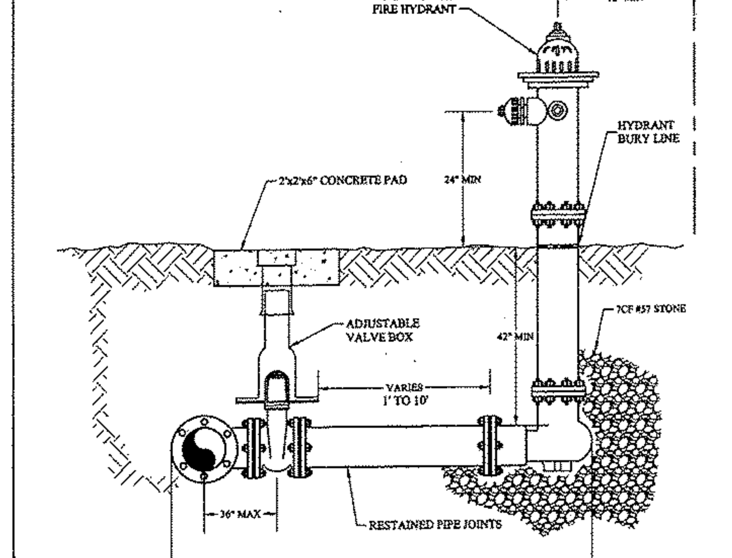
TOWN OF FRONT ROYAL
STANDARD WATER DETAILS
PIPE ENCASEMENT DETAIL HIGHWAY CROSSING
W-4
DATE: MAY 2004
REVISION:



NOTES:
1.) VALVE TO BE AMERICAN FLOW CONTROL TRENCH ADAPTOR OR APPROVED EQUIVALENT
2.) VALVE LID TO BE EAST JORDON IRON WOKS, INC. OR APPROVED EQUIVALENT
3.) VALVE TO OPEN COUNTER CLOCKWISE.

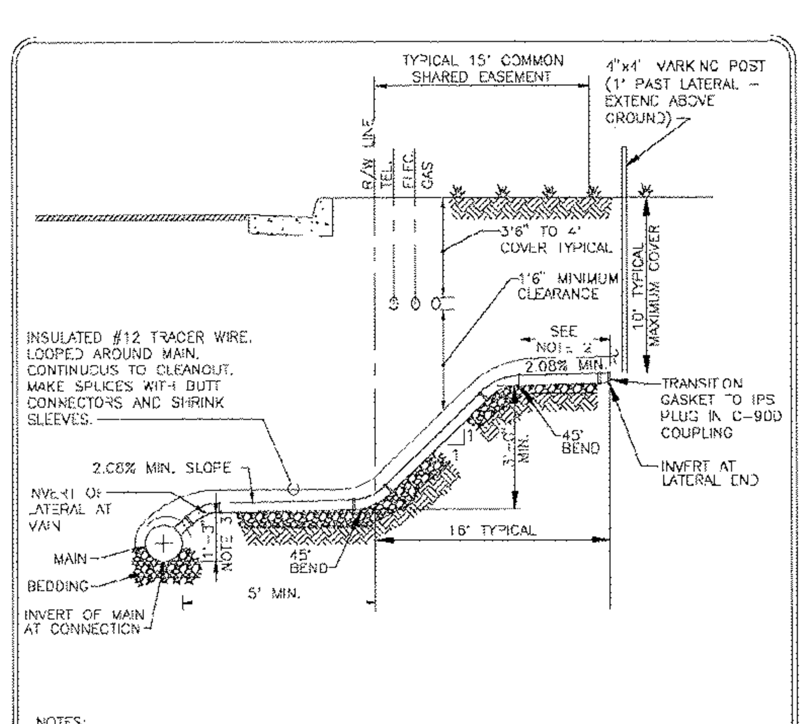
TOWN OF FRONT ROYAL
STANDARD WATER DETAILS
VALVE SETTING STANDARD DETAIL
W-12
DATE: MAY 2004
REVISION:

NOTES:
1.) ALL BOLTED FITTINGS ARE TO BE POLYETHYLENE WRAPPED.
2.) VALVE(S) ARE TO BE ENCASED IN CONCRETE PAD PER TOWN STANDARDS
3.) IF FIRE HYDRANT IS TO BE LOCATED WITHIN 10 FT OR LESS OF A VEHICULAR TRAVEL AREA, BOLLARDS ARE TO BE INSTALLED PER TOWN STANDARDS UNLESS OTHERWISE APPROVED BY THE DIRECTOR OF PUBLIC WORKS
4.) IF DISTANCE BETWEEN VALVE AND HYDRANT IS GREATER THAN 10 FT, AN ADDITIONAL VAVLE IS TO BE INSTALLED FOR CONTROL OF THE HYDRANT UNLESS OTHERWISE APPROVED BY THE DIRECTOR OF PUBLIC WORKS
5.) HYDRANT IS TO BE INSTALLED PLUMB
6.) HYDRANT TO BE PAINTED UPON INSTALLATION PER TOWN STANDARDS
7.) HYDRANT TO OPEN COUNTER CLOCKWISE



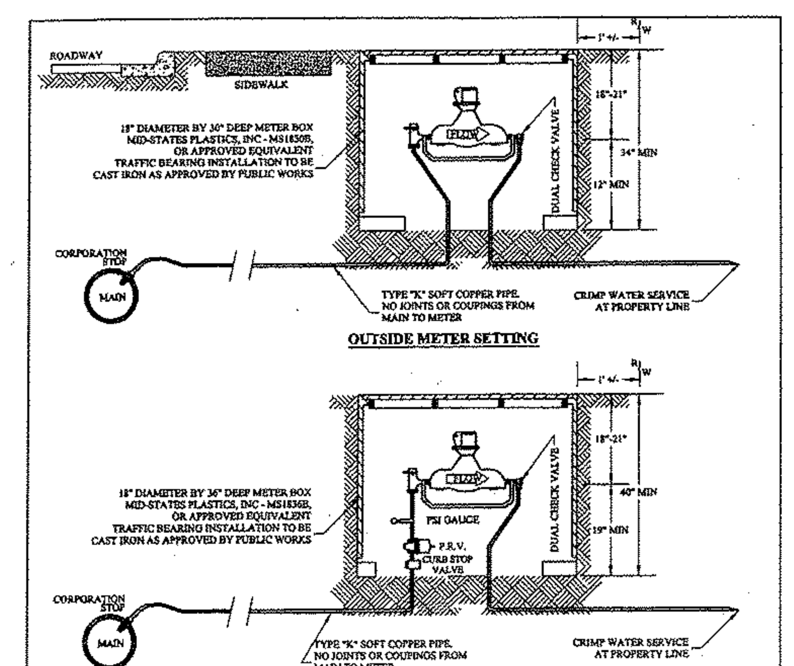
TOWN OF FRONT ROYAL
STANDARD WATER DETAILS
FIRE HYDRANT ASSEMBLY STANDARD DETAIL
W-13
DATE: MAY 2004
REVISION:

LOUDOUN WATER



NOTES:
1. ALL LATERAL MUST RECEIVE INSPECTION AND APPROVAL FROM LOUDOUN WATER PRIOR TO BACKFILL.
2. COUPLING TO BE A MINIMUM OF 5' FROM LAST PIPE JOINT.
3. DIMENSION BASED ON 8" DIAMETER MAIN. ADD FOR LARGER MAINS.
4. ALL MATERIALS MUST CONFORM TO LOUDOUN WATER'S APPROVED MATERIALS LIST.

OCT. 2016 | LATERAL WITH VERTICAL BENDS | S-1?



NOTES:
1.) METER COVER: SET 2" ABOVE FINISHED GRADE PRIOR TO SODDING.
2.) EXACT LOCATION OF METER BOX ASSEMBLY TO BE APPROVED PRIOR TO INSTALLATION.
3.) METER PROVIDED BY TOWN OF FRONT ROYAL.
4.) ASSEMBLY EQUIPMENT BY FORD METER BOX, CO., UNLESS OTHERWISE INDICATED, OR APPROVED BY DIRECTOR OF PUBLIC WORKS.

SERVICE PIPE DIA	METER SIZE	YOKE NO.	ANGLE VALVE	EXP CONN	DUAL CHECK VALVE	CURB STOP
3/4"	5/8"	Y501	AV92-313W	EC-1	HHA92-313D	B22-333
1"	1"	Y504	AV92-444W	EC-4	HHA91-344D	B44-444

SERVICE PIPE DIA	WATER METER COVER	PRESSURE REDUCING VALVE
3/4"	STND A32H PENTAGON	WILKENS #70 MUELLER H-9310
1"	STND A32H PENTAGON	WILKENS #70 MUELLER H-9310

TOWN OF FRONT ROYAL
STANDARD WATER DETAILS
TYPICAL 3/4" & 1" SERVICE CONNECTION DETAIL
W-6
DATE: MAY 2004
REVISION:

DEPARTMENT OF PLANNING & ZONING
T: (540) 635-4236 Town Hall 102 E. Main Street
F: (540) 631-2727 P.O. Box 1560, Front Royal, VA 22630-1560

July 18, 2019

Ramsey Inc
Attn: Chris S. Ramsey

Re: FRSUB-000830-2018
Preliminary Plan for Happy Creek Knolls, Section 4

Dear Mr. Ramsey,

On May 15, 2019, the Front Royal Planning Commission APPROVED the above-referenced Preliminary Plan. The approval was conditional of the following:

1) The Final Subdiviaion Plan shall be submitted within three years from the date of approval of the Preliminary Plan and shall meet all Town requirements prior to recordation.
2) All information not provided on the Preliminary Plan, shall be included on the Final Subdivision Plan, including, but not limited to, the following: 1) landscaping plan, 2) design of the pump station, and 3) regrading plan to address the recommendations of the geotechnical report prepared by ECS Mid-Atlantic, LLC.
3) A handrail, fence or other suitable barrier shall be provided between the public sidewalk and slopes of the stormwater management facility.
4) The Applicant shall be responsible for all costs associated with the design, bonding, and construction of the proposed improvements.

Please feel free to contact me if you have any questions.

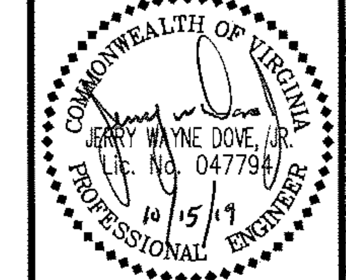
Sincerely,

Jeremy F. Camp, Director of Planning & Zoning
Town of Front Royal, VA

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com
© Bowman Consulting Group, Ltd.

TOWN OF FRONT ROYAL WATER AND SEWER DETAILS
HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA



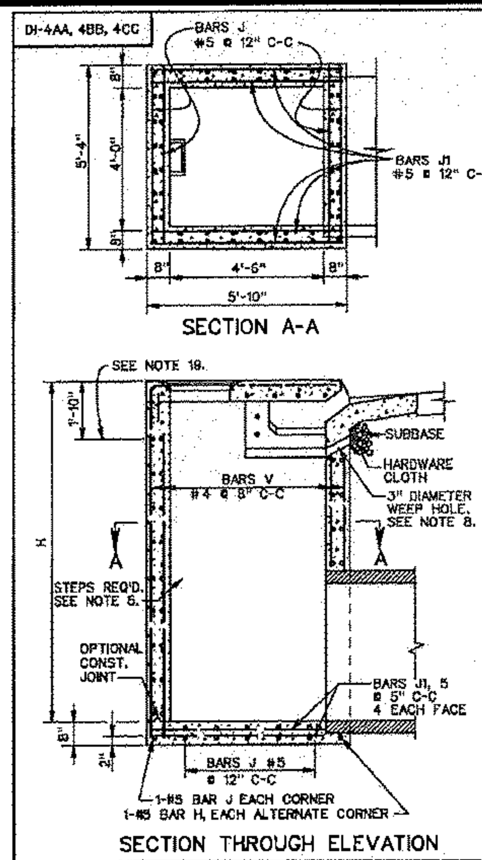
PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS
DATE	DESCRIPTION

GC DESIGN	MCW DRAWN	CHKD
SCALE	H: V:	
JOB No. 1602-02-016		
DATE JULY 19, 2019		
FILE No. 1602-D-CP-005		
SHEET 30 OF 33		

Cad file name: P:\1602 - happy creek knolls sec 3\1602-04-001 (eng)\engineering\engineering plans\Sheets\1602-D-CP-001-MISC-DET.dwg

STANDARD CURB DROP INLET — 36" - 48" PIPE: DEPTH (H) 8' TO 20'

DI-4AA, 4BB, 4CC



NOTES

1. DEPTH OF INLET (H) TO BE SHOWN ON PLANS. MINIMUM DEPTH (H) TO BE 8'-0". MAXIMUM DEPTH TO BE 20'-0". FOR INLETS LESS THAN 8' USE STANDARD DI-4A, 4B, AND 4C.
2. THE "H" DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF THE OUTFALL PIPE TO THE TOP OF THE STRUCTURE. PLAN "H" DIMENSIONS ARE APPROXIMATE ONLY FOR ESTIMATING PURPOSES AND THE ACTUAL DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FROM FIELD CONDITIONS.
3. WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
4. IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
5. STEPS ARE TO BE PROVIDED. FOR DETAILS SEE STANDARD ST-1.
6. THIS ITEM MAY BE PRECAST OR CAST-IN-PLACE.
7. #4 X 8" SMOOTH DOWELS AT APPROXIMATELY 12" C-C TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT. IN LIEU OF DOWELS A 2" X 4" NOTCH MAY BE PROVIDED. SEE STANDARD T-DI-3, 4 FOR ALTERNATE DESIGN.
8. 3" DIAMETER WEEP HOLE TO BE LOCATED TO DRAIN SUBBASE MATERIAL. WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
9. ALL REINFORCING STEEL SHALL HAVE A MIN. COVER OF 2".
10. ALL REINFORCING STEEL TO BE CUT CLEAR OF ALL OPENINGS BY 2".
11. CAST-IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
12. LENGTH OF SLOT (L) WILL, IN EVERY CASE, BE SHOWN ON PLANS.
13. IF INLET IS CONSTRUCTED IN MEDIAN CURB OR WITH INTEGRAL CURB, GUTTER IS TO BE OMITTED (SEE DETAIL WITH STANDARD DI-4A, 4B, 4C).
14. IF OPTIONAL CONSTRUCTION JOINT IS USED IT IS TO BE KEYED. ALL SPLICES IN BARS V TO BE A MINIMUM OF 40 DIAMETERS (20").
15. FOR PLAN VIEW OF INLET SEE STANDARD DI-4A, 4B, 4C.
16. QUANTITIES SHOWN ARE FOR MINIMUM INLETS OF EACH TYPE. FOR INLETS OF GREATER DEPTH (H) OR LONGER SLOT (L) INCREMENTS SHOWN PER FOOT MUST BE ADDED. THE AMOUNT OF CONCRETE AND STEEL DISPLACED BY PIPES MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES.
17. FOR NUMBER OF BARS A-H REQUIRED AND LENGTH SEE TABLE OF QUANTITIES FOR STANDARD DI-4A, 4B, 4C.
18. FOR DESCRIPTION AND LOCATION OF DIMENSION L SEE SHEET STANDARD DI-4A, 4B, 4C.
19. FOR ALL DETAILS, DIMENSIONS AND REINFORCING STEEL ABOVE THIS LINE, SEE STANDARD DI-4A, 4B, AND 4C.
20. PROVIDE SAFETY SLABS WHEN SPECIFIED ON THE PLANS.

SCHEDULE OF REINFORCING STEEL (SEE NOTE 17.)

BARS J		BARS J1		BARS V	
NO. REQUIRED	LENGTH	NO. REQUIRED	LENGTH	NO. REQUIRED	LENGTH
4X(H + 2)	5'-0"	4H+6	5'-6"	60	H-1'-4"

APPROXIMATE QUANTITIES FOR MINIMUM 8' DEPTH INLET

TYPE	DIMENSION L SEE NOTE 18	REINFORCING STEEL	CONCRETE
DI-	LIN. FT.	LBS.	CU. YDS.
4AA	4'-0"	798	5.14
4BB	6'-0"	856	5.56
4CC	8'-0"	914	5.97

INCREMENTS TO BE ADDED FOR EACH ADDITIONAL FOOT OF DEPTH (H) AND/OR SLOT LENGTH (L)

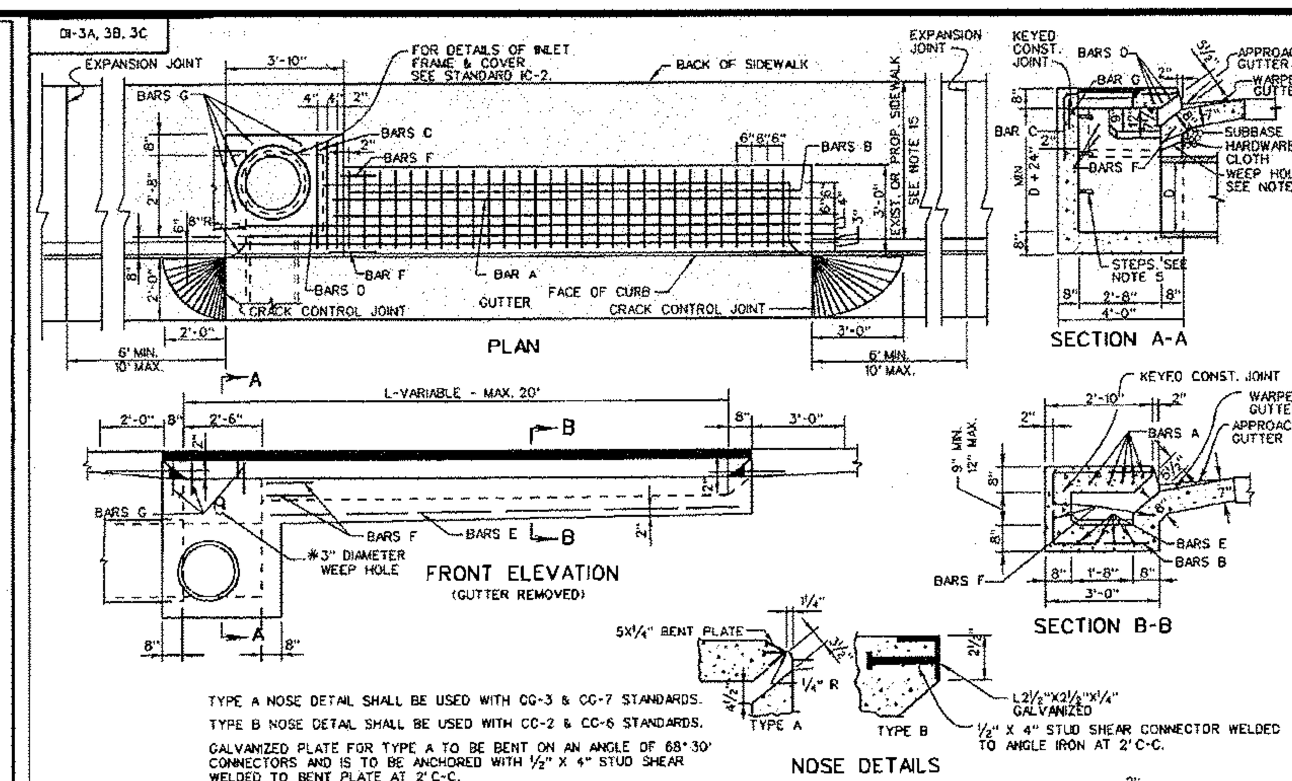
H		L	
CONCRETE CU. YDS.	STEEL LBS.	CONCRETE CU. YDS.	STEEL LBS.
0.479	84	-	-
0.479	84	0.22	23.5
0.479	84	0.22	23.5

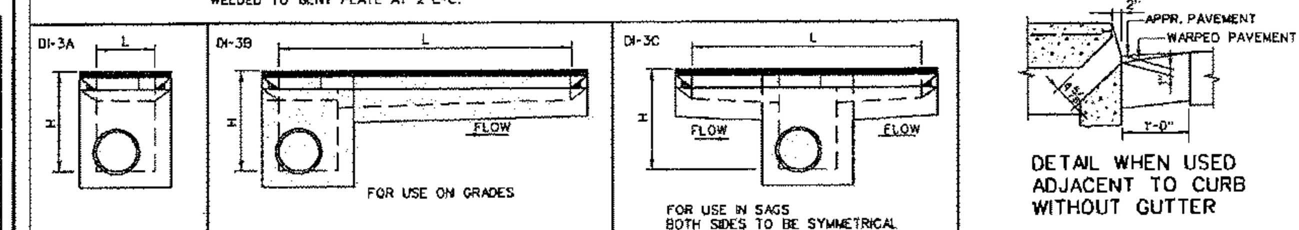
VDOT ROAD AND BRIDGE STANDARDS | SHEET 1 OF 1 | REVISION DATE | 104.17
STANDARD CURB DROP INLET
36" - 48" PIPE: DEPTH (H) 8' TO 20'
VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIFICATION REFERENCE 233 302

2016 ROAD & BRIDGE STANDARDS

STANDARD CURB DROP INLET — 12" - 30" PIPE: MAXIMUM DEPTH (H) - 8'

DI-3A, 3B, 3C

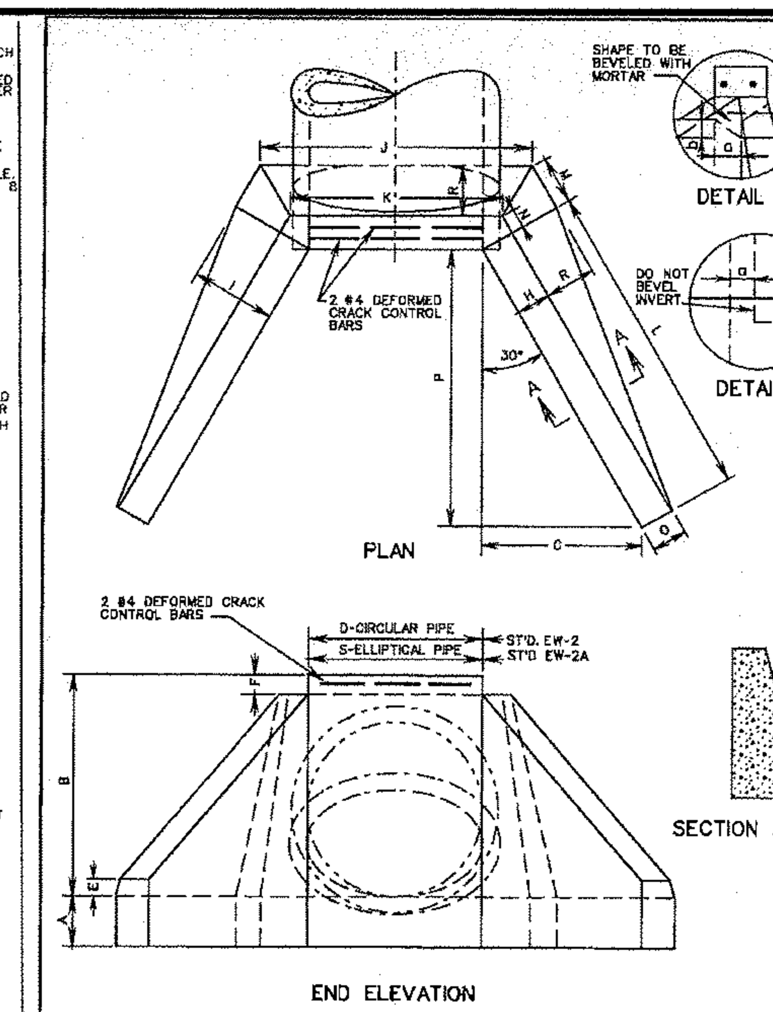




VDOT ROAD AND BRIDGE STANDARDS | SHEET 1 OF 2 | REVISION DATE 08/10 | 104.09
STANDARD CURB DROP INLET
12" - 30" PIPE: MAXIMUM DEPTH (H) - 8'
VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIFICATION REFERENCE 233 302

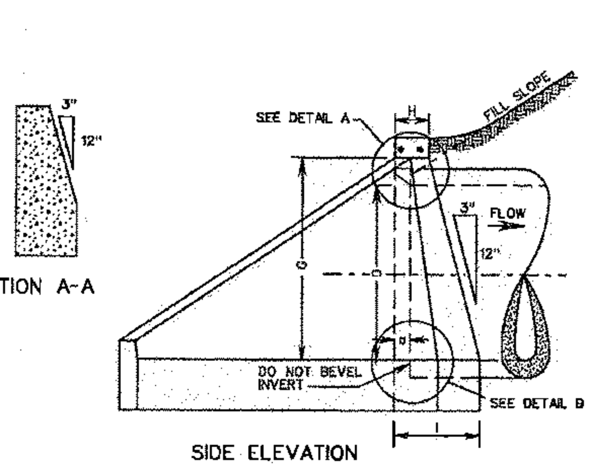
2016 ROAD & BRIDGE STANDARDS

STANDARD ENDWALL FOR PIPE CULVERTS — EW-2, 2A



NOTES:

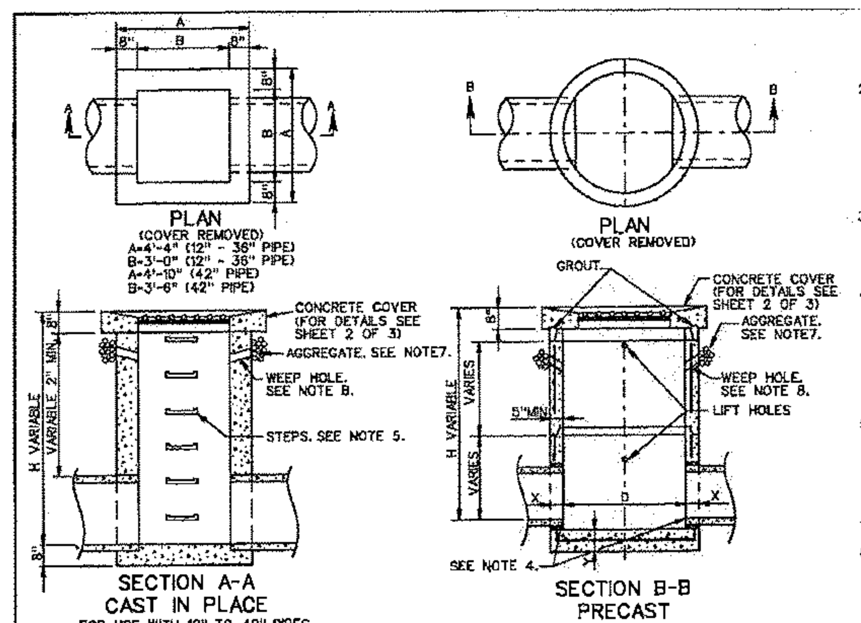
1. FOR TABLE OF DIMENSIONS AND VOLUMES FOR CIRCULAR PIPES (STANDARD EW-2) SEE SHEET 2 OF 3.
2. FOR TABLE OF DIMENSIONS AND VOLUMES FOR ELLIPTICAL PIPES (STANDARD EW-2A) SEE SHEET 3 OF 3.
3. THIS ITEM MAY BE PRECAST OR CAST IN PLACE.
4. ON SHALLOW FILLS, WHERE ENDWALLS ARE 1' OR LESS BELOW SHOULDER LINE, THE TOP OF THE ENDWALL SHALL BE CONSTRUCTED PARALLEL TO THE GRADE OF ROAD.
5. ALL CAST IN PLACE CONCRETE TO BE CLASS A3. FOR PRECAST SEE SHEETS 101.06 AND 101.07.
6. IN NO CASE SHALL TOP OF ENDWALL PROJECT ABOVE FILL SLOPE, DITCH SLOPE, OR SHOULDER.
7. THIS STANDARD TO BE USED WITH STRAIGHT CROSSINGS AND SKEW ANGLES TO 15°.
8. COST OF BARS FOR CRACK CONTROL TO BE INCLUDED IN PRICE PER BID PER CUBIC YARD CONCRETE.
9. HEADWALL TO BE BEVELED IN ALL AREAS EXCEPT WHERE A CONFLICT WITH INVERT AND WINGWALLS OCCUR.
10. BEVEL EDGE IS REQUIRED ON THE HEADWALL AT THE INLET END OF THE CULVERT (WHERE THE FLOW ENTERS THE CULVERT). HEADWALL AT THE OUTLET END OF THE CULVERT MAY BE EITHER SQUARE EDGE OR BEVEL EDGE.
11. 3/4" CHAMFER MAY BE PROVIDED ON ALL EDGES AT MANUFACTURER'S OPTION.



SPECIFICATION REFERENCE 105 302
STANDARD ENDWALL FOR PIPE CULVERTS
42" - 96" CIRCULAR AND 60" x 38" - 106" x 68" ELLIPTICAL PIPES
VIRGINIA DEPARTMENT OF TRANSPORTATION
VDOT ROAD AND BRIDGE STANDARDS | REVISION DATE | SHEET 1 OF 3 | 101.03

2016 ROAD & BRIDGE STANDARDS

STANDARD MEDIAN DROP INLET — 12" TO 42" PIPE



NOTES — DI-7, 7A, 7B

1. DEPTH OF INLET (H) TO BE SHOWN ON PLANS.
2. [illegible]
3. WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICEN FOR THE STRUCTURE.
4. [illegible]
5. STEPS ARE TO BE PROVIDED WHEN H IS 4'-0" OR GREATER. FOR DETAILS SEE STANDARD ST-1.
6. REINFORCED CONCRETE FOOTING MAY BE PRECAST OR CAST-IN-PLACE. TWO LIFTING HOOKS OF FABRICATORS DESIGN TO BE PROVIDED IN PRECAST FOOTING
7. 4" DEPTH AGGREGATE #68, #78, OR #8 X 6" WIDTH.
8. 3" DIAMETER WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
9. THE TYPE OF INLET (PRECAST OR CAST IN PLACE), DETAILED HEREON, TO BE CONSTRUCTED, WILL BE AT THE OPTION OF THE CONTRACTOR.
10. FOR DETAILS OF CONCRETE COVER, COLLAR AND GRATE AND THE METHOD OF PLACING APPROACH GUTTER SEE SHEET 2 OF 3.
11. CAST-IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
12. CONCRETE QUANTITIES SHOWN ARE FOR INDICATED DEPTH (H) WITHOUT PIPES. THE AMOUNT DISPLACED BY PIPES MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES. FOR INLETS OF DIFFERENT DEPTHS ADD OR SUBTRACT THE APPROPRIATE CUBIC YARDS OF CONCRETE FOR EACH FOOT OF DEPTH.
13. PAVED DITCHES ARE TO BE TRANSITIONED TO MEET INLET GUTTER AS SHOWN IN STANDARD PG-2A.
14. PROVIDE SAFETY SLABS WHEN SPECIFIED ON THE PLANS.

NOTES (CONT.)

15. DI-7 ---------NO GUTTER
    DI-7A-------SINGLE GUTTER WHEN DROP INLET IS ON A GRADE.
    DI-7B------ DOUBLE GUTTER WHEN DROP INLET IS IN A SAG BETWEEN TWO GRADES.
16. FOR DETAILS OF PRECAST DI-7 NOT SHOWN HEREON SEE PRECAST UNIT ASSEMBLY DIAGRAM, PAGE 103.01, FOR PRECAST GENERAL NOTES, PAGE 103.02 AND FOR APPLICABLE PRECAST BASE, RISER AND TOP DETAILS, PAGES 103.07 THRU 103.12.
17. GRATE BARS TO BE PARALLEL TO DITCH FLOW.

RECOMMENDED MINIMUM HEIGHT CHART

PIPE SIZE	H DIMENSION CONC.	H DIMENSION CORR. METAL
12"	2'-6"	2'-5"
15"	2'-9¼"	2'-8"
18"	3'-0½"	2'-11"
21"	3'-3¾"	3'-2"
24"	3'-7"	3'-5"
27"	3'-10¼"	3'-8"
30"	4'-1½"	3'-11"
33"	4'-4¾"	4'-2"
36"	4'-8"	4'-5"
42"	5'-2½"	4'-11"

PIPE SIZE	12"	15"	18"	24"	30"	36"	42"
MINIMUM DEPTH H	2'-0"	2'-3¼"	2'-6½"	3'-1"	3'-7½"	4'-2"	4'-8½"
CONCRETE CUBIC YARDS	.947	1.045	1.143	1.339	1.535	1.731	1.927

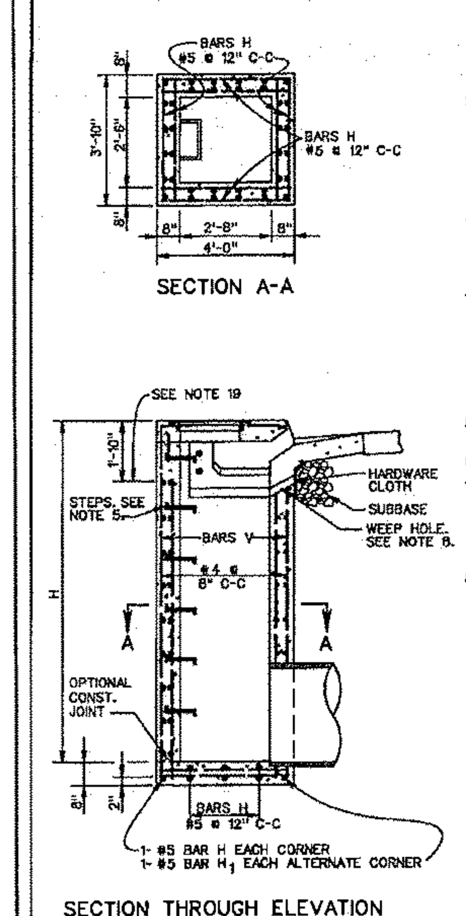
INCREMENT PER FOOT OF ADDITIONAL DEPTH (H) { = 0.362 CU. YDS. (12" - 36" PIPE) = 0.410 CU. YDS. (42" PIPE)

SPECIFICATION REFERENCE 241 503
STANDARD MEDIAN DROP INLET
12" TO 42" PIPE
VIRGINIA DEPARTMENT OF TRANSPORTATION
VDOT ROAD AND BRIDGE STANDARDS | REVISION DATE | SHEET 1 OF 3 | 104.22

2016 ROAD & BRIDGE STANDARDS

STANDARD CURB DROP INLET — 12" - 30" PIPE: DEPTH (H) 8' TO 20'

DI-3AA, 3BB, 3CC



NOTES

1. DEPTH OF INLET (H) TO BE SHOWN ON PLANS. MINIMUM DEPTH (H) TO BE 8'-0". MAXIMUM DEPTH TO BE 20'-0". FOR INLETS LESS THAN 8' USE STANDARD DI-3A, 3B, 3C.
2. [illegible]
3. WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
4. [illegible]
5. STEPS ARE REQUIRED. FOR DETAILS SEE STANDARD ST-1.
6. THIS ITEM MAY BE PRECAST OR CAST-IN-PLACE.
7. #4 X 8" SMOOTH DOWELS AT APPROXIMATELY 12" C-C TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT. IN LIEU OF DOWELS A 2" X 4" NOTCH MAY BE PROVIDED. SEE STANDARD T-DI-3, 4 FOR ALTERNATE DESIGN.
8. 3" DIAMETER WEEP HOLE TO BE LOCATED TO DRAIN SUBBASE MATERIAL. WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
9. ALL REINFORCING STEEL SHALL HAVE A MIN. COVER OF 2".
10. ALL REINFORCING STEEL TO BE CUT CLEAR OF ALL OPENINGS BY 2".
11. CAST-IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
12. LENGTH OF SLOT (L) WILL, IN EVERY CASE, BE SHOWN ON PLANS.
13. WHEN INLET IS USED IN 4' MEDIAN BACK OF INLET IS TO BE SHAPED TO CONFORM WITH PROPOSED CURB.
14. IF OPTIONAL CONSTRUCTION JOINT IS USED IT IS TO BE KEYED. ALL SPLICES IN BARS V TO BE A MINIMUM OF 40 DIAMETERS (20").
15. FOR PLAN VIEW OF INLET SEE STANDARD DI-3A, 3B, 3C.
16. QUANTITIES SHOWN ARE FOR MINIMUM INLETS OF EACH TYPE. FOR INLETS OF GREATER DEPTH (H) OR LONGER SLOT (L) INCREMENTS SHOWN PER FOOT MUST BE ADDED. THE AMOUNT OF CONCRETE AND STEEL DISPLACED BY PIPES MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES.
17. FOR NUMBER OF BARS A-G REQUIRED AND LENGTHS SEE SHEET 104.10.
18. FOR DESCRIPTION AND LOCATION OF DIMENSION L SEE SHEET 104.09.
19. FOR ALL DETAILS, DIMENSIONS, AND REINFORCING STEEL ABOVE THIS LINE SEE STANDARD DI-3A, 3B, 3C.

SCHEDULE OF REINFORCING STEEL

BARS H		BARS H1		BARS V	
NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH
4x(H+1)	3'-6"	4x(H+1)	3'-8"	38	H-1'-4"

APPROXIMATE QUANTITIES FOR MINIMUM 8' DEPTH INLET

TYPE	DIMENSION L SEE NOTE 18	REINFORCING STEEL	CONCRETE
DI-	Lin. Ft.	Lbs.	Cu. Yds.
3AA	2'-6"	452	3.14
3BB	4'-0"	494	3.47
3CC	6'-0"	541	3.89

INCREMENTS TO BE ADDED FOR EACH ADDITIONAL FOOT OF DEPTH (H) AND/OR SLOT LENGTH (L)

H		L	
CONCRETE Cu. Yds.	STEEL Lbs.	CONCRETE Cu. Yds.	STEEL Lbs.
0.317	54	-	-
0.317	54	0.22	23.5
0.317	54	0.22	23.5

VDOT ROAD AND BRIDGE STANDARDS | SHEET 1 OF 1 | REVISION DATE | 104.11
STANDARD CURB DROP INLET
12" - 30" PIPE: DEPTH (H) 8' TO 20'
VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIFICATION REFERENCE 233 302

2016 ROAD & BRIDGE STANDARDS

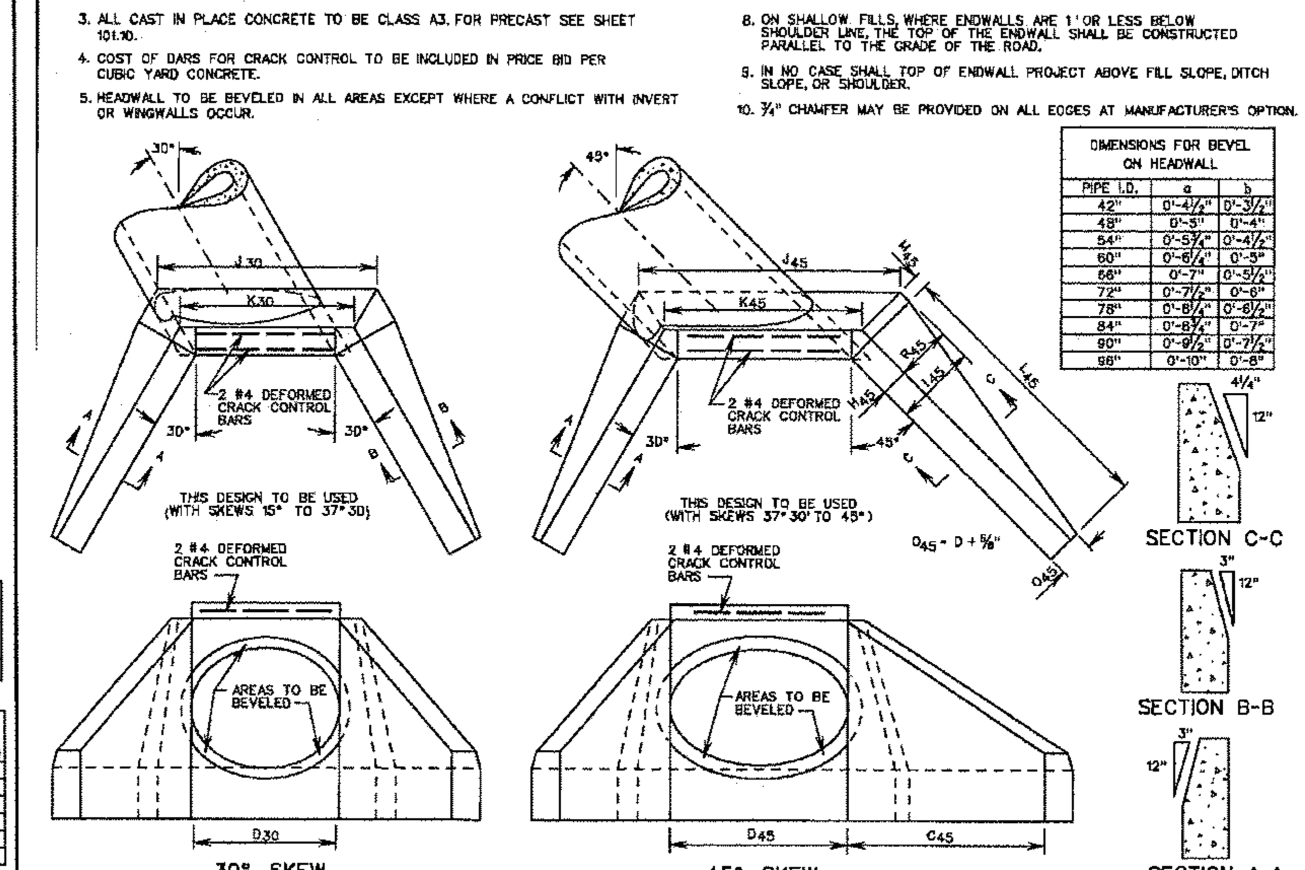
STANDARD ENDWALLS FOR PIPE CULVERTS — EW-2S

NOTES:

1. ALL DETAILS AND DIMENSIONS NOT SHOWN ARE THE SAME AS STANDARD EW-2. FOR TABLES OF DIMENSIONS AND VOLUMES SEE SHEET 2 OF 2. FOR DETAILS OF BEVEL REFER TO STANDARD EW-1, 1APC SHEET 101.02.
2. THIS ITEM MAY BE PRECAST OR CAST IN PLACE.
3. ALL CAST IN PLACE CONCRETE TO BE CLASS A3. FOR PRECAST SEE SHEET 101.10.
4. COST OF BARS FOR CRACK CONTROL TO BE INCLUDED IN PRICE BID PER CUBIC YARD CONCRETE.
5. HEADWALL TO BE BEVELED IN ALL AREAS EXCEPT WHERE A CONFLICT WITH INVERT OR WINGWALLS OCCUR.
6. BEVEL EDGE IS REQUIRED ON THE HEADWALL AT THE INLET END OF THE CULVERT (WHERE THE FLOW ENTERS THE CULVERT).
7. HEADWALL AT THE OUTLET END OF THE CULVERT MAY BE EITHER SQUARE EDGE OR BEVEL EDGE.
8. ON SHALLOW FILLS, WHERE ENDWALLS ARE 1' OR LESS BELOW SHOULDER LINE, THE TOP OF THE ENDWALL SHALL BE CONSTRUCTED PARALLEL TO THE GRADE OF THE ROAD.
9. IN NO CASE SHALL TOP OF ENDWALL PROJECT ABOVE FILL SLOPE, DITCH SLOPE, OR SHOULDER.
10. 3/4" CHAMFER MAY BE PROVIDED ON ALL EDGES AT MANUFACTURER'S OPTION.

DIMENSIONS FOR BEVEL ON HEADWALL

PIPE I.D.	a	b
42"	0'-4½"	0'-3½"
48"	0'-5"	0'-4"
54"	0'-5½"	0'-4½"
60"	0'-6¼"	0'-5"
66"	0'-7"	0'-5½"
72"	0'-7½"	0'-6"
78"	0'-8¼"	0'-6½"
84"	0'-8¾"	0'-7"
90"	0'-9½"	0'-7½"
96"	0'-10"	0'-8"

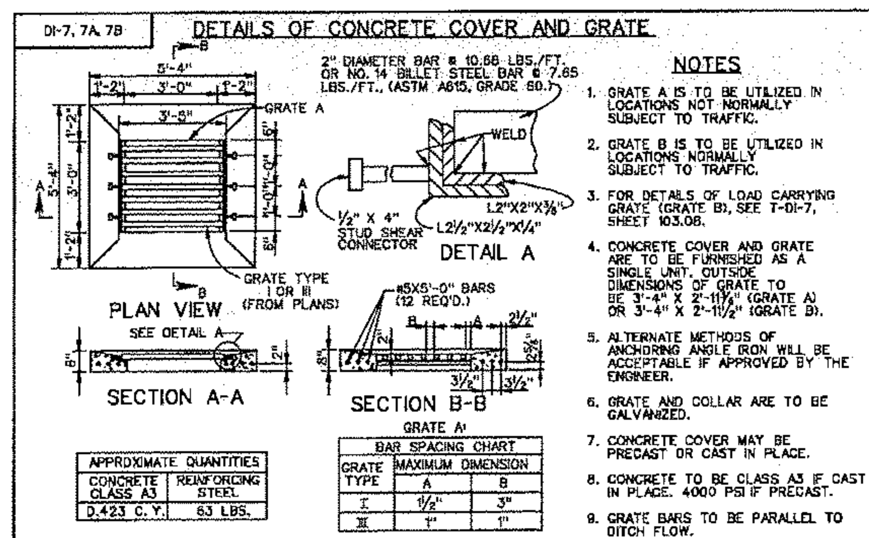


VDOT ROAD AND BRIDGE STANDARDS | SHEET 1 OF 2 | REVISION DATE | 101.08
STANDARD ENDWALLS FOR PIPE CULVERTS
42" - 96" CIRCULAR PIPES WITH 30° AND 45° SKEW
VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIFICATION REFERENCE 105 302

2016 ROAD & BRIDGE STANDARDS

STANDARD MEDIAN DROP INLET — DI-7, 7A, 7B

DETAILS OF CONCRETE COVER AND GRATE



NOTES

1. GRATE A IS TO BE UTILIZED IN LOCATIONS NOT NORMALLY SUBJECT TO TRAFFIC.
2. GRATE B IS TO BE UTILIZED IN LOCATIONS NORMALLY SUBJECT TO TRAFFIC.
3. FOR DETAILS OF LOAD CARRYING GRATE (GRATE B), SEE T-DI-7, SHEET 103.08.
4. CONCRETE COVER AND GRATE ARE TO BE FURNISHED AS A SINGLE UNIT. OUTSIDE DIMENSIONS OF GRATE TO BE 3'-4" X 2'-11⅞" (GRATE A) OR 3'-4" X 2'-11½" (GRATE B).
5. ALTERNATE METHODS OF ANCHORING ANGLE IRON WILL BE ACCEPTABLE IF APPROVED BY THE ENGINEER.
6. GRATE AND COLLAR ARE TO BE GALVANIZED.
7. CONCRETE COVER MAY BE PRECAST OR CAST IN PLACE.
8. CONCRETE TO BE CLASS A3 IF CAST IN PLACE. 4000 PSI IF PRECAST.
9. GRATE BARS TO BE PARALLEL TO DITCH FLOW.

APPROXIMATE QUANTITIES	
CONCRETE CLASS A3	REINFORCING STEEL
0.423 C. Y.	63 LBS.

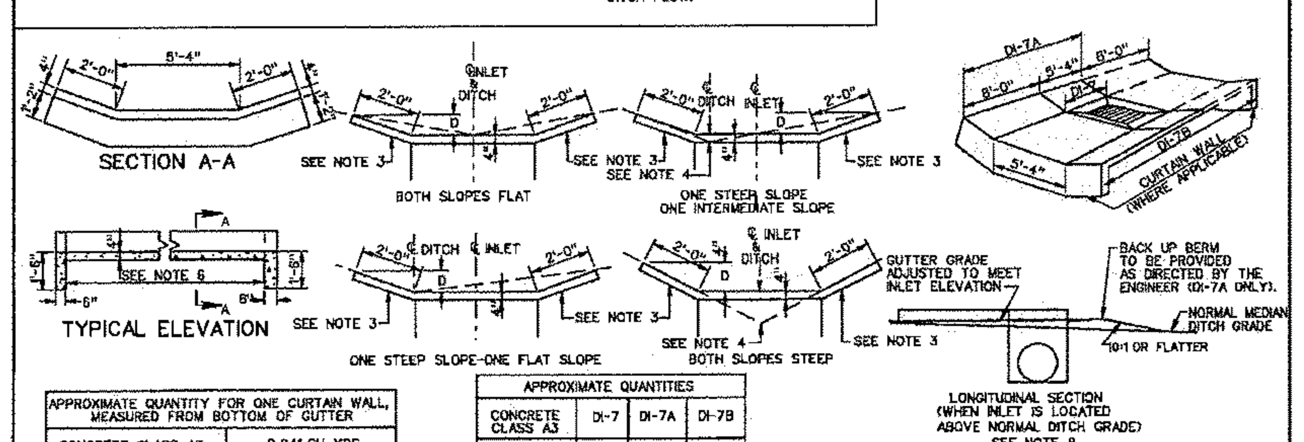
GRATE A' — BAR SPACING CHART

GRATE TYPE	MAXIMUM DIMENSION A	MAXIMUM DIMENSION B
I	1/2"	3"
II	1"	1"

DETAILS OF GUTTER AND METHOD OF PLACEMENT

NOTES

1. DI-7 NO GUTTERS.
   DI-7A NO GUTTER IN ONE DIRECTION.
   DI-7B GUTTER IN BOTH DIRECTIONS.
2. JOINTS BETWEEN GUTTERS AND CONCRETE COVER ARE TO BE DOWELED WITH #4 X 8" SMOOTH RODS @ APPROX. 12" C-C TO PREVENT SETTLEMENT. IN LIEU OF DOWELS A 2" X 4" NOTCH MAY BE PROVIDED. SEE STANDARD T-DI-3, 4 ALTERNATE DESIGN.
3. VARIABLE 2:1 OR FLATTER.
4. DITCH GRADE MUST BE ADJUSTED TO MEET DIFFERENCE IN ELEVATION. SEE LONGITUDINAL SECTION.
5. IF DEPTH (D) BECOMES LESS THEN 4", LENGTH OF WINGS ARE TO BE EXTENDED AS DIRECTED BY THE ENGINEER.
6. CURTAIN WALL TO BE LOCATED AT THE END OF THE PAVED DITCH SECTIONS OF THE DI-7A & DI-7B THAT ARE NOT ABUTTED BY OTHER DRAINAGE.
7. IF NORMAL DITCH GRADE IS TOO FLAT TO ALLOW FOR ADJUSTED GRADE TO INLET, A SPECIAL GUTTER DETAIL WILL BE REQUIRED ON PLANS.



APPROXIMATE QUANTITY FOR ONE CURTAIN WALL, MEASURED FROM BOTTOM OF GUTTER	
CONCRETE CLASS A3	0.241 CU. YDS.

APPROXIMATE QUANTITIES

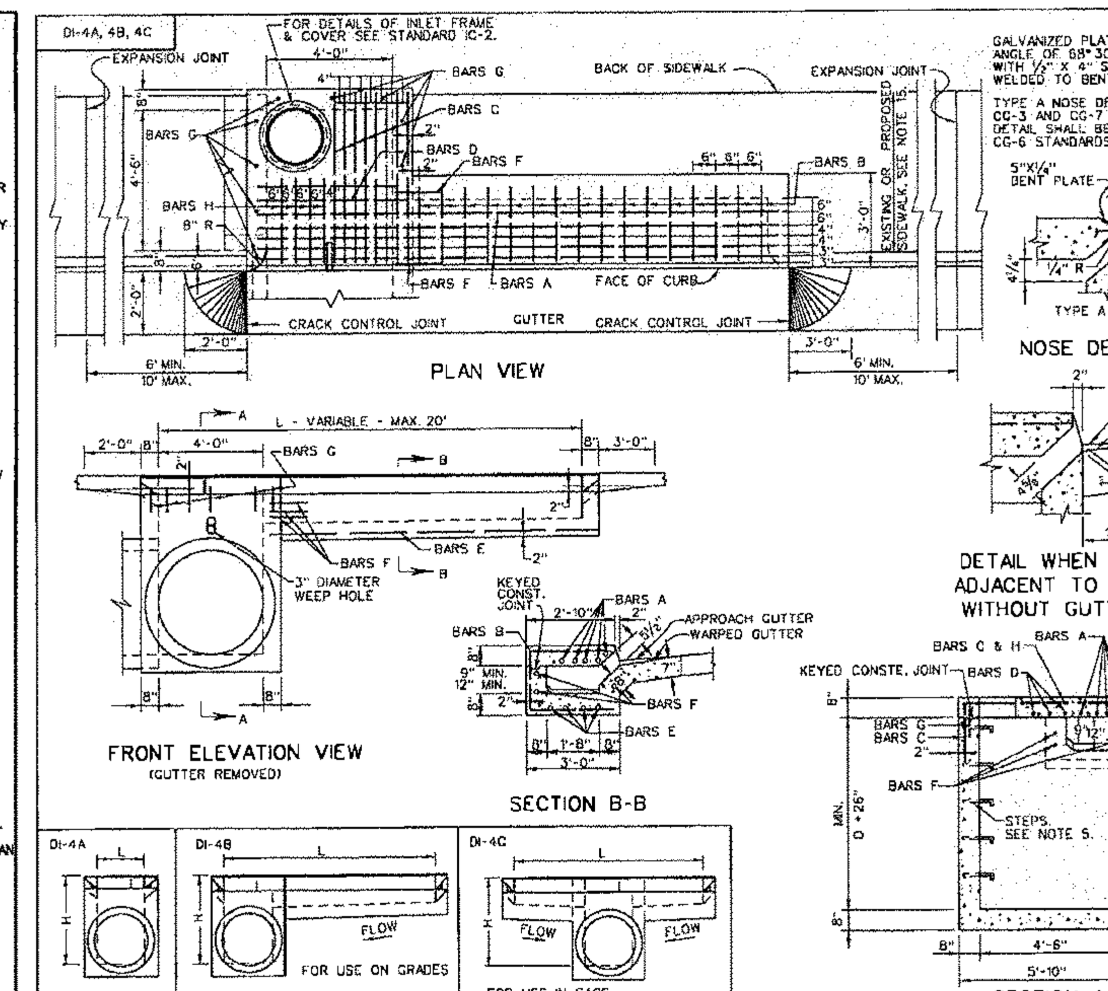
CONCRETE CLASS A3	DI-7	DI-7A	DI-7B
(CU. YDS.)	NONE	1.211	2.148

VDOT ROAD AND BRIDGE STANDARDS | SHEET 2 OF 3 | REVISION DATE | 104.23
STANDARD MEDIAN DROP INLET
12" TO 42" PIPE
VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIFICATION REFERENCE 241 503

2016 ROAD & BRIDGE STANDARDS

STANDARD CURB DROP INLET — 36" - 48" PIPE: MAXIMUM DEPTH (H) - 8'

DI-4A, 4B, 4C



GALVANIZED PLATE TO BE BENT ON AN ANGLE OF 68°30' AND IS TO BE ANCHORED WITH 1/2" X 4" STUD SHEAR CONNECTORS WELDED TO BENT PLATE AT 2'-0" C-C.

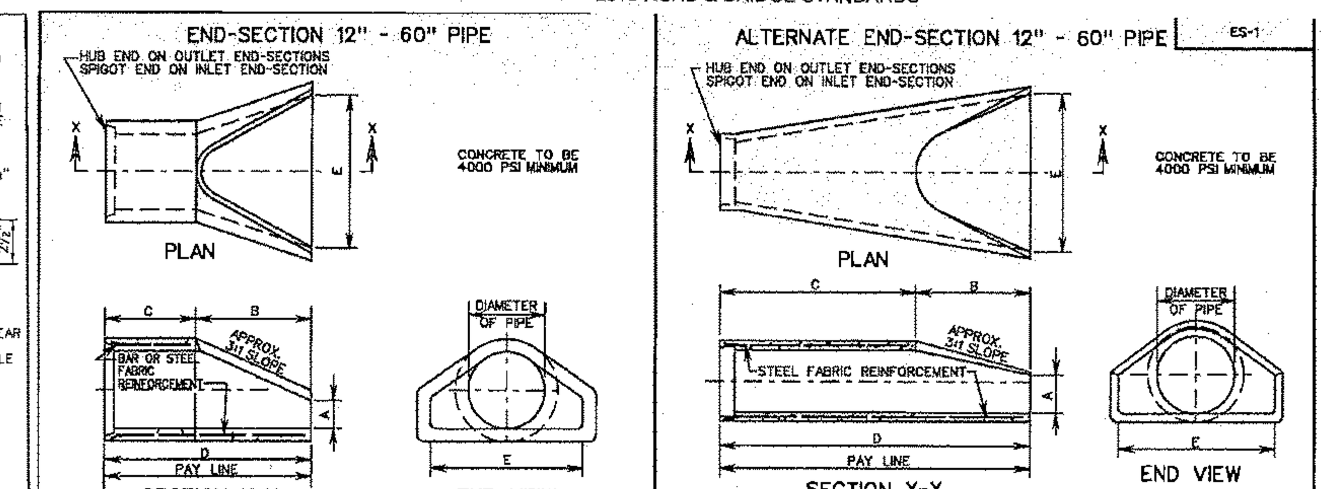
TYPE A NOSE DETAIL SHALL BE USED WITH CG-3 AND CG-7 STANDARDS. TYPE B NOSE DETAIL SHALL BE USED WITH CG-2 AND CG-6 STANDARDS.

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

VDOT ROAD AND BRIDGE STANDARDS | SHEET 1 OF 2 | REVISION DATE 04/19 | 104.15
STANDARD CURB DROP INLET
36" - 48" PIPE: MAXIMUM DEPTH (H) - 8'
VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIFICATION REFERENCE 233 302

2016 ROAD & BRIDGE STANDARDS

FLARED END SECTION — ES-1

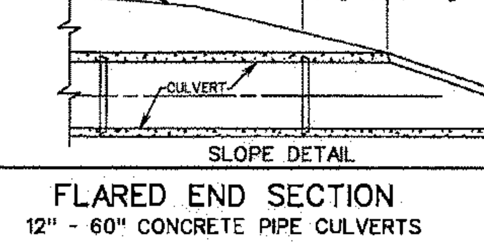


END SECTION DIMENSIONS (END-SECTION 12" - 60" PIPE)

PIPE DIAMETER	A	B	C	D	E
12"	4"	2'-0"	2'-0"	4'-0"	2'-0"
15"	6"	2'-3"	1'-9"	4'-0"	2'-6"
18"	9"	2'-3"	1'-9"	4'-0"	3'-0"
21"	9¼"	2'-11"	2'-1"	5'-0"	3'-6"
24"	9½"	3'-7"	2'-6"	6'-1"	4'-0"
27"	10¾"	4'-0"	2'-1"	6'-1"	4'-6"
30"	1'-0"	4'-6"	1'-7¾"	6'-1½"	5'-0"
33"	1'-1½"	4'-10½"	2'-3¼"	7'-1½"	5'-6"
36"	1'-3"	5'-3"	2'-10¾"	8'-1¾"	6'-0"
42"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"
48"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"
54"	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"
60"	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"

END SECTION DIMENSIONS (ALTERNATE END-SECTION 12" - 60" PIPE)

PIPE DIAMETER	A	B	C	D	E
12"	4"	2'-0"	4'-1"	6'-1"	2'-0"
15"	6"	2'-3"	3'-10"	6'-1"	2'-6"
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"
21"	9"	2'-11"	3'-2"	6'-1"	3'-6"
24"	10"	3'-7"	2'-8"	6'-3"	4'-0"
27"	10½"	4'-0"	2'-1½"	6'-1½"	4'-6"
30"	1'-0"	4'-6"	1'-7¾"	8'-1½"	5'-0"
33"	1'-1½"	4'-10½"	3'-3¾"	8'-1½"	5'-6"
36"	1'-3"	5'-3"	2'-10¾"	8'-1¾"	6'-0"
42"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"
48"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"
54"	2'-3"	5'-5"	2'-11"	8'-4"	7'-6"
60"	2'-6"	5'-0"	3'-3"	8'-3"	8'-0"



NOTES:
PIPE LENGTHS SHOWN ON PLANS ARE BASED ON END-SECTION DESIGN SHOWN ON THE LEFT. IF THE CONTRACTOR ELECTS TO USE THE ALTERNATE DESIGN SHOWN ON THE RIGHT, LENGTHS WILL BE REDUCED BY THE DIFFERENCE IN DIMENSION "D".

SPECIFICATION REFERENCE 302
FLARED END SECTION
12" - 60" CONCRETE PIPE CULVERTS
VIRGINIA DEPARTMENT OF TRANSPORTATION
VDOT ROAD AND BRIDGE STANDARDS | REVISION DATE | SHEET 1 OF 1 | 102.01

2016 ROAD & BRIDGE STANDARDS

Bowman CONSULTING
Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com
© Bowman Consulting Group, Ltd.

VDOT STORM AND PAVEMENT DETAILS
HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN
TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA — JERRY WAYNE DOVE JR. Lic. No. 047794 — 10/15/19 — PROFESSIONAL ENGINEER

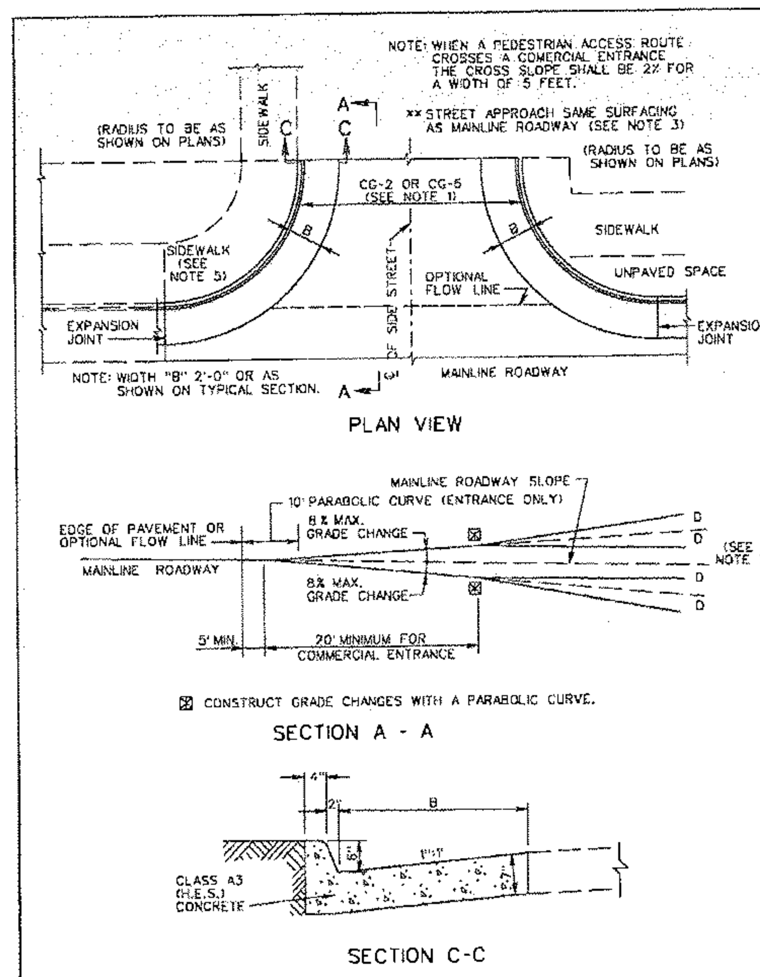
PLAN STATUS

DATE	DESCRIPTION
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

GC DESIGN | MCW DRAWN | CHKD
SCALE H: V:
JOB No. 1602-02-016
DATE JULY 19, 2019
FILE No. 1602-D-CP-005
SHEET 31 OF 33

Cad file name: P:\1602 - happy creek knolls sec 3\1602-04-001 (eng)\engineering\engineering plans\Sheets\1602-D-CP-001-MISC-DET.dwg

CG-11



GENERAL NOTES

1. WHEN USED IN CONJUNCTION WITH STANDARD CG-3 OR CG-7, THE CURB FACE ON THIS STANDARD IS TO BE ADJUSTED TO MATCH THE MOUNTABLE CURB CONFIGURATION.
2. SEE STANDARD CG-12 FOR CURB RAMP DESIGN TO BE USED WITH THIS STANDARD.
3. MAINLINE PAVEMENT SHALL BE CONSTRUCTED TO THE R/W LINE (EXCEPT ANY SUBGRADE STABILIZATION REQUIRED FOR MAINLINE PAVEMENT WHICH CAN BE OMITTED IN THE ENTRANCE.)
4. RADIAL CURB OR COMBINATION CURB AND GUTTER SHALL NOT BE CONSTRUCTED BEYOND THE R/W LINE EXCEPT FOR REPLACEMENT PURPOSES.

ENTRANCE NOTES

5. WHEN THE ENTRANCE RADII CANNOT ACCOMMODATE THE TURNING REQUIREMENTS OF ANTICIPATED HEAVY TRUCK TRAFFIC, THE DEPTH FOR SIDEWALK & CURB RAMPS WITHIN THE LIMITS OF THE RADII SHOULD BE INCREASED TO 7". (SEE CG-13)
6. PLANS ARE TO INDICATE WHEN CONSTRUCTION OF A FLOW LINE IS REQUIRED TO PROVIDE POSITIVE DRAINAGE ACROSS THE ENTRANCE.
7. THE DESIRABLE AND MAXIMUM ENTRANCE GRADE CHANGES "D" ARE LISTED IN THE ALLOWABLE ENTRANCE GRADE TABLE. THESE VALUES ARE NOT APPLICABLE TO STREET CONNECTIONS.

INTERSECTION NOTES

8. WHEN CG-11 IS USED FOR STREET CONNECTIONS, THE CONNECTION MUST BE DESIGNED IN ACCORDANCE WITH AASHTO POLICY AND THE APPLICABLE REQUIREMENTS OF THE VDOT ROAD DESIGN MANUAL, INCLUDING STOPPING SIGHT DISTANCE AND K VALUE REQUIREMENTS.
9. OPTIONAL FLOWLINE MAY REQUIRE WARPING OF A PORTION OF GUTTER TO PROVIDE POSITIVE DRAINAGE ACROSS THE INTERSECTION.

ALLOWABLE ENTRANCE GRADE CHANGES

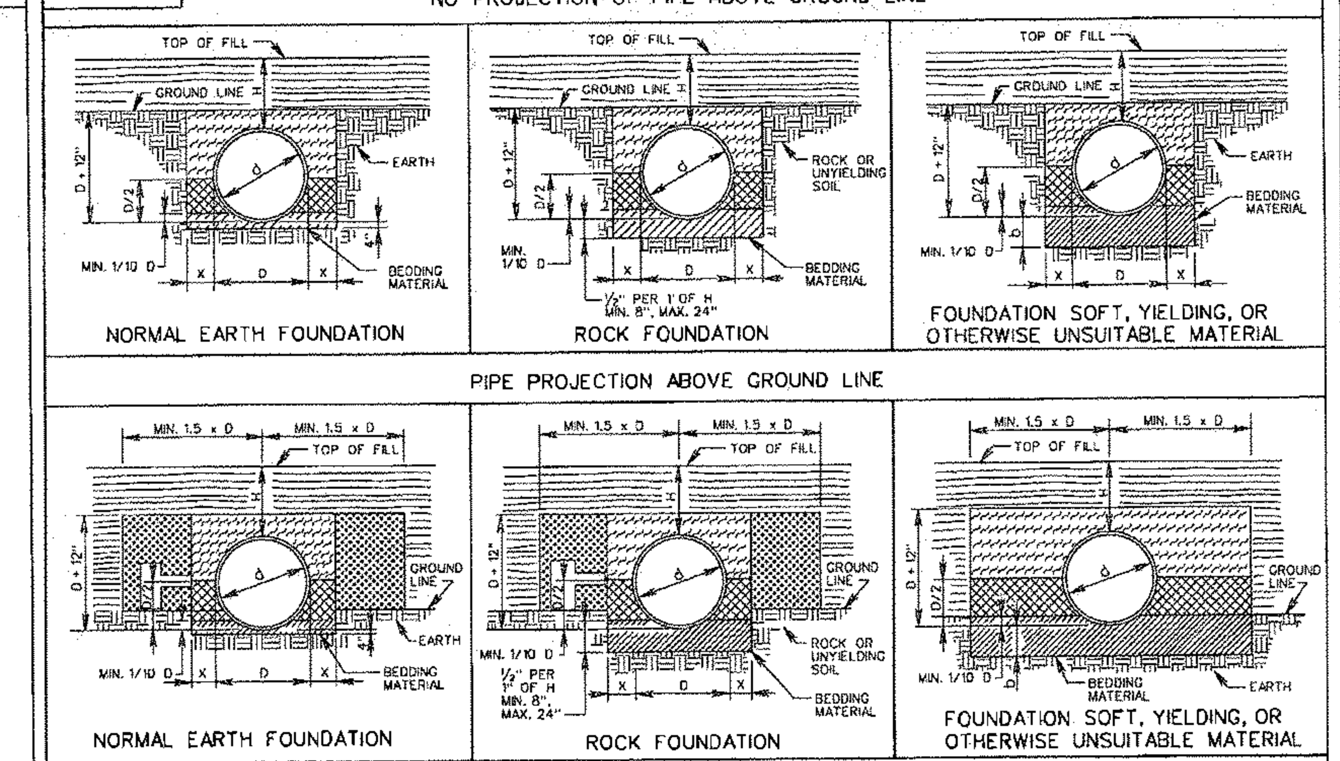
ENTRANCE VOLUME		GRADE CHANGE "D"	
		DESIRABLE	MAXIMUM
HIGH	MORE THAN 1500 VPD	0 %	3 %
MEDIUM	500-1500 VPD	≤ 3 %	5 %
LOW	LESS THAN 500 VPD	≤ 6 %	8 %

NOTE: ALLOWABLE ENTRANCE GRADE TABLE IS NOT APPLICABLE TO STREET CONNECTIONS

SPECIFICATION REFERENCE	METHOD OF TREATMENT	VDOT ROAD AND BRIDGE STANDARDS	
502	(CONNECTION FOR STREET INTERSECTIONS AND COMMERCIAL ENTRANCES) VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE 07/15	SHEET 1 OF 1 203.04

2016 ROAD & BRIDGE STANDARDS

PB-1



- BEDDING MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
- CLASS I BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
- FOR PLASTIC PIPE : 8" MINIMUM CLASS I BACKFILL MATERIAL PLACED DIRECTLY OVER PIPE AND 6" REGULAR BACKFILL MATERIAL. OR 12" OF CLASS I BACK FILL MATERIAL. IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
- EMBANKMENT
- REGULAR BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
- FOR ALL OTHER PIPE REGULAR BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

NOTES:

FOR GENERAL NOTES ON PIPE BEDDING, SEE INSTALLATION OF PIPE CULVERTS AND STORM SEWERS GENERAL NOTES ON SHEET 107.00.

CRUSHED GLASS CONFORMING TO THE SIZE REQUIREMENTS FOR CRUSHER RUN AGGREGATE SIZE 25 AND 26 MAY BE USED IN PLACE OF CLASS I BACKFILL.

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

VDOT ROAD AND BRIDGE STANDARDS		INSTALL. OF PIPE CULVERTS AND STORM SEWERS	SPECIFICATION REFERENCE
SHEET 1 OF 4 107.01	REVISION DATE 07/19	CIRC. PIPE BEDDING AND BACKFILL - METHOD "A" VIRGINIA DEPARTMENT OF TRANSPORTATION	302 303

2016 ROAD & BRIDGE STANDARDS

MH-1

SEE STANDARAD SL-1 FOR APPLICABILITY OF SAFETY SLABS.

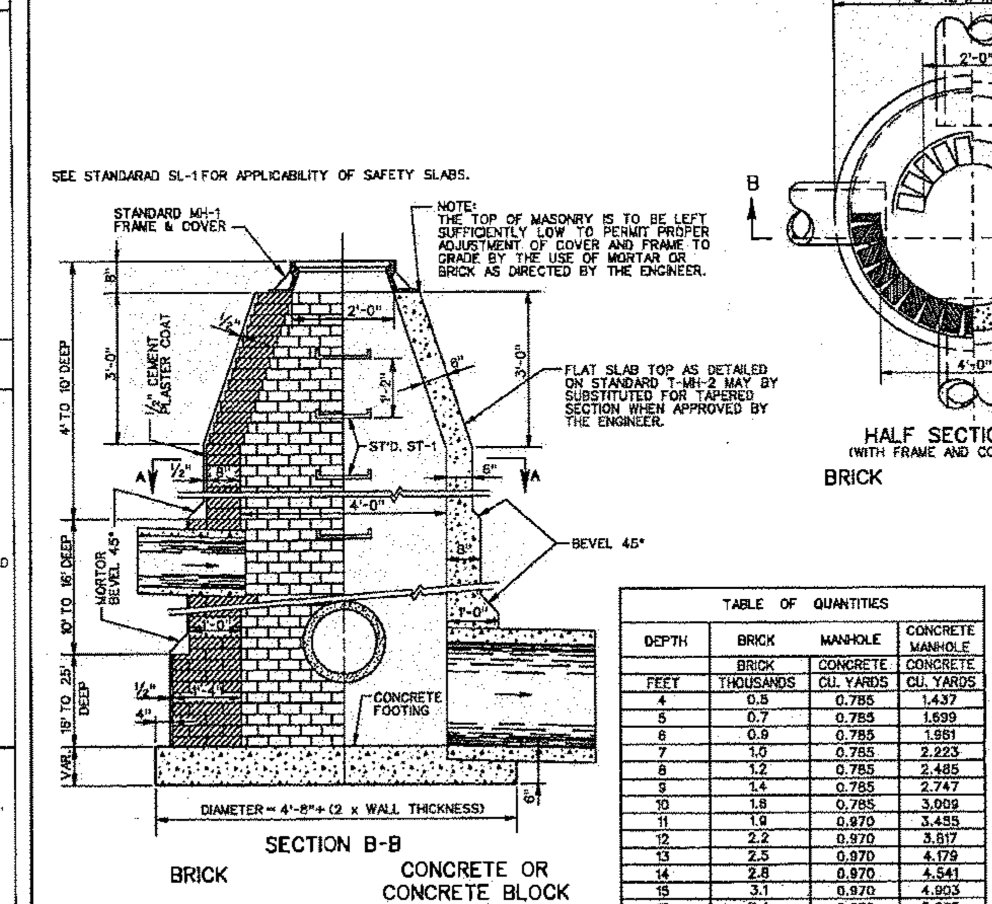


TABLE OF QUANTITIES

DEPTH	BRICK	MANHOLE	CONCRETE MANHOLE
	BRICK	CONCRETE	CONCRETE
FEET	THOUSANDS	CU. YARDS	CU. YARDS
4	0.5	0.785	1.437
5	0.7	0.785	1.699
6	0.9	0.785	1.961
7	1.0	0.785	2.223
8	1.2	0.785	2.485
9	1.4	0.785	2.747
10	1.6	0.785	3.009
11	1.9	0.970	3.455
12	2.2	0.970	3.817
13	2.5	0.970	4.179
14	2.8	0.970	4.541
15	3.1	0.970	4.903
16	3.4	0.970	5.265
17	4.0	1.173	6.032
INCREMENT	0.45	-	0.562

NOTES:

1. QUANTITIES SHOWN ARE FOR MANHOLE WITHOUT PIPES. THE AMOUNT DISPLACED BY PIPES MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES.
2. A BASE THICKNESS OF 8" WAS USED IN COMPUTING CONCRETE QUANTITIES.
3. INCREMENTS TO BE ADDED FOR EACH ADDITIONAL FOOT OF DEPTH.
4. MATERIALS MAY BE BRICK, CONCRETE OR APPROVED CONCRETE MANHOLE BLOCK.
5. IF BLOCKS ARE USED THE MINIMUM THICKNESS OF SAME IS TO BE 5". OTHER THICKNESSES ARE TO CONFORM TO WALL THICKNESS SHOWN FOR CONCRETE.
6. ALL CONCRETE TO BE CLASS A3.
7. WHEN SPECIFIED ON PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.

SPECIFICATION REFERENCE	MANHOLE FOR 12" - 48" PIPE CULVERTS	VDOT ROAD AND BRIDGE STANDARDS	
302	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE	SHEET 1 OF 5 106.01

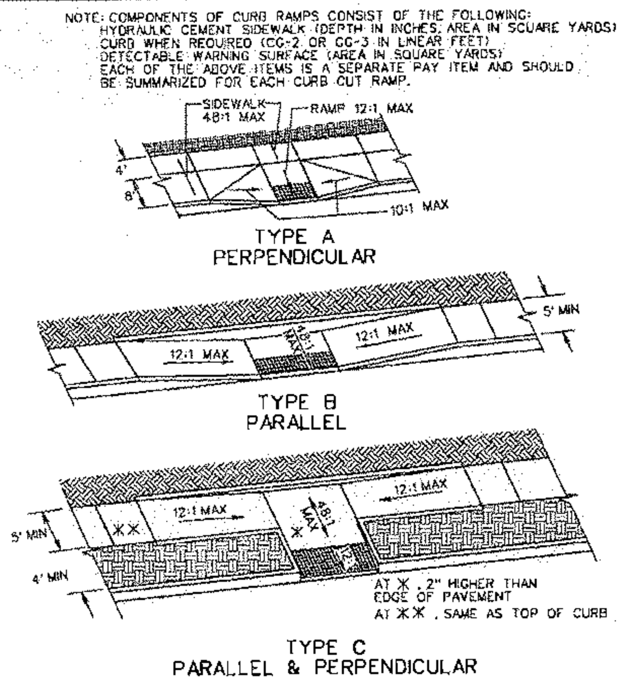
2016 ROAD & BRIDGE STANDARDS

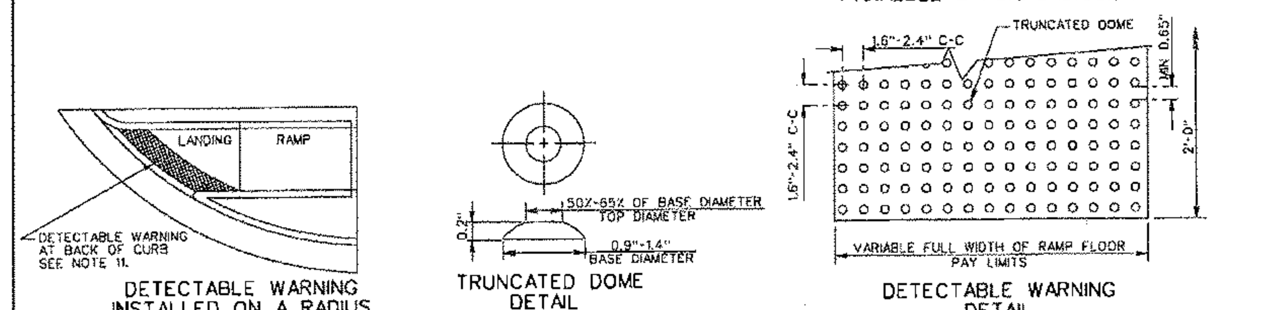
CG-12

GENERAL NOTES:

1. THE DETECTABLE WARNING SHALL BE PROVIDED BY TRUNCATED DOMES.
2. ALL DETECTABLE WARNING SURFACE PRODUCTS SHALL MEET THE REQUIREMENTS OF SECTION 504 OF THE SPECIFICATIONS FOR CG-12 DETECTABLE WARNING SURFACE. DETECTABLE WARNING SUFACE PRODUCTS USED SHALL BE FROM THE MATERIALS APPROVED PRODUCT LIST NUMBER 72.
3. SLOPING SIDES OF CURB RAMP MAY BE POURED MONOLITHICALLY WITH RAMP FLOOR OR BY USING PERMISSIBLE CONSTRUCTION JOINT WITH REQUIRED BARS.
4. REQUIRED BARS ARE TO BE NO. 5 X 8" PLACED 1' CENTER TO CENTER ALONG BOTH SIDES OF THE RAMP FLOOR, MID-DEPTH OF RAMP FLOOR, MINIMUM CONCRETE COVER 1½".
5. ROADWAY CURB / CURB AND GUTTER SLOPE TRANSITIONS ADJACENT TO CURB RAMPS ARE INCLUDED IN PAYMENT FOR CURB / CURB AND GUTTER.
6. CURB RAMPS ARE REQUIRED FOR SIDEWALKS AND SHARED USE PATHS. THE WIDTH OF THE CURB RAMP SHALL MATCH SIDEWALK WIDTH. WHEN CURB RAMPS ARE USED IN CONJUNCTION WITH A SHARED USE PATH, THE MINIMUM WIDTH SHALL BE THE WIDTH OF THE SHARED USE PATH.
7. DETECTABLE WARNINGS SHALL EXTEND THE FULL WIDTH OF THE CURB RAMP LANDING FLOOR.
8. CURB RAMPS WILL BE INSTALLED AND LOCATED WITHIN PEDESTRIAN CROSSWALKS AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER. CURB RAMPS SHOULD NOT BE LOCATED BEHIND VEHICLE STOP LINES, LIGHT POLES, FIRE HYDRANTS, DROP INLETS, ETC.
9. RAMPS MAY BE PLACED ON RADIAL OR TANGENTIAL SECTIONS PROVIDED THAT THE CURB OPENING IS PLACED WITHIN THE LIMITS OF THE CROSSWALK AND THAT THE SLOPE AT THE CONNECTION OF THE CURB OPENING IS PERPENDICULAR TO THE CURB.
10. DETECTABLE WARNING SURFACE PANELS SHALL BE INSTALLED FLUSH WITH THE BACK OF CURB.
11. WHERE CURB RAMPS INTERSECT A RADIAL SECTION OF CURB AT ENTRANCES OR STREET CONNECTIONS THE DETECTABLE WARNING SURFACE SHALL HAVE A FACTORY RADIUS OR BE FIELD-MODIFIED AS RECOMMENDED BY THE MANUFACTURER TO MATCH THE BACK OF CURB. SEE CG-12-INS PAGES 204.06 AND 204.07 FOR METHODS OF INSTALLING DETECTABLE WARNINGS ON A RADIUS.

NOTE: COMPONENTS OF CURB RAMPS CONSIST OF THE FOLLOWING: HYDRAULIC CEMENT SIDEWALK (DEPTH IN INCHES, AREA IN SQUARE YARDS) CURB WHEN REQUIRED (CG-2 OR CG-3 IN LINEAR FEET) DETECTABLE WARNING SURFACE (AREA IN SQUARE YARDS) EACH OF THE ABOVE ITEMS IS A SEPARATE PAY ITEM AND SHOULD BE SUMMARIZED FOR EACH CURB CUT RAMP.





A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

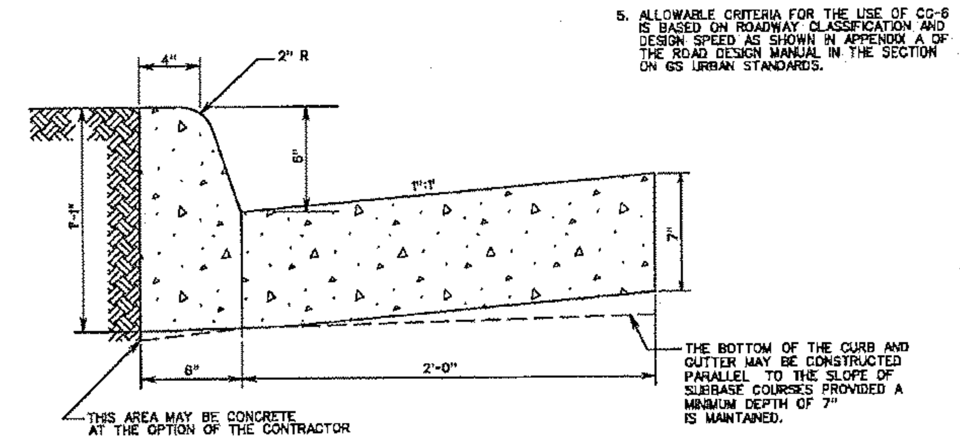
VDOT ROAD AND BRIDGE STANDARDS		CG-12 DETECTABLE WARNING SURFACE	SPECIFICATION REFERENCE
SHEET 1 OF 5 204.01	REVISION DATE 04/19	(GENERAL NOTES) VIRGINIA DEPARTMENT OF TRANSPORTATION	105 502 504

2016 ROAD & BRIDGE STANDARDS

CG-6

NOTES:

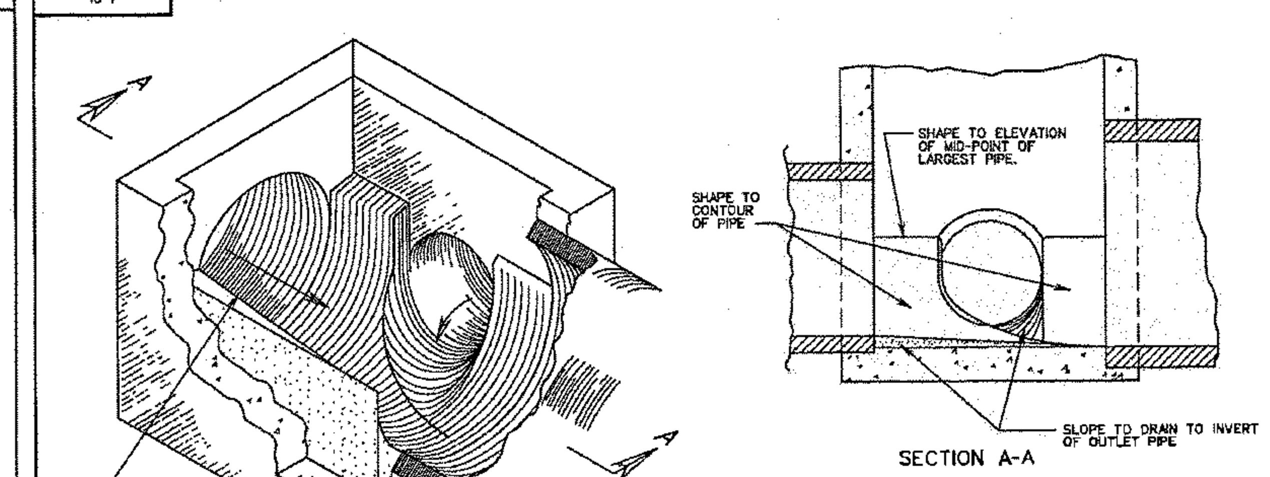
1. THIS ITEM MAY BE PRECAST OR CAST IN PLACE.
2. CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.
3. COMBINATION CURB & GUTTER HAVING A RADIUS OF 300 FEET OR LESS (ALONG FACE OF CURB) SHALL BE PAID FOR AS RADIAL COMBINATION CURB & GUTTER.
4. FOR USE WITH STABILIZED OPEN-GRADED DRAINAGE LAYER, THE BOTTOM OF THE CURB & GUTTER SHALL BE CONSTRUCTED PARALLEL TO THE SLOPE OF SUBBASE COURSES AND TO THE DEPTH OF THE PAVEMENT.
5. ALLOWABLE CRITERIA FOR THE USE OF CG-6 IS BASED ON ROADWAY CLASSIFICATION AND DESIGN SPEED AS SHOWN IN APPENDIX A OF THE ROAD DESIGN MANUAL IN THE SECTION ON GS URBAN STANDARDS.



SPECIFICATION REFERENCE	COMBINATION 6" CURB AND GUTTER	VDOT ROAD AND BRIDGE STANDARDS	
105 502	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE	SHEET 1 OF 1 201.03

2016 ROAD & BRIDGE STANDARDS

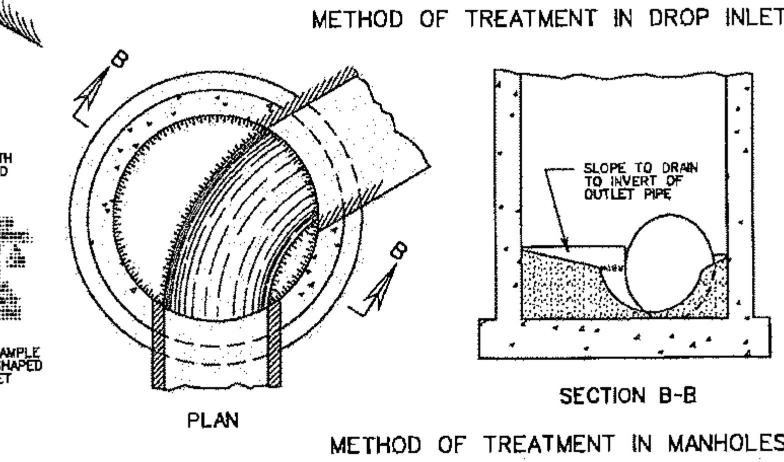
IS-1



METHOD OF TREATMENT IN DROP INLETS

NOTES:
SHAPING OF MANHOLE AND INLET INVERTS IN ACCORDANCE WITH THIS DRAWING IS TO APPLY TO THOSE STRUCTURES SPECIFIED ON PLANS OR WHERE INVERT OF PIPE IS ABOVE INVERT OF STRUCTURE.

DETAILS OF INVERT SHAPING AS SHOWN HEREON ARE FOR EXAMPLE PURPOSES ONLY. EACH MANHOLE OR DROP INLET IS TO BE SHAPED INDIVIDUALLY TO BEST FIT THE PARTICULAR INLET AND OUTLET CONFIGURATION AND FLOW LINES.

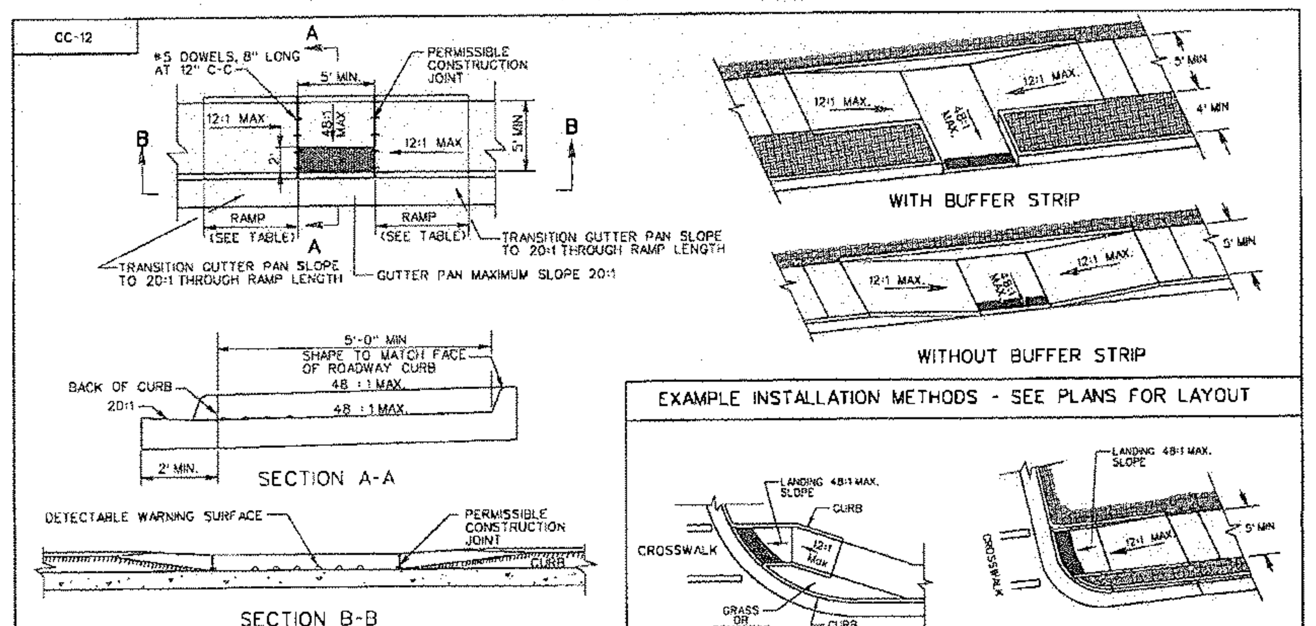


METHOD OF TREATMENT IN MANHOLES

VDOT ROAD AND BRIDGE STANDARDS		STANDARD METHOD OF SHAPING	SPECIFICATION REFERENCE
SHEET 1 OF 1 106.08	REVISION DATE	MANHOLE & INLET INVERTS VIRGINIA DEPARTMENT OF TRANSPORTATION	302

2016 ROAD & BRIDGE STANDARDS

CG-12

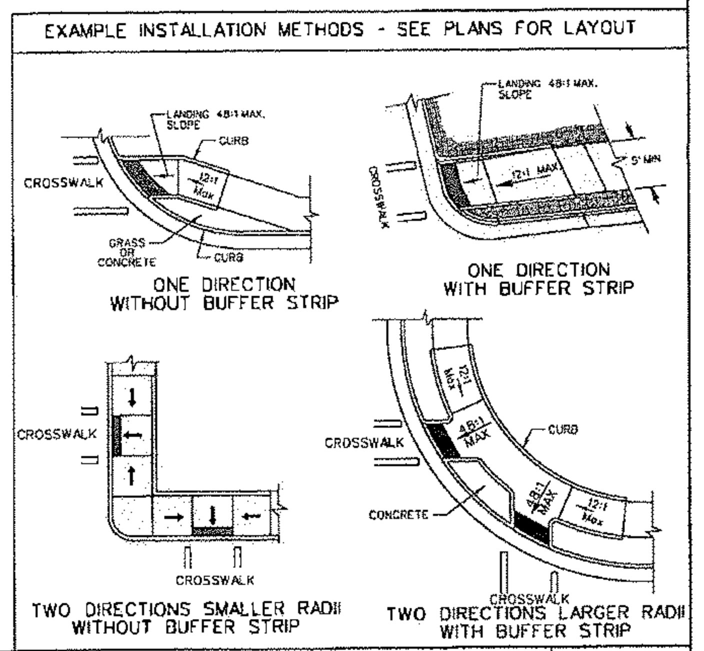


NOTES:

1. FOR GENERAL NOTES ON THE DETECTABLE WARNING SURFACE, SEE SHEET 1 OF 5.
2. THE REQUIRED LENGTH OF A PARALLEL RAMP IS LIMITED TO 15 FEET, REGARDLESS OF THE SLOPE.
3. GUTTER PAN SHALL BE A MAXIMUM SLOPE OF 20:1 AT THE RAMP OPENING.
4. DIAGONAL PLACEMENT IS NOT PERMITTED.

TYPE B PARALLEL APPLICATION		
ROADWAY GRADE IN PERCENT	MINIMUM RAMP LENGTH IN FEET	
	4" CURB	6" CURB
0	4	6
1	5	7
2	5	8
3	6	9
4	8	12
5	10	15
6	14	15

EXAMPLE INSTALLATION METHODS - SEE PLANS FOR LAYOUT

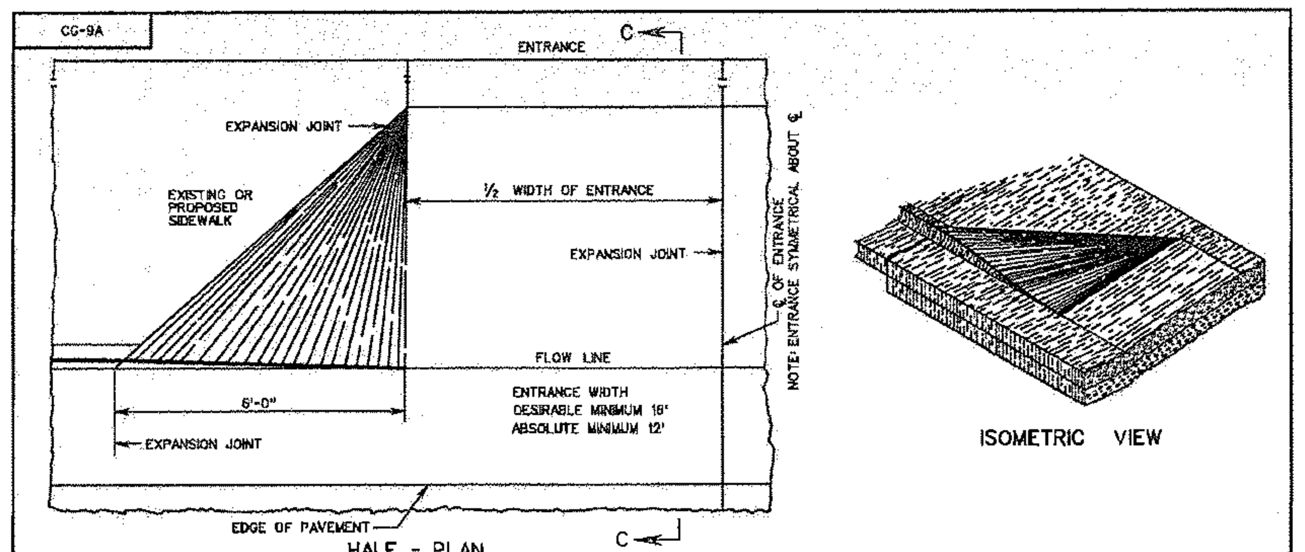


A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

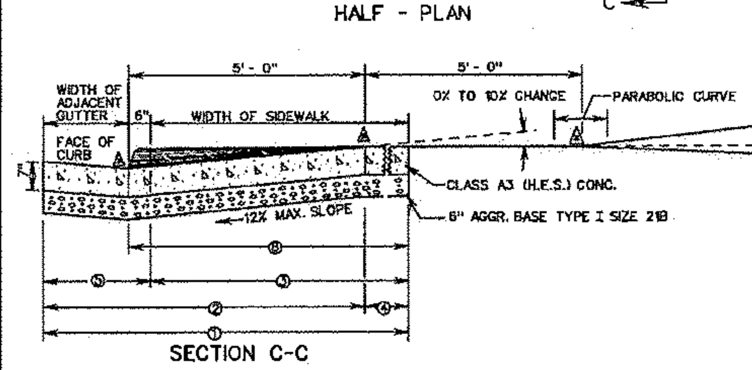
VDOT ROAD AND BRIDGE STANDARDS		CG-12 DETECTABLE WARNING SURFACE	SPECIFICATION REFERENCE
SHEET 3 OF 5 204.03	REVISION DATE 04/19	TYPE B (PARALLEL) APPLICATION VIRGINIA DEPARTMENT OF TRANSPORTATION	105 502 504

2016 ROAD & BRIDGE STANDARDS

CG-9A



WHEN USED IN CONJUNCTION WITH STANDARD CG-3 OR CG-7, THE CURB FACE ON THIS STANDARD IS TO BE ADJUSTED TO MATCH THE MOUNTABLE CURB CONFIGURATION.



** 12% MAXIMUM INCREASE IN SLOPE AT MINIMUM 10' INTERVALS
*** 3% MAXIMUM DECREASE IN SLOPE FOR FIRST 10' INTERVAL AND 8% MAXIMUM DECREASE FOR SUCCEEDING MINIMUM 10' INTERVALS

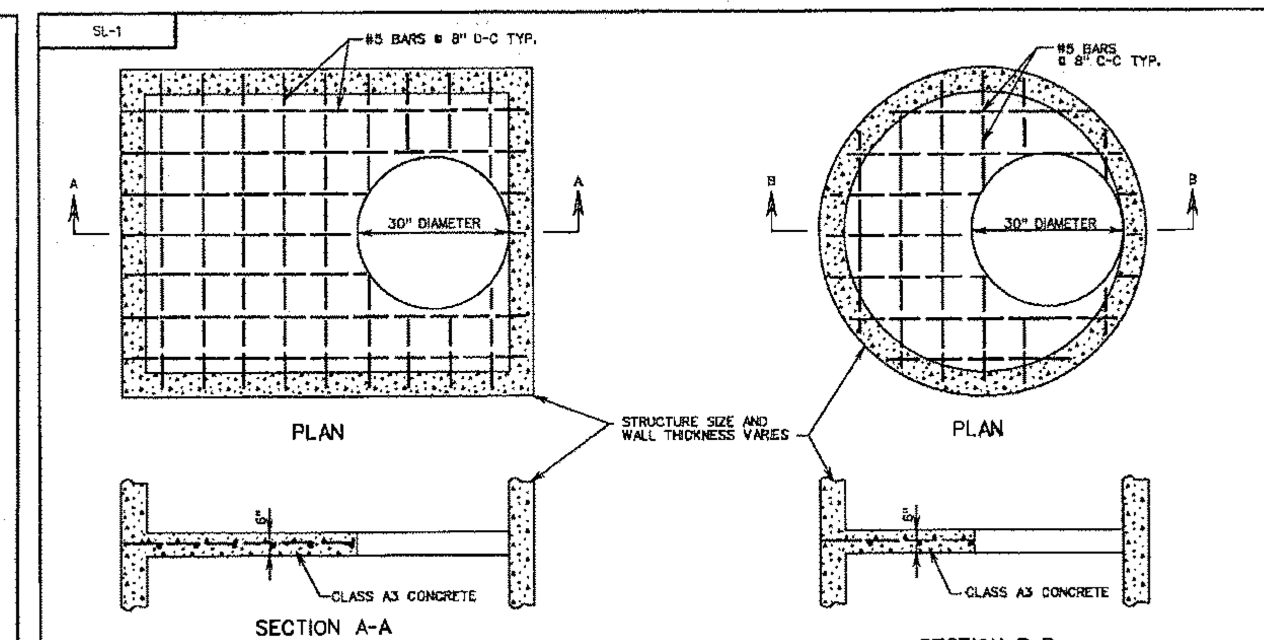
1. FOR SIDEWALK, CURB AND GUTTER - BUILT CONCURRENTLY.
2. FOR INITIAL CURB AND GUTTER ONLY.
3. FOR INITIAL SIDEWALK ONLY - 7" SIDEWALK TO BE DIPPED.
4. FOR PEDESTRIAN ACCESS ROUTE - MINIMUM 4'-0" TRAVERSABLE WIDTH IS REQUIRED WITH A MAXIMUM 2% CROSS SLOPE.
5. FOR CURB AND GUTTER ONLY - AFTER INITIAL SIDEWALK.
6. FOR CURB AND SIDEWALK ONLY - WITHOUT GUTTER.

△ INDICATES POINT OF GRADE CHANGE.

VDOT ROAD AND BRIDGE STANDARDS		STANDARD ENTRANCE GUTTER WITH FLARED OPENING	SPECIFICATION REFERENCE
SHEET 1 OF 1 203.01	REVISION DATE	(FOR USE ACROSS SIDEWALK) VIRGINIA DEPARTMENT OF TRANSPORTATION	502

2016 ROAD & BRIDGE STANDARDS

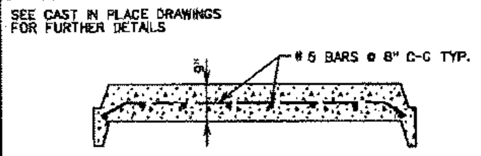
SL-1



NOTES:

1. THE STANDARD SAFETY SLAB (SL-1) IS TO BE USED ONLY WHEN SPECIFIED IN THE PLANS ON THE DRAINAGE SUMMARY SHEET AND/OR THE DRAINAGE DESCRIPTION. FOR MANHOLES, JUNCTION BOXES, AND DROP INLETS WITH HEIGHTS GREATER THAN 12 FEET, THE SPACING OF ADJACENT SAFETY SLABS SHALL BE 8' TO 12' WITH NO SAFETY SLAB LOCATED WITHIN 6 FEET OF THE TOP OR BOTTOM OF THE STRUCTURE. SAFETY SLABS SHALL NOT BE LOCATED BELOW ANY INLET PIPE OF 30" DIAMETER OR GREATER.
2. THE COST OF THE SL-1 IS INCLUDED IN THE COST OF THE STRUCTURE.
3. ACCESS OPENINGS ARE TO BE STAGGERED FROM ONE SIDE OF STRUCTURE TO THE OTHER WHERE APPLICABLE. STEPS ARE TO BE STAGGERED ACCORDINGLY.
4. SAFETY SLAB MAY BE CAST-IN-PLACE OR PRECAST. CAST-IN-PLACE CONCRETE TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE A4 (4000 PSI). REINFORCING STEEL TO BE IN ACCORDANCE WITH AASHTO M31.
5. ACCESS OPENINGS MAY BE 30" DIAMETER OR 30" SQUARE. WHEN STRUCTURE WIDTH IS LESS THAN 30" THE ACCESS OPENING SHALL BE RECTANGULAR (STRUCTURE WIDTH BY 30" LONG).

SEE CAST IN PLACE DRAWINGS FOR FURTHER DETAILS



TYPICAL PRECAST UNIT

VDOT ROAD AND BRIDGE STANDARDS		TYPICAL CONCRETE SAFETY SLAB FOR DROP INLETS,	SPECIFICATION REFERENCE
SHEET 1 OF 1 106.14	REVISION DATE	MANHOLES AND JUNCTION BOXES VIRGINIA DEPARTMENT OF TRANSPORTATION	302

2016 ROAD & BRIDGE STANDARDS

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S. E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

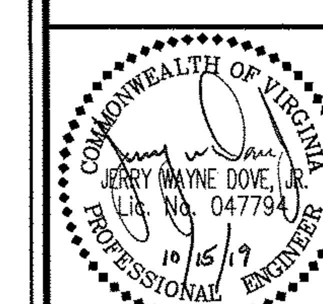
© Bowman Consulting Group, Ltd.

VDOT STORM AND PAVEMENT DETAILS

HAPPY CREEK KNOLLS SECTION 4

FINAL SUBDIVISION PLAN

TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA



PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS
DATE	DESCRIPTION

GC DESIGN	MCW DRAWN	CHKD

SCALE H: V:

JOB No. 1602-02-016

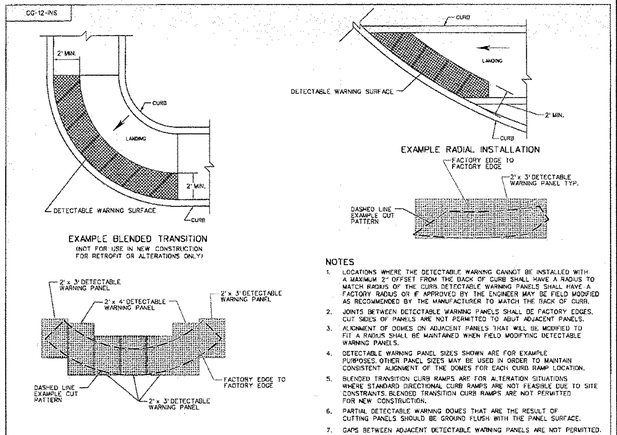
DATE JULY 19, 2019

FILE No. 1602-D-CP-005

SHEET 32 OF 33

Cad file name: P:\1602 - happy creek knolls sec 3\1602-04-001 (eng)\engineering\engineering plans\Sheets\1602-D-CP-001-MISC-DET.dwg

CG-12-INS



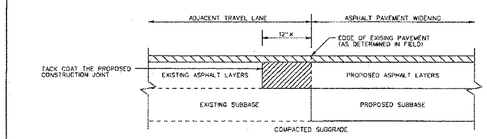
NOTES

1. LOCATIONS WHERE THE DETECTABLE WARNING CANNOT BE INSTALLED WITH A MAXIMUM 2" OFFSET FROM THE BACK OF CURB SHALL HAVE A RADIUS TO MATCH RADIUS OF THE CURB. DETECTABLE WARNING PANELS SHALL HAVE A FACTORY RADIUS OR IF APPROVED BY THE ENGINEER MAY BE FIELD MODIFIED AS RECOMMENDED BY THE MANUFACTURER TO MATCH THE BACK OF CURB.
2. JOINTS BETWEEN DETECTABLE WARNING PANELS SHALL BE FACTORY EDGES. CUT SIDES OF PANELS ARE NOT PERMITTED TO ABUT ADJACENT PANELS.
3. ALIGNMENT OF DOMES ON ADJACENT PANELS THAT WILL BE MODIFIED TO FIT A RADIUS SHALL BE MAINTAINED WHEN FIELD MODIFYING DETECTABLE WARNING PANELS.
4. DETECTABLE WARNING PANEL SIZES SHOWN ARE FOR EXAMPLE PURPOSES. OTHER PANEL SIZES MAY BE USED IN ORDER TO MAINTAIN CONSISTENT ALIGNMENT OF THE DOMES FOR EACH CURB RAMP LOCATION.
5. BLENDED TRANSITION CURB RAMPS ARE FOR ALTERATION SITUATIONS WHERE STANDARD DIRECTIONAL CURB RAMPS ARE NOT FEASIBLE DUE TO SITE CONSTRAINTS. BLENDED TRANSITION CURB RAMPS ARE NOT PERMITTED FOR NEW CONSTRUCTION.
6. PARTIAL DETECTABLE WARNING DOMES THAT ARE THE RESULT OF CUTTING PANELS SHOULD BE GROUND FLUSH WITH THE PANEL SURFACE.
7. GAPS BETWEEN ADJACENT DETECTABLE WARNING PANELS ARE NOT PERMITTED.
8. SEE PLANS FOR CROSSWALK MARKINGS, TURNING AREAS, ROUTE WIDTHS, GRADE CHANGES, AND RAMP CONFIGURATIONS.

VDOT ROAD AND BRIDGE STANDARDS		A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.	SPECIFICATION REFERENCE
SHEET 2 OF 2	REVISION DATE	CG-12 DETECTABLE WARNING SURFACE METHOD OF INSTALLING DETECTABLE WARNINGS ON A RADIUS VIRGINIA DEPARTMENT OF TRANSPORTATION	105 502 504
204.07	NEW 04/19		

2016 ROAD & BRIDGE STANDARDS

WP-2



CONSTRUCTION JOINT DETAIL

REMOVE EXISTING ASPHALT LAYERS TO EXISTING SUBBASE AND REPLACE WITH PROPOSED ASPHALT WIDENING LAYERS

PROPOSED MINIMUM 1½ INCH THICK ASPHALT SURFACE COURSE (SEE NOTE 5)

x MINIMUM 12 INCHES OR GREATER AS NECESSARY TO ABUT THE FULL THICKNESS OF EXISTING ASPHALT LAYERS AS DETERMINED BY CORES (SEE NOTE 3)

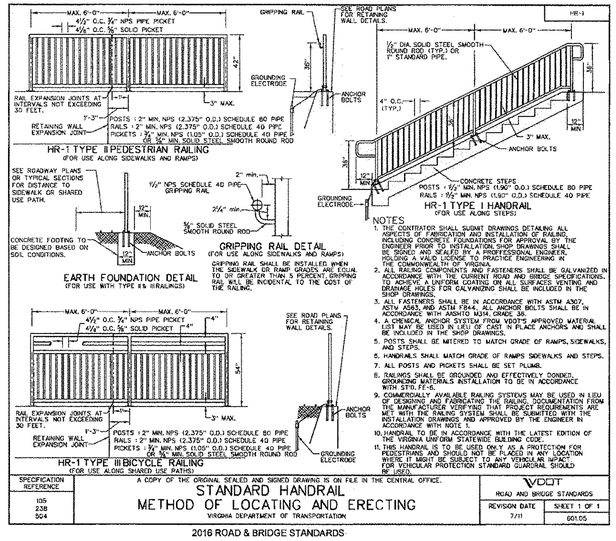
NOTES:

1. ASPHALT PAVEMENT WIDENING SHALL HAVE A PAVEMENT DESIGN IN ACCORDANCE WITH CURRENT VDOT PROCEDURES AND BE APPROVED BY THE ENGINEER.
2. THE PAVEMENT DESIGN FOR ASPHALT PAVEMENT WIDENING SHALL MEET OR EXCEED THE DEPTHS AND TYPES OF THE LAYERS OF EXISTING PAVEMENT. SUBSURFACE DRAINAGE OF THE EXISTING AND PROPOSED PAVEMENT SHALL BE ADDRESSED IN THE PAVEMENT DESIGN.
3. A MINIMUM OF THREE CORES SHALL BE TAKEN ALONG THE CENTER OF THE ADJACENT TRAVEL LANE TO DETERMINE THE TYPE AND THICKNESS OF EXISTING PAVEMENT LAYERS. THESE CORES SHALL BE SPACED NO MORE THAN 500 FEET APART.
4. THE ADJACENT TRAVEL LANE SHALL BE MILLED A MINIMUM DEPTH OF 1½ INCHES AND REPLACED WITH AN ASPHALT SURFACE COURSE TO MATCH THE PROPOSED PAVEMENT WIDENING SURFACE COURSE, UNLESS WAIVED BY THE ENGINEER.
5. THE ENGINEER MAY REQUIRE THE MILLING DEPTH OF THE EXISTING PAVEMENT TO BE ADJUSTED TO ACHIEVE AN ACCEPTABLE PAVEMENT CROSS-SLOPE AND EFFECTIVE SURFACE DRAINAGE.
6. EXISTING PAVEMENT MARKINGS AND MARKERS WITHIN THE PROJECT LIMITS SHALL BE RESTORED SUBJECT TO THE APPROVAL OF THE ENGINEER.
7. FINAL TRANSVERSE PAVEMENT TIE-IN SHALL CONFORM TO THE REQUIREMENTS OF SECTION 315 OF THE SPECIFICATIONS EXCEPT THAT ALL JOINTS AT TIE-IN LOCATIONS SHALL BE TESTED USING A 10 FOOT STRAIGHTEDGE IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 315 OF THE SPECIFICATIONS.

VDOT ROAD AND BRIDGE STANDARDS			SPECIFICATION REFERENCE
SHEET 1 OF 1	REVISION DATE	ASPHALT PAVEMENT WIDENING FOR WIDENING SUBJECT TO TRAFFIC VIRGINIA DEPARTMENT OF TRANSPORTATION	315
303.02			

2016 ROAD & BRIDGE STANDARDS

HR-1



NOTES

1. THE CONTRACTOR SHALL SUBMIT DRAWINGS DETAILING ALL ASPECTS OF FABRICATION AND INSTALLATION OF RAILING, INCLUDING CONCRETE FOUNDATIONS FOR APPROVAL BY THE ENGINEER PRIOR TO INSTALLATION. SHOP DRAWINGS SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER, HOLDING A VALID LICENSE TO PRACTICE ENGINEERING IN THE COMMONWEALTH OF VIRGINIA.
2. THE GROUNDING COMPONENTS AND FASTENERS SHALL BE GALVANIZED IN ACCORDANCE WITH THE CURRENT ROAD AND BRIDGE SPECIFICATIONS TO ACHIEVE A UNIFORM COATING ON ALL SURFACES. VENTING AND DRAINAGE HOLES FOR GALVANIZING SHALL BE INCLUDED IN THE SHOP DRAWINGS.
3. ALL FASTENERS SHALL BE IN ACCORDANCE WITH ASTM A307, ASTM A563, AND ASTM F844. ALL ANCHOR BOLTS SHALL BE IN ACCORDANCE WITH AASHTO M314, GRADE 36.
4. A CHEMICAL ANCHOR SYSTEM FROM VDOT'S APPROVED MATERIAL LIST MAY BE USED IN LIEU OF CAST IN PLACE ANCHORS AND SHALL BE INCLUDED IN THE SHOP DRAWINGS.
5. POSTS SHALL BE MITERED TO MATCH GRADE OF RAMPS, SIDEWALKS, AND STEPS.
6. HANDRAILS SHALL MATCH GRADE OF RAMPS SIDEWALKS AND STEPS.
7. ALL POSTS AND PICKETS SHALL BE SET PLUMB.
8. RAILINGS SHALL BE GROUNDED AND EFFECTIVELY BONDED. GROUNDING MATERIALS INSTALLATION TO BE IN ACCORDANCE WITH STD. EE-6.
9. COMMERCIALLY AVAILABLE RAILING SYSTEMS MAY BE USED IN LIEU OF DESIGNING AND FABRICATING THE RAILING. DOCUMENTATION FROM THE MANUFACTURER VERIFYING THAT PROJECT REQUIREMENTS ARE MET WITH THE RAILING SYSTEM SHALL BE SUBMITTED WITH THE INSTALLATION DRAWINGS AND APPROVED BY THE ENGINEER IN ACCORDANCE WITH NOTE 1.
10. HANDRAIL TO BE IN ACCORDANCE WITH THE LATEST EDITION OF THE VIRGINIA UNIFORM STATEWIDE BUILDING CODE.
11. THIS HANDRAIL IS TO BE USED ONLY AS A PROTECTION FOR PEDESTRIANS AND SHOULD NOT BE PLACED IN ANY LOCATION WHERE IT MIGHT BE SUBJECT TO ANY VEHICULAR IMPACT. FOR VEHICULAR PROTECTION STANDARD GUARDRAIL SHOULD BE USED.

SPECIFICATION REFERENCE	A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.	VDOT ROAD AND BRIDGE STANDARDS	
105 238 504	STANDARD HANDRAIL METHOD OF LOCATING AND ERECTING VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE 7/11	SHEET 1 OF 1 601.05

2016 ROAD & BRIDGE STANDARDS

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

VDOT STORM AND PAVEMENT DETAILS

HAPPY CREEK KNOLLS
SECTION 4
FINAL SUBDIVISION PLAN

TOWN OF FRONT ROYAL WARREN COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
JERRY WAYNE DOVE, JR.
No. 047794
10/15/19
PROFESSIONAL ENGINEER

PLAN STATUS	
07/24/19	COUNTY SUBMISSION
10/01/19	COUNTY COMMENTS

DATE	DESCRIPTION

GC	MCW	
DESIGN	DRAWN	CHKD
SCALE	H: V:	

JOB No. 1602-02-016

DATE JULY 19, 2019

FILE No. 1602-0-CP-005

SHEET 33 OF 33

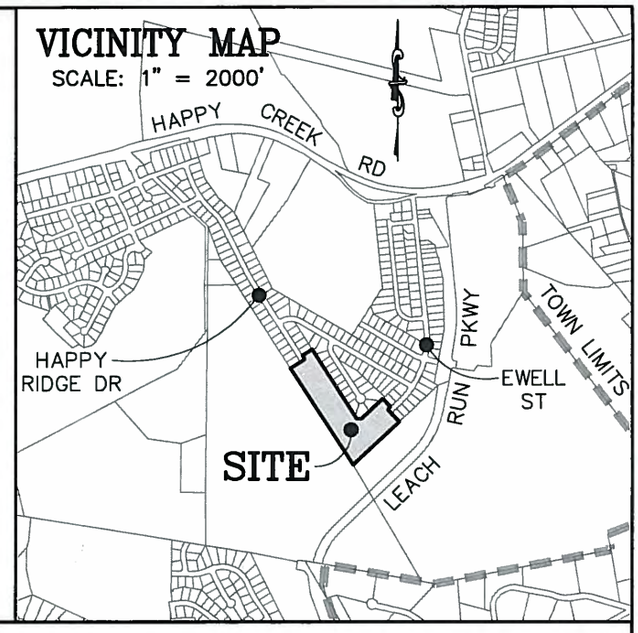
Cad file name: K:\1602 - Happy Creek Knolls Sec 3\1602-04-001 (eng)\engineering\plans\Sheets\1602-04-001-1602-DE.dwg

APPROVALS

TOWN OF FRONT ROYAL PLANNING COMMISSION _____ DATE _____

TOWN COUNCIL _____ DATE _____

DIRECTOR OF FINANCE _____ DATE _____



OWNER'S CONSENT AND DEDICATION

I, CHRIS S. RAMSEY, PRESIDENT OF RAMSEY, INC., A VIRGINIA CORPORATION, THE OWNER AND DEVELOPER OF THE SUBDIVISION SHOWN HEREON, DO HEREBY CERTIFY THAT THE SUBDIVSION AND EASEMENTS DEPICTED HEREIN ARE WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE DESIRE OF THE UNDERSIGNED OWNER.

PRESIDENT OF RAMSEY, INC. _____ DATE _____

NOTARY'S CERTIFICATE

I, _____, A NOTARY PUBLIC IN AND FOR THE COMMONWEALTH OF VIRGINIA, AT LARGE, DO HERBY CERTIFY THAT _____, WHOSE NAME(S) IS(ARE) SIGNED TO THE FOREGOING OWNER'S CONSENT AND DEDICATION, HAS(HAVE) ACKNOWLEDGED THE SAME BEFORE ME IN MY STATE.

GIVEN UNDER MY HAND THIS _____ DAY OF _____, 2019

MY COMMISSION EXPIRES _____

AREA TABULATION

33 LOTS	374,768 S.F.	OR 8.60346 ACRES
LOT 900	67,551 S.F.	OR 1.55077 ACRES
STREET	99,011 S.F.	OR 2.27299 ACRES
TOTAL AREA	541,330 S.F.	OR 12.42722 ACRES

SURVEYOR'S CERTIFICATE

I, PAUL SWARTZ, A DULY LICENSED LAND SURVEYOR IN THE COMMONWEALTH OF VIRGINIA, DO HEREBY CERTIFY THAT THE PROPERTY SHOWN HEREON IS NOW IN THE NAME OF RAMSEY, INC., A VIRGINIA CORPORATION, AS RECORDED IN INSTRUMENT 010008722, LAST MODIFIED BY INSTRUMENT 070005283; ALL AMONG THE LAND RECORDS OF WARREN COUNTY, VIRGINIA.

I FURTHER CERTIFY THAT THIS SUBDIVISION LIES WITHIN THE BOUNDS OF THE ORIGINAL TRACT AND THAT THIS SURVEY COMPLIES WITH THE MINIMUM STANDARDS ESTABLISHED BY THE VIRGINIA BOARD OF ARCHITECTS, PROFESSIONAL ENGINEERS, LAND SURVEYORS, CERTIFIED INTERIOR DESIGNERS AND LANDSCAPE ARCHITECTS.

PAUL SWARTZ
L.S. 002701

FINAL PLAT

HAPPY CREEK KNOLLS

SECTION 4

HAPPY CREEK MAGISTERIAL DISTRICT

WARREN COUNTY, VIRGINIA

1602-A-RP-003

DWG: P:\1602 - Happy Creek Knolls Sec 3\1602-02-015 (SUR) - Happy Creek Knolls Sec 4\Survey\Plats\1602-A-RP-003.dwg

DATE: AUGUST 5, 2019

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175

Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

REVISION

COMMONWEALTH OF VIRGINIA
PAUL SWARTZ
Lic. No. 002701
8-5-19
LAND SURVEYOR

BCG PROJECT NO: 1602-02-016 TASK: 00010	SHEET 1 OF 11	BY: SKS
COUNTY REF NO:	SCALE: NONE	CHK:

CURVE TABLE

CURVE	RADIUS	LENGTH	CHORD BEARING	CHORD	DELTA	TANGENT
C1	170.00'	298.37'	N 73°49'31" W	261.52'	100°33'34"	204.62'
C2	230.00'	403.65'	N 73°49'40" W	353.81'	100°33'17"	276.81'
C3	25.00'	39.27'	S 68°33'01" E	35.36'	90°00'00"	25.00'
C4	25.00'	39.27'	S 21°26'59" W	35.36'	90°00'00"	25.00'
C5	200.00'	351.00'	N 73°49'40" W	307.66'	100°33'17"	240.71'

EASEMENT LEGEND

(E) 10' ELECTRIC EASEMENT

(SD) STORM DRAINAGE EASEMENT

(SS) SANITARY SEWER EASEMENT

(W) WATERLINE EASEMENT

(E) EX. 10' ELECTRIC EASEMENT
INSTR. 070005283

(SD1) EX. STORM DRAIN EASEMENT
INSTR. 030014359
HATCHED PORTION HEREBY VACATED

(SD2) EX. TEMPORARY STORM DRAIN EASEMENT
INSTR. 070005283
HATCHED PORTION HEREBY VACATED

(SS) EX. TEMPORARY SANITARY SEWER EASEMENT
INSTR. 070005283
HATCHED PORTION HEREBY VACATED

(TT) EX. TEMPORARY TURNAROUND EASEMENT
INSTR. 070005283
HATCHED PORTION HEREBY VACATED

(W) EX. TEMPORARY WATER EASEMENT
INSTR. 070005283
HATCHED PORTION HEREBY VACATED

LINE TABLE

LINE	BEARING	DISTANCE
L1	N 66°26'59" E	120.03'
L2	S 68°46'27" W	39.07'
L3	S 58°12'45" W	30.86'
L4	S 54°22'00" W	29.42'
L5	S 40°25'36" W	36.48'
L6	S 70°00'32" E	7.09'
L7	N 86°59'15" E	27.59'
L8	N 80°30'55" E	50.77'
L9	N 73°28'00" E	24.14'
L10	N 63°32'18" E	23.63'
L11	N 22°16'49" W	63.91'
L12	N 55°53'41" E	74.04'
L13	S 34°06'19" E	107.41'
L14	S 32°37'17" W	21.26'
L15	S 61°09'36" W	64.74'
L16	N 55°53'41" E	76.00'
L17	S 85°11'21" E	76.02'
L18	N 63°56'12" E	135.46'
L19	N 54°42'52" W	77.12'
L20	N 27°45'25" W	150.38'
L21	N 76°25'01" E	20.07'
L22	N 34°04'38" W	7.58'
L23	S 66°59'13" W	26.45'
L24	N 18°04'36" E	37.10'

NOTES

1. THE PROPERTY DELINEATED HEREON IS LOCATED ON WARREN COUNTY TAX ASSESSMENT MAP 20A2 ((13)) PARCEL G AND IS ZONED R-1.
2. THE PROPERTY IS NOW IN THE NAME OF RAMSEY, INC AS RECORDED IN INSTRUMENT 01-0008722 AMONG THE LAND RECORDS OF WARREN COUNTY, VIRGINIA.
3. BOUNDARY AND NORTH MERIDIAN INFORMATION AS SHOWN HEREON ARE BASED ON A RECORD PLAT OF HAPPY CREEK KNOLLS, SECTION 1 AS RECORDED IN INSTRUMENT 010009421 AMONG THE LAND RECORDS OF WARREN COUNTY, VIRGINIA AND DOES NOT REPRESENT A CURRENT FIELD RUN SURVEY.
4. THE PROPERTY AS SHOWN HEREON IS SUBJECT TO ALL COVENANTS AND RESTRICTIONS OF RECORD AND THOSE RECORDED HEREWITH. BOWMAN CONSULTING GROUP, LTD. HAS NOT BEEN PROVIDED A TITLE REPORT AND THEREFORE THIS PLAT DOES NOT NECESSARILY INDICATE THE EXISTENCE OF ANY COVENANTS AND RESTRICTIONS ON THE PROPERTY.
5. CORNER MARKERS TO BE SET PURSUANT TO WARREN COUNTY SUBDIVISION ORDINANCE AS MANDATED BY SUBSECTION 15.2-2240 OF THE CODE OF VIRGINIA.
6. THE PROPERTY SHOWN HEREON IS NOT IN A 100-YEAR FLOODPLAIN. IT LIES IN ZONE "X" (UN-SHADED)(AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN) AS SHOWN ON FEMA FLOOD INSURANCE RATE MAP FOR TOWN OF FRONT ROYAL VIRGINIA, WARREN COUNTY, COMMUNITY-PANEL NUMBER 51187C0116C, EFFECTIVE DATE JUNE 3, 2008.
7. BULDING RESTRICTION LINES AS FOLLOWS:
   FRONT: 35 FEET
   SIDE: 10 FEET
   REAR: 25 FEET

FINAL PLAT
HAPPY CREEK KNOLLS
SECTION 4
HAPPY CREEK MAGISTERIAL DISTRICT
WARREN COUNTY, VIRGINIA

1602-A-RP-003

DWG: P:\1602 - Happy Creek Knolls Sec 3\1602-02-015 (SUR) - Happy Creek Knolls Sec 4\Survey\Plats\1602-A-RP-003.dwg

DATE: AUGUST 5, 2019

Bowman CONSULTING
Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

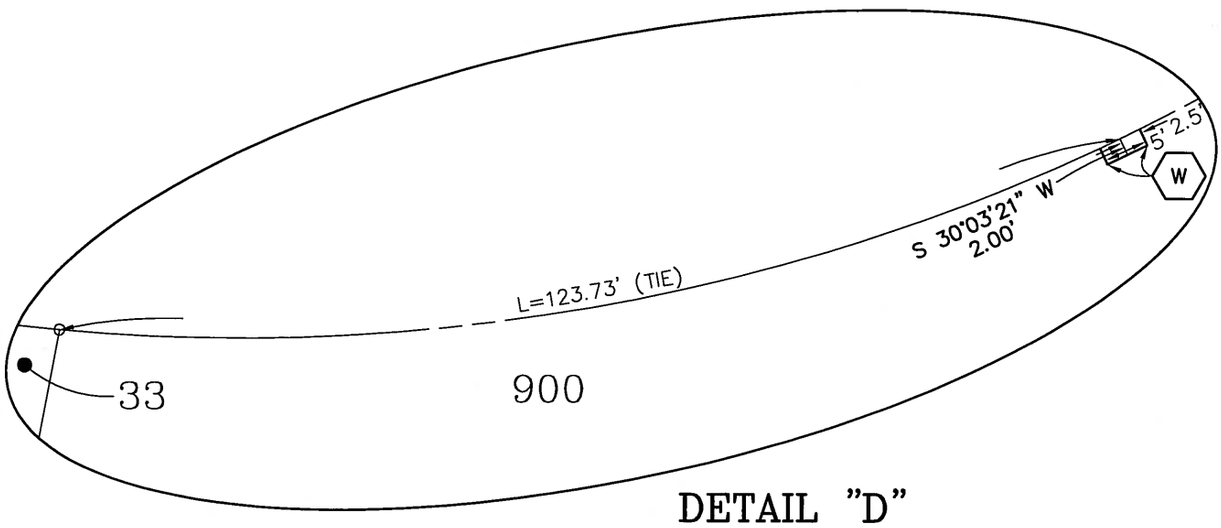
REVISION

COMMONWEALTH OF VIRGINIA
PAUL SWARTZ
Lic. No. 002701
8-5-19
LAND SURVEYOR

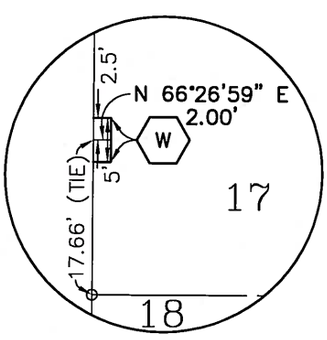
BCG PROJECT NO: 1602-02-016 TASK: 00010	SHEET 2 OF 11	BY: SKS
COUNTY REF NO:	SCALE: NONE	CHK:

ADJACENT OWNER INFORMATION

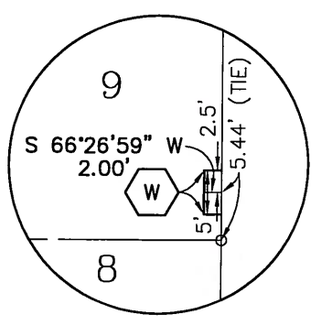
LOT IDENTIFICATION			TAX MAP #	OWNERS NAME	DEED REFERENCE
LOT 57	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-57	ELI THOMAS JOHNSON	INSTR. 160006592
LOT 58	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-58	KAREN FLICK-TOMLINSON	INSTR. 090002897
LOT 64	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-64	KEVIN T. JENKINS	INSTR. 060003463
LOT 65	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-65	JOHN B. & MARIE P. MAVRETICH	INSTR. 180002557
LOT 66	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-66	JAMES L. & VALERIE S. CLARK	INSTR. 170005635
LOT 67	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-67	MARY ELIZABETH BOCKRATH	INSTR. 080000003
LOT 68	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-68	ERIC J. & SARAH T. JENISLAWSKI	INSTR. 060004592
LOT 69	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-69	KENNETH TERRY LECKIE	INSTR. 180004020
LOT 70	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-70	KEITH W. & MICHELLE L. FAUVER	INSTR. 180001002
LOT 71	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-71	DAVID EDWARD FISHER	INSTR. 130004722
LOT 72	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-72	JOHN M. KELLY	INSTR. 110000102
LOT 73	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-73	KRISTI N. COONS	INSTR. 160005012
LOT 74	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-74	PETER KOZHENEVSKY	INSTR. 050016309
LOT 75	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-75	MICHAEL R. KELLY	INSTR. 120000401
LOT 76	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-76	TIMOTHY J. TAYLOR	INSTR. 170002441
LOT 77	SECTION 2	HAPPY CREEK KNOLLS	T.M. 20A213-2-77	JAMES M. & BETSY A. SHANLEY	INSTR. 170001877
LOT 112	SECTION 3	HAPPY CREEK KNOLLS	T.M. 20A213-3-16	JERRY L. HAMMAN	INSTR. 090004905
LOT 135	SECTION 3	HAPPY CREEK KNOLLS	T.M. 20A213-3-17	JERRY L. HAMMAN	INSTR. 090004905
LOT 138	SECTION 3	HAPPY CREEK KNOLLS	T.M. 20A213-3-20	JOHN WESLEY EVANS IV	INSTR. 190001619



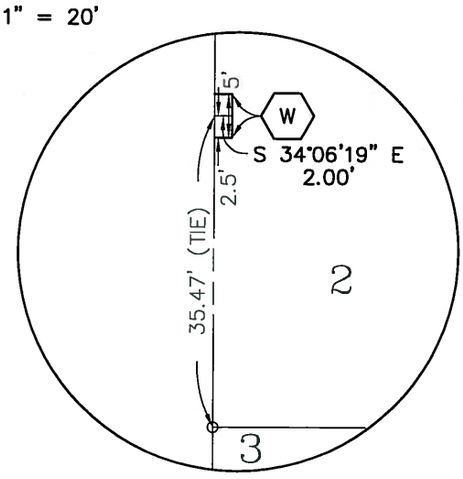
DETAIL "D"
SCALE: 1" = 20'



DETAIL "A"
SCALE: 1" = 20'



DETAIL "B"
SCALE: 1" = 20'



DETAIL "D"
SCALE: 1" = 20'

FINAL PLAT
HAPPY CREEK KNOLLS
SECTION 4
HAPPY CREEK MAGISTERIAL DISTRICT
WARREN COUNTY, VIRGINIA

20 0 10 20
GRAPHIC SCALE

1602-A-RP-003

DWG: P:\1602 - Happy Creek Knolls Sec 3\1602-02-015 (SUR) - Happy Creek Knolls Sec 4\Survey\Plats\1602-A-RP-003.dwg

DATE: AUGUST 5, 2019

Bowman CONSULTING

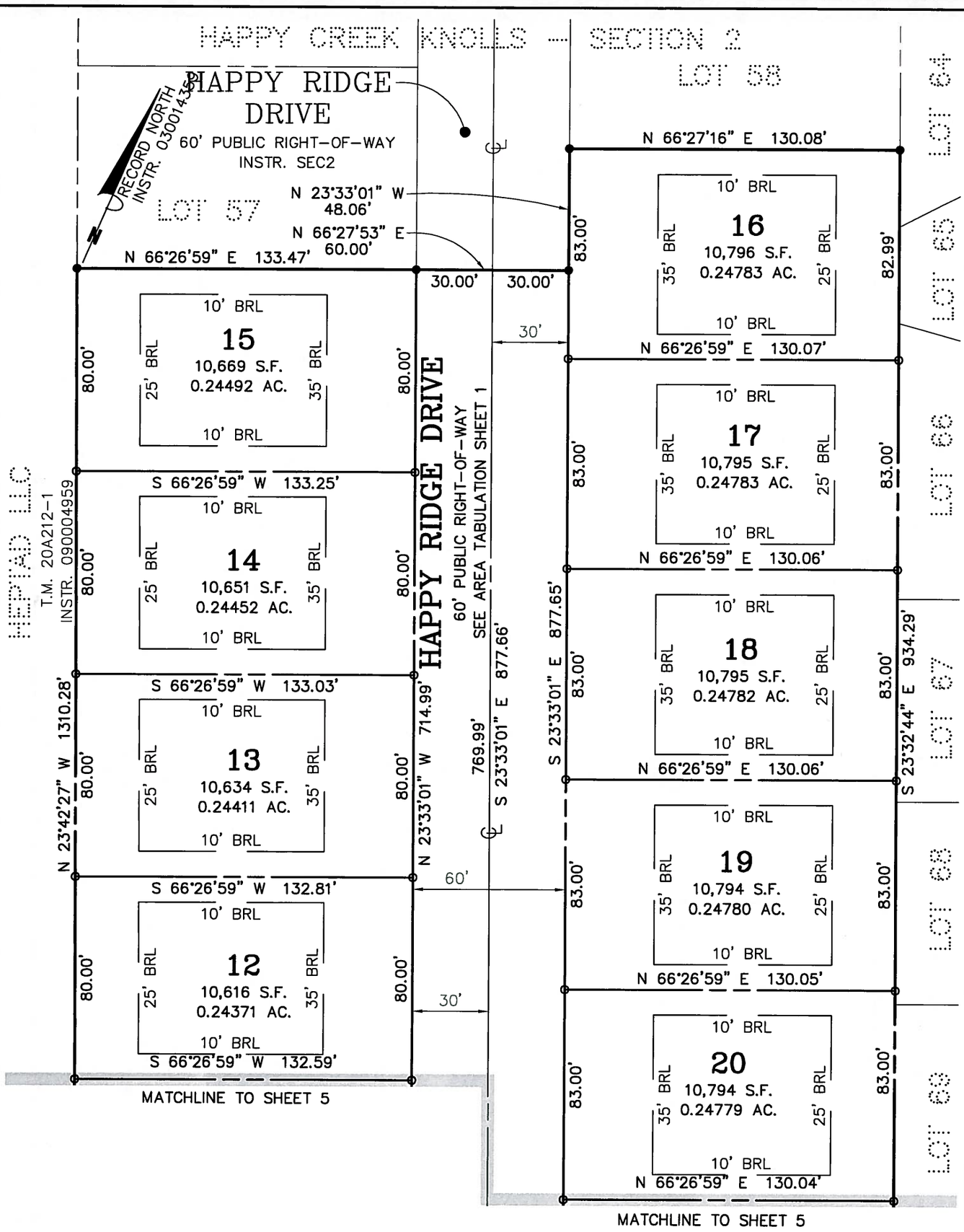
Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

REVISION

COMMONWEALTH OF VIRGINIA
PAUL SWARTZ
Lic. No. 002701
8-5-19
LAND SURVEYOR

BCG PROJECT NO: 1602-02-016 TASK: 00010	SHEET 3 OF 11	BY: SKS
COUNTY REF NO:	SCALE: 1" = 20'	CHK:



BRL MERGED AROUND
* = PROPOSED EASEMENT
SEE SHEETS 9 & 11

50 0 25 50
GRAPHIC SCALE

FINAL PLAT
HAPPY CREEK KNOLLS
SECTION 4
HAPPY CREEK MAGISTERIAL DISTRICT
WARREN COUNTY, VIRGINIA

1602-A-RP-003

DWG: P:\1602 - Happy Creek Knolls Sec 3\1602-02-015 (SUR) - Happy Creek Knolls Sec 4\Survey\Plats\1602-A-RP-003.dwg

DATE: AUGUST 5, 2019

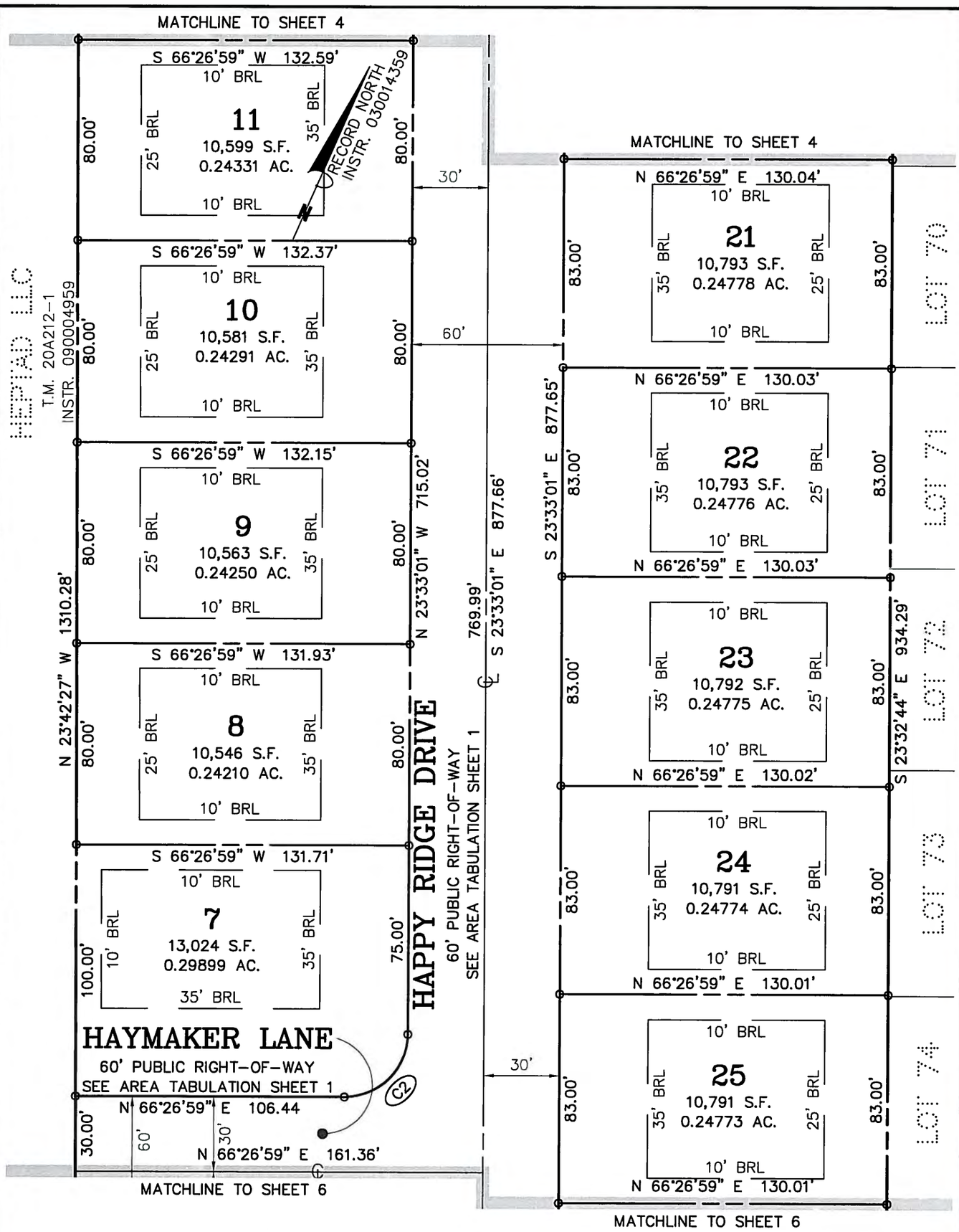
Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com
© Bowman Consulting Group, Ltd.

REVISION

COMMONWEALTH OF VIRGINIA
PAUL SWARTZ
Lic. No. 002701
8-5-19
LAND SURVEYOR

BCG PROJECT NO: 1602-02-016 TASK: 00010	SHEET 4 OF 11	BY: SKS
COUNTY REF NO:	SCALE: 1" = 50'	CHK:



BRL MERGED AROUND
* = PROPOSED EASEMENT
SEE SHEETS 9 & 11

50 0 25 50
GRAPHIC SCALE

FINAL PLAT

HAPPY CREEK KNOLLS

SECTION 4

HAPPY CREEK MAGISTERIAL DISTRICT
WARREN COUNTY, VIRGINIA

1602-A-RP-003

DWG: P:\1602 - Happy Creek Knolls Sec 3\1602-02-015 (SUR) - Happy Creek Knolls Sec 4\Survey\Plats\1602-A-RP-003.dwg

DATE: AUGUST 5, 2019

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175

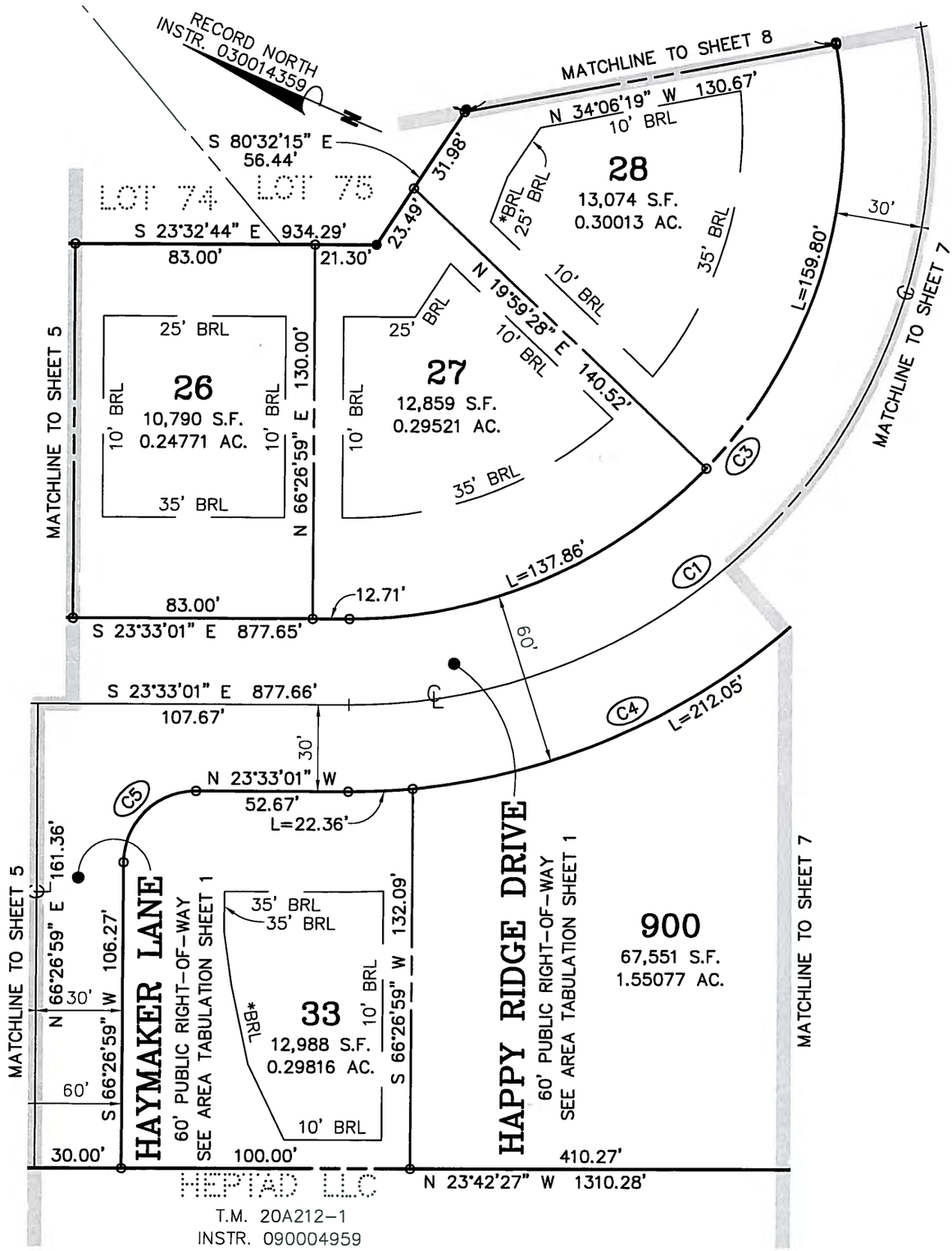
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

REVISION

COMMONWEALTH OF VIRGINIA
PAUL SWARTZ
Lic. No. 002701
8-5-19
LAND SURVEYOR

BCG PROJECT NO: 1602-02-016 TASK: 00010	SHEET 5 OF 11	BY: SKS
COUNTY REF NO:	SCALE: 1" = 50'	CHK:



* = BRL MERGED AROUND PROPOSED EASEMENT SEE SHEETS 9 & 11

50 0 25 50
GRAPHIC SCALE

FINAL PLAT
HAPPY CREEK KNOLLS
SECTION 4
HAPPY CREEK MAGISTERIAL DISTRICT
WARREN COUNTY, VIRGINIA

1602-A-RP-003

DWG: P:\1602 - Happy Creek Knolls Sec 3\1602-02-015 (SUR) - Happy Creek Knolls Sec 4\Survey\Plats\1602-A-RP-003.dwg

DATE: AUGUST 5, 2019

Bowman CONSULTING

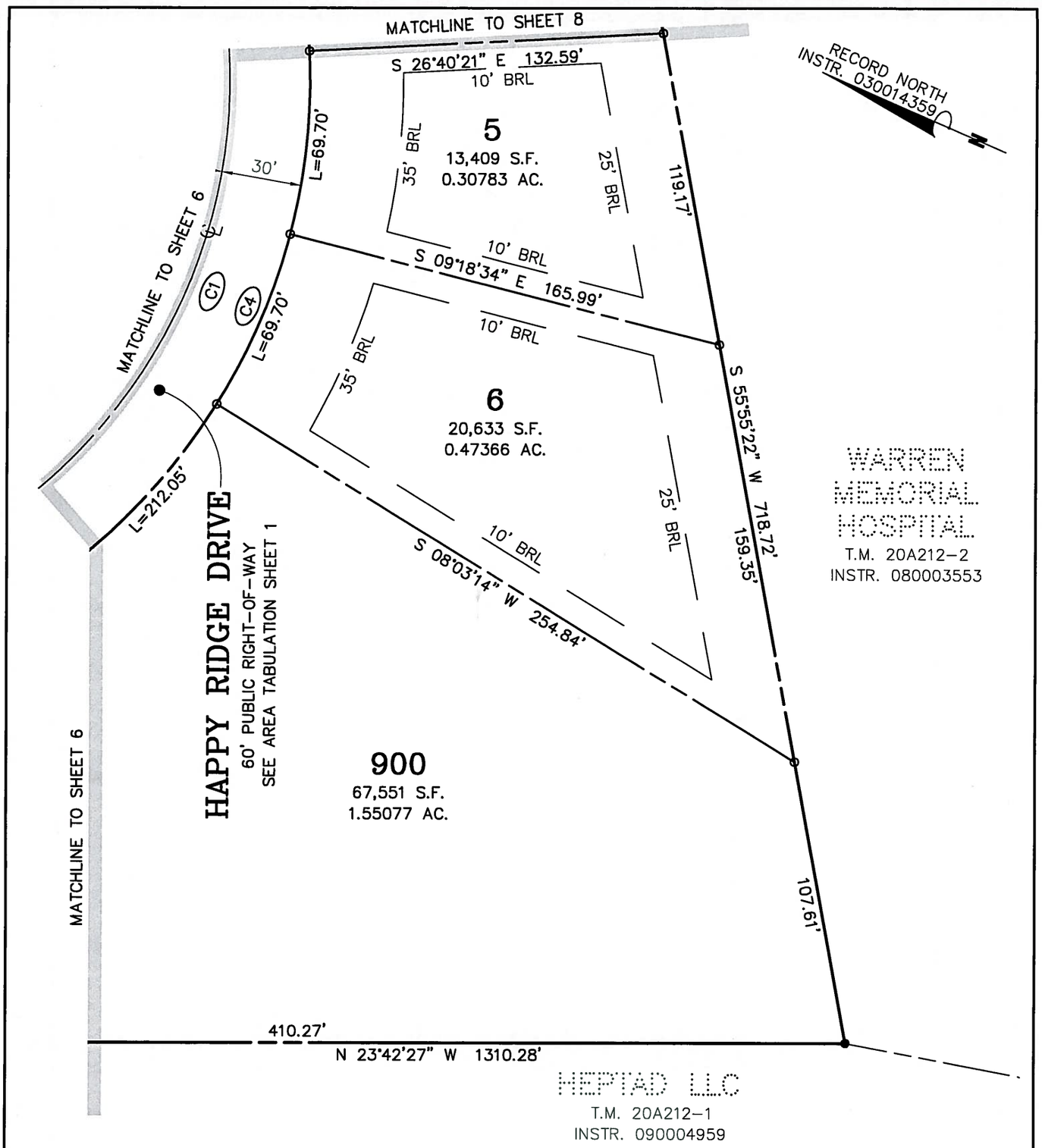
Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

REVISION

COMMONWEALTH OF VIRGINIA
PAUL SWARTZ
Lic. No. 002701
8-5-19
LAND SURVEYOR

BCG PROJECT NO: 1602-02-016 TASK: 00010	SHEET 6 OF 11	BY: SKS
COUNTY REF NO:	SCALE: 1" = 50'	CHK:



* = BRL MERGED AROUND PROPOSED EASEMENT SEE SHEETS 9 & 11

50 0 25 50
GRAPHIC SCALE

FINAL PLAT
HAPPY CREEK KNOLLS
SECTION 4
HAPPY CREEK MAGISTERIAL DISTRICT
WARREN COUNTY, VIRGINIA

1602-A-RP-003

DWG: P:\1602 - Happy Creek Knolls Sec 3\1602-02-015 (SUR) - Happy Creek Knolls Sec 4\Survey\Plats\1602-A-RP-003.dwg

DATE: AUGUST 5, 2019

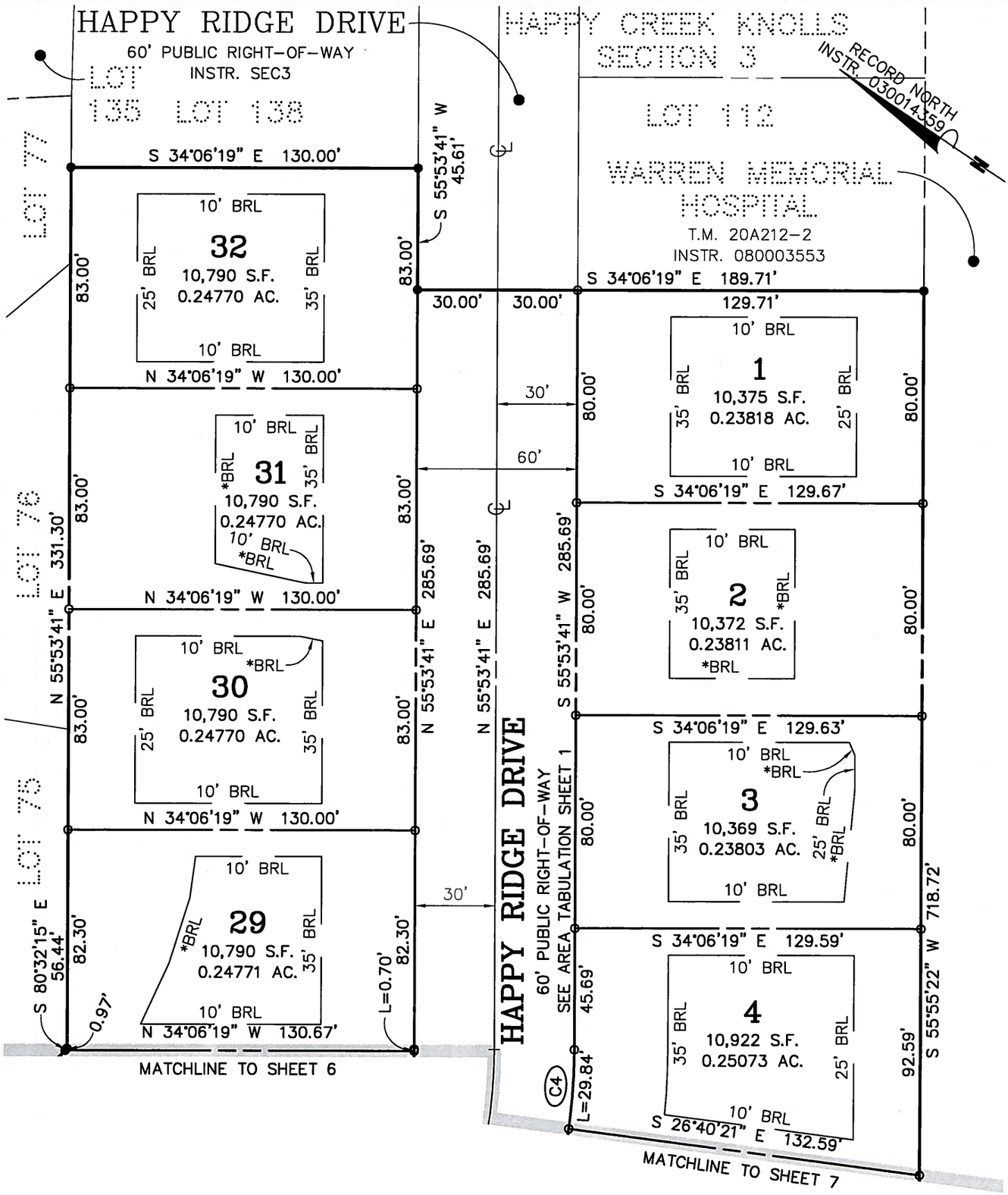
Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com
© Bowman Consulting Group, Ltd.

REVISION

COMMONWEALTH OF VIRGINIA
PAUL SWARTZ
Lic. No. 002701
8-5-19
LAND SURVEYOR

BCG PROJECT NO: 1602-02-016 TASK: 00010	SHEET 7 OF 11	BY: SKS
COUNTY REF NO:	SCALE: 1" = 50'	CHK:



* = BRL MERGED AROUND PROPOSED EASEMENT SEE SHEETS 9 & 11

50 0 25 50
GRAPHIC SCALE

FINAL PLAT

HAPPY CREEK KNOLLS

SECTION 4

HAPPY CREEK MAGISTERIAL DISTRICT
WARREN COUNTY, VIRGINIA

1602-A-RP-003

DWG: P:\1602 - Happy Creek Knolls Sec 3\1602-02-015 (SUR) - Happy Creek Knolls Sec 4\Survey\Plats\1602-A-RP-003.dwg

DATE: AUGUST 5, 2019

Bowman CONSULTING

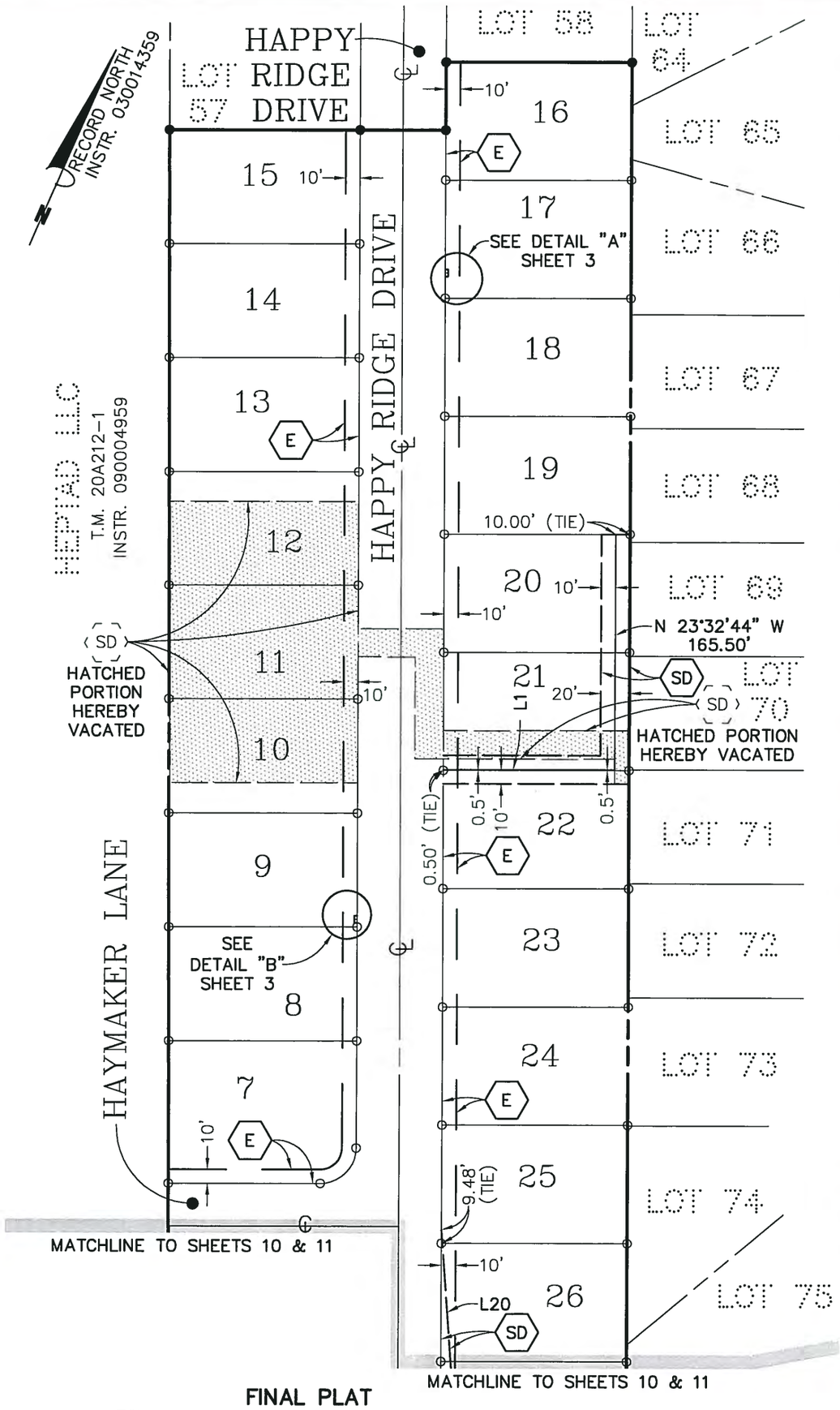
Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

REVISION

COMMONWEALTH OF VIRGINIA
PAUL SWARTZ
Lic. No. 002701
8-5-19
LAND SURVEYOR

BCG PROJECT NO: 1602-02-016 TASK: 00010	SHEET 8 OF 11	BY: SKS
COUNTY REF NO:	SCALE: 1" = 50'	CHK:



FINAL PLAT

HAPPY CREEK KNOLLS

SECTION 4

HAPPY CREEK MAGISTERIAL DISTRICT
WARREN COUNTY, VIRGINIA

100 0 50 100
GRAPHIC SCALE

1602-A-RP-003

DWG: P:\1602 – Happy Creek Knolls Sec 3\1602-02-015 (SUR) – Happy Creek Knolls Sec 4\Survey\Plats\1602-A-RP-003.dwg

DATE: AUGUST 5, 2019

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175

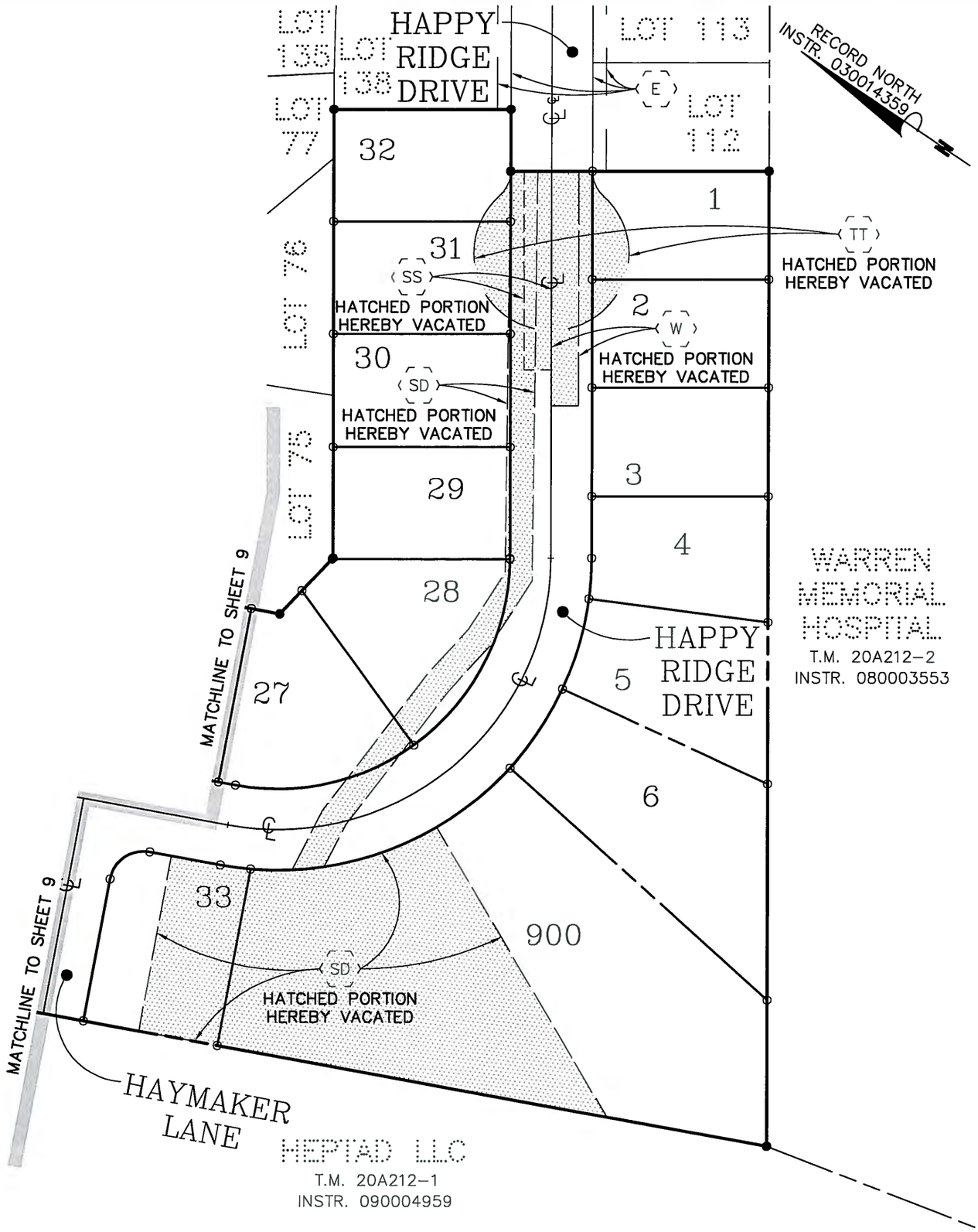
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

REVISION

COMMONWEALTH OF VIRGINIA
PAUL SWARTZ
Lic. No. 002701
8-5-19
LAND SURVEYOR

BCG PROJECT NO: 1602-02-016 TASK: 00010	SHEET 9 OF 11	BY: SKS
COUNTY REF NO:	SCALE: 1" = 100'	CHK:



FINAL PLAT

HAPPY CREEK KNOLLS

SECTION 4

HAPPY CREEK MAGISTERIAL DISTRICT
WARREN COUNTY, VIRGINIA

100 0 50 100
GRAPHIC SCALE

SEE SHEET 11 FOR PROPOSED EASEMENTS

1602-A-RP-003

DWG: P:\1602 – Happy Creek Knolls Sec 3\1602-02-015 (SUR) – Happy Creek Knolls Sec 4\Survey\Plats\1602-A-RP-003.dwg

DATE: AUGUST 5, 2019

Bowman CONSULTING

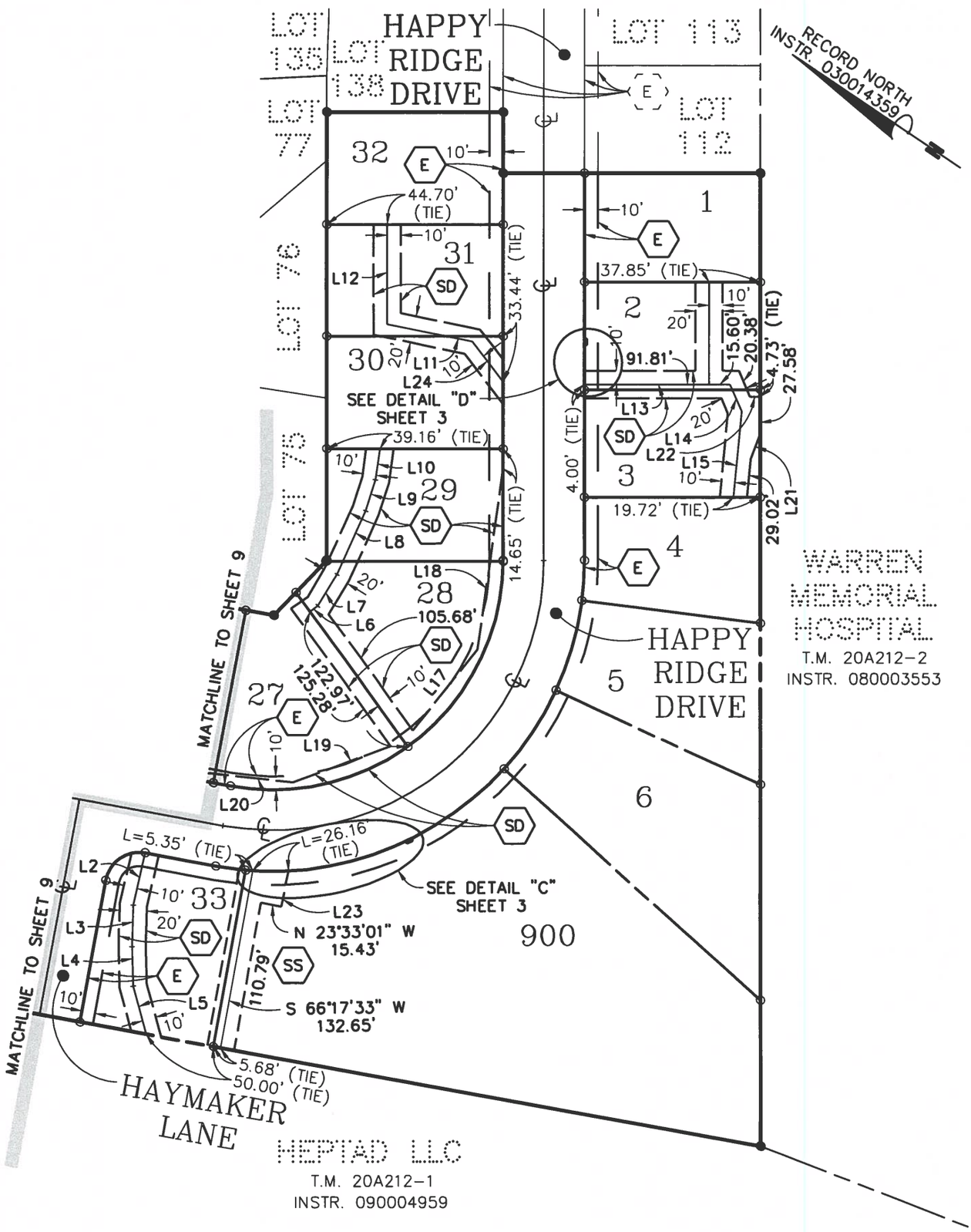
Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

REVISION

COMMONWEALTH OF VIRGINIA
PAUL SWARTZ
Lic. No. 002701
8-5-19
LAND SURVEYOR

BCG PROJECT NO: 1602-02-016 TASK: 00010	SHEET 10 OF 11	BY: SKS
COUNTY REF NO:	SCALE: 1" = 100'	CHK:



FINAL PLAT

HAPPY CREEK KNOLLS

SECTION 4

HAPPY CREEK MAGISTERIAL DISTRICT
WARREN COUNTY, VIRGINIA

100 0 50 100
GRAPHIC SCALE

SEE SHEET 10 FOR EXISTING EASEMENTS BEING VACATED

1602-A-RP-003

DWG: P:\1602 - Happy Creek Knolls Sec 3\1602-02-015 (SUR) - Happy Creek Knolls Sec 4\Survey\Plats\1602-A-RP-003.dwg

DATE: AUGUST 5, 2019

Bowman CONSULTING

Bowman Consulting Group, Ltd.
101 South Street, S.E.
Leesburg, Virginia 20175
Phone: (703) 443-2400
Fax: (703) 443-2425
www.bowmanconsulting.com

© Bowman Consulting Group, Ltd.

REVISION

COMMONWEALTH OF VIRGINIA
PAUL SWARTZ
Lic. No. 002701
8-5-19
LAND SURVEYOR

BCG PROJECT NO: 1602-02-016 TASK: 00010	SHEET 11 OF 11	BY: SKS
COUNTY REF NO:	SCALE: 1" = 100'	CHK:

Bowman CONSULTING

October 15, 2019

Mr. Jeremy F. Camp, Director
Department of Planning & Zoning
Town Administration Building
102 East Main Street
Front Royal, VA 22630-1560

RE: **Happy Creek Knolls Section 4**
FRSUB-000830-2018, Major Subdivision Plan and Final Record Plats
BCG Project #1602-02-016

Dear Mr. Camp:

We have received your comments from the staff report for the September 18, 2019 Planning Commission Meetings and offer the following in response.

A. <u>PLANNING AND ZONING REVIEW COMMENTS</u>

l. *Street Name. The portion of Ewell Street that is south of Imboden Drive, from the centerline intersection, will need to be renamed to Happy Ridge Drive based on the proposed street extension layout. Please include new street signage at this intersection as part of the plans.*

Response: The street has been revised as requested. See Sheets 3-4A, 6, 8, 27, & 29.

2. *Final Plats. You will need to submit signed and stamped final plats prior to final approval. Thank you for submitting the advanced copies for review.*

Response: Comment acknowledged. Plats have been provided as requested. See Attached.

3. *Development Surety. After consultation with the Town Engineer and Public Works Department, a development guarantee, such as a performance bond, letter of credit or cash escrow, is required in the amount of $1,242,859.20. This will need to be submitted to the Town before final approvals are granted.*

Domestic Water Total -	*$ 443,400.00*
Sanitary Sewer Total -	*$ 277,150.00*
Storm water System and Asphalt -	*$ 382,322.00*
Handrail	*$ 21,000.00*
Landscaping (public)	*$ 6,000.00*
SUBTOTAL	*$1,129,872.00*
10% Contingency	*$ 112,987.20*
TOTAL BOND AMOUNT	*$1,242,859.20*

Response: Comment acknowledged. Bond documents will be submitted under separate cover.

4. *Maintenance of nondedicated open space. Please submit for review by the Town Attorney all covenants or other documents governing the reservation and maintenance of undedicated open space, including the proposed stormwater management facility. A maintenance agreement with the Town is required. Town Staff can provide you with a template document.*

Response: Comment acknowledged. The requested documentation will be provided under separate cover.

5. *Subdivision Name Error. Correct the name of the subdivision under the Owner's Certificate on page 1 of 33 and provide the owner's signature here on the final plan sets for approval. It currently states that the subdivision name is Happy Hills.*

Response: The subdivision name has been corrected as requested. See Sheet 1.

B. <u>TOWN ENERGY SERVICES DEPARTMENT</u>

1. *The plans must have a sheet with underground electrical conduit drawings shown as to where contractor will be installing primary conduit to feed distribution transformers for the community and where it is being fed from.*

Response: As additional "Utility Plan" sheet (Sheet 4A) has been provided as requested. See Sheet 4A.

C. <u>TOWN PUBLIC WORKS DEPARTMENT</u>

1. *There needs to be three (3) valves at every MJ tee.*

Response: Additional valves have been added as requested. See Sheets 4-9.

2. *The Applicant will need a Right-of-Way utilization permit and bond.*

Response: Comment acknowledged. Permit and bond will be provided under separate cover.

3. *Landscaping. Please modify the landscaping plan to address the following review comments from the Town's arborist/horticulturalist.*

   a. *Diversify the White Pine species with other evergreen species to avoid creating a monoculture. Other species that may be used include: Japanese Cedar, Norway Spruce, White Spruce, Serbian Spruce and Virginia Pine. Leyland Cypress trees are NOT appropriate species.*

   Response: White Pines have been removed and substituted with Norway Spruce, Serbian Spruce, and Scotch Pine as requested. See Sheets 27 & 28.

   b. *Pin Oaks should not be planted next to sidewalks due to downward growing branches and the need for constant pruning. Include other oak varieties, or other shade trees, like London Plane Tree, Blackgum, Hybrid Elms and/or Hackberry.*

Response: All Pin Oaks have been removed as a street tree and substituted with London Plan Tree as requested. See Sheets 27 & 28.

c. *Use Mixed cultivars for Red Maples. You may also use Sugar Maples and Freeman Maples.*

Response: A second Red Maple cultivar has been added as well as additional Sugar Maples. See Sheets 27 & 28.

D. <u>TOWN ENGINEER</u>

1. *The subdivision plans do not show the future continuation of the gravity sewer line, so the Applicant would have to submit a new plan and profile of the sewer extension before making the off-site connection.*

Response: Comment acknowledged.

2. *A maintenance agreement for the pond will have to be recorded as part of DEQ's permitting process. I don't think the Town will need a separate agreement since it will be maintained by the POA.*

Response: Comment acknowledged.

E. <u>WARREN COUNTY BUILDING OFFICIAL</u>

1. *Evidence of an existing (current) Stormwater Management (SWM) plan and permit with Department of Environmental Quality (DEQ). If that does not exist, DEQ must be contacted to determine what is required.*

Response: Comment acknowledged.

2. *Evidence of an existing (current) Erosion and Sediment Control (ESC) plan and permit with Warren County. If that does not exist, a new plan and permit would be required.*

Response: Comment acknowledged.

If you have further questions please contact me at the office.

Sincerely,
BOWMAN CONSULTING GROUP, LTD.

Jerry W. Dove, Jr., P.E.
Sr. Project Manager

cc: Chris Ramsey (Ramsey, Inc.)

4

Work Session Agenda Form

Item # 4

DATE: October 21, 2019

Work Session

AGENDA ITEM: Continued Discussion for Water/Sewer on Guard Hill Road – Chris Ramsey

SUMMARY: Town Council received a request from Chris S. Ramsey representing Ramsey, Inc for water and sewer to facilitate the construction of approximately 150 rental apartments to be located at 3853 Guard Hill Road. In addition, taps for fire suppression and ancillary uses. If approved, construction is to begin in late spring of 2020. Town Code contains policies and procedures for the extension of water and sewer service to Warren County (Chapter 134-1.C.). Guard Hill Road is one of six area considered as an exception (Chapter 134-1.D.).

Council discussed this request at their September 9, 2019 work session and requested research on how Guard Hill Road was considered into the list of exceptions. On June 8, 1998, Council approved a Resolution that permitted the provision of water and sewer services for residential customers located along Guard Hill Road with contingencies. In 2006, Council approved a Water Policy. In June 2012, the Water Policy was codified along with the Resolutions that verified the locations that were considered exceptions. This was done to make the Water Policy and Moratorium Areas more easily accessible to Council, Staff and the general public. In December 2012 the Extension Moratorium Areas (134-D) were revised again to more clearly identify the six areas known as the exceptions.

BUDGET/FUNDING: None

STAFF RECOMMENDATION: Council takes desired action.

Ramsey Inc.

CHRIS RAMSEY

508 Commerce Avenue
Front Royal, Virginia 22630

Phone (540) 635-5637
Fax (540) 635-8392

August 23, 2019

Joseph E. Waltz
Town Manager
Town of Front Royal, Virginia 22630
540-635-8007
jwaltz@frontroyalva.com

RECEIVED
AUG 23 2019
Town of Front Royal
Town Manager's Office

RE: Water and Sewer Access

Dear Mr Waltz

Please accept this letter as my formal request for access to existing water and sewer lines contained within the Town of Front Royal Water and Sewer Systems. The purpose of access is to facilitate the construction of approximately 150 fair market value rental apartments, to be located at **3853 Guard Hill Road, Front Royal, Virginia.**.

In addition to residential consumption, taps will be needed for fire suppression as well as ancillary uses. My proposed commencement of construction is predicated on the timeframe in which proper permits can be obtained through the Town of Front Royal and Warren County. My goal is to begin construction in the late Spring of 2020.

Respectfully Submitted

Chris L Ramsey

Owner

R-12-98

RESOLUTION

WHEREAS, the Town of Front Royal has in effect a limited moratorium on the provision of water and sewer services outside the Town's corporate limits; and,

WHEREAS, the Town has received requests from property owners, located adjacent to existing water and/or sewer lines, to connect to the system due to failing well and/or septic systems;

WHEREAS, the Town wishes to amend the provisions of the water and sewer moratorium to allow such connections in areas where the main lines have adequate pressure and/or capacity so that further connections will not result in decreased service for those customers already connected to said system.

NOW THEREFORE BE IT RESOLVED by the Town Council of the Town of Front Royal, Virginia that the moratorium on the provision of water and sewer service outside the Town's corporate limits is amended to permit the provision of water and/or sewer services for residential customers located along Guard Hill Road, State Route 522 South, and Harmony Hollow Road, contingent upon: the property owner extending the service lateral to the Town's existing mains (there will be no new main extensions); a limit of one residential connection per lateral extension; the property owner securing the necessary easement(s) for the lateral extension, with said easement(s) to include a clause allowing the Town to inspect the lines as required to ensure they are being properly maintained; that the lateral construction must meet the Town's water and/or sewer construction standards; that the property served remain in exclusive residential use; that the property owner bear the total cost of the lateral extension; and the property owner be responsible for paying the out-of-town water and/or sewer connection fee and the out-of-town water and/or sewer rates.

APPROVED:

George E. Banks

George E. Banks, Mayor

ATTEST:

Rhonda S. North

Rhonda S. North, CMC/AAE
Clerk of Council

This resolution was adopted by the Town Council of the Town of Front Royal, Virginia on the 8th day of June, 1998.

This resolution has been approved as to form and legality.

John B. Arledge
Town Attorney

Date: 6/12/98

Town Code Chapter 134 (C) and (D)

C. EXTENSION POLICY BEYOND TOWN LIMITS: To better serve the social and economic needs and the common good of Front Royal and Warren County, the Town Council of Front Royal has formulated these policies and procedures for the extension of water and sewer service to Warren County.

The Town has evaluated our resources and anticipated growth within the Town to determine the anticipated excess volume available for extension into Warren County for residential, commercial, or industrial use. This volume will be determined annually based upon conditions within the Town and County. Excess volume shall be defined as the current and projected volume required by the Town subtracted from the current permitted plant capacities.

1. The contact person for the Town is the Town Manager. Any request for water and/or sewer services must be made in writing to the Town accompanied by a joint request from the property owner and the County for the property to be boundary adjusted into the Town's corporate limits or justification to simply provide utility extension. Such request must be made prior to a rezoning or any other action by the County.

2. The Town Council will decide on a case-by-case basis whether to provide water and sewer to the proposed property(ies) as well as whether a boundary adjustment is appropriate.

3. Following a boundary adjustment, the Town will consider the appropriate zoning classification of the property to be boundary adjusted and will complete a rezoning of the property to the classification deemed appropriate through the standard zoning process. Boundary adjusted property(ies) shall be considered as part of the water volume allocated by the Town to the County.

4. In any case of rezoning by the Town, the Town Council will consider proffers deemed necessary to mitigate the impact of the development on County services, as well as what proffers are necessary for the Town. These decisions shall be made before the Town's rezoning of the property(ies) is completed.

5. The Town may elect to provide water and/or sewer services without a boundary adjustment where the Town Council determines it would not be feasible or appropriate to provide other Town services to the property.

6. Extension of utility service shall require development, submittal, and review of site development plans demonstrating the proposed utility locations, proposed usage, appropriate modeling demonstrating no impact to existing users, and construction standard complying with Town standards.

7. Design and construction standards for all utility extensions shall comply with the current standards and specifications adopted by the Town.

8. The Town presently has no intention of extending water and sewer lines into the

unincorporated portion of the County at the Town's expense.

9. The Town presently has no desire to sell water for resale through a master meter to third parties.

10. Given the Town's Inflow and Infiltration (I&I) issues associated with the sanitary sewer system, the Town has no desire to accept outside water sources into the Town's sewer system. Future considerations to outside water sources will be evaluated as the I&I issues are addressed.

11. This Policy can be reviewed and updated by Town Council as necessary, but at a minimum annually.

(Added (C) 6-25-12-Effective Upon Passage)

D. EXTENSION MORATORIUM AREAS: Recognizing demonstrated service issues in providing utility service to certain areas within Warren County, a moratorium of utility connections and extensions to all undeveloped properties or lots not served by Town utilities as of the date of adoption of this Code Section is established that shall require sufficient studies and modeling prior to the Town's consideration of additional connections or extensions with the exception of:

1. Property zoned commercial or industrial that is currently located within the Rt. 522 Corridor as defined in that "Amendment to an Agreement between the County of Warren and the Town of Front Royal Regarding the Provision of Water and Sewer Service by the Town in the U.S. Route 522/340 North Corridor and the Assumption of Full Funding and Responsibility by the County of Fire/Rescue, Parks/Recreation Operations, and Animal Control Services" dated August 9, 1999 entered into between the Town of Front Royal, Virginia, and County of Warren, Virginia as both sides of U.S. Routes 522/340 North of the Town of Front Royal, extending to Crooked Run on the West, the Norfolk Southern Railroad tracks on the East, and Fairground Road (SR 661) to the North ;

2. Blue Ridge Shadows Subdivision as platted on November 26, 2012
3. McKay Property jointly owned by the Town and County as platted on November 26, 2012
4. Henselstone Subdivision as platted on November 26, 2012
5. Guard Hill Road parcels located within 100' of the existing water main on November 26, 2012
6. Harmony Hollow Road parcels located within 100' of the existing water main on November 26, 2012

(Added (D) 6-25-12-Effective Upon Passage)
(Amended (1-6) 12-10-12-Effective Upon Passage)

AN ORDINANCE TO AMEND SECTION 134-1 OF THE FRONT ROYAL TOWN CODE PERTAINING TO WATER AND SEWER CONNECTIONS

WHERES, the Water and Sewer Policy was approved by Council on September 25, 2006; and,

WHEREAS, Council discussed the said Policy at the Council Retreat held on January 28, 2012; and,

NOW, THEREFORE, BE IT ENACTED by the Town Council of the Town of Front Royal, Virginia that 134-1 of the Front Royal Town Code is hereby amended as follows:

134-1 ~~CONNECTION REQUIRED~~ CONNECTIONS

A. **Connection Requirements**

Every house used for human habitation and every place of business or manufacture where one (1) or more persons are employed shall be connected to the Town water system and to the Town sewer system when they are accessible, unless such house or place of business or manufacture is served by an adequate sewer system approved by the State Health Department. All methods of disposing of human excreta in these places of habitation, business or manufacture other than by a properly connected water closet are hereby declared to be unlawful.

When they become accessible, connection to the sewer and water mains shall be made within one (1) year after notification to the property owners by the Town Manager. Any person violating the provisions of this sections shall be punished as provided in Chapter 1, Article II, Penalties, of this Code, and each week's failure to comply herewith shall constitute a separate offense.

B. **Sewer Connection Requirement**

All premises which are connected to and using the Town sewer system shall be required to be connected to and use the Town water system if the Town water systems available to serve the premises.

C. Extension Policy Beyond Town Limits

To better serve the social and economic needs and the common good of Front Royal and Warren County, the Town Council of Front Royal has formulated these policies and procedures for the extension of water and sewer service to Warren County.

The Town has evaluated our resources and anticipated growth within the Town to determine the anticipated excess volume available for extension into Warren County for residential, commercial, or industrial use. This volume will be determined annually based upon conditions within the Town and County. Excess volume shall be defined as the current and projected volume required by the Town subtracted from the current permitted plant capacities.

1. **The contact person for the Town is the Town Manager. Any request for water and/or sewer services must be made in writing to the Town accompanied by a joint request from the property owner and the County for the property to be boundary adjusted into the Town's corporate limits or justification to simply provide utility extension. Such request must be**

made prior to a rezoning or any other action by the County.

2. The Town Council will decide on a case-by-case basis whether to provide water and sewer to the proposed property(ies) as well as whether a boundary adjustment is appropriate.

3. Following a boundary adjustment, the Town will consider the appropriate zoning classification of the property to be boundary adjusted and will complete a rezoning of the property to the classification deemed appropriate through the standard zoning process. Boundary adjusted property(ies) shall be considered as part of the water volume allocated by the Town to the County.

4. In any case of rezoning by the Town, the Town Council will consider proffers deemed necessary to mitigate the impact of the development on County services, as well as what proffers are necessary for the Town. These decisions shall be made before the Town's rezoning of the property(ies) is completed.

5. The Town may elect to provide water and/or sewer services without a boundary adjustment where the Town Council determines it would not be feasible or appropriate to provide other Town services to the property.

6. Extension of utility service shall require development, submittal, and review of site development plans demonstrating the proposed utility locations, proposed usage, appropriate modeling demonstrating no impact to existing users, and construction standard complying with Town standards.

7. Design and construction standards for all utility extensions shall comply with the current standards and specifications adopted by the Town.

8. The Town presently has no intention of extending water and sewer lines into the unincorporated portion of the County at the Town's expense.

9. The Town presently has no desire to sell water for resale through a master meter to third parties.

10. Given the Town's Inflow and Infiltration (I&I) issues associated with the sanitary sewer system, the Town has no desire to accept outside water sources into the Town's sewer system. Future considerations to outside water sources will be evaluated as the I&I issues are addressed.

11. This Policy can be reviewed and updated by Town Council as necessary, but at a minimum annually.

D. Extension Moratorium Areas

Recognizing demonstrated service issues in providing utility service to certain areas within Warren County, a moratorium of utility connections and extensions to all undeveloped properties or lots not served by Town utilities as of the date of adoption of this Code Section is established that shall require sufficient studies and modeling prior to the Town's consideration of additional connections or extensions with the exception of:

1. **Property zoned commercial or industrial that is currently located within the Rt. 522 Corridor located to the east of Rt. 522, south of Fairground Road, west of the Norfolk and Southern Railroad and north of Country Club Road;**
2. **Blue Ridge Shadows Subdivision;**
3. **McKay Property jointly owned by the Town and County;**
4. **Henselstone Subdivision**
5. **Guard Hill Road (within existing water service area)**
6. **Harmony Hollow Road**

This ordinance shall become effective upon passage.

APPROVED:

Timothy W. Darr, Mayor

ATTEST:

Jennifer E. Berry, Clerk of Council

THIS ORDINANCE was approved at the Regular Meeting of the Town of Front Royal, Virginia on its second reading, conducted 6-25- 2012, upon the following recorded vote:

Thomas E. Conkey	Yes/No	Chris W. Holloway	Yes/No
Hollis L. Tharpe	Yes/No	Carson C. Lauder, Jr.	Yes/No
Thomas H. Sayre	Yes/No	N. Shae Parker	Yes/No

A public hearing on the above was held on 6-11- ,2012 having been advertised in the Northern Virginia Daily on 5-24 ,2012 and 6-2 ,2012. The Ordinance was enacted at the Regular Meeting of the Town Council held 6-25- 2012.

Approved as to form and legality:

Douglas W. Napier, Town Attorney
Date: 07/06/2012

134- W&S
Moratorium Area

AN ORDINANCE TO AMEND SECTION 134-1 OF THE FRONT ROYAL TOWN CODE PERTAINING TO WATER & SEWER CONNECTIONS

WHEREAS, the Water & Sewer Policy was codified into Town Code Chapter 134-1 by Council on June 25, 2012; and,

WHEREAS, the area defined as the Rt 522 Corridor for purposes of exemption from the Out-of-Town utility provision moratorium was based upon the original 1998 Corridor Agreement; and,

WHEREAS, the 1999 Amendment to the original 1998 Corridor Agreement expanded the area designated as the Rt 522 Corridor designated for utility provision; and,

NOW, THEREFORE, BE IT ENACTED by the Town Council of the town of Front Royal, Virginia that Chapter 134-1 of the Front Royal Town Code is hereby amended as follows:

134-1 Connections

D. Extension Moratorium Areas

Recognizing demonstrated service issues in providing utility service to certain areas within Warren County, a moratorium of utility connections and extensions to all undeveloped properties or lots not served by Town utilities as of the date of adoption of this Code Section is established that shall require sufficient studies and modeling prior to the Town's consideration of additional connections or extensions with the exception of:

1. Property zoned commercial or industrial that is currently located within the Rt. 522 Corridor ~~located *to the east of Rt. 522, south of Fairground Road, west of the Norfolk and Southern Railroad and north of Country Club Road*~~ *as defined in that "Amendment to an Agreement Between the County of Warren and the Town of Front Royal Regarding the Provision of Water and Sewer Service by the Town in the U.S. Route 522/340 North Corridor and the Assumption of Full Funding and Responsibility by the County of Fire/Rescue, Parks/Recreation Operations, and Animal Control Services" dated August 9, 1999 entered into between the Town of Front Royal, Virginia, and County of Warren, Virginia as both sides of U.S. Routes 522/340 North of the Town of Front Royal, extending to Crooked Run on the West, the Norfolk Southern Railroad tracks on the East, and Fairground Road (SR 661) to the North*;
2. Blue Ridge Shadows Subdivision as platted on November 26, 2012;
3. McKay Property jointly owned by the Town and County as platted on November 26, 2012;
4. Henselstone Subdivision as platted on November 26, 2012
5. Guard Hill Road parcels located within 100' of the existing water main on November 26, 2012
6. Harmony Hollow Road parcels located within 100' of the existing water main on November 26, 2012

This ordinance shall become effective immediately.

APPROVED:

Timothy W. Darr, Mayor

ATTEST:

Jennifer E. Berry, Clerk of Council

THIS ORDINANCE was approved at the Regular Meeting of the Town of Front Royal, Virginia on its second reading, conducted 12-10- 2012, upon the following recorded vote:

Thomas H. Sayre	Yes/No	Bret W. Hrbek	Yes/No
Hollis L. Tharpe	Yes/No	Eugene R. Tewalt	Yes/No
N. Shae Parker	Yes/No	Daryl L. Funk	Abstained ~~Yes/No~~

A public hearing on the above was held on 11-26 ,2012 having been advertised in the Northern Virginia Daily on 11-10 ,2012 and 11-17 ,2012. The Ordinance was enacted at the Regular Meeting of the Town Council held 12-10- 2012.

Approved as to form and legality:

Douglas W. Napier, Town Attorney
Date: 12 / 15 / 2012

5

Work Session Agenda Form

Item # 5

DATE: October 21, 2019

Work Session

AGENDA ITEM: Special Use Permit Application for a daycare at 460 S Commerce Avenue
Director of Planning/Zoning

SUMMARY: Embassy Deliverance & Workship Center, located at 460 S Commerce Avenue, part of the Front Royal Business Park, submitted an application to operate a daycare. The Planning Commission reviewed the application and recommended approval of it with 4 conditions. The attached Staff Report includes these conditions and additional information on the application and Town Code. Also attached are other documents submitted by the Applicant.

BUDGET/FUNDING: N/A

STAFF RECOMMENDATION: The purpose of the October 21, 2019 Work Session is to brief Town Council on the application prior to the upcoming public hearing.

TOWN OF FRONT ROYAL
DEPARTMENT OF PLANNING & ZONING

STAFF REPORT FOR THE SEPTEMBER 18, 2019 PLANNING COMMISSION MEETING
Updated for 10/21/19 Town Council Work Session

APPLICATION #:
FRSPU-1263-2019

APPLICANT:
The Embassy Deliverance & Worship Center

SUMMARY OF REQUEST:
A request to operate a daycare within the C-1 District within a section of 460 S Commerce Avenue, a building within the Front Royal Business Park. The proposed daycare would operate under the business name of "A Parent's Heart." See Attachment A: Application

GENERAL INFORMATION:

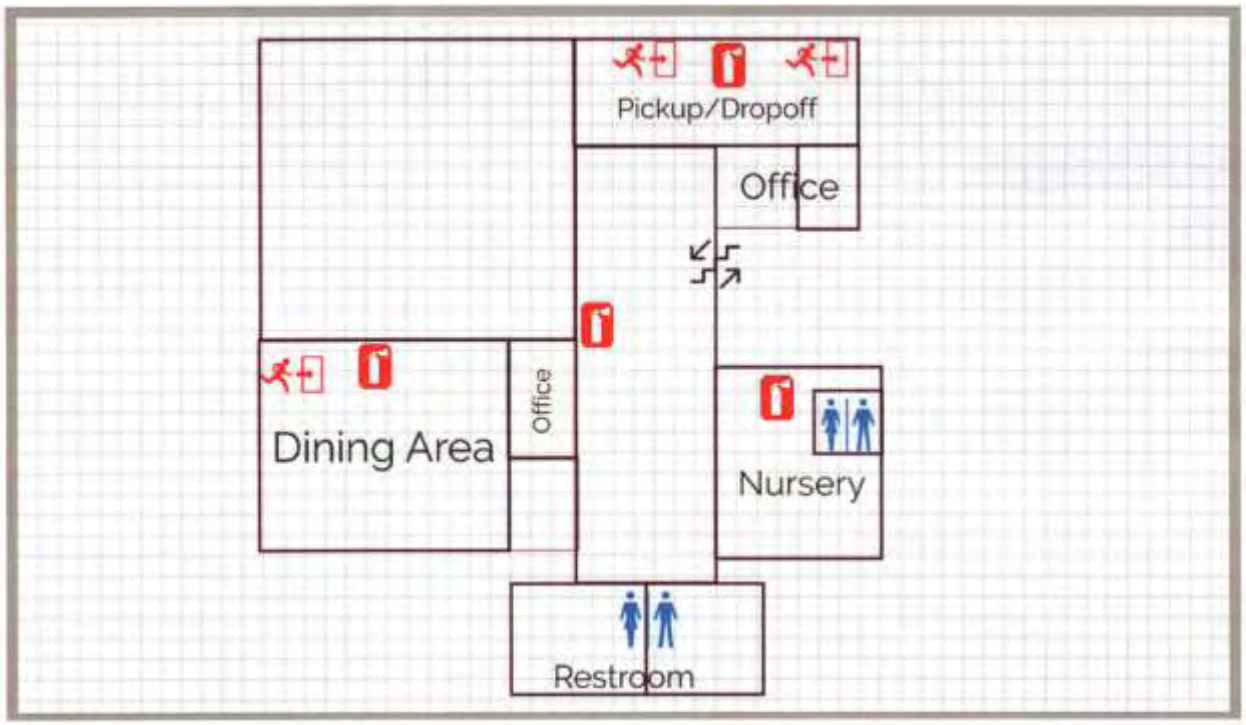
Site Addresses	460 S Commerce Avenue
Property Owner(s)	Puja Properties LLC
Existing Zoning	C-1 (Community Business) District
Proposed Use	Commercial Parking Lot for Overflow Parking of UPS Distribution Center
Tax Identification	20A101 4D2
Location	The location is at 460 S Commerce Avenue where the Embassy Deliverance & Worship Center is presently located.

Vicinity Map (*Warren County GIS*)

Town Zoning Map *(Warren County GIS)*

Aerial *(Warren County GIS)*

Floorplan and Preliminary Site Plan (Applicant)



INFORMATION ON THE APPLICATION:

Project Summary	This application is a request to obtain approval for a day care within the C-1 District. The Applicant has submitted a documented titled "Executive Summary" describing the proposed use within Attachment A. Attachment B includes photos and additional information about the site. In conversation with the Applicant, the proposed daycare would hold approximately 25 children, ranging in age from infants to older children. The Applicant has not begun the process to obtain a day care permit from the Department of Social Services. Town Staff consulted with the local department of Social Services who was interested to see if the day care could accept state subsidies. According to the local Director of Social Services, there is a shortage of facilities that accept these in the community. The applicant indicated that she would be accepting these subsidy payments from customers when asked. The local Director of Social Services also inquired about outdoor recreation but noted that the applicant could provide indoor recreation and take trips to local parks to meet the State requirements. The property is owned by Puja Properties LLC, and is part of the Front Royal Business Park, one of the denser locations in the Town for commercial uses.
Special Use Permits in General	The Town is authorized to require a special use permit for certain uses within any zoning district under Virginia Code §15.2-2286. Some specific uses are granted protection from regulation from localities by the Virginia Code, including agriculture uses, small scale conversion of biomass to alternative fuel, certain residential uses, private tents, farm wineries, assisted living facilities, and group homes. These exempt uses are not relevant for this application. The issuance of a special use permit is subject to such conditions as are deemed necessary by the Front Royal Town Council after recommendations of the Front Royal Planning Commission. Prior to an action by Town Council or a recommendation by the Planning Commission, a public hearing is required for special use permits. Town Code 175-136 requires that Special Use Permits meet the following requirements: (i) is not detrimental to the overall health, safety, and general welfare of the public, (ii) does not conflict with the Comprehensive Plan, (iii) is substantially compatible with surrounding land uses, and (iv) complies with laws of the Commonwealth of Virginia."

Discussion

Site Suitability:

- The location may be able to meet the requirements for a day care facility according to representatives from the Warren County Department of Social Services. However, until a permit is issued by Social Services this can only be a matter of speculation.

- Staff observes a concern for the lack of exterior recreation at the location of the proposed day care. Many day care facilities in the area have exterior areas that are safe for children to play within.

- The busy exterior parking lot may not be ideal for pedestrian safety, particularly since there is not a designated drop off lane.

Land Use:

- Day cares to provide a needed service within the Town of Front Royal and are generally in high demand.

- The applicant has indicated that they will be accepting state subsidy payments from their customers, which according the Warren County Director of Social Services, is in high demand within the community.

- The site is also a busy commercial center within the Town. Much like a shopping center, a concentration of commercial uses thrives best when accompanied with similar and supporting uses. Retail, restaurant and entertainment uses are generally the category of uses that do best in denser commercial centers. Uses such as personal services (day cares) can thrive in many other commercial locations.

Tax Revenue:

- Personal services pay a higher tax rate than retail uses (.20 per $100 gross sales vs .12 per $100 gross sales). However, 501(C)3 nonprofit organizations do not pay tax.

Applicant's revision

Following the initial public hearing by the Planning Commission, the Applicant submitted a revised site layout and plan for loading and unloading children at the daycare. This information is included as Attachment C and D.

Conclusion

In September, the Planning Commission recommended approval of this special use permit application with the following conditions:

1. This special use permit is only valid for the purpose of authorizing a day care facility at 460 S Commerce Avenue. This permit shall be void if the proposed day care does not obtain approval from the Department of Social Services. Furthermore, all requirements of the Department of Social Services shall be complied with at all times.

2. Town Council, or other designated representative, may inspect the property at any reasonable time to ensure compliance with local regulations, including, but not limited to, the conditions placed on this special use permit.

3. Upon inspection of the property, if it is found that the property is not in compliance with local regulations, including but not limited to, the conditions of this special use permit, the Town may revoke this special use permit after notice to the applicant and public hearing.

4. The applicant will follow the loading and unloading plan submitted with their application on September 11, 2019.

Following a public hearing with Town Council, action on the Special Use Permit Application may be taken. Only one reading is required.

Attachment A: Application including executive summary
Attachment B: Photos and additional information
Attachment C: Action Plan
Attachment D: Site Layout

TOWN OF FRONT ROYAL
DEPARTMENT OF PLANNING & ZONING
102 EAST MAIN STREET
P.O. BOX 1560
FRONT ROYAL, VA 22630

Main: 540.635.4236
Fax: 540.631.2727
Internet: www.frontroyalva.com

SUP FRSPU 1263-2019

SPECIAL USE PERMIT REQUEST

7243 Ronald Shanon

APPLICANT

NAME The Embassy Deliverance & Worship center PHONE 540-398-~~7443~~ (?)

ADDRESS 470 S. Commerce Ave, Unit E, Front Royal

E-MAIL admin@theembassyoutreachministries.org

PROPERTY DESCRIPTION

PROPERTY ADDRESS 470 S. Commerce Ave., Unit E

TAX MAP 20A SECTION 1014D2 BLOCK _____ LOT _____

SUBDIVISION NAME _____ ACREAGE _____

REQUEST

ZONING DISTRICT _____

PROPOSED USE OF PROPERTY _____

SPECIFIC SPECIAL USE PERMIT REQUEST Day Care

RECEIVED
Recvd additional required info.
FEB 27 2019
TOWN OF FRONT ROYAL
PLANNING & ZONING DEPARTMENT

ATTACHMENTS --The following *must* be submitted with the application. Additional information may be required depending on the nature of the request.

1. Survey/Plat of property showing all **existing** improvements. (10 copies if larger than 11" X 17")
2. Site Plan Application
3. Application Fee of $400.00 (Checks payable to the Town of Front Royal)
4. Additional information as required by the Department of Planning & Zoning.

RECEIVED
JAN 16 2019
TOWN OF FRONT ROYAL
PLANNING & ZONING DEPARTMENT

CERTIFICATION

I certify that the information provided with this application is correct to the best of my knowledge and should the special use permit be granted, the project will comply with the conditions imposed upon it and will be implemented only as approved by Town Council.

Signature _____ Date _____

By submitting this application, the applicant grants permission to Town officials and employees to enter upon the property, which is the subject of this application, during reasonable hours and for purposes related to the application process.

Receipt # 940117 Check# 195 Date Paid 1-16-19

Revised 2-15-13

A Parent's Heart
CHILD & AFTER CARE LEARNING CENTER
"Protecting them for you, loving them with you"

Executive Summary

Mission

A Parent's Heart mission is to create a safe and nurturing environment that encourages both children and families to be embellished through education and nurturing.

Vision

Our vision is to establish solid policies and procedures that foster quality operations throughout the entire school and deliver high quality academic programs. We aim to create a superior learning environment within the classroom setting and be the school where teachers want to work and invest their careers.

A Parent's Heart Childcare Center was established by, The Embassy Outreach Ministries, a non-profit organization geared toward the development of our community. The Embassy Outreach Ministries was created in an effort to provide assistance and education in a social capacity in order to facilitate a more balanced service to the community, as not only do we aim to assist spiritually but also to help nurture and shape a well-rounded community.

Location

A Parent's Heart is based out of Front Royal VA. It is located it, 460 South Commerce Ave, Ste. E.

Ownership

A Parent's Heart was founded by M. Anthony Edwards, Chief Executive Officer of The Embassy Outreach Ministries, a mission of The Embassy Deliverance and Worship Center. This reformation holds branches located in, Plainfield New Jersey, Front Royal VA, Atlanta Georgia, and The Island of Jamaica, West Indies.

The operation of the childcare center is held under the supervision of a M. Anthony Edwards II and a governing board. The members of the board are composed of the Pastor, the Director, and members of the church who have expertise or interest in education, early childhood development, and business management.

Services

Overview

A Parent's Heart provides the best education for children ages two through the ages of four. Our passion is to provide a high quality program that is designed to meet the needs of the parents, as well as our students. We are located at, 460 Commerce Ave, Front Royal VA, 22630, and will be offering service from the hours of 6:00am to 6:00pm. During those hours, children will be exposed to a wide range of activities including: arts and crafts, socialization, large muscle group activities, and general learning.

As a general rule, the school will offer a full-time educational program, as well as multiple meals to feed the children throughout the day.

Pre-K Readiness

Though we are a daycare, we can't properly serve the community unless our children grow. In recognition of this, we are preparing a Pre-Kindergarten curriculum to support children to build upon their skills and equip them with the necessary skills to future academic success. Our teachers are trained to facilitate lesson plans that tap into each child's abilities and interests.

Daily interaction, and one-on-one support by our staff will prepare children with an arsenal of productive and empowering vocabulary.

After Care

Our Aftercare program was designed to meet the specific needs of both parent and child and provide a safe, supervised place for students to study and play.

Terrific Two's (24 to 36 months)

Teachers actively work side by side with parents towards potty-training each child. In an effort to prepare each student for the next level, teacher will begin to introduce a curriculum to begin building vocabulary, so that literary skills may be introduced. Teachers will help kids learn to recognize and identify the numbers one through 10 and correctly count 10 or more objects. Learning what numerals 0 to 9 look like and being able to name them correctly.

Developing important social skills is necessary before starting Pre-K. Students will learn how to share and cooperate, to work together and take turns, to participate in group activities and follow simple directions, and to communicate wants and needs

Nature Class (2-4 years)

In the nature classroom children are exposed to a print-rich environment, which allows students to associate written language to oral language. Students will be introduced to basic math skills such as adding and subtracting. Before entering kindergarten, children should be able to cut with scissors. As they develop better hand-eye coordination and fine motor skills, they will start drawing and coloring beyond just scribbles and will learn to use pencils, paintbrushes, and glue.

Teachers and students will explore nature and their surroundings as they dive into the world of Science and nature as well as teaching each child the art of teamwork. Parents are fully aware of

their child's academic progress through quarterly assessment tools and parent- teacher conferences.

Opportunity

Target Market

Key Customers

A Parent's Heart, set in Front Royal, seeks to cater to families in the local area. More so, the program serves as a relief to parents who are unable to leave work to pick up their children from traditional daycare. Additionally, the daycare serves as a vital tool to parents who are looking to for an atmosphere to prepare their children for the initial stages of academic and social development.

Market Size & Segments

Our strongest market is anticipated to be mostly made up of working parents. These parents have children, aged 5 and under, and are looking for a safe environment for their children to be taken care of and to be prepped for early success in their academics.

According to research done by the US census in 2017, Front Royal contains an estimated total of 15,239. With over 6,000 households, there is an estimated 6% of children that are aged 5 and under.

By those statistics and by offering our services, Front Royal parents will have the option of sending the nearly 1,000 children to learn and play in a wholesome environment.

With competition in place, A Parent's Heart is still able to touch the lives of potentially hundreds, with growth and expansion opportunities.

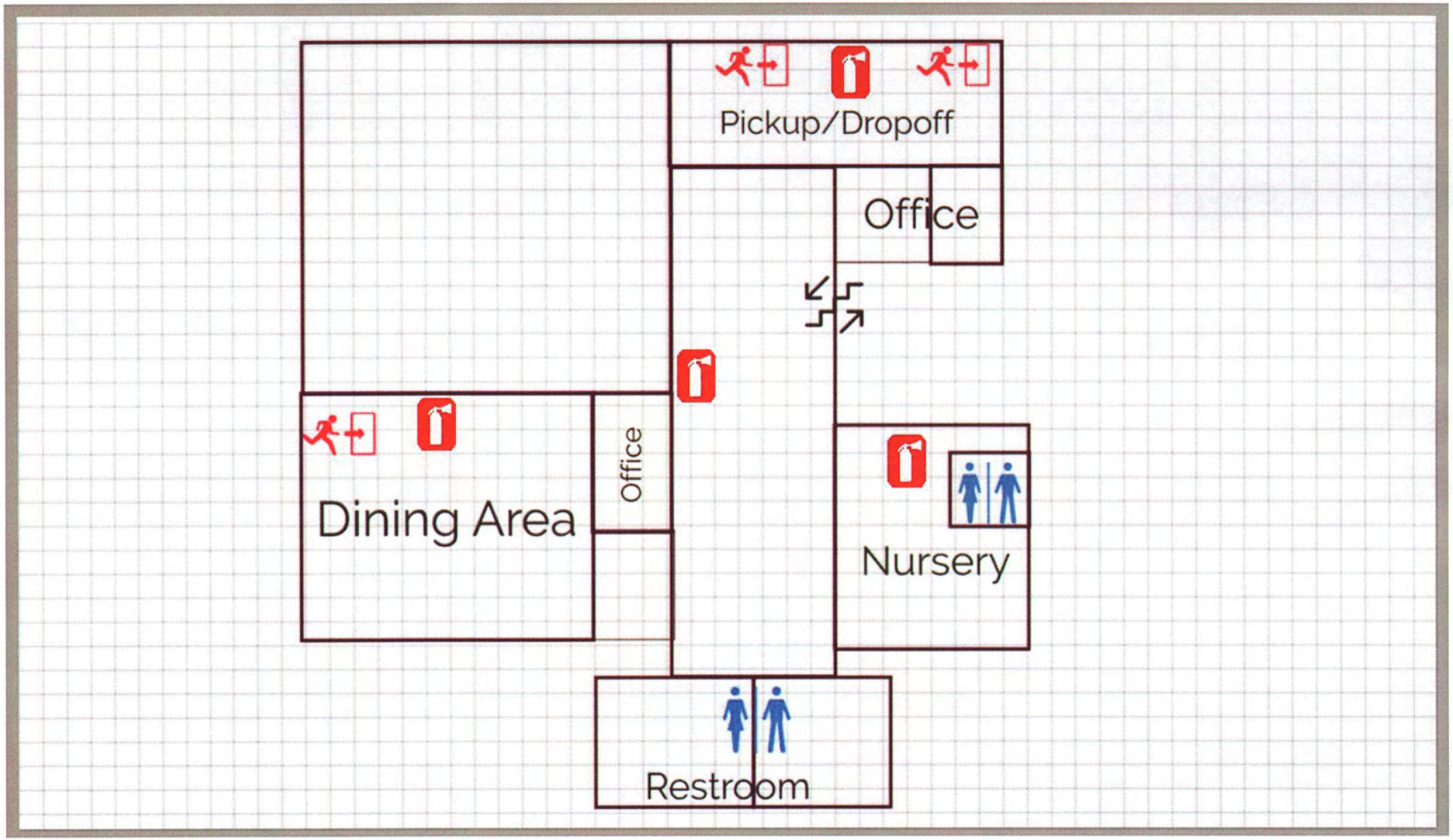
Execution

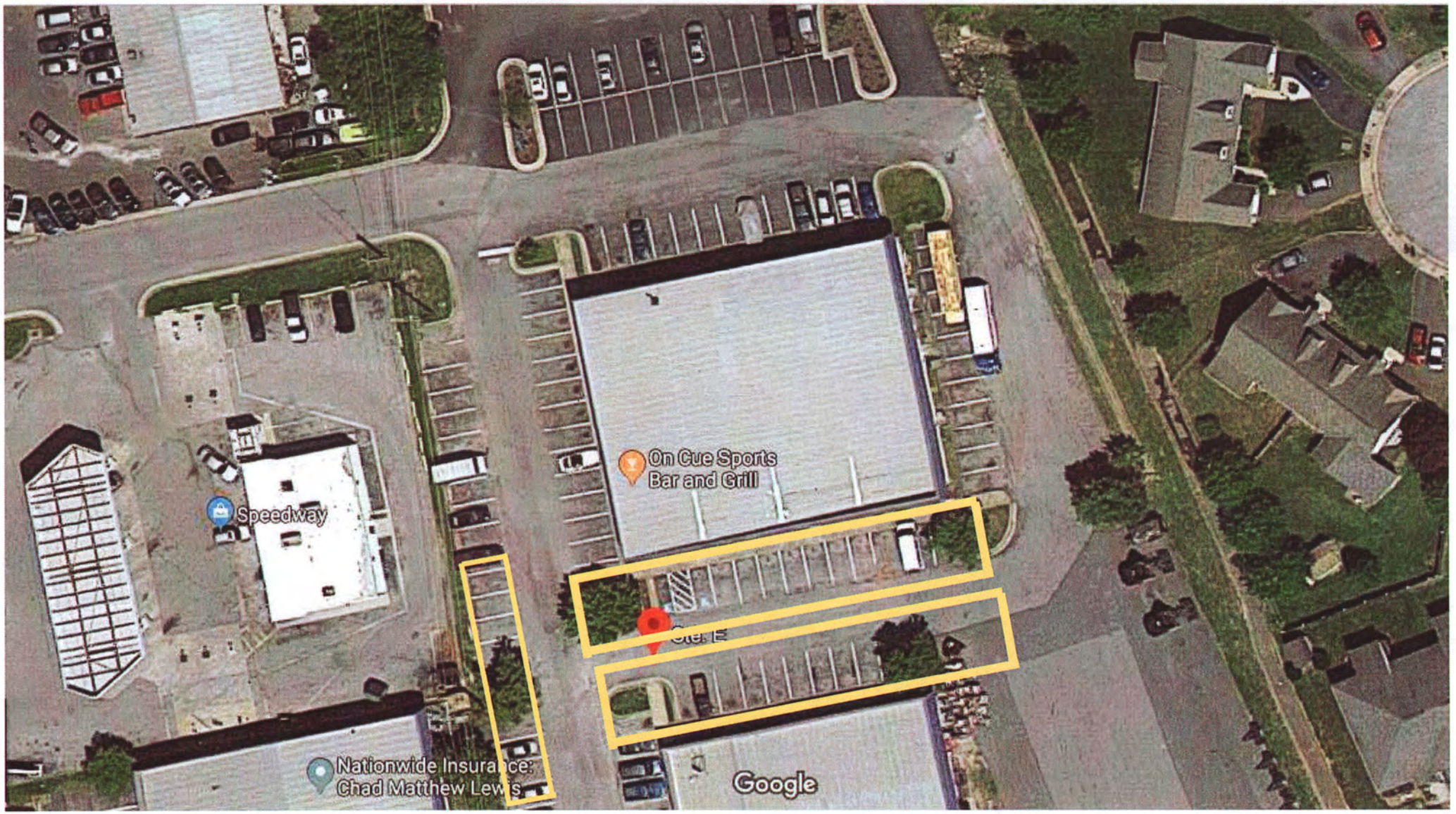
Equipment & Tools

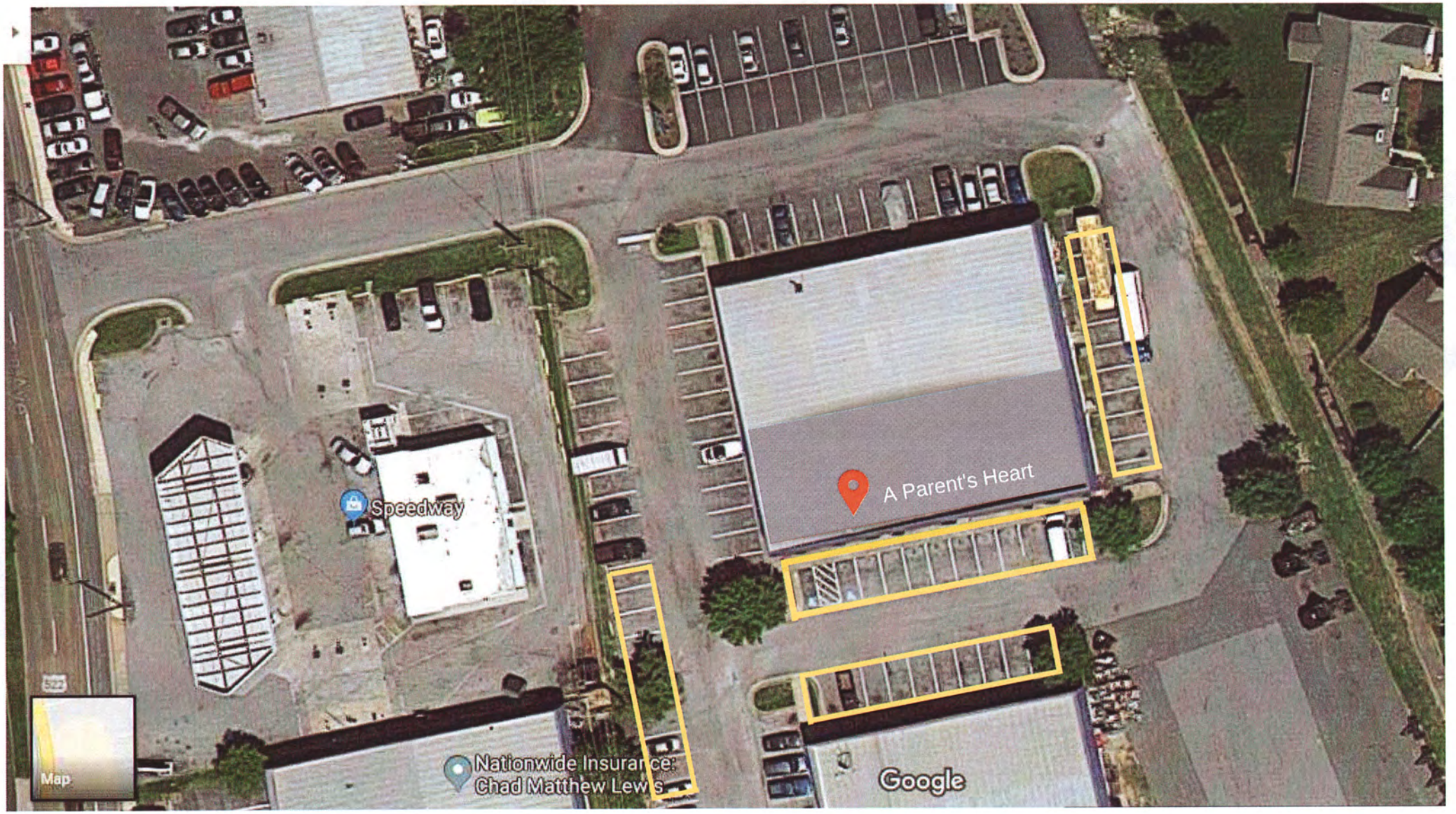
To start, we will acquire the following items to take care, provide the comfort, and facilitate the safest, cleanest, and comfortable learning environment:

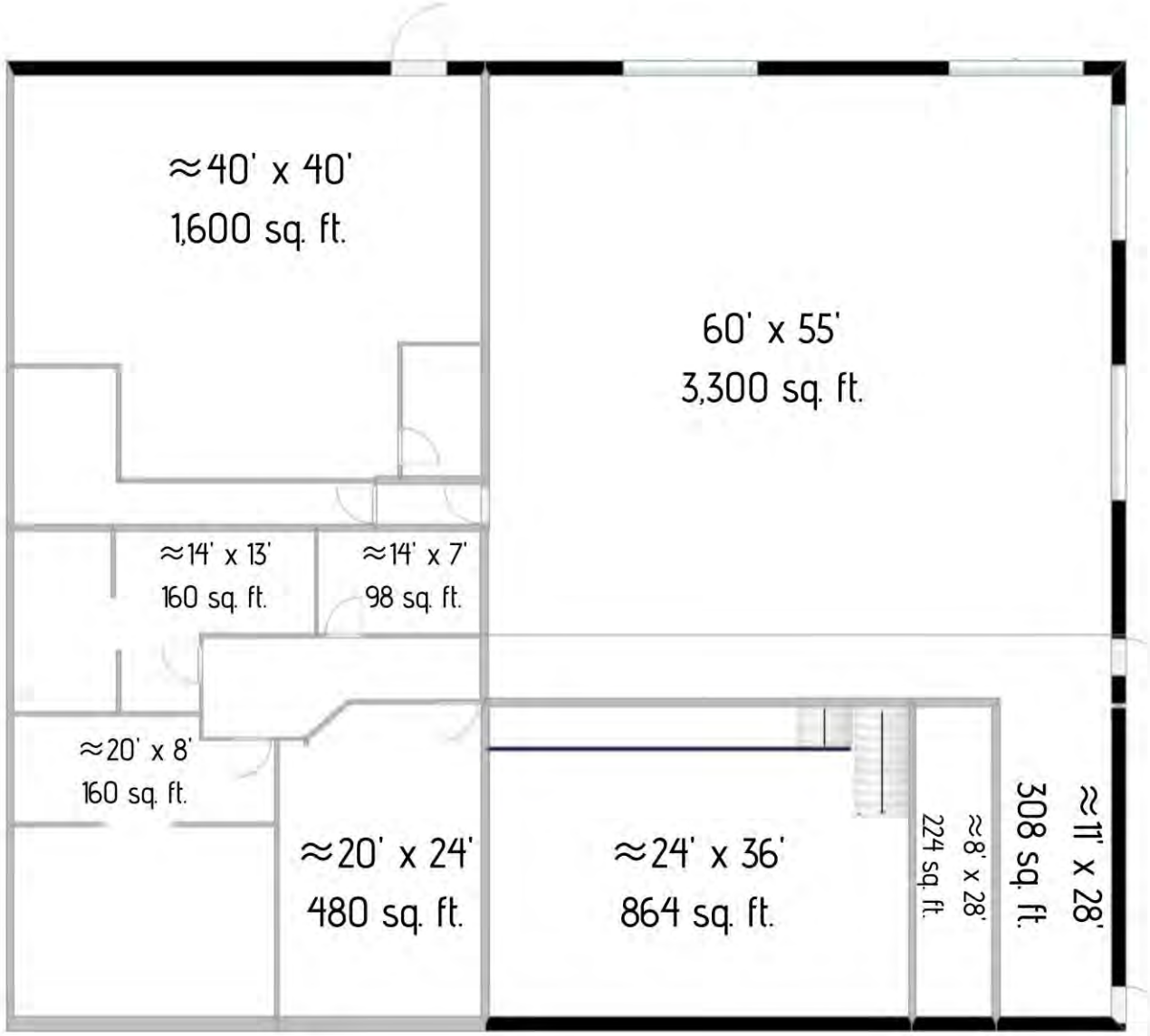
- Bed (Cots, Sheets, Blankets)
- Cubbies and Storage Cubes
- Stacking Chairs
- Tables
- Mats
- Carpets
- Office Furniture
- Television (DVD player)
- Radio
- Computer system with printer, CD-RW, and Internet connection
- Copier and Fax Machine
- Storage Bins
- Trash Bin
- Toy Chest
- Toys
- Art Supplies
- Paper
- Books

- Book Shelf
- Pencils
- Medicine Kits
- Kitchen Supplies
- Organic Cleaning Supplies
- Gloves


Pickup/Dropoff
Office
Dining Area
Office
Nursery
Restroom


On Cue Sports
Bar and Grill
Speedway
Nationwide Insurance:
Chad Matthew Lewis
Google


A Parent's Heart
Speedway
Nationwide Insurance:
Chad Matthew Lewis
Google
Map


≈40' x 40'
1,600 sq. ft.
60' x 55'
3,300 sq. ft.
≈14' x 13'
160 sq. ft.
≈14' x 7'
98 sq. ft.
≈20' x 8'
160 sq. ft.
≈20' x 24'
480 sq. ft.
≈24' x 36'
864 sq. ft.
≈8' x 28'
224 sq. ft.
≈11' x 28'
308 sq. ft.

Parking

Parking

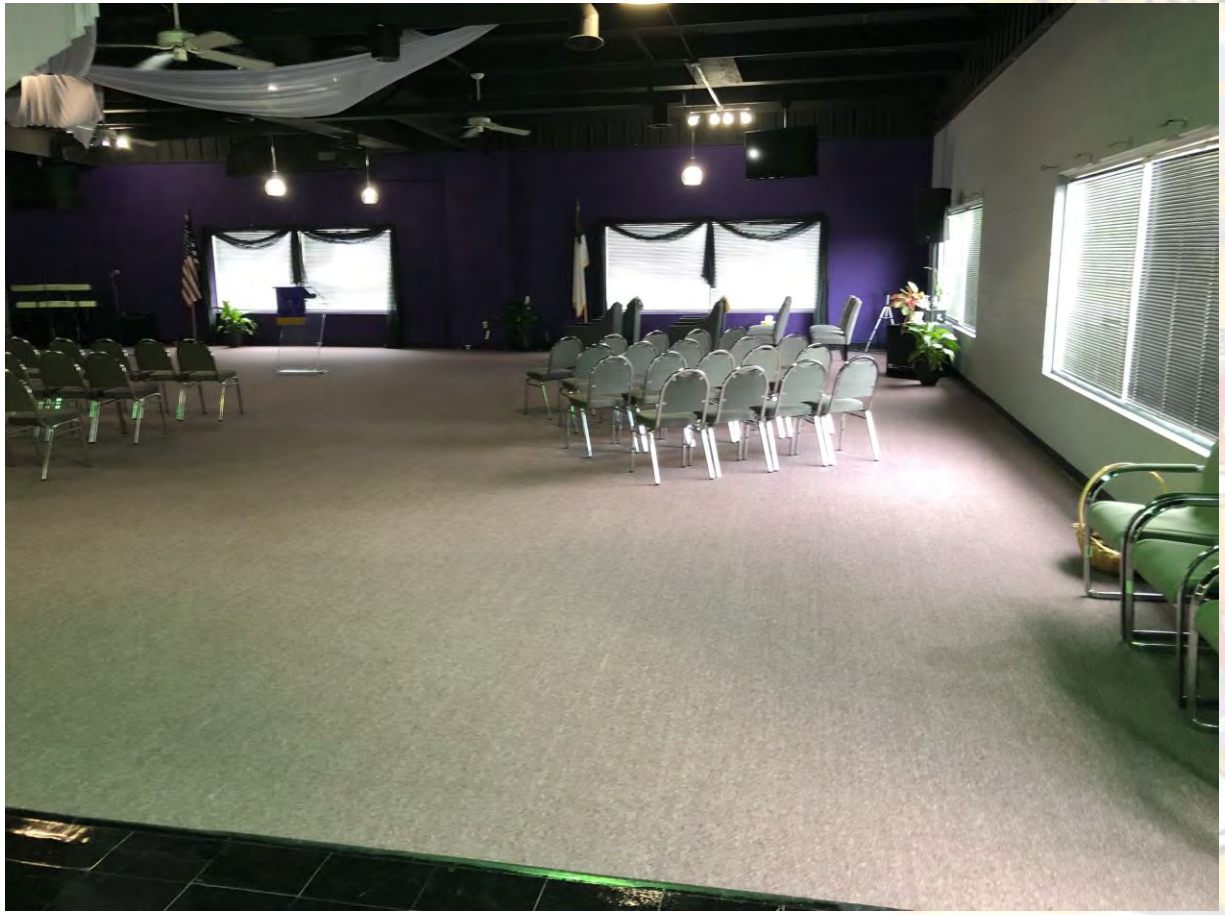
Entry/Exits

- Aluminum Glazed Exit Doors
- Metal Frames
- Glass for visibility & safety monitoring.
- Emergency Panic Bars
- Deadbolt Locks
- Surface Mounted Hydraulic Closers
- 5 x 12 Fixed Windows

Entry/Exits

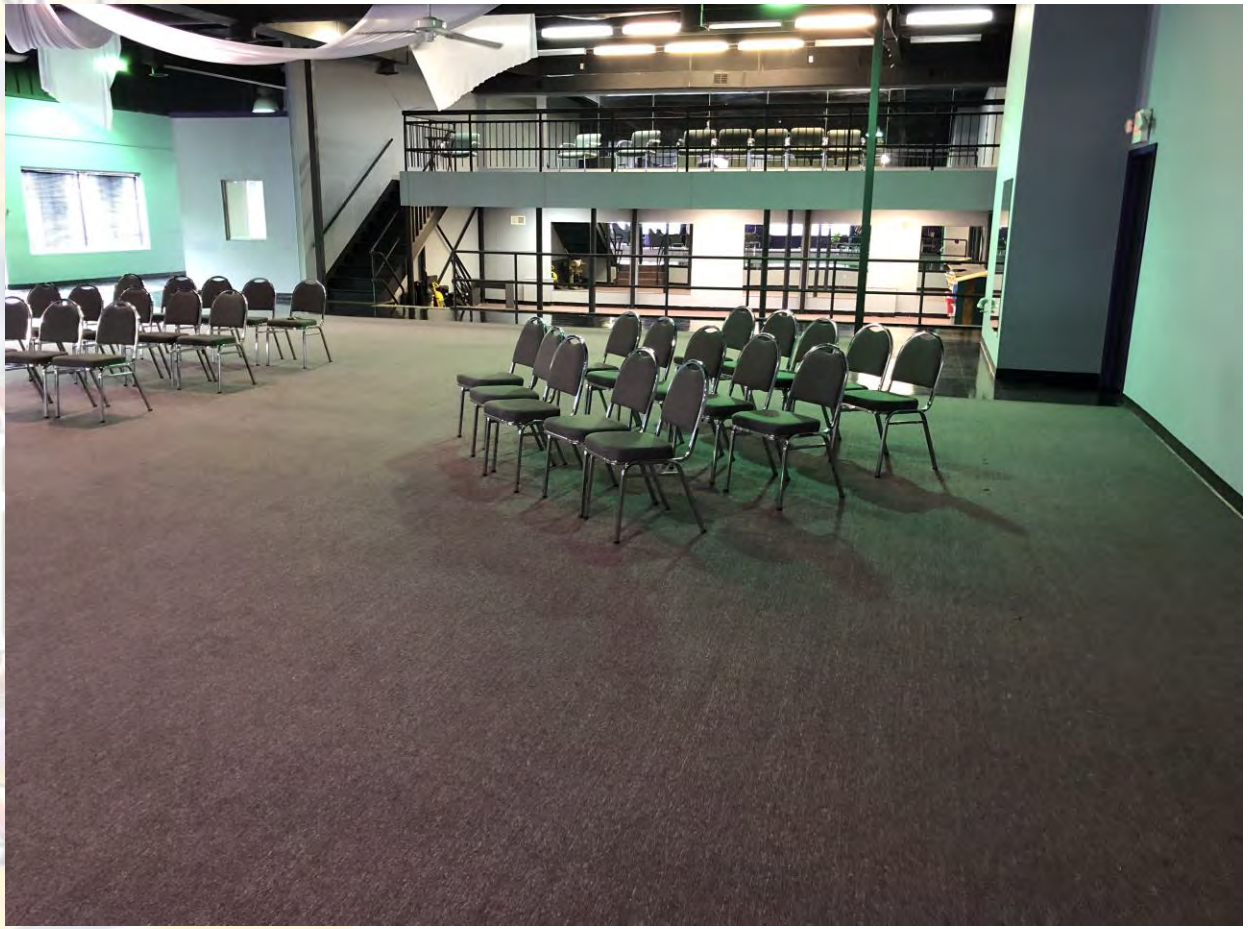
Entry/Exits

Sanctuary



Sanctuary

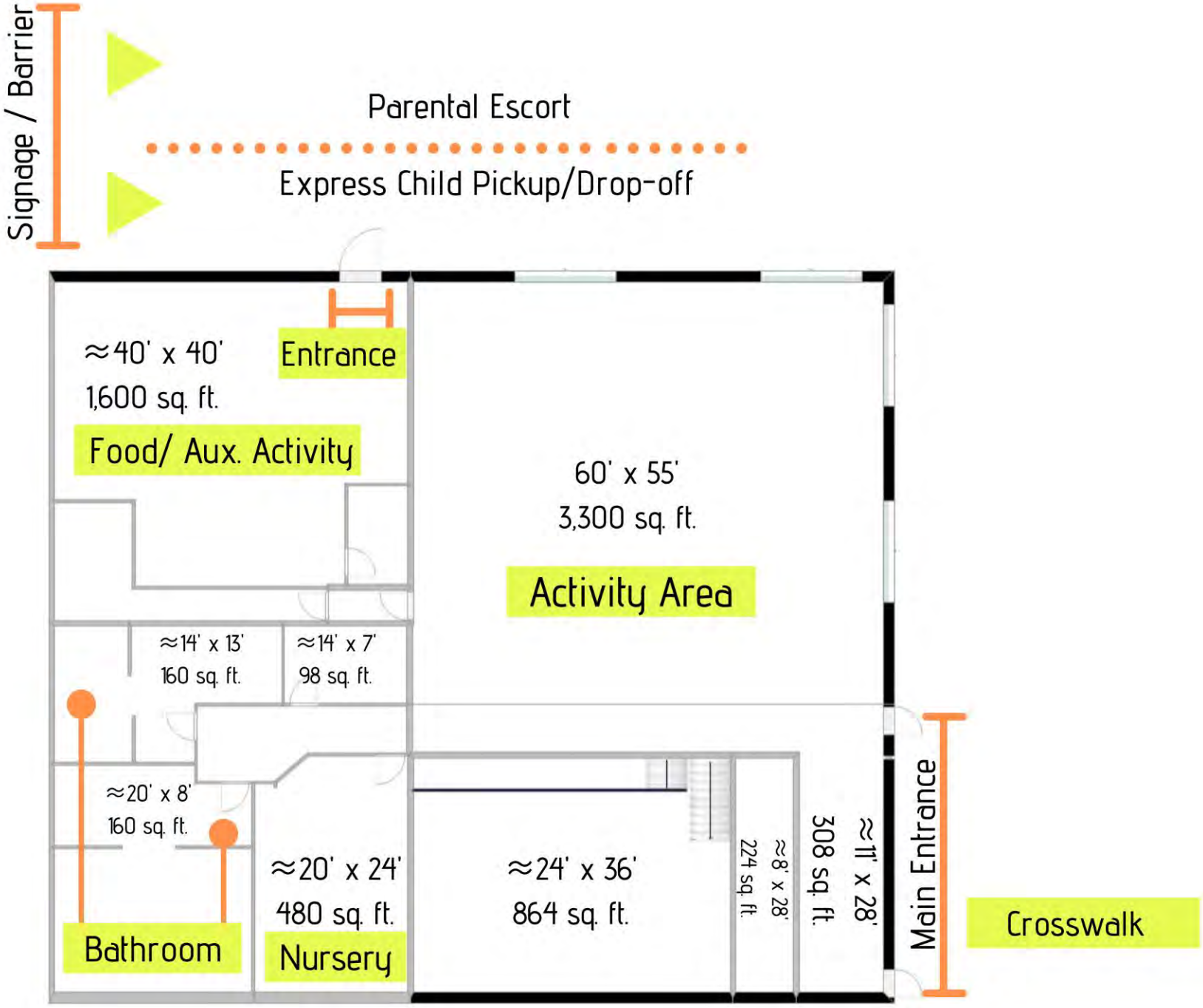
Balcony



Balcony

Nursery

Food/Aux. Class Space


Signage / Barrier
Parental Escort
Express Child Pickup/Drop-off
≈40' x 40'
1,600 sq. ft.
Entrance
Food/ Aux. Activity
60' x 55'
3,300 sq. ft.
Activity Area
≈14' x 13'
160 sq. ft.
≈14' x 7'
98 sq. ft.
≈20' x 8'
160 sq. ft.
Bathroom
≈20' x 24'
480 sq. ft.
Nursery
≈24' x 36'
864 sq. ft.
≈8' x 28'
224 sq. ft.
≈11' x 28'
308 sq. ft.
Main Entrance
Crosswalk

Supervision & Safety Action Plans:

Supervision and safety practices are of the utmost importance. Not only do these keep children safe, but it also helps to provide quality care. Because safety is important, the following is a revised plan to soothe all concerns in regards to the location of the daycare:

Pickup/Drop-off Zone:

Dropping off and picking children up could entail a dangerous labyrinth of moving cars and opening doors. A well-planned school site must entail the safe arrival and departure of any pedestrians and cars while maintaining an efficient flow.

The pickup/drop-off zone will consist of a two-lane system, going in one clockwise direction. This way, the students are loaded/unloaded directly to a staffed entrance, a monitored walkway, or the sidewalk itself. This practice will best minimize conflicts between pedestrians and vehicles due to the limited exposure to traffic.

1. Upon arriving at the beginning of the loading area, there will be a staff positioned at the post and signage indicating the start of the pickup/drop-off zone.

2. The zone will be divided into two lanes separated by cones.
    a. The right lane will lead to the loading door. This serves as an express pickup/drop-off for parents. Parents/guardians will pull in parallel to the door, pickup/drop off their child(ren), then merge back into the left lane. A member of staff will be available to assist the child(ren).

    b. The left lane will lead around to the front of the building. This will serve as parent parking. This gives parents the option to personally escort their children to the door, or to their car.

3. In the case where parents are parked across the parking lot, or if there is heavy traffic, a guided crosswalk will ensure the safe pickup/drop-off of the child, by the parent. This crosswalk, aided with signage, will be monitored by staff during pickup/drop-off times.

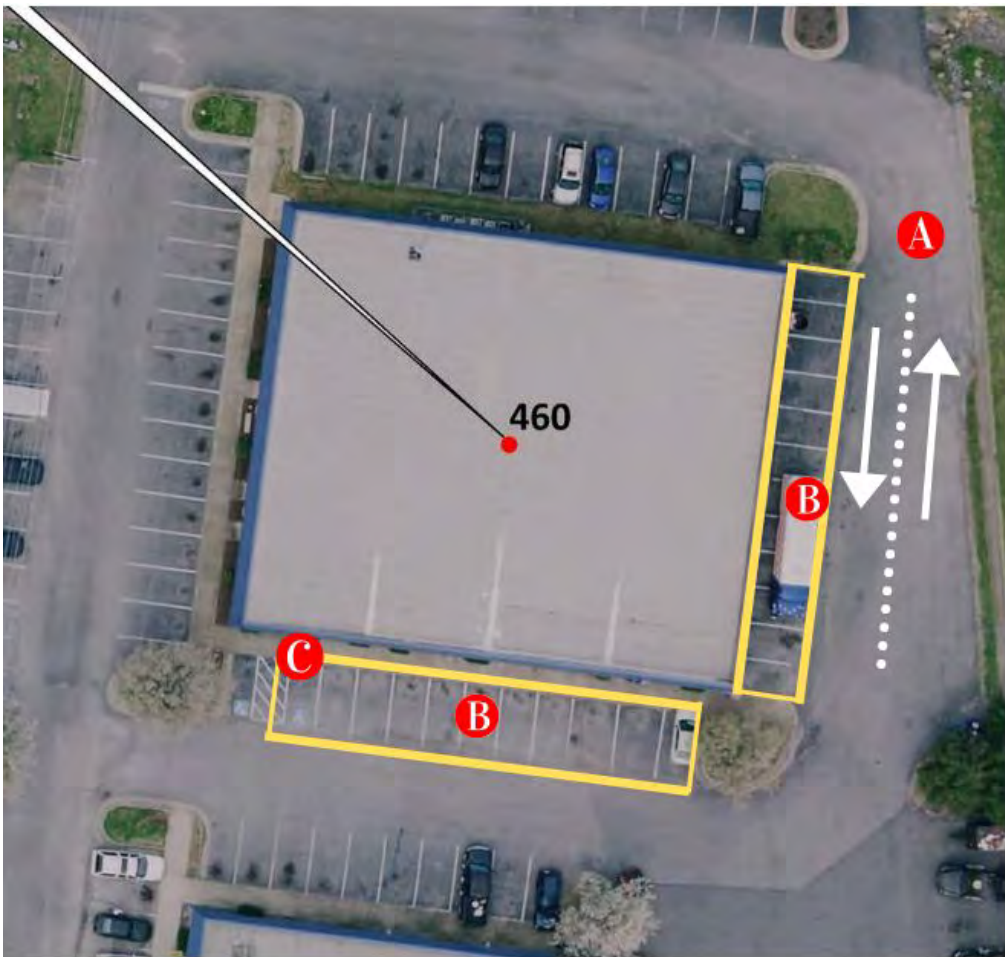
Signage & Fixtures:

Currently, options are being fielded to have permanent barriers in the roadway that leads to the side and rear of the building. Here, where the back exit is, a chain and signage will go up during the morning/afternoon drop-off/pick-up hours. This is an additional effort to curtail traffic in that area only. Seeing as there will be no weekend hours, it will only be used Monday through Friday, during the appropriate hours.

Reserved Parking Spaces:

Along with the work to obtain barriers, discussions are being had with the landlord, who will allow us to reserve a few spots in the front of the building as an extra precautionary measure. In addition, we will put up additional signs noting that there is a daycare, and the hours of operation of the daycare.

A Parent's Heart: Site Parking Proposal



- Point A indicates the location of the bollards. The bollards will be connected by a chain to control the drop-off/pick-up traffic. The bollards will be supplemented by multiple signage. (Reference Image Below)

- The arrows indicate the directional flow of the 2-lane system.

- Point B indicates the parking for the parents picking up and dropping off their children. After parking, the parents will escort their child(ren) to point C.

- Point C indicates the main entrance. Here, parents will bring their child(ren) to the administration desk, and sign them in. (Supplemented by the sign-in image below)

NOTICE

PARENT/GUARDIAN MUST SIGN CHILDREN IN AND OUT OF THE CENTER

6

Work Session Agenda Form

Item # 6

DATE: October 21, 2019

Work Session

AGENDA ITEM: Letter of Support from Alliance for the Shenandoah Valley requesting funding from the State for the Stormwater Local Assistance Fund (SLAF)

SUMMARY: Kim Woodwell, representing Alliance for the Shenandoah Valley is requesting that Council approve a Letter of Support addressed to Governor Northam requesting his commitment of $50 million in FY20 for the Stormwater Local Assistance Fund (SLAF). If approved, in the State's budget, they can be applied for through matching fund programs by local towns, cities and counties to help treat run off water and keep the waterways healthy. This falls under the Chesapeake Bay Watershed Act. Numerous surrounding counties and towns provided the letter of support last year.

The letter and a template of the Letter of Support is attached and may be revised as necessary.

BUDGET/FUNDING: None

STAFF RECOMMENDATION: If council desires, the Letter of Support would be placed on the October 28, 2019 agenda for final approval.

Joe,

I spoke with Ms. Woodwell with the Alliance for the Shenandoah Valley about her email she had sent wanting the Town to send a letter to their organization requesting that the Governor of Virginia, Ralph Northam requesting that he commit to $100 million this year for the Virginia Agricultural Cost-Share PROGRAM (VACS) which allows local farmers apply for grants to fence off areas around rivers, creeks and streams to keep the water ways cleaner and install self-waters for their livestock. The second part is requesting &$80 Million per year for the Stormwater Local Assistance Fund (SLAF). These funds once approved in the State's budget can be applied for through matching funds programs by local Towns, Cities and County to help treat run off water and keep the waterways healthy.

From what Ms. Woddwell said this falls under the Chesapeake Bay water shed act, so they push for the Governor to provide this funding each year to help complete projects. She said last year they got letters from Fredrick County, Shenandoah County, Woodstock, Broadway, Elkton, Warren and Augusta Counties. Their hoping this year to add Mount Jackson, New Market, Rockingham and Front Royal if possible. Ms. Woodwell said that they hope with all these Towns, County's and Cities requesting this the Governor will provide the funding requesting so there will be grant money available for future projects. If you have any questions or want me to find anything else out just let me know.

Thanks,

Robert B. Boyer
Public Works Director
PO Box 1560
Front Royal VA, 22630
540-635-7819 Phone
540-635-8973 Fax

-----Original Message-----
From: Kim Woodwell <kwoodwell@shenandoahalliance.org>
Sent: Thursday, September 12, 2019 9:47 AM
To: Tina Presley <tpresley@frontroyalva.com>
Subject: request for agenda

Tina,

As I mentioned on the phone, I am with Alliance for the Shenandoah Valley and we are working with our conservation partners across the Commonwealth to get letters from localities showing support for these cost-share programs. These letters will be packaged by our partner, Virginia Conservation Network, and presented all at once to the Governor and state legislators

So, I am asking for your help in requesting a letter of support from the Town of Front Royal for state cost-share funding for stormwater and agricultural best management practices. Our campaign was so successful last year with record setting levels of funding for cost-share we are hoping to get more letters and success this time!

Given the rainfall from recent years, I am sure stormwater management improvements have been discussed in Front Royal! And, I am sure you understand the benefits of agricultural BMP cost-share for both farmers and water quality. These programs would bring money to our region, address local challenges, and help Virginia meet its Chesapeake Bay clean-up commitment.

All we need from you is a simple letter of support. Attached is a draft letter for your consideration. Please changes as needed and then return a signed copy to me at kwoodwell@shenandoahalliance.org.

Don't hesitate to contact me with questions at kwoodwell@shenandoahalliance.org or 540-333-3681.

Thanks for the consideration and I hope Front Royal will join other Valley localities in supporting this effort! And, if you have questions, give a call.

Thanks Kim.

Kim Woodwell

Alliance for the Shenandoah Valley
9386 South Congress Street
PO Box 674
New Market VA 22844
c: 540.333.3681
o: 540.740.4500
www.shenandoahalliance.org
kwoodwell@shenandoahalliance.org

October 28, 2019

The Honorable Ralph Northam
Governor of Virginia
P.O. Box 1475
Richmond, VA 23218

Dear Governor Northam:

On behalf of the Town of Front Royal, we write to request your support for funding and budget language that will assist Virginia in meeting its Chesapeake Clean Water Blueprint goals.

Please include the following in your 2020 budget.

- **$50 million in funding for the Stormwater Local Assistance Fund (SLAF) for FY20**. We appreciate the FY19 allocation of $20 million to this grant program; however, there is currently $0 allocated for FY20. As you know, SLAF provides critical matching funds to local governments like ours to help install urban best management practices.

Polluted runoff is not just an environmental problem - it's also an economic problem. Investing in these programs can decrease drinking water treatment costs, minimize local flooding and grow our regional tourism.

We look forward to helping Virginia meet its 2025 Bay clean-up goals while improving the health and well-being of our citizens.

Sincerely,

Matthew A. Tederick
Interim Town Manager

DRAFT

7

Work Session Agenda Form Item # 7

DATE: 10/21/19

AGENDA ITEM: Project Costs for Fairgrounds Road Water Tank Rehabilitation

SUMMARY:

The Town has encumbered a total of $460,000 from previous budget cycles for phase one of the Fairground Road Water Tank Rehabilitation Project and recently received bids for the project.. Bid results show that the total amount to complete phase one of the project is estimated to be $227,125 and the estimated cost to complete the entire project is $892,625-$992,625.

If the Town were to elect to complete the entire project the total additional funds needed to complete the project is estimated to be $432,625-$532,625.

The Fairgrounds Road Water Tank will need to be temporarily taken out of service to perform the rehabilitation. If the Town elects to perform rehabilitation in multiple phases the water tank will need to be taken out of service for each phase and the Town will incur additional mobilization costs. Taking the water tank out of service requires preparation, planning, and coordination, especially with large industries located in the 522 corridor.

Council may elect to utilize water fund balance reserves to complete the project or may elect to proceed only with phase 1 at this time.

BUDGET/FUNDING: 9601-3510110 – Water Treatment Plant – Appropriated Funds Forward
9601-47009 – Water Treatment Plant Building & Structures

STAFF RECOMMENDATION:

Staff recommends for Council to approve the use of water fund balance reserves and award the entire project. Completion of the entire project will save the Town funds on mobilization costs and will help minimalize the impact to users of water. Staff feels that there are adequate reserve levels of water fund balance to allow for completion of this project.

Work Session

Town of Front Royal
Public Works

MEMORANDUM

TO: **BJ Wilson, Finance Director**
Joe Waltz, Town Manager

FROM: **Robert B Boyer, Public Works Director**

DATE: **October 8, 2019**

SUBJECT: **Project Cost for Fairgrounds Road Water Tank Rehab**

Phase 1 – Interior Work Only (Base Bid)
Total Construction - $187, 125.00
Total Engineering - $40,000.00
Phase 1 Total Cost - $227,125.00

Phase 2 – Exterior Work (Alternate Bid)
Total Construction - $700,500.00
Total Engineering - $65,000.00
Phase 2 Total Cost - $765,500.00

Total project cost for Phase 1 & Phase 2 -	$992.625.00
Funding budgeted in FY19/20 budget -	$460,000.00
Project cost left with current funding -	**$532,625.00**
Deduction for antenna removal if in current contract -	$100,000.00
Total project cost once the deduction is applied to cost -	**$432,625.00**

If you have any questions or need any further information, please contact me at 540-692-4789.

Thank You.

8

Work Session Agenda Form

Item # 8

DATE: October 21, 2019

Work Session

AGENDA ITEM: Goals/Update

SUMMARY: The goals presented at the August 19, 2019 work session will be updated for Council

BUDGET/FUNDING: None

STAFF RECOMMENDATION: None

TOWN OF FRONT ROYAL

TOWN COUNCIL GOAL SESSION

GOALS FOR FY19-20

Goals Setting Session for Fall 2019		Due Date	Complete	Council Lead	Staff Lead
1	Develop a plan to improve scoring in the smartscale funding for Happy Creek Phase II road project	10/30/19		Gillispie	Brown
2	Develop and issue an RFP for the road design for Happy Creek Phase II road project	9/30/19	9/27/19	Waltz	Brown
3	Establish a committee to review and provide recommended changes to subdivision Ordinances - Chapter 148 Subdivision and Land Development	9/30/19	9/30/19	Holloway	Camp
4	The Subdivision Committee to provide a draft report to Town Council	1/30/20		Holloway	Camp
5	Install additional pedestrian crossing equipment at all crosswalks on South Street	11/1/19		Sealock	Jenkins
6	Reevaluate the South Street Study conducted by VDOT	9/30/19	9/16/19	Thompson	Brown
7	Develop a safety plan for Kerfoot Avenue near the soccer fields	9/30/19	10/1/19	Thompson	Boyer
8	Develop an overall plan to address the I&I issues	12/31/19		Holloway	Boyer
9	Investigate inhouse work vs. contract labor for cost reduction on I&I work	12/31/19		Holloway	Boyer
10	Issue an RFP for consultant services for healthcare services	9/18/19		Meza	Waltz
11	Develop an action plan to redevelop the Afton Inn	9/15/19		Tederick	Waltz
12	Determine water capacity & improvement necessary in the Rt. 522 corridor for additional services	9/30/19	9/23/19	Gillispie	Boyer
13	Develop an overall project list to include funding and time schedule (current/encumber funds)	*10/30/19*		Tewalt	Wilson
14	Inspect former Town Hall for damage and overall condition of the building	8/30/19	8/28/19	Tederick	Brown
15	Contract enforcement on the building condition of Town Hall	9/30/19		Tederick	Napier
16	Develop an overall infrastructure plan with cost estimates (roads, sidewalks, curb & gutter)	9/30/19		Tewalt	Boyer
17	Develop funding options to implement infrastructure plan	10/30/19		Tewalt	Boyer
18	Develop recommendations for reforming the EDA (EDA Reform Committee)	11/29/19	N/A	Meza	Waltz
19	Develop a legal strategy for current and future lawsuits on the EDA and others	9/30/19	Ongoing	Meza	Napier
20	Determine overall cost for the PD with the EDA (% rate, legal fees and etc.)	9/30/19		Sealock	Wilson
21	Develop a public relations/communications plan and strategy	1/1/20		Thompson	Waltz
22	Investigate a pilot agreement with Valley Health to include state law and financial perspective	1/1/20		Thompson	Napier
23	Develop a policy/procedure to address blighted structures in Town	12/3/19		Thompson	Camp

Updated 10/17/19

9

Work Session Agenda Form

Item # 9

DATE: October 21, 2019

Work Session

AGENDA ITEM: Board of Architectural Review Term Expires

SUMMARY: Angela Toler's term on the Board of Architectural Review (BAR) expires November 13, 2019. She would like to be considered for re-appointment. BAR terms are 4-year terms.

BUDGET/FUNDING: None

STAFF RECOMMENDATION: Council takes desired action

10

VERSION 2 (REVISED OCTOBER 8, 2019)

134-22 SANITARY SEWER CONNECTION FEES

FIRST: RESIDENTIAL PREMISES AND UNITS:

A. The connection charge for non-commercial residential premises and units, including residential apartments, houses, condominiums, and hostels, but excluding hotels and motels, will be based on the size of the water meter for water entering the premises from which a sewer connection exits, according to the following:

1. Sewer tap served by up to and including one-inch water meter: five thousand dollars ($5,000.00) each, including installation costs, which installation costs shall be borne by the Town of Front Royal,

2. Sewer tap served by larger than one-inch and larger water meter: For sewer taps served by larger than one-inch (1") and larger water meter, the connection and installation charge shall be the same as the corresponding connection charge as for the same sized sewer tap served by the same sized water meter for non-residential premises. Installation and connection charge for residential premises for sewer taps served by larger than one-inch and larger water meters shall be in accordance with Section 134-22., "*SECOND: NON-RESIDENTIAL PREMISES AND UNITS*".

~~E.~~ 3. The charges for apartments, condominium units and trailers will be two thousand three hundred four dollars ($2,304.00) for sewer service for each unit after the first unit.

~~F.~~ 4.In the event that any multiple-unit complex which initially qualifies for the reduced rates for additional apartment units shall convert such units from a rental basis to an ownership basis, then, at the time of such conversion, the standard fee schedule charges shall be assessed against each single unit that is so converted.

5. Single-family and two-family residential dwellings will be charged according to the standard fee schedule charges for each sewer tap made, with additional charge of four hundred eighty-two dollars ($482.00) for each dwelling unit.

SECOND: NON-RESIDENTIAL PREMISES AND UNITS:

B. The connection charge for sewer service to non-residential premises and units, independent of and in addition to installation costs, will be based on the size of the water meter for water entering the premises from which a sewer connection exits, according to the following:

1. Sewer tap served by three-fourths-inch water meter: nine thousand seven hundred fifty dollars ($9,750.00) each.
2. Sewer tap served by one-inch water meter: twenty-one thousand nine hundred thirty-eight dollars ($21,938.00) each.
3. Sewer tap served by one and one-half-inch water meter: fifty thousand seven hundred dollars ($50,700.00) each.
4. Sewer tap served by two-inch water meter: seventy-nine thousand nine hundred fifty dollars ($79,950.00) each.
5. Sewer tap served by three-inch water meter: one hundred fifty-seven thousand nine hundred fifty dollars ($157,950.00) each.
6. Sewer tap served by four-inch water meter: two hundred four-five thousand seven hundred dollars (245,700.00) each.
7. Sewer tap served by six-inch water meter: four hundred eight-nine thousand four hundred fifty dollars ($489,450.00) each.
8. Sewer tap served by eight-inch water meter: seven hundred eighty-one thousand nine hundred fifty dollars ($781,950.00) each.

9. Sewer tap served by ten-inch water meter: one million nine hundred twenty-three thousand two hundred dollars ($1,123,200.00) each.
10. Sewer tap served by twelve-inch water meter: one million four hundred sixty-four thousand four hundred fifty dollars ($1,464,450.00) each.

THIRD: PROVISIONS APPLICABLE TO ALL PREMISES AND UNITS:
C. The above standard fee schedule charges shall apply to apartments, houses, condominiums, commercial buildings and hostels.
D. For purposes of this fee schedule, the following terms shall have the meanings indicated:
APARTMENT UNIT - A single-dwelling unit in a multiple-unit structure which is occupied on a rental basis.
CONDOMINIUM - A single-dwelling unit in a multiple-unit structure which is occupied on an ownership basis.
UNIT - Any single place of residence, any single place of business or any single hostelry room.
E. The standard fee schedule shall apply to the first unit of any structure. The standard fee schedule charges shall apply to each condominium unit.
F. Commercial and industrial buildings; hotels, motels, inns and other lodging facilities; dormitories; and nursing care facilities with central dining areas will be charged according to the standard fee schedule charges for each sewer tap made, with an additional charge of three hundred seventy-five dollars ($375.00) for each water closet.
G. Notwithstanding the provisions of Section 134-22A, E and G, the connection charges for sewer service provided to structures and facilities which were existing as of May 20, 1991, in the following annexed areas of the Town of Front Royal shall be frozen at rates in effect on the date of May 20, 1991, to wit:
1. The annexed area incorporated into the Town of Front Royal by order of the Annexation Court, effective December 31, 1976, as shown by the plat of record in the annexation file of record in the office of the Clerk of the Circuit Court of Warren County.
2. The annexed area incorporated into the Town of Front Royal by order of the Annexation Court, effective December 31, 1978, as shown by the plat of record in the annexation file of record in the office of the Clerk of the Circuit Court of Warren County. I. All connection fees for sewer services furnished outside of the limits of the Town of Front Royal will be one hundred percent (100%) more than the in-town rates as provided in Section 134-22, Subsections A through H.
J. No connection fee for sewer service shall be accepted by the Town of Front Royal prior to the issuance of a zoning permit and the approval of a building permit application for building development or conversion upon the lot or parcel of land to be served. This provision shall not apply when the lot or parcel of land to be served has an existing structure approved for occupancy.

134-22.3 SANITARY SEWER CONNECTIONS; FURNISHING AND REPAIR

FIRST: RESIDENTIAL PREMISES AND UNITS SERVED BY UP TO AND INCLUDING ONE INCH WATER METERS:
A. Upon appropriate payment of the connection charge as provided in Section 134-22, for non-commercial residential premises and untis, including residential apartments, houses, condominiums, and hostels, but excluding hotels and motels, the Town shall, at its expense, provide, furnish and install the following services, material, labor and equipment.
1. The actual connection into the existing sanitary sewer line and connection with the customer's lateral sewer line.

2. All connection fittings, valves and sleeves.
3. The stub to the customer's property line for the customer's connection.
4. Necessary repairs to any existing sidewalk, pavement, landscaping or lawn caused by the town's sanitary sewer line connection measures.
B. The Town shall be responsible for the cost of maintenance, repair and/or replacement to the above-stated sanitary sewer line connection, materials and equipment. The Town shall not be responsible for the cost of repair, maintenance and/or replacement of any sewer lines, material or equipment located on the customer's property.
C. The customer shall have the option to provide, furnish and install the sanitary sewer connection at his cost and only upon prior written approval by the Town.
E. Subsection A shall not apply in the case of subdividers or developers required to install like improvements under the Town's Subdivision Ordinance (Chapter 148, Subdivision and Land Development). In such cases the town shall have no repair responsibility under Subsection B until and unless said improvements have been dedicated to and accepted by the Town.

SECOND: NON-RESIDENTIAL PREMISES AND UNITS:
A. Upon appropriate payment of the connection charge as provided in Section 134-22, the Town shall, at its option, may provide, [NOTE: THE HIGHLIGHTED WORDS ARE THE WAY THE CURRENT ORDINANCE IS WORDED. DO WE WANT TO MAKE THIS OPTIONAL FOR THE TOWN, OR DO WE WANT THE TOWN TO INSTALL THESE IN CIRCUMSTANCES?] furnish and install the following services, material, labor and equipment. Incurred costs for said services, material, labor and equipment shall be borne and paid for by the property owner.
1. The actual connection into the existing sanitary sewer line and connection with the customer's lateral sewer line.
2. All connection fittings, valves and sleeves.
3. The stub to the customer's property line for the customer's connection.
4. Necessary repairs to any existing sidewalk, pavement, landscaping or lawn caused by the town's sanitary sewer line connection measures.
B. The customer shall be responsible for all costs of the materials and installation of the equipment described in this Section. Upon the request of a customer for service, the Town shall prepare an estimate of the cost of all materials and installation of the meters and connections and all appurtenances to be installed and shall collect the amount from the customer prior to installation. In the event the final charge exceeds or is less than the estimate and payment, an additional billing or refund, respectively, shall be made by the Town. Failure of the customer to pay the additional charge within thirty (30) days may result in disconnection of the service until paid in full, including any reconnection and administrative fee.
C. The Town shall be responsible for the cost of maintenance, repair and/or replacement to the above-stated sanitary sewer line connection, materials and equipment. The Town shall not be responsible for the cost of repair, maintenance and/or replacement of any sewer lines, material or equipment located on the customer's property.
D. The customer shall have the option to provide, furnish and install the sanitary sewer connection at his cost and only upon prior written approval by the Town.
E. Subsection A shall not apply in the case of subdividers or developers required to install like improvements under the Town's Subdivision Ordinance (Chapter 148, Subdivision and Land Development). In such cases the town shall have no repair responsibility under Subsection B until and unless said improvements have been dedicated to and accepted by the Town.

PROVISIONS APLICABLE PARTICULARY TO WATER
134-30 CONNECTION CHARGE ESTABLISHED

FIRST: RESIDENTIAL PREMISES AND UNITS:

A. The connection charge for water service to residential premises and units, including residential apartments, houses, condominiums, and hostels, but excluding hotels and motels, including installation costs, which installation costs shall be borne by the Town of Front Royal, will be based on meter size and service line size. The larger size will dictate the fee in conjunction with the following schedule:
1. Three-fourths-inch (3/4") water tap: four thousand three hundred forty dollars ($4,340.00) each
2. One-inch (1") water tap: five thousand dollars ($5,000.00) each.
3. Larger than one-inch (1") and larger tap: For sewer taps served by larger than one-inch and larger water meter, the connection fee shall be the same as the corresponding connection fee as for the same sized water connection tap fee served by the same sized water connection tap fee for non-residential premises. Installation for residential premises for water taps served by larger than one-inch and larger water meters shall be in accordance with Section 134-32., "*SECOND: NON-RESIDENTIAL PREMISES*".
~~E.~~ 4. The standard fee schedule shall apply to the first unit of any structure. These standard fee schedule charges shall apply to each condominium unit.
~~F.~~ 5.The charges for apartments, condominium units and trailers will be two thousand three hundred seventy-one dollars ($2,371.00) for water service for each unit after the first unit.
6. Single-family and two-family residential dwellings will be charged according to the standard fee schedule charges for each water tap made, with an additional charge of four hundred ninety-six dollars ($496.00) for each dwelling unit.

SECOND: NON-RESIDENTIAL PREMISES AND UNITS:
A. Connection charge for water service to non-residential premises and units, independent of and in addition to installation costs, will be based on meter size and service line size. The larger size will dictate the fee in conjunction with the following schedule:
1. Three-fourths-inch water tap: four thousand three hundred forty dollars ($4,340.00) each.
2. One-inch water tap: eight thousand eight hundred sixteen dollars ($8,816.00) each.
3. One and one-half-inch water tap: twenty thousand one hundred dollars ($20,100.00) each.
4. Two-inch water tap: thirty-one thousand one hundred fifty-four dollars ($31,154.00) each.
5. Three-inch water tap: sixty thousand six hundred thirty-four dollars ($60,634.00) each.
6. Four-inch water tap: ninety-three thousand seven hundred ninety-eight dollars ($93,798.00) each.
7. Six-inch water tap: one hundred eighty-five thousand nine hundred twenty-two dollars ($185,922.00) each.
8. Eight-inch water tap: two hundred ninety-six thousand four hundred sixty-nine dollars ($296,469.00) each.
9. Ten-inch water tap: four hundred twenty-five thousand four hundred forty-two dollars ($425,442.00) each.
10. Twelve-Inch water tap: five hundred fifty-four thousand four hundred fifteen dollars ($554,415.00) each.
B. The connection charge for water service exclusively used for fire-suppression systems will be based on the line size, according to the following fee schedule:

1. Three-inch line or smaller: two thousand one hundred twenty-four dollars ($2,124.00), plus thirty-nine dollars and sixty-seven cents ($39.67) per month.
2. Four-inch line: four thousand two hundred forty-eight dollars ($4,248.00), plus seventy-nine dollars and thirty-two cents ($79.32) per month.
3. Six-inch line: eight thousand four hundred ninety-five dollars ($8,495.00), plus one hundred sixty-one dollars and forty-nine cents ($161.49) per month.
4. Eight-inch line: twelve thousand seven hundred forty-three dollars ($12,743.00), plus two hundred forty dollars and eighty cents ($240.80) per month.
5. Ten-inch line: sixteen thousand nine hundred ninety-one dollars ($16,991.00), plus three hundred twenty dollars and fourteen cents ($320.14) per month.

THIRD: PROVISIONS APPLICABLE TO ALL PREMISES AND UNITS:

C. The above standard fee schedule charges shall apply to apartments, houses, condominiums, commercial buildings and hostels.
D. For the purpose of this fee schedule, the following terms shall have the meanings indicated:
APARTMENT UNIT - A single dwelling unit in a multiple-unit structure which is occupied on a rental basis.
CONDOMINIUM - A single dwelling unit in a multiple-unit structure which is occupied on an ownership basis.
UNIT - Any single place of residence, any single place of business or any single hostelry room.
G. (RESERVED)
H. Commercial and industrial buildings; hotels, motels, inns and other lodging facilities; dormitories; and nursing-care facilities with central dining areas will be charged according to the standard fee schedule charges for each water tap made, with an additional charge of three hundred eighty-seven dollars ($387.00) for each water closet.
~~Single family and two family residential dwellings will be charged according to the standard fee schedule charges for each water tap made, with an additional charge of four hundred ninety-six dollars ($496.00) for each dwelling unit.~~ [MOVED TO A. 6. ABOVE.]
I. There will be an additional monthly charge for each water meter exceeding one (1) inch in size according to the following fee schedule:
1. One-and-one-fourth inch meter: seventeen dollars and thirty-five cents ($17.35) per month.
One-and-one-half inch meter: twenty-three dollars and twenty-eight cents ($23.28) per month.
3. Two-inch meter: fifty-five dollars and thirty-one cents ($55.31) per month.
4. Three-inch meter: two hundred ninety dollars and seventeen cents ($290.17) per month.
5. Four-inch meter: three hundred seventy-seven dollars and twenty-two cents ($377.22) per month.
6. Six-inch meter: five hundred eighty dollars and thirty-three cents ($580.33) per month.
J. All connection fees for water service furnished outside the limits of the Town of Front Royal will be one hundred percent (100%) more than the in-town rates as provided above. This section shall not apply to property located in the Belmont Subdivision of Warren County served by the water system constructed by the lot owners and subsequently conveyed to the Town of Front Royal.
K. No connection fee for water service shall be accepted by the Town of Front Royal prior to the issuance of a zoning permit and the approval of a building permit application for building development or conversion upon the lot or parcel of land to be served. This provision shall not apply when the lot or parcel of land to be served has an existing structure approved for occupancy.
L. Notwithstanding the provisions of Section 134-30A through I, the connection charges for water service provided to structures and facilities which were existing as of May 20, 1991, in the following annexed areas of the Town of Front Royal shall be frozen at the rates in effect on the date of May 20, 1991, as follows:

1. The annexed are incorporated into the Town of Front Royal by order of the Annexation Court, effective December 31, 1976, as shown by the plat of record in the annexation file of record in the office of the Clerk of the Circuit Court of Warren County.
2. The annexed area incorporated into the Town of Front Royal by order of the Annexation Court effective December 31, 1978, as shown by the plat of record in the annexation file of record in the office of the Clerk of the Circuit Court of Warren County.

134-32 FURNISHING OF WATER METERS AND APPURTENANCES; REPAIRS

FIRST: RESIDENTIAL PREMISES AND UNITS SERVED BY AND UP TO ONE INCH:

The following shall apply to residential premises and units, including residential apartments, houses, condominiums, and hostels, but excluding hotels and motels:

A. Taps up to and including one inch (1") on development of existing in-fill lots:
1. Upon appropriate payment of the connection charge(s) as provided in Section 134-30, ain consideration whereof, the Town shall provide, furnish and install the following services, material, labor and equipment to residential premises, including residential apartments, houses, condominiums, and hostels, but excluding hotels and motels, including installation costs, which installation costs shall be borne by the Town of Front Royal.

a. The tap (connection) into the existing waterline.

b. All fittings, valves and sleeves deemed necessary by the Town for said tap.

c. All appurtenances deemed necessary by the Town including the service line to the meter, water meter jar, angle valve, yoke bar, flanges, gaskets, back-flow prevention device, ring & lid assembly, and up to five feet of pig-tail at the property. The meter will be located at the Town right-of-way/easement/property line.

d. The Town will own and maintain all appurtenances up to the discharge side of the water meter/back-flow device.

SECOND: NON-RESIDENTIAL PREMISES AND UNITS:

A. Taps ~~under 2"~~ above one inch (1") on development of existing in-fill lots:
1. Upon appropriate payment of the connection charge(s) as provided in Section 134-30, and in consideration whereof, the Town shall provide, furnish and install the following services, material, labor and equipment. Incurred costs for said services, material, labor and equipment shall be borne and paid for by the property owner.
a. The tap (connection) into the existing waterline.
b. All fittings, valves and sleeves deemed necessary by the Town for said tap.
c. All appurtenances deemed necessary by the Town including the service line to the meter, water meter jar, angle valve, yoke bar, flanges, gaskets, back-flow prevention device, ring & lid assembly, and up to five feet of pig-tail at the property. The meter will be located at the Town right-of-way/easement/property line.

d. The Town will own and maintain all appurtenances up to the discharge side of the water meter/back-flow device.
2. The customer shall be responsible for all costs of the materials and installation of the equipment described in this Section. Upon the request of a customer for service, the Town shall prepare an estimate of the cost of all materials and installation of the meters and connections and all appurtenances to be installed, in addition to the connection tap fees described in Section 134-30, and shall collect the amount from the customer prior to installation. In the event the final charge exceeds or is less than the estimate and payment, an additional billing or refund, respectively, shall be made by the Town. Failure of the customer to pay the additional charge within thirty (30) days may result in disconnection of the service until paid in full, including any reconnection and administrative fee.
B. Taps ~~2" and greater~~ above one inch (1") ~~and~~ on development of any parcels other than existing in-fill lots:
1. The customer will be responsible for the purchase, excavation and installation of the meter vault, water meter, valves, piping, back-flow device, and all other appurtenances deemed necessary by the Town and County.
2. The materials and configuration and installation of all appurtenances shall be in compliance with the Town of Front Royal Standards and Specifications.
3. After the installation and final inspection, the Town of Front Royal will assume full ownership and maintenance of the vault and Town required appurtenances.
C. All services will be protected with back-flow protection devices.
D. For water taps used exclusively for fire suppression systems:
1. The Town will tap the main line and extend the service as a stub to the edge of the right-of-way/easement/property line.
2. The customer will be responsible for the excavation and installation at the edge of the right-of-way/easement/property line for the required vault and appurtenances deemed necessary by the Town of Front Royal and by the customer and in compliance with all applicable codes and regulations.
3. Upon final inspection, the Town will assume responsibility and maintenance for the vault and all appurtenances deemed necessary by the Town of Front Royal.
4. The installation and appurtenances will be in compliance with the Town of Front Royal Standards and Specifications.
E. The Town will not be responsible for the cost of repair, maintenance and/or replacement of any lines, materials or equipment located on the customer's property from and beyond the end point of the Town owned meter vault.
F. The Town thereafter shall be responsible for the cost of repair and/or replacement to the above-stated waterline connection, materials and equipment. The Town shall not be responsible for the cost of repair, maintenance and/or replacement of any lines, material or equipment located on the customer's property from and beyond the end point of the town-installed tail specified at Subsection (E) herein.
G. Subsection A shall not apply in the case of subdividers or developers required to install like improvements under the Town's Subdivision Ordinance (Chapter 148, Subdivision and Land Development). In such cases the Town shall have no repair responsibility under Subsection B until and unless said improvements have been dedicated to and accepted by the Town.
3. Upon final inspection, the Town will assume responsibility and maintenance for the vault and all appurtenances deemed necessary by the Town of Front Royal.
4. The installation and appurtenances will be in compliance with the Town of Front Royal Standards and Specifications.
E. The Town will not be responsible for the cost of repair, maintenance and/or replacement of any lines, materials or equipment located on the customer's property from and beyond the end point of the Town owned meter vault.

F. The Town thereafter shall be responsible for the cost of repair and/or replacement to the above-stated waterline connection, materials and equipment. The Town shall not be responsible for the cost of repair, maintenance and/or replacement of any lines, material or equipment located on the customer's property from and beyond the end point of the town-installed tail specified at Subsection (E) herein.
G. Subsection A shall not apply in the case of subdividers or developers required to install like improvements under the Town's Subdivision Ordinance (Chapter 148, Subdivision and Land Development). In such cases the Town shall have no repair responsibility under Subsection B until and unless said improvements have been dedicated to and accepted by the Town.

This ordinance shall become effective upon passage.

APPROVED:

_____
Matthew A. Tederick, Interim Mayor

ATTEST:

_____
Jennifer E. Berry, MMC, Clerk of Council

THIS ORDINANCE was approved at the Regular Meeting of the Town of Front Royal, Virginia on its second reading, conducted _____2019, upon the following recorded vote:

Eugene R. Tewalt	Yes/No	Jacob L. Meza	Yes/No
William A. Sealock	Yes/No	Chris W. Holloway	Yes/No
Letasha Thompson	Yes/No	Gary Gillispie	Yes/No

A public hearing on the above was held on _____, 2019, having been advertised in the Northern Virginia Daily on September 28 and October 5, 2019. The Ordinance was enacted at the Regular Meeting of the Town Council held _____2019, to become effective immediately.

Approved as to form and legality:

_____
Douglas W. Napier, Town Attorney

Date: ____/____/_____