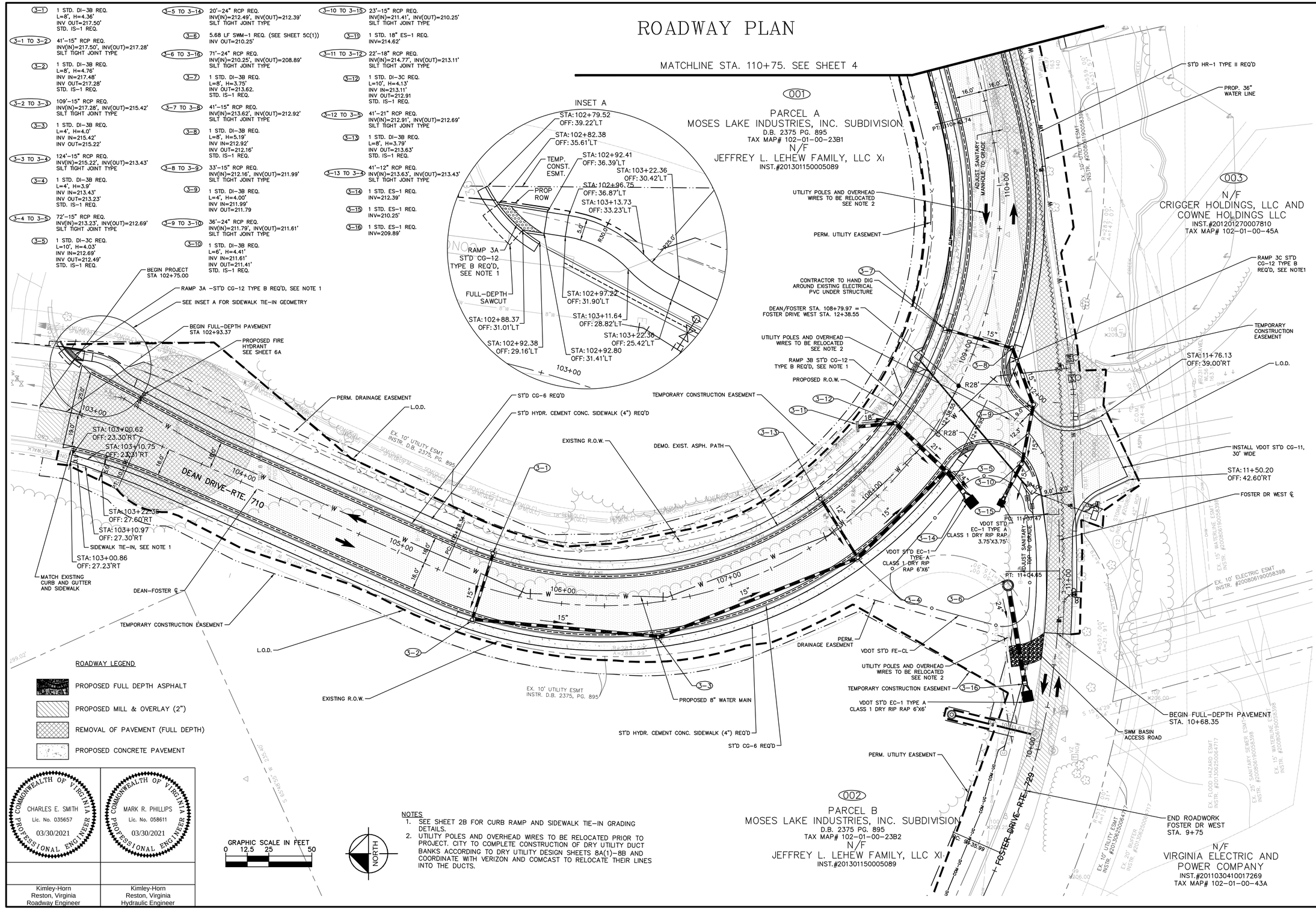
ROADWAY PLAN

MATCHLINE STA. 110+75. SEE SHEET 4

3–1	1 STD. DI–3B REQ. L=8', H=4.36' INV OUT=217.50' STD. IS–1 REQ.	
3–1 TO 3–2	41'–15" RCP REQ. INV(IN)=217.50', INV(OUT)=217.28' SILT TIGHT JOINT TYPE	
3–2	1 STD. DI–3B REQ. L=8', H=4.76' INV IN=217.48' INV OUT=217.28' STD. IS–1 REQ.	
3–2 TO 3–3	109'–15" RCP REQ. INV(IN)=217.28', INV(OUT)=215.42' SILT TIGHT JOINT TYPE	
3–3	1 STD. DI–3B REQ. L=4', H=4.0' INV IN=215.42' INV OUT=215.22'	
3–3 TO 3–4	124'–15" RCP REQ. INV(IN)=215.22', INV(OUT)=213.43' SILT TIGHT JOINT TYPE	
3–4	1 STD. DI–3B REQ. L=4', H=3.9' INV IN=213.43' INV OUT=213.23' STD. IS–1 REQ.	
3–4 TO 3–5	72'–15" RCP REQ. INV(IN)=213.23', INV(OUT)=212.69' SILT TIGHT JOINT TYPE	
3–5	1 STD. DI–3C REQ. L=10', H=4.03' INV IN=212.69' INV OUT=212.49' STD. IS–1 REQ.	
3–5 TO 3–14	20'–24" RCP REQ. INV(IN)=212.49', INV(OUT)=212.39' SILT TIGHT JOINT TYPE	
3–6	5.68 LF SWM–1 REQ. (SEE SHEET 5C(1)) INV OUT=210.25'	
3–6 TO 3–16	71'–24" RCP REQ. INV(IN)=210.25', INV(OUT)=208.89' SILT TIGHT JOINT TYPE	
3–7	1 STD. DI–3B REQ. L=8', H=3.75' INV OUT=213.62. STD. IS–1 REQ.	
3–7 TO 3–8	41'–15" RCP REQ. INV(IN)=213.62', INV(OUT)=212.92' SILT TIGHT JOINT TYPE	
3–8	1 STD. DI–3B REQ. L=8', H=5.19' INV IN=212.92' INV OUT=212.16' STD. IS–1 REQ.	
3–8 TO 3–9	33'–15" RCP REQ. INV(IN)=212.16', INV(OUT)=211.99' SILT TIGHT JOINT TYPE	
3–9	1 STD. DI–3B REQ. L=4', H=4.00' INV IN=211.99' INV OUT=211.79	
3–9 TO 3–10	36'–24" RCP REQ. INV(IN)=211.79', INV(OUT)=211.61' SILT TIGHT JOINT TYPE	
3–10	1 STD. DI–3B REQ. L=6', H=4.41' INV IN=211.61' INV OUT=211.41' STD. IS–1 REQ.	
3–10 TO 3–15	23'–15" RCP REQ. INV(IN)=211.41', INV(OUT)=210.25' SILT TIGHT JOINT TYPE	
3–11	1 STD. 18" ES–1 REQ. INV=214.62'	
3–11 TO 3–12	22'–18" RCP REQ. INV(IN)=214.77', INV(OUT)=213.11' SILT TIGHT JOINT TYPE	
3–12	1 STD. DI–3C REQ. L=10', H=4.13' INV IN=213.11' INV OUT=212.91 STD. IS–1 REQ.	
3–12 TO 3–5	41'–21" RCP REQ. INV(IN)=212.91', INV(OUT)=212.69' SILT TIGHT JOINT TYPE	
3–13	1 STD. DI–3B REQ. L=8', H=3.79' INV OUT=213.63' STD. IS–1 REQ.	
3–13 TO 3–4	41'–12" RCP REQ. INV(IN)=213.63', INV(OUT)=213.43' SILT TIGHT JOINT TYPE	
3–14	1 STD. ES–1 REQ. INV=212.39'	
3–15	1 STD. ES–1 REQ. INV=210.25'	
3–16	1 STD. ES–1 REQ. INV=209.89'	



NOTES
1. SEE SHEET 2B FOR CURB RAMP AND SIDEWALK TIE–IN GRADING DETAILS.
2. UTILITY POLES AND OVERHEAD WIRES TO BE RELOCATED PRIOR TO PROJECT. CITY TO COMPLETE CONSTRUCTION OF DRY UTILITY DUCT BANKS ACCORDING TO DRY UTILITY DESIGN SHEETS 8A(1)–8B AND COORDINATE WITH VERIZON AND COMCAST TO RELOCATE THEIR LINES INTO THE DUCTS.

GRAPHIC SCALE IN FEET
0 12.5 25 50

NORTH

COMMONWEALTH OF VIRGINIA CHARLES E. SMITH Lic. No. 035657 03/30/2021 PROFESSIONAL ENGINEER	COMMONWEALTH OF VIRGINIA MARK R. PHILLIPS Lic. No. 058611 03/30/2021 PROFESSIONAL ENGINEER
Kimley-Horn Reston, Virginia Roadway Engineer	Kimley-Horn Reston, Virginia Hydraulic Engineer

100% DESIGN SUBMITTAL

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

REVISIONS
DATE | DESCRIPTION | BY

MANASSAS PROJECT NO.:	T–030
DATE OF PLAN ISSUANCE:	TBD
CONSULTANT PROJECT ID.:	594000
DESIGNED BY: MP	DATE: 1/15/2020
DRAWN BY: DB	DATE: 2/18/2020
CHECKED BY: SH	DATE: 2/21/2020
APPROVED BY: CS	DATE: 5/6/2020

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WWW.KIMLEY–HORN.COM

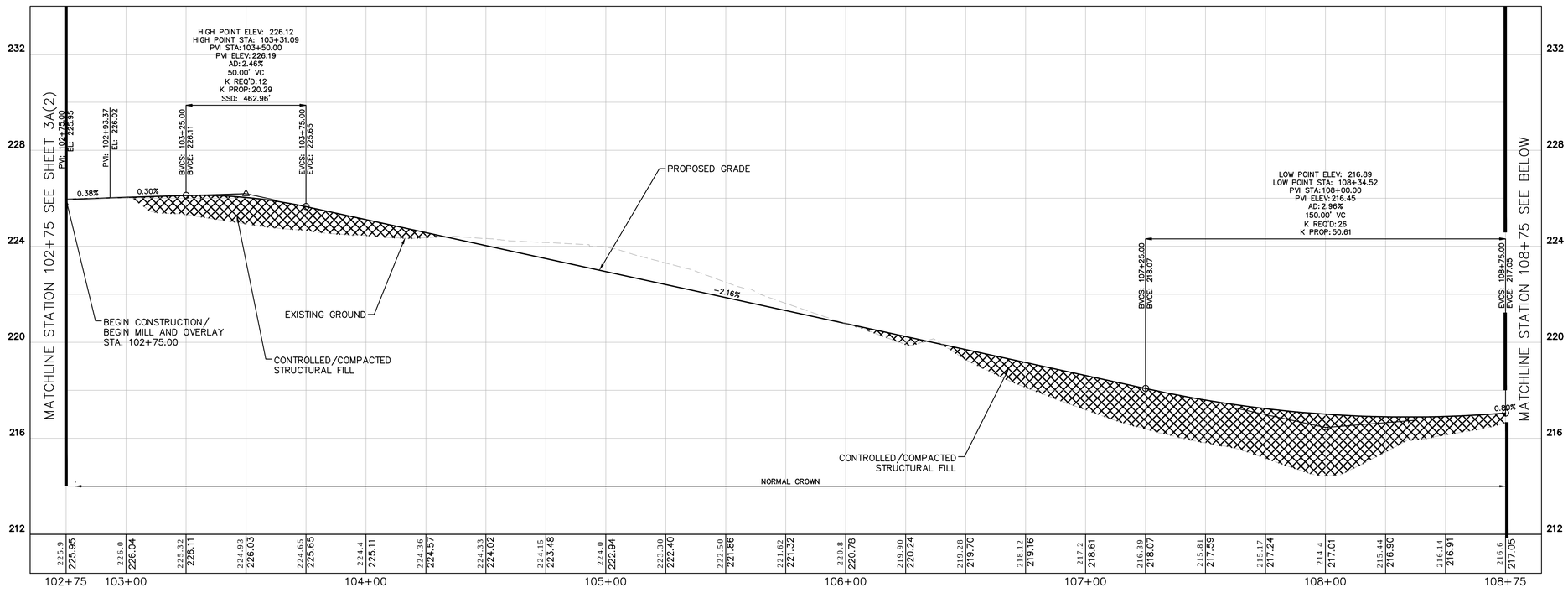
DEAN DRIVE EXTENDED (T–030)

SHEET
3 – ROADWAY PLAN

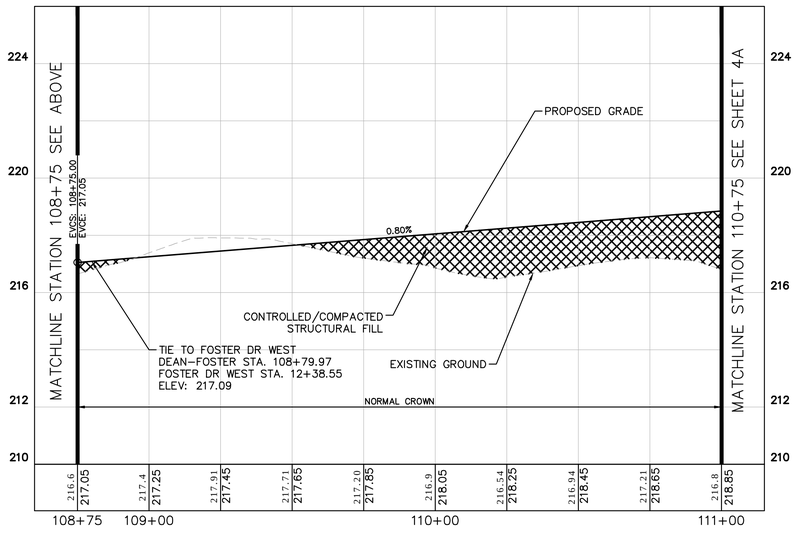
SCALE 1:25

DEAN – FOSTER DRIVE

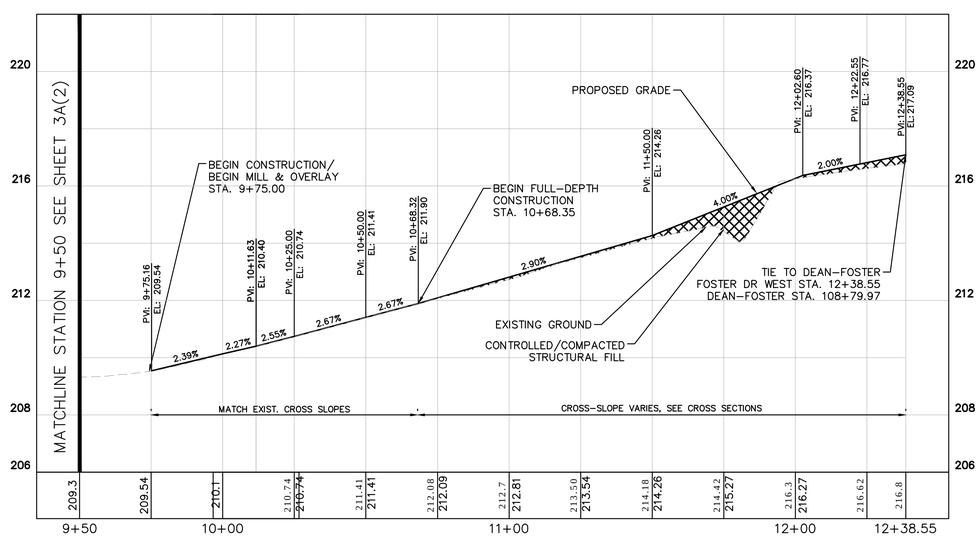
ROADWAY PROFILES

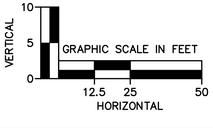


DEAN – FOSTER DRIVE



FOSTER DRIVE WEST





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Kimley-Horn
Reston, Virginia
Hydraulic Engineer

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CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

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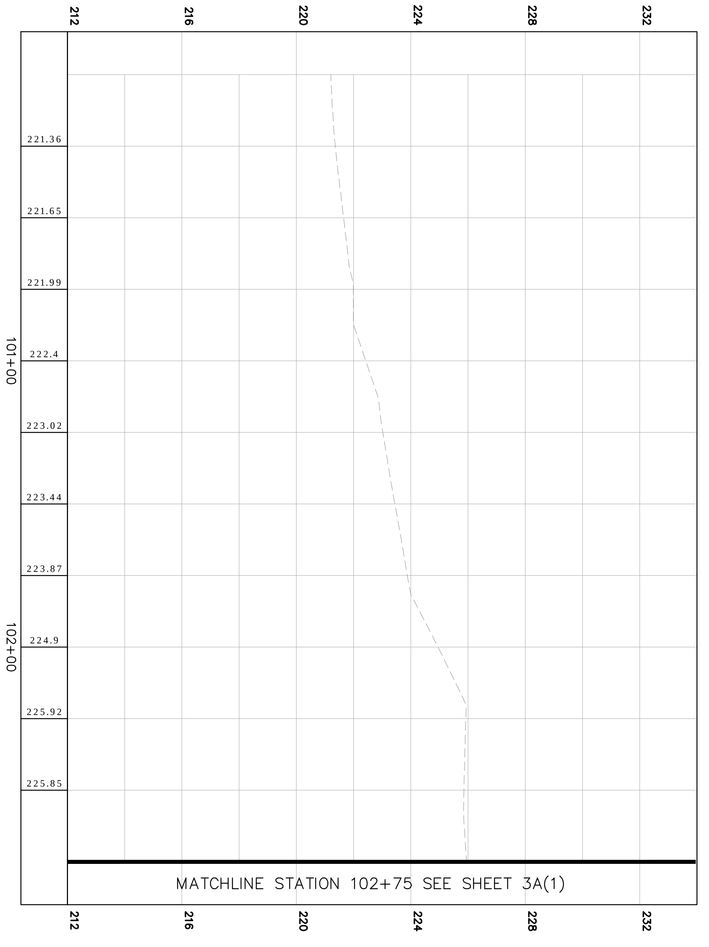
DEAN DRIVE EXTENDED (T-030)

SHEET
3A(1) – ROADWAY PROFILE

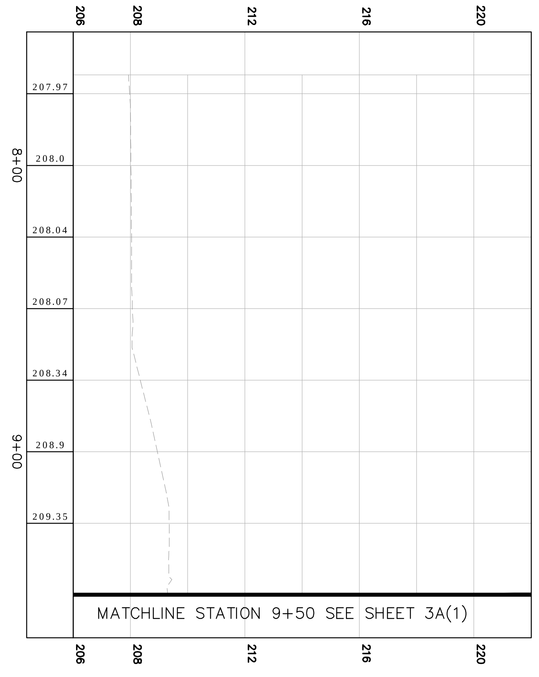
SCALE H 1:25
V 1:5

DEAN – FOSTER DRIVE

ROADWAY PROFILES



FOSTER DRIVE WEST



VERTICAL
0 5 10
GRAPHIC SCALE IN FEET
HORIZONTAL
12.5 25 50

Kimley-Horn
Rosemary Virginia
Hydraulic Engineer

Kimley-Horn
Rosemary Virginia
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03/30/2021
COMMONWEALTH OF VIRGINIA
PROFESSIONAL ENGINEER

DEAN DRIVE EXTENDED (T-030)

100% DESIGN SUBMITTAL

SHEET 3A(2) – ROADWAY PROFILES
SCALE H 1:25 V 1:5

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CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

MANASSAS, VIRGINIA
Rich in History
Inspired
1873

EROSION AND SEDIMENT CONTROL PHASE 1

MATCHLINE STA. 110+75. SEE SHEET 4B

PARCEL A
MOSES LAKE INDUSTRIES, INC. SUBDIVISION
D.B. 2375 PG. 895
TAX MAP# 102-01-00-23B1
N/F
JEFFREY L. LEHEW FAMILY, LLC XI
INST.#201301150005089

N/F
CRIGGER HOLDINGS, LLC AND
COWNE HOLDINGS LLC
INST.#201201270007810
TAX MAP# 102-01-00-45A

DEAN DRIVE-RTE. 710
(VARIABLE RIGHT-OF-WAY)

EXISTING R.O.W.

PARCEL B
MOSES LAKE INDUSTRIES, INC. SUBDIVISION
D.B. 2375 PG. 895
TAX MAP# 102-01-00-23B2
N/F
JEFFREY L. LEHEW FAMILY, LLC XI
INST.#201301150005089

N/F
VIRGINIA ELECTRIC AND
POWER COMPANY
INST.#2011030410017269
TAX MAP# 102-01-00-43A

LEGEND

SF — TSF	DENOTES TEMPORARY SILT FENCE, ST'D EC-5
RCD-2	DENOTES ROCK CHECK DAM, TYPE II, ST'D EC-4
IP-A	DENOTES INLET PROTECTION, TYPE A, ST'D EC-6
IP-B	DENOTES INLET PROTECTION, TYPE B, ST'D EC-6
IP-C	DENOTES INLET PROTECTION, TYPE C, ST'D EC-6

GRAPHIC SCALE IN FEET
0 12.5 25 50

NORTH

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PROFESSIONAL ENGINEER

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CITY OF MANASSAS, VIRGINIA
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MANASSAS, VIRGINIA 20110

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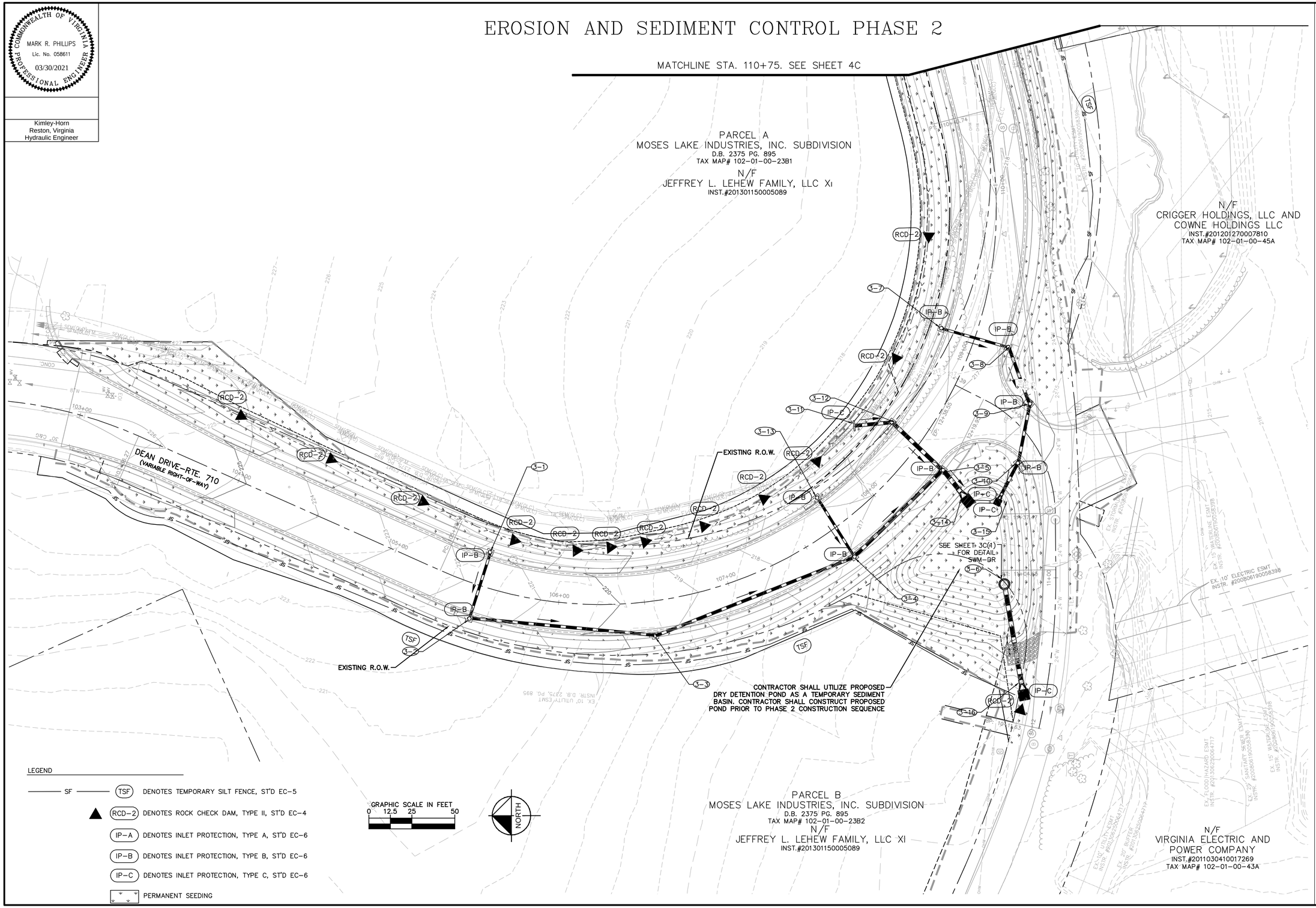
DEAN DRIVE EXTENDED (T-030)

SHEET
3B - EROSION AND SEDIMENT CONTROL PHASE 1
SCALE 1:25

EROSION AND SEDIMENT CONTROL PHASE 2



COMMONWEALTH OF VIRGINIA
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DEAN DRIVE EXTENDED (T-030)

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

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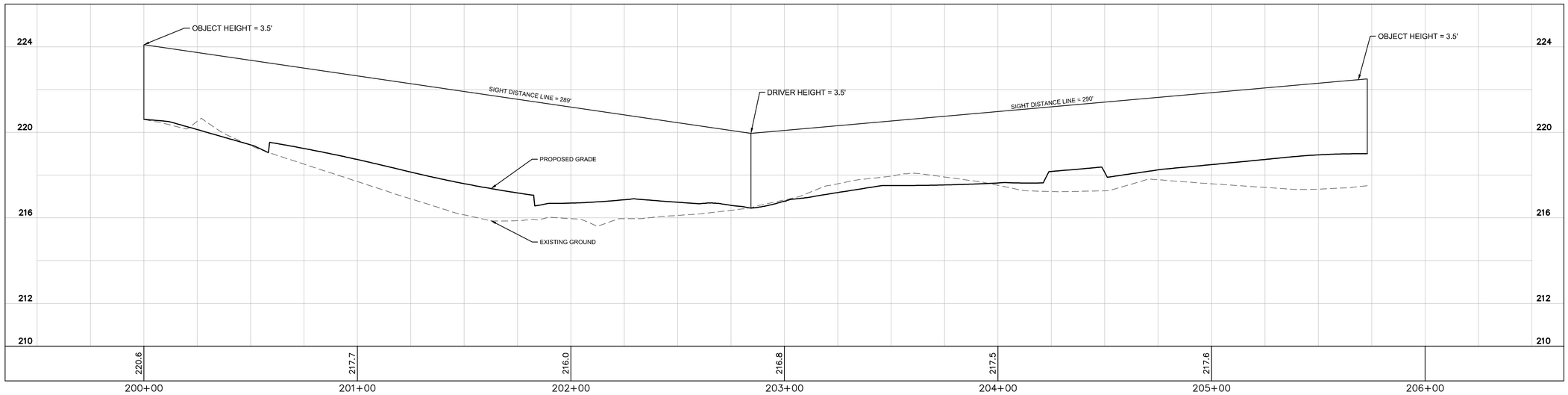
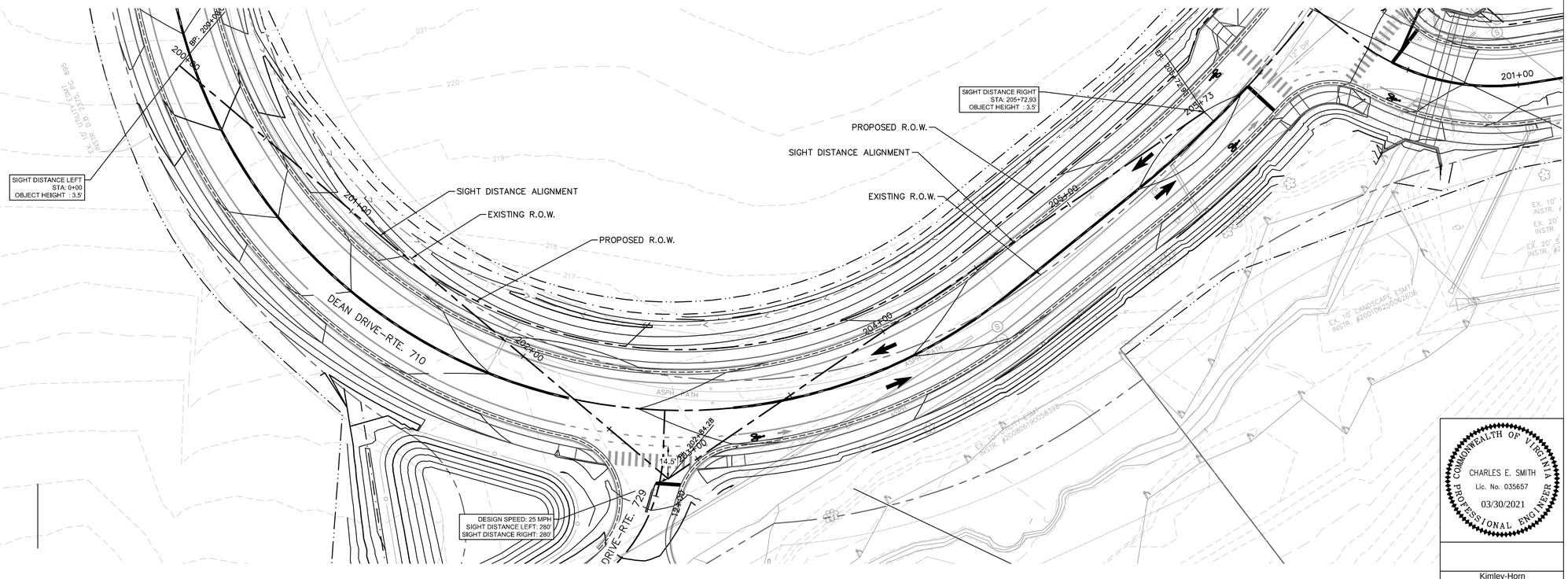
SHEET
3C – EROSION AND SEDIMENT CONTROL PHASE 2
SCALE 1:25

INTERSECTION SIGHT DISTANCE





100% DESIGN SUBMITTAL

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
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MANASSAS, VIRGINIA 20110

REVISIONS

BY	DATE	DESCRIPTION
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SH	2/21/2020	
CS	5/8/2020	

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COMMONWEALTH OF VIRGINIA
CHARLES E. SMITH
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03/30/2021
PROFESSIONAL ENGINEER

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Reston, Virginia
Civil Engineer

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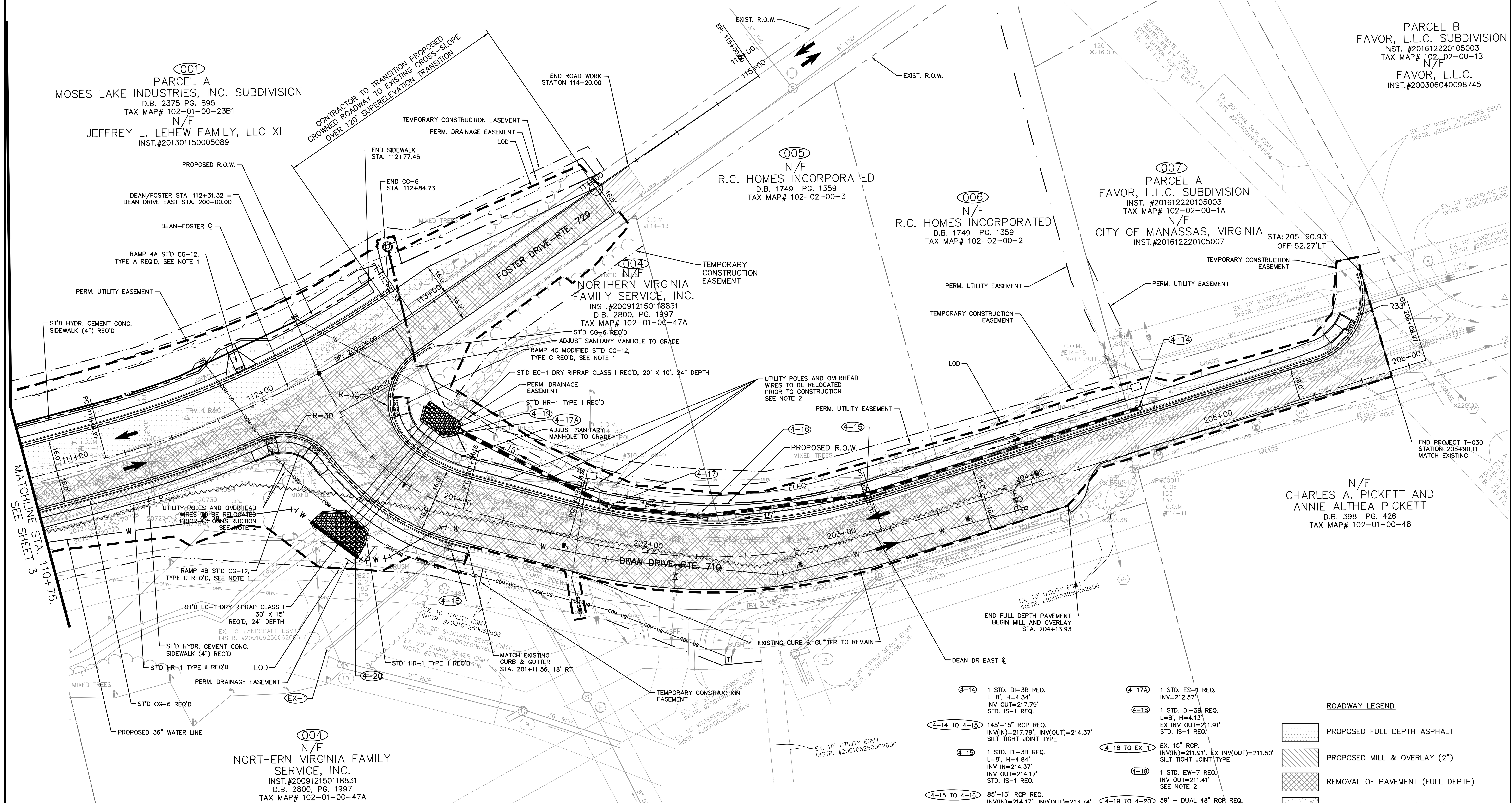
SHEET
3D – INTERSECTION SIGHT DISTANCE

SCALE 1:25

ROADWAY PLAN



NOTES
1. SEE SHEET 2B FOR CURB RAMP AND SIDEWALK TIE-IN GRADING DETAILS.
2. UTILITY POLES AND OVERHEAD WIRES TO BE RELOCATED PRIOR TO PROJECT. CITY TO COMPLETE CONSTRUCTION OF DRY UTILITY DUCT BANKS ACCORDING TO DRY UTILITY DESIGN SHEETS 8A(1)-8B AND COORDINATE WITH VERIZON AND COMCAST TO RELOCATE THEIR LINES INTO THE DUCTS.
3. CONSTRUCTION OF DUAL-48" RCP CULVERT TO BE GOVERNED BY DEQ VWP GENERAL PERMIT NUMBER WP3-20-0554.

4-14	1 STD. DI-3B REQ. L=8', H=4.34' INV OUT=217.79' STD. IS-1 REQ.
4-14 TO 4-15	145'-15" RCP REQ. INV(IN)=217.79', INV(OUT)=214.37' SILT TIGHT JOINT TYPE
4-15	1 STD. DI-3B REQ. L=8', H=4.84' INV IN=214.37' INV OUT=214.17' STD. IS-1 REQ.
4-15 TO 4-16	85'-15" RCP REQ. INV(IN)=214.17', INV(OUT)=213.74' SILT TIGHT JOINT TYPE
4-16	1 STD. DI-3B REQ. L=4', H=4.0' INV IN=213.74' INV OUT=213.54'
4-16 TO 4-17	48'-15" RCP REQ. INV(IN)=213.54', INV(OUT)=213.20' SILT TIGHT JOINT TYPE
4-17	1 STD. DI-3B REQ. L=4', H=3.91' INV IN=213.20' INV OUT=213.00' STD. IS-1 REQ.
4-17 TO 4-17A	84'-15" RCP REQ. INV(IN)=213.00', INV(OUT)=212.57' SILT TIGHT JOINT TYPE
4-17A	1 STD. ES-1 REQ. INV=212.57'
4-18	1 STD. DI-3B REQ. L=8', H=4.13' EX INV OUT=211.91' STD. IS-1 REQ.
4-18 TO EX-1	EX. 15" RCP. INV(IN)=211.91', EX INV(OUT)=211.50' SILT TIGHT JOINT TYPE
4-19	1 STD. EW-7 REQ. INV OUT=211.41' SEE NOTE 2
4-19 TO 4-20	59' - DUAL 48" RCP REQ. INV(IN)=211.41', INV(OUT)=210.93' SILT TIGHT JOINT TYPE
4-20	1 STD. EW-7 REQ. INV IN=210.93' SEE NOTE 2

ROADWAY LEGEND
- PROPOSED FULL DEPTH ASPHALT
- PROPOSED MILL & OVERLAY (2")
- REMOVAL OF PAVEMENT (FULL DEPTH)
- PROPOSED CONCRETE PAVEMENT

GRAPHIC SCALE IN FEET
0 12.5 25 50

NORTH

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03/30/2021
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Reston, Virginia
Roadway Engineer

Kimley-Horn
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Hydraulic Engineer

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CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
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REVISIONS
DATE	BY	DESCRIPTION

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APPROVED BY: CS DATE: 5/8/2020

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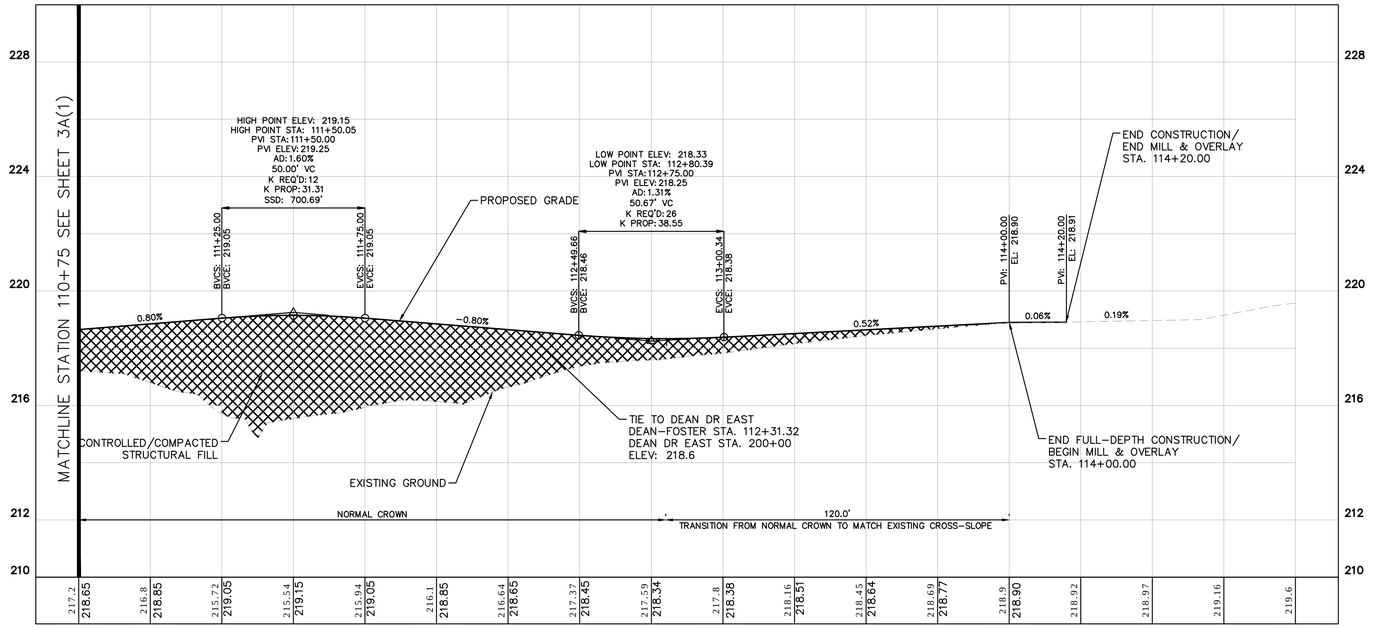
DEAN DRIVE EXTENDED (T-030)

SHEET
4 - ROADWAY PLAN

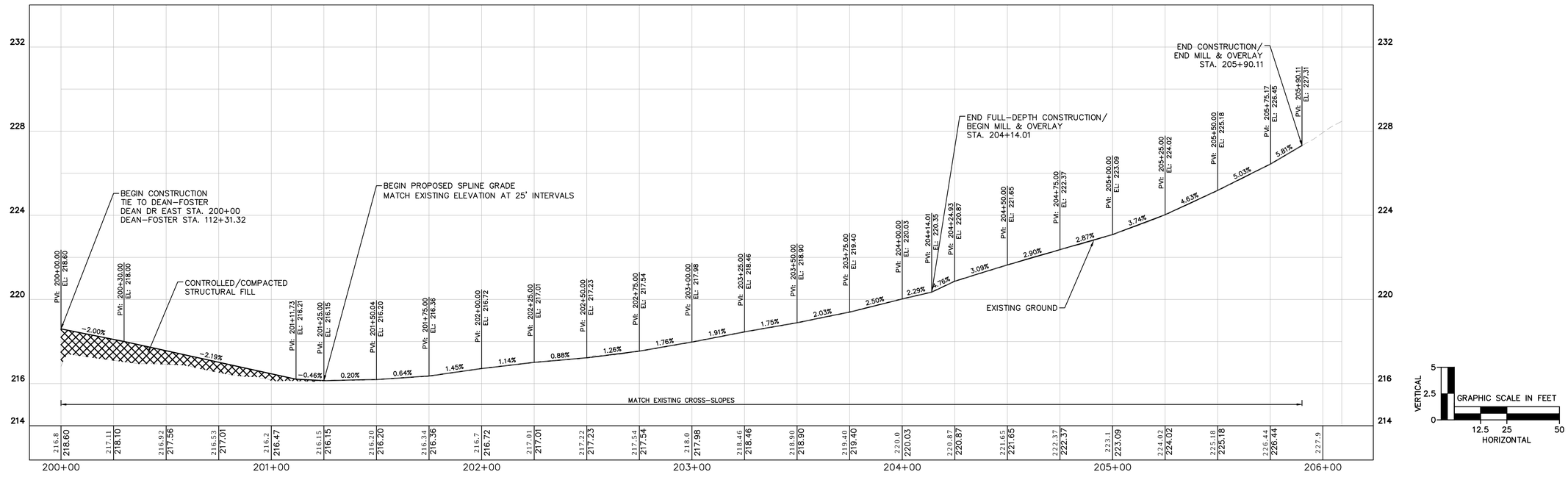
SCALE 1:25

ROADWAY PROFILES

DEAN / FOSTER DRIVE



DEAN DRIVE EAST



Kimley-Horn
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Roadway Engineer

COMMONWEALTH OF VIRGINIA
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03/30/2021

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100% DESIGN SUBMITTAL

CITY OF MANASSAS, VIRGINIA
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8500 PUBLIC WORKS DRIVE
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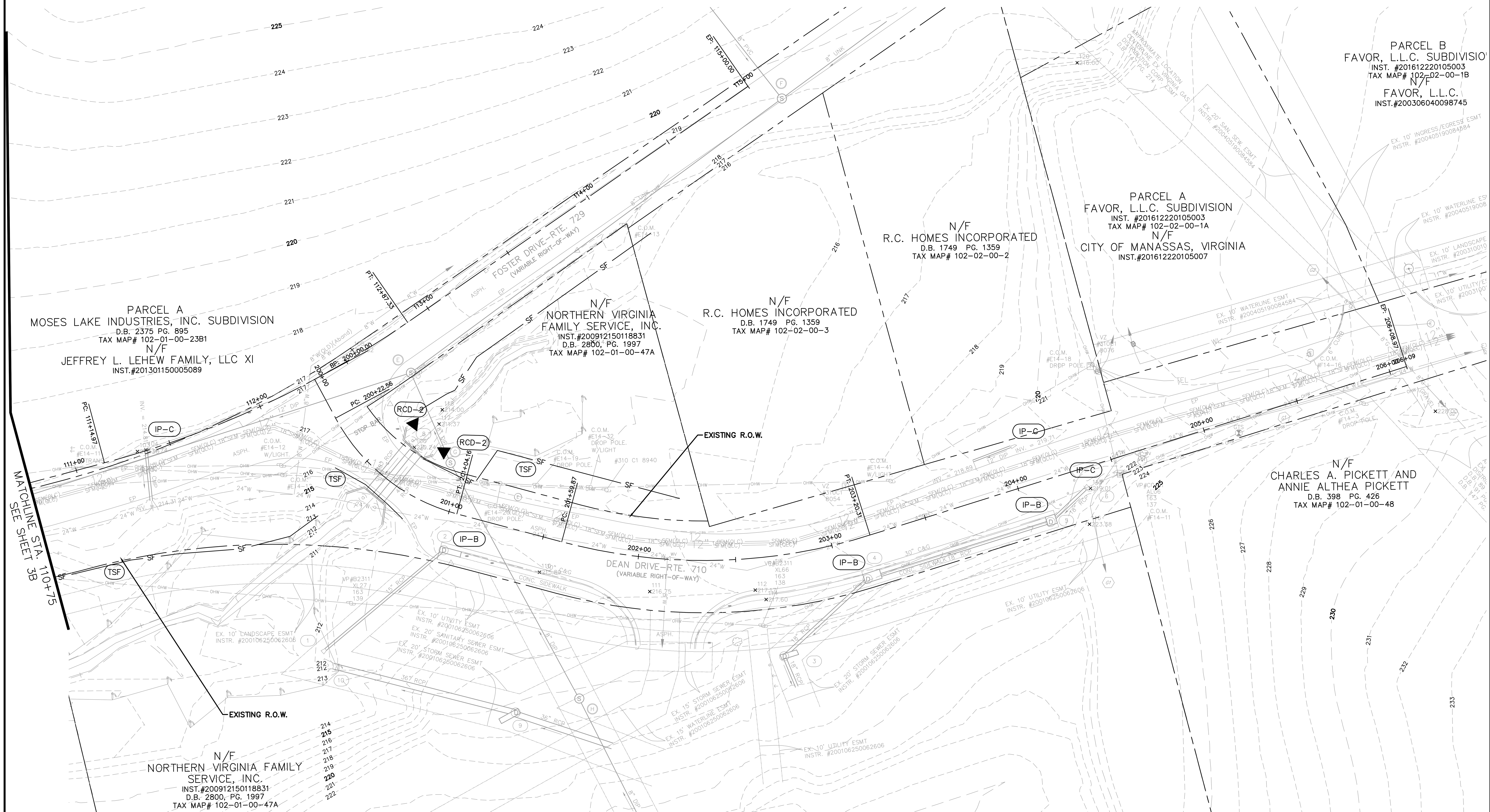
DEAN DRIVE EXTENDED (T-030)

SHEET
4A – ROADWAY PROFILE

SCALE H 1:25
V 1:5

EROSION AND SEDIMENT CONTROL PHASE 1



LEGEND

SF (TSF) DENOTES TEMPORARY SILT FENCE, ST'D EC-5

(RCD-2) DENOTES ROCK CHECK DAM, TYPE II, ST'D EC-4

(IP-A) DENOTES INLET PROTECTION, TYPE A, ST'D EC-6

(IP-B) DENOTES INLET PROTECTION, TYPE B, ST'D EC-6

(IP-C) DENOTES INLET PROTECTION, TYPE C, ST'D EC-6

GRAPHIC SCALE IN FEET

0 12.5 25 50

NORTH

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CITY OF MANASSAS, VIRGINIA
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8500 PUBLIC WORKS DRIVE
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Kimley»Horn
11400 COMMERCE PARK DRIVE SUITE #400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

DEAN DRIVE EXTENDED (T-030)

SHEET
4B – EROSION AND SEDIMENT CONTROL PHASE 1
SCALE 1:25

EROSION AND SEDIMENT CONTROL PHASE 2

PARCEL A
MOSES LAKE INDUSTRIES, INC. SUBDIVISION
D.B. 2375 PG. 895
TAX MAP# 102-01-00-23B1
N/F
JEFFREY L. LEHEW FAMILY, LLC XI
INST.#201301150005089

FOSTER DRIVE-RTE. 729
(VARIABLE RIGHT-OF-WAY)

N/F
R.C. HOMES INCORPORATED
D.B. 1749 PG. 1359
TAX MAP# 102-02-00-3

N/F
NORTHERN VIRGINIA FAMILY SERVICE, INC.
INST.#200912150118831
D.B. 2800, PG. 1997
TAX MAP# 102-01-00-47A

N/F
R.C. HOMES INCORPORATED
D.B. 1749 PG. 1359
TAX MAP# 102-02-00-2

PARCEL A
FAVOR, L.L.C. SUBDIVISION
INST. #201612220105003
TAX MAP# 102-02-00-1A
N/F
CITY OF MANASSAS, VIRGINIA
INST.#201612220105007

PARCEL B
FAVOR, L.L.C. SUBDIVISIO
INST. #201612220105003
TAX MAP# 102-02-00-1B
N/F
FAVOR, L.L.C.
INST.#200306040098745

N/F
CHARLES A. PICKETT AND
ANNIE ALTHEA PICKETT
D.B. 398 PG. 426
TAX MAP# 102-01-00-48

DEAN DRIVE-RTE. 710
(VARIABLE RIGHT-OF-WAY)

MATCHLINE STA. 110+75
SEE SHEET 3B

ST'D EC-1 DRY RIPRAP CLASS I REQ'D, 20' X 10', 24" DEPTH

ST'D EC-1 DRY RIPRAP CLASS I
30' X 15'
REQ'D, 24" DEPTH

EXISTING R.O.W.

EX. 10' UTILITY ESMT
INSTR. #20010625006260 6

EX. 20' SANITARY SEWER ESMT
INSTR. #20010625006260 6

EX. 20' STORM SEWER ESMT
INSTR. #20010625006260 6

EX. 15' STORM SEWER ESMT
INSTR. #20010625006260 6

EX. 15' WATERLINE ESMT
INSTR. #20010625006260 6

EX. 10' WATERLINE ESMT
INSTR. #20040519008 4584

EX. 20' SAN. SEW. ESMT
INSTR. #20040519008 4584

EX. 10' INGRESS/EGRESS ESMT
INSTR. #20040519008 4584

EX. 10' LANDSCAP
INSTR. #20031101

EX. 10' UTILITY ESMT
INSTR. #20031

EX. 10' WATERLINE ES
INSTR. #20040519007

EX. 10' UTILITY ESMT
INSTR. #20010625006260 6

EX. 10' LANDSCAPE ESMT
INSTR. #20010625006260 6

APPROXIMATE LOCATION
EX. VERIZON, COMCAST
EX. DOMINION, COMCAST
EX. POLYTEC, 214
EX. 20' GAS ESMT

EX. 8" DIP WATER
EX. 8" SAN. SEWER
EX. 8" LINK
EX. 8" PVC
EX. 8" DIP
EX. 8" DIP WATER
EX. 8" DIP

EP-115+00.00

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GRAPHIC SCALE IN FEET
0 12.5 25 50

NORTH

LEGEND

SF — SILT FENCE
TSF — DENOTES TEMPORARY SILT FENCE, ST'D EC-5
RCD-2 — DENOTES ROCK CHECK DAM, TYPE II, ST'D EC-4
IP-A — DENOTES INLET PROTECTION, TYPE A, ST'D EC-6
IP-B — DENOTES INLET PROTECTION, TYPE B, ST'D EC-6
IP-C — DENOTES INLET PROTECTION, TYPE C, ST'D EC-6
PERMANENT SEEDING

COMMONWEALTH OF VIRGINIA
MARK R. PHILLIPS
Lic. No. 058611
PROFESSIONAL ENGINEER
03/30/2021

Kimley-Horn
Reston, Virginia
Hydraulic Engineer

100% DESIGN SUBMITTAL

DEAN DRIVE EXTENDED (T-030)

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

REVISIONS

DATE	BY	DESCRIPTION

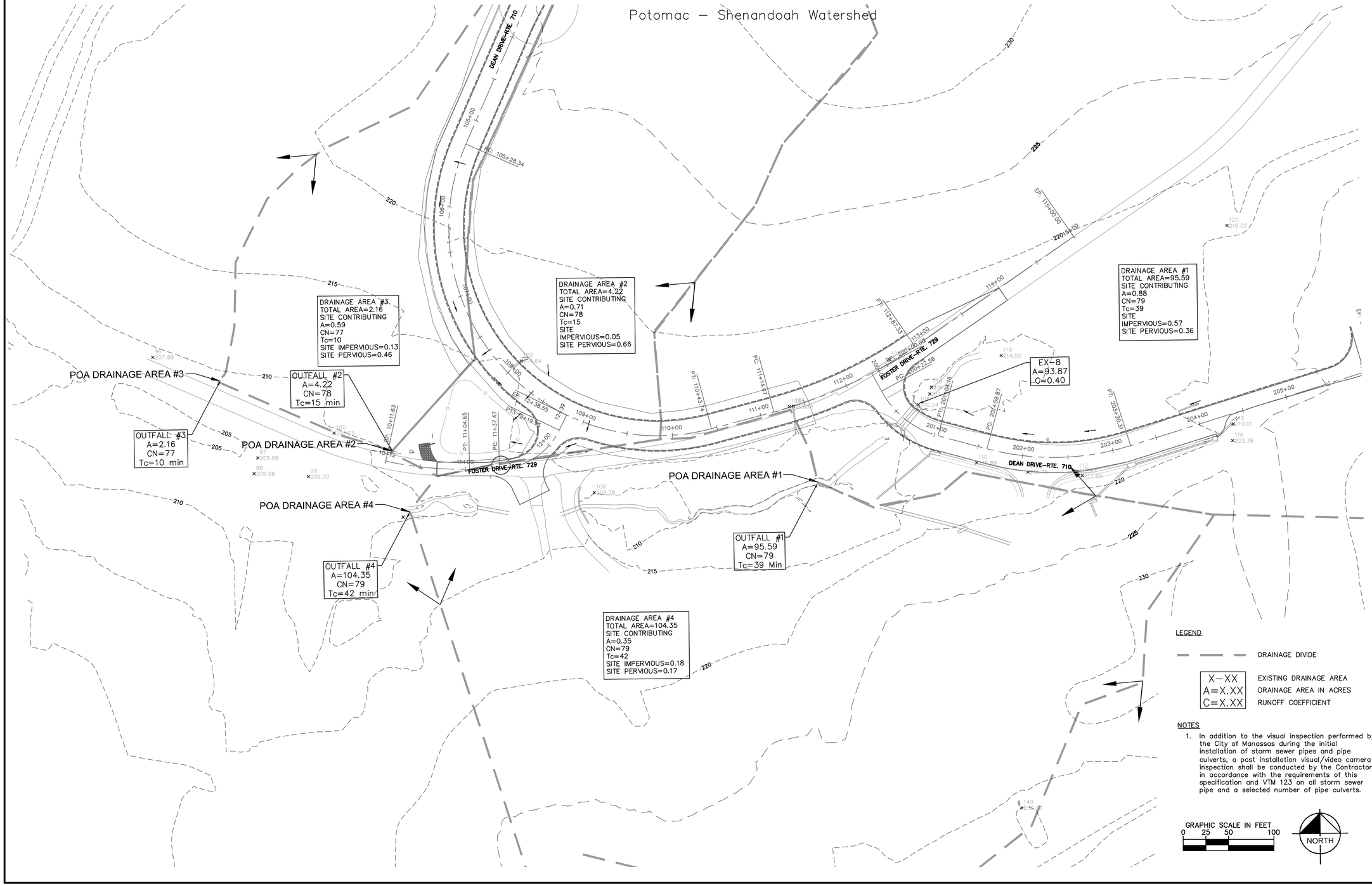
MANASSAS PROJECT NO.:	T-030
DATE OF PLAN ISSUANCE:	TBD
CONSULTANT PROJECT ID.:	594000
DESIGNED BY: MP	DATE: 1/15/2020
DRAWN BY: DB	DATE: 2/18/2020
CHECKED BY: SH	DATE: 2/21/2020
APPROVED BY: CS	DATE: 5/8/2020

Kimley»Horn
11400 COMMERCE PARK DRIVE SUITE #400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

SHEET
4C – EROSION AND SEDIMENT CONTROL PHASE 2
SCALE 1:25

DRAINAGE AREA MAP
EXISTING CONDITIONS

Potomac – Shenandoah Watershed



LEGEND

- DRAINAGE DIVIDE
- X–XX — EXISTING DRAINAGE AREA
- A=X.XX — DRAINAGE AREA IN ACRES
- C=X.XX — RUNOFF COEFFICIENT

NOTES

1. In addition to the visual inspection performed by the City of Manassas during the initial installation of storm sewer pipes and pipe culverts, a post installation visual/video camera inspection shall be conducted by the Contractor in accordance with the requirements of this specification and VTM 123 on all storm sewer pipe and a selected number of pipe culverts.

GRAPHIC SCALE IN FEET
0 25 50 100

NORTH

100% DESIGN SUBMITTAL

DEAN DRIVE EXTENDED (T-030)

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

REVISIONS	
DATE	DESCRIPTION

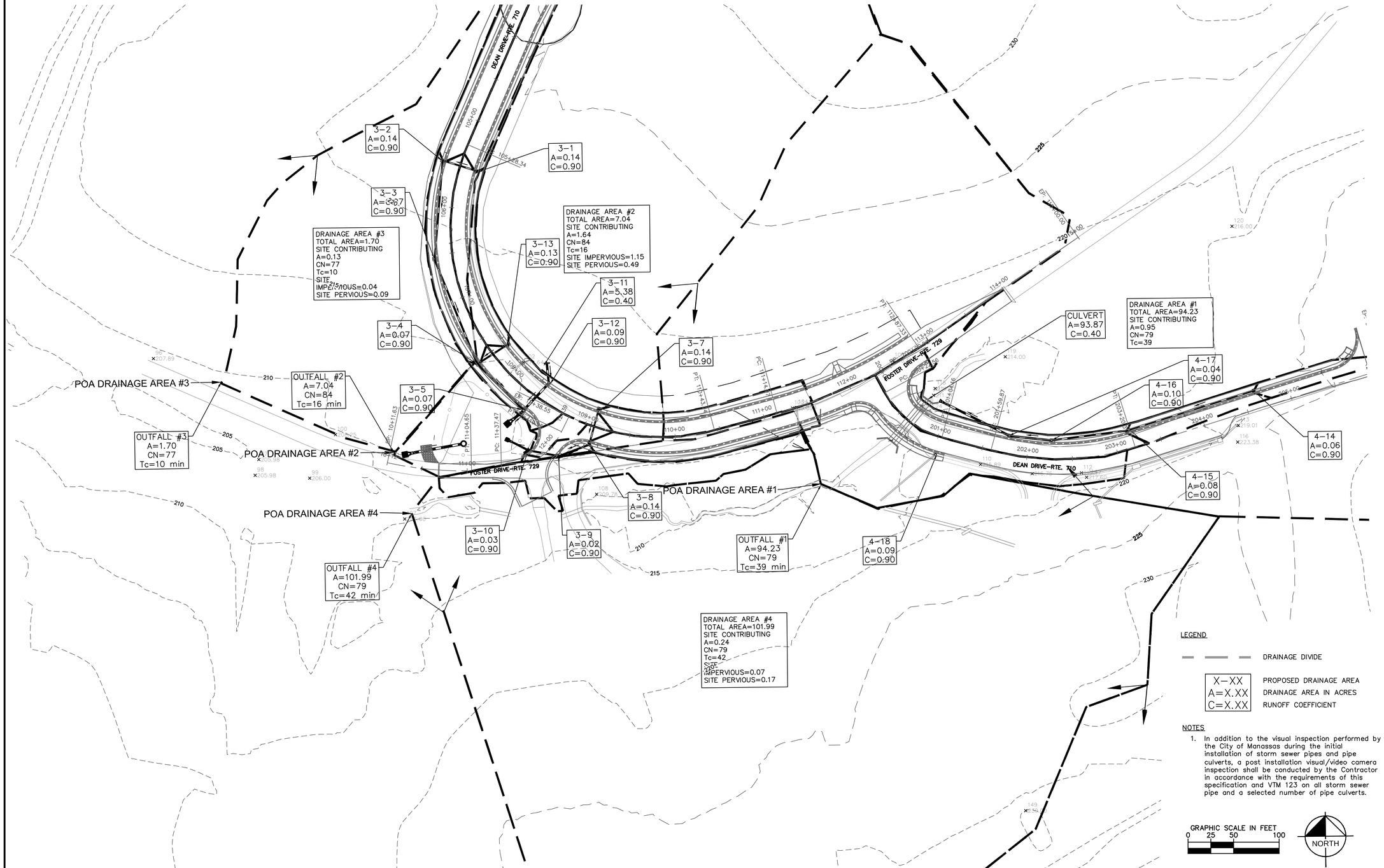
MANASSAS PROJECT NO.:	T-030
DATE OF PLAN ISSUANCE:	TBD
CONSULTANT PROJECT ID.:	594000
DESIGNED BY: MP	DATE: 1/15/2020
DRAWN BY: DB	DATE: 2/18/2020
CHECKED BY: SH	DATE: 2/21/2020
APPROVED BY: CS	DATE: 5/8/2020

Kimley»Horn
11400 COMMERCE PARK DRIVE SUITE #400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

SHEET
5A(1) – DRAINAGE AREA MAP EXISTING

SCALE 1:60

DRAINAGE AREA MAP
PROPOSED CONDITIONS



LEGEND

- DRAINAGE DIVIDE
- X-XX / A=X.XX / C=X.XX — PROPOSED DRAINAGE AREA / DRAINAGE AREA IN ACRES / RUNOFF COEFFICIENT

NOTES

1. In addition to the visual inspection performed by the City of Manassas during the initial installation of storm sewer pipes and pipe culverts, a post installation visual/video camera inspection shall be conducted by the Contractor in accordance with the requirements of this specification and VTM 123 on all storm sewer pipe and a selected number of pipe culverts.

GRAPHIC SCALE IN FEET
0 25 50 100

NORTH

100% DESIGN SUBMITTAL

DEAN DRIVE EXTENDED (T-030)

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

REVISIONS		
DATE	DESCRIPTION	BY

MANASSAS PROJECT NO.:	T-030
DATE OF PLAN ISSUANCE:	TBD
CONSULTANT PROJECT ID.:	594000
DESIGNED BY: MP	DATE: 1/15/2020
DRAWN BY: DB	DATE: 2/18/2020
CHECKED BY: SH	DATE: 2/21/2020
APPROVED BY: CS	DATE: 5/8/2020

Kimley»Horn
11400 COMMERCE PARK DRIVE SUITE #400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
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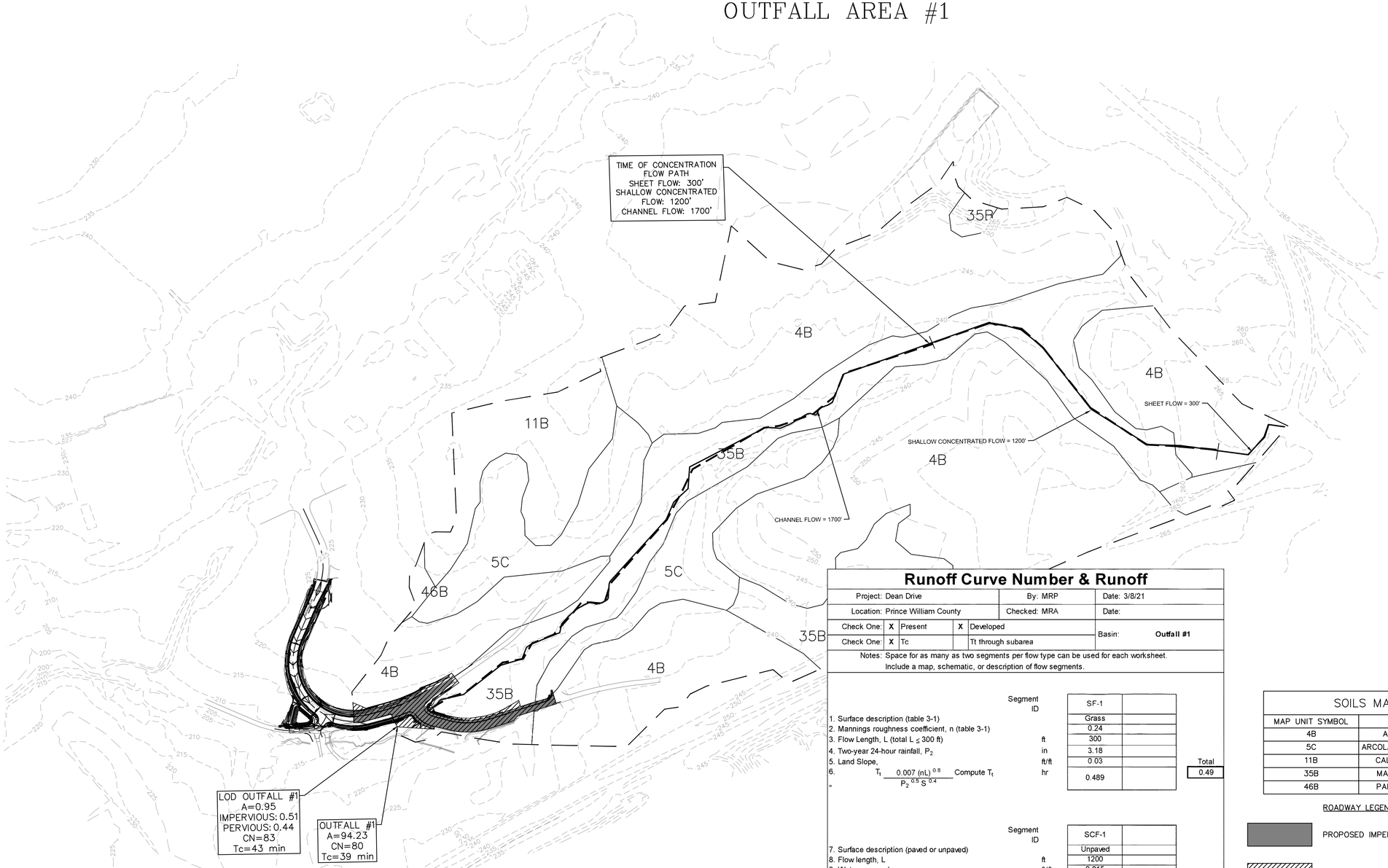
SHEET
5A(2) – DRAINAGE AREA MAP PROPOSED
SCALE 1:60

OUTFALL AREA #1



Runoff Curve Number & Runoff

Project: Dean Drive			By: MRP	Date: 3/8/21	
Location: Prince William County			Checked: MRA	Date:	
Check One:	X	Present	X	Developed	Basin: **Outfall #1**
Check One:	X	Tc		Tt through subarea	

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

		Segment ID	SF-1		
1. Surface description (table 3-1)			Grass		
2. Mannings roughness coefficient, n (table 3-1)			0.24		
3. Flow Length, L (total L ≤ 300 ft)		ft	300		
4. Two-year 24-hour rainfall, P_2		in	3.18		
5. Land Slope,		ft/ft	0.03		Total
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5} S^{0.4}}$	Compute T_t	hr	0.489		0.49

		Segment ID	SCF-1		
7. Surface description (paved or unpaved)			Unpaved		
8. Flow length, L		ft	1200		
9. Watercourse slope, s		ft/ft	0.015		
10. Average velocity, V (figure3-1)		ft/s	1.9		Total
11. $T_t = \frac{L}{3600\,V}$	Compute T_t	hr	0.18		0.18

		Segment ID	CF-1		
12. Cross sectional flow area, a		ft^2	8		
13. Wetted perimeter, pw		ft	6		
14. Hydraulic radius, r = a / pw Compute r		ft	1.333		
15. Channel slope, s		ft/ft	0.015		
16. Manning's roughness coefficient, n			0.020		
17. $V = \frac{1.49\, r^{2/3}\, s^{1/2}}{n}$	Compute V	ft/s	11.05		
18. Flow length, L		ft	1700		
19. $T_t = \frac{L}{3600\,V}$	Compute T_t	hr	0.04		Total
					0.04
20. Watershed or subarea T_c or T_t (add T_t in steps 6,11, and 19)				Hr	0.71

SOILS MAP UNIT LEGEND	
MAP UNIT SYMBOL	MAP UNIT NAME
4B	ARCOLA SILT LOAM, 2%–7% SLOPES
5C	ARCOLA–NESTORIA COMPLEX, 7%–15% SLOPES
11B	CALVERTON SILT LOAM, 0%–7% SLOPES
35B	MANASSAS SILT LOAM, 2%–7% SLOPES
46B	PANORAMA SILT LOAM, 2%–7% SLOPES

ROADWAY LEGEND

PROPOSED IMPERVIOUS AREA = 0.51 ACRES

PROJECT CONTRIBUTING DRAINAGE AREA = 0.95 ACRES

OUTFALL DRAINAGE AREA = 94.23 ACRES

GRAPHIC SCALE IN FEET
0 100 200 400

NORTH

100% DESIGN SUBMITTAL

DEAN DRIVE EXTENDED (T–030)

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

REVISIONS

DESCRIPTION	BY	DATE

MANASSAS PROJECT NO.: T–030
DATE OF PLAN ISSUANCE: TBD
CONSULTANT PROJECT ID.: 594000
DESIGNED BY: MP DATE: 1/15/2020
DRAWN BY: DB DATE: 2/18/2020
CHECKED BY: SH DATE: 2/21/2020
APPROVED BY: CS DATE: 5/8/2020

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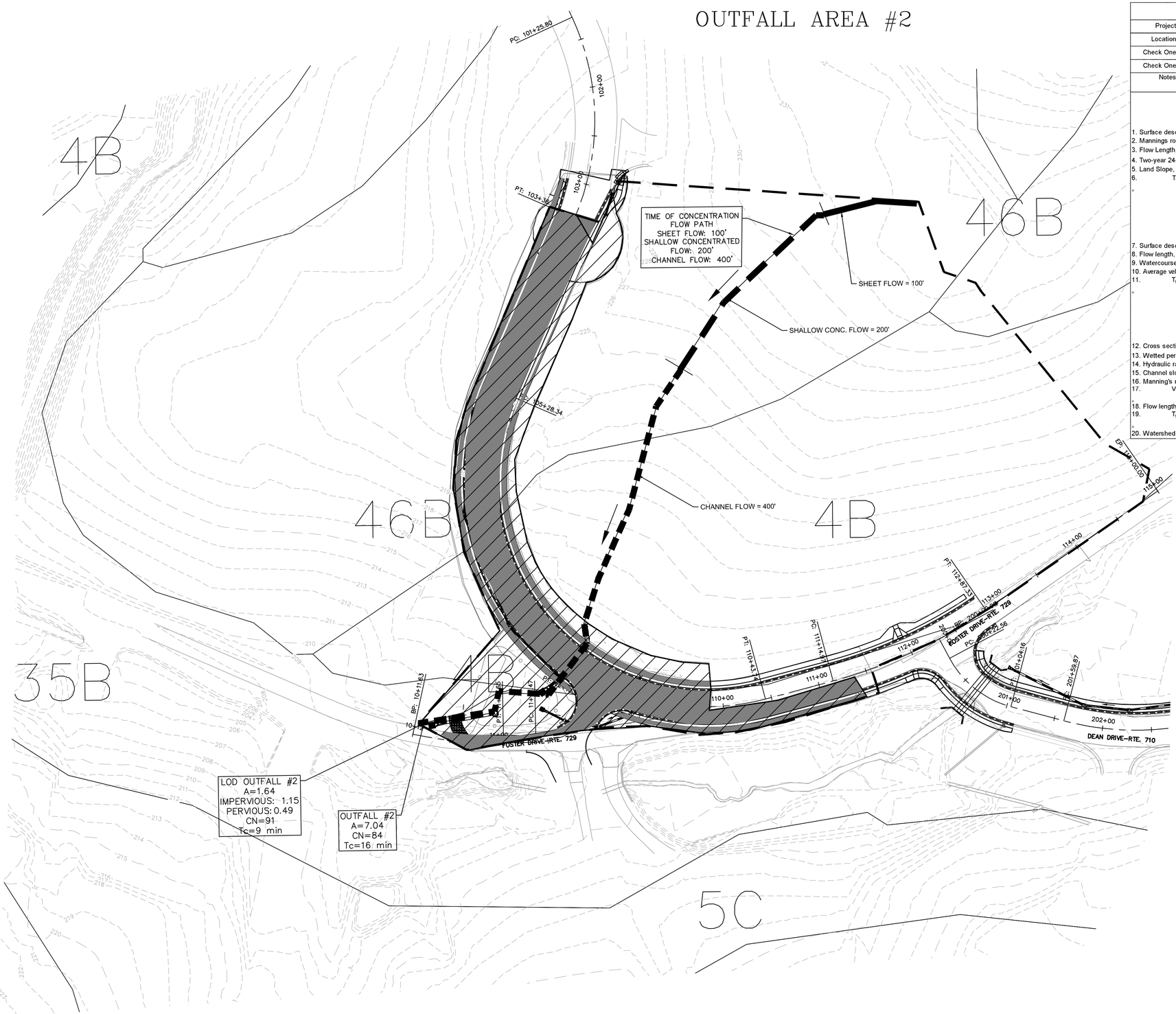
SHEET
5B(1) – OUTFALL AREA 1

SCALE 1:200

OUTFALL AREA #2



Runoff Curve Number & Runoff

Project: Dean Drive				By: MRP	Date: 3/8/21
Location: Prince William County				Checked: MRA	Date:
Check One:	X	Present	X	Developed	Basin: Outfall #2
Check One:	X	Tc		Tt through subarea	

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

		Segment ID		
		SF-1		
1. Surface description (table 3-1)		Grass		
2. Mannings roughness coefficient, n (table 3-1)		0.18		
3. Flow Length, L (total L ≤ 300 ft)	ft	100		
4. Two-year 24-hour rainfall, P_2	in	3.18		
5. Land Slope,	ft/ft	0.08		Total
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ S^{0.4}}$ Compute T_t	hr	0.109		0.11

		Segment ID		
		SCF-1		
7. Surface description (paved or unpaved)		Unpaved		
8. Flow length, L	ft	200		
9. Watercourse slope, s	ft/ft	0.043		
10. Average velocity, V (figure3-1)	ft/s	3.2		Total
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr	0.02		0.02

		Segment ID		
		CF-1		
12. Cross sectional flow area, a	ft^2	7		
13. Wetted perimeter, pw	ft	5		
14. Hydraulic radius, r = a / pw Compute r	ft	1.400		
15. Channel slope, s	ft/ft	0.005		
16. Manning's roughness coefficient, n		0.025		
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s	5.27		
18. Flow length, L	ft	400		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr	0.02		Total
				0.02
20. Watershed or subarea T_c or T_t (add T_t in steps 6,11, and 19)			Hr	0.15

SOILS MAP UNIT LEGEND	
MAP UNIT SYMBOL	MAP UNIT NAME
4B	ARCOLA SILT LOAM, 2%–7% SLOPES
5C	ARCOLA–NESTORIA COMPLEX, 7%–15% SLOPES
11B	CALVERTON SILT LOAM, 0%–7% SLOPES
35B	MANASSAS SILT LOAM, 2%–7% SLOPES
46B	PANORAMA SILT LOAM, 2%–7% SLOPES

ROADWAY LEGEND

PROPOSED IMPERVIOUS AREA = 1.15 ACRES

PROJECT CONTRIBUTING DRAINAGE AREA = 1.64 ACRES

OUTFALL DRAINAGE AREA = 7.04 ACRES

GRAPHIC SCALE IN FEET
0 25 50 100

NORTH

100% DESIGN SUBMITTAL

DEAN DRIVE EXTENDED (T–030)

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

REVISIONS

BY	DESCRIPTION	DATE

MANASSAS PROJECT NO.:	T–030
DATE OF PLAN ISSUANCE:	TBD
CONSULTANT PROJECT ID:	59400
DESIGNED BY: MP	DATE: 1/15/2020
DRAWN BY: DB	DATE: 2/18/2020
CHECKED BY: SH	DATE: 2/21/2020
APPROVED BY: CS	DATE: 5/8/2020

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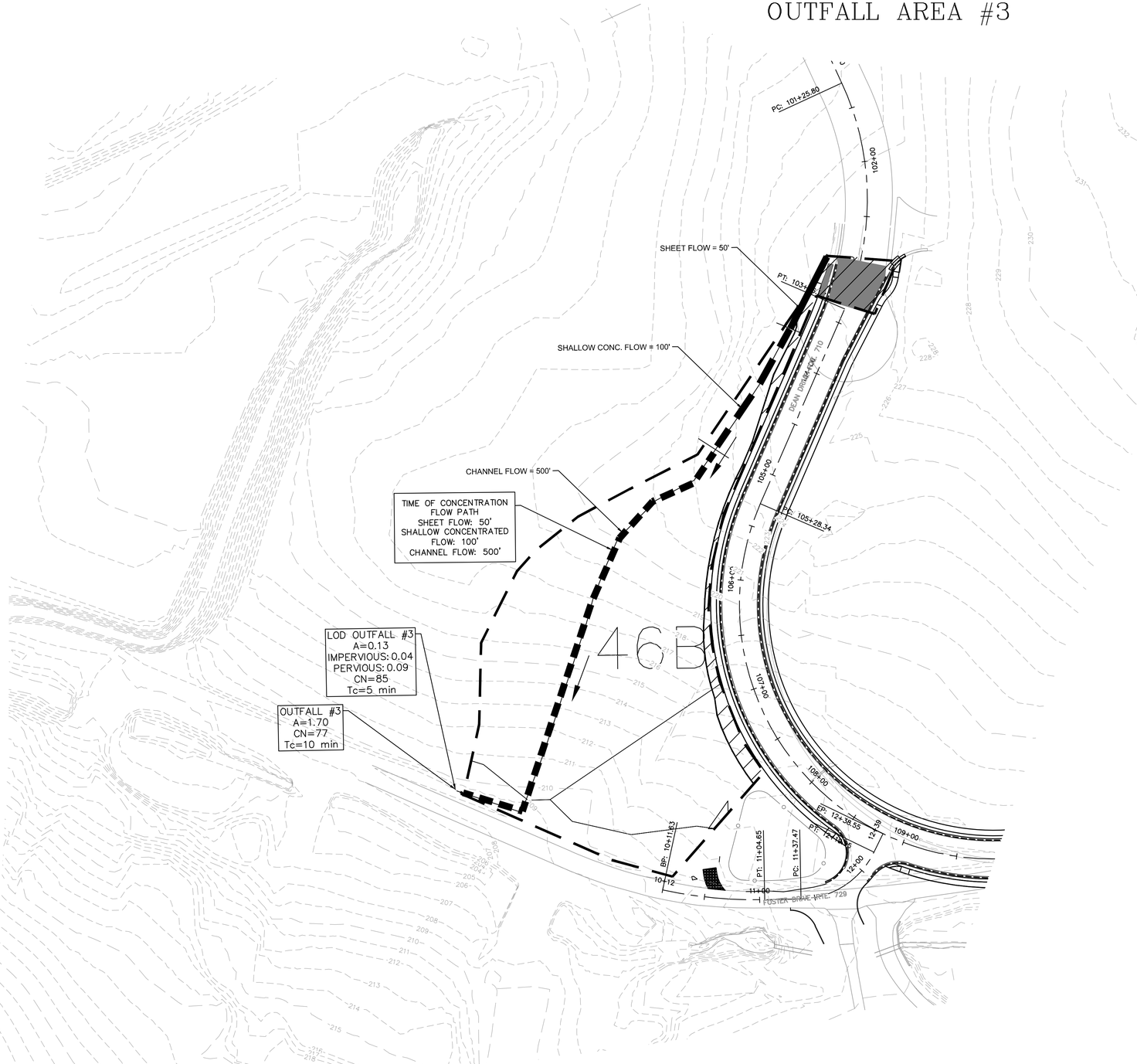
WWW.KIMLEY–HORN.COM

SHEET
5B(2) – OUTFALL AREA 2

SCALE 1:50

OUTFALL AREA #3



Runoff Curve Number & Runoff

Project: Dean Drive				By: MRP	Date: 3/8/21
Location: Prince William County				Checked: MRA	Date:
Check One:	X	Present	X	Developed	Basin: **Outfall #3**
Check One:	X	Tc		Tt through subarea	

Notes: Space for as many as two segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

		Segment ID	SF-1		
1. Surface description (table 3-1)			Grass		
2. Mannings roughness coefficient, n (table 3-1)			0.08		
3. Flow Length, L (total L ≤ 300 ft)		ft	50		
4. Two-year 24-hour rainfall, P_2		in	3.18		
5. Land Slope,		ft/ft	0.04		Total
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,S^{0.4}}$ Compute T_t		hr	0.043		0.04

		Segment ID	SCF-1		
7. Surface description (paved or unpaved)			Unpaved		
8. Flow length, L		ft	100		
9. Watercourse slope, s		ft/ft	0.015		
10. Average velocity, V (figure3-1)		ft/s	1.9		Total
11. $T_t = \frac{L}{3600\,V}$ Compute T_t		hr	0.01		0.01

		Segment ID	CF-1		
12. Cross sectional flow area, a		ft^2	8		
13. Wetted perimeter, pw		ft	6		
14. Hydraulic radius, r = a / pw Compute r		ft	1.333		
15. Channel slope, s		ft/ft	0.015		
16. Manning's roughness coefficient, n			0.020		
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V		ft/s	11.05		
18. Flow length, L		ft	500		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t		hr	0.01		Total 0.01
20. Watershed or subarea T_c or T_t (add T_t in steps 6,11, and 19)				Hr	0.07

SOILS MAP UNIT LEGEND	
MAP UNIT SYMBOL	MAP UNIT NAME
4B	ARCOLA SILT LOAM, 2%–7% SLOPES
5C	ARCOLA–NESTORIA COMPLEX, 7%–15% SLOPES
11B	CALVERTON SILT LOAM, 0%–7% SLOPES
35B	MANASSAS SILT LOAM, 2%–7% SLOPES
46B	PANORAMA SILT LOAM, 2%–7% SLOPES

ROADWAY LEGEND

PROPOSED IMPERVIOUS AREA = 0.04 ACRES

PROJECT CONTRIBUTING DRAINAGE AREA = 0.13 ACRES

OUTFALL DRAINAGE AREA = 1.70 ACRES

GRAPHIC SCALE IN FEET
0 25 50 100

NORTH

100% DESIGN SUBMITTAL

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

REVISIONS

BY	DATE	DESCRIPTION

MANASSAS PROJECT NO.: T-030
DATE OF PLAN ISSUANCE: TBD
CONSULTANT PROJECT ID.: 594000
DESIGNED BY: MP DATE: 1/15/2020
DRAWN BY: DB DATE: 2/18/2020
CHECKED BY: SH DATE: 2/21/2020
APPROVED BY: CS DATE: 5/8/2020

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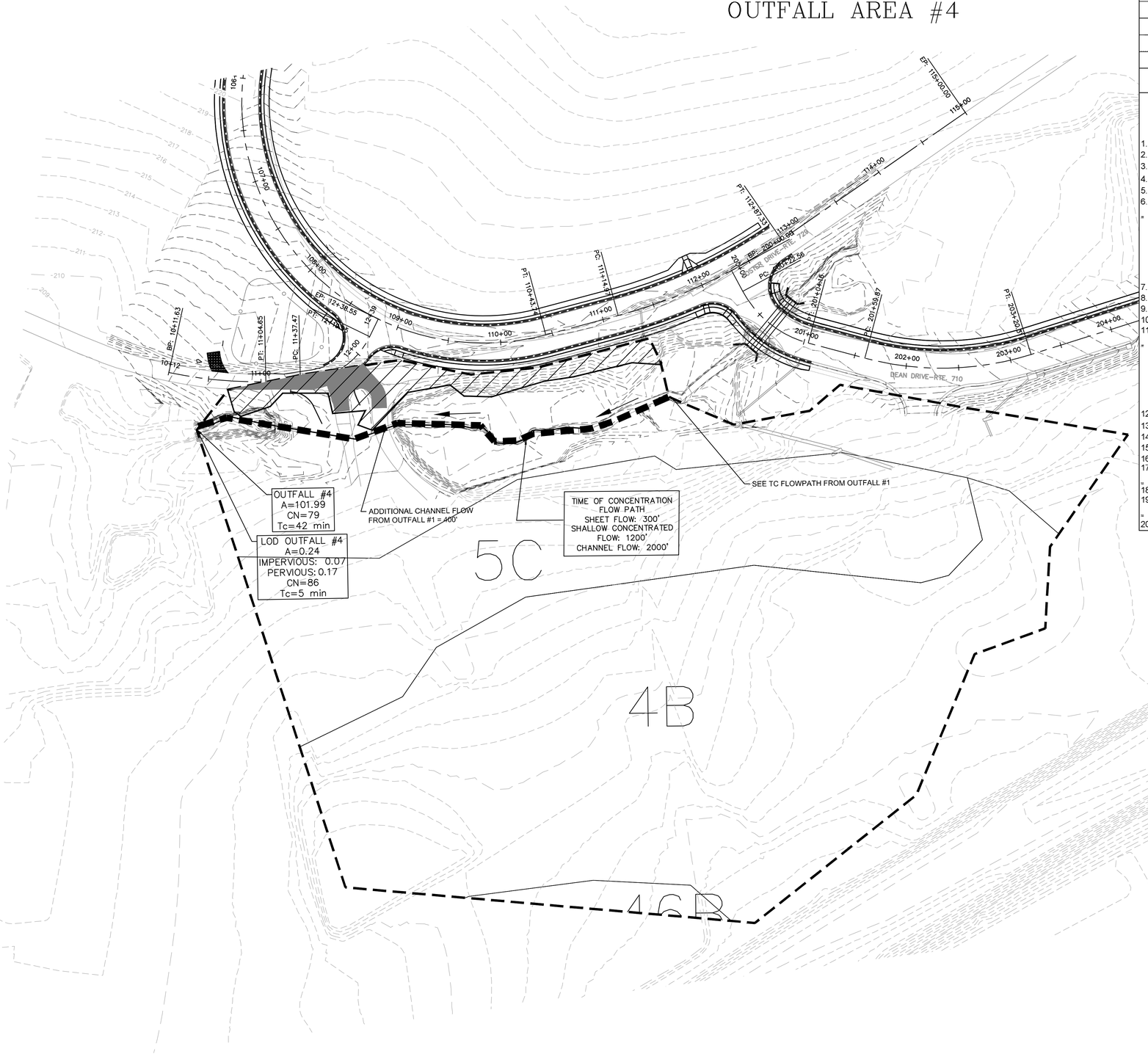
DEAN DRIVE EXTENDED (T-030)

SHEET
5B(3) – OUTFALL AREA 3

SCALE 1:50

OUTFALL AREA #4



Runoff Curve Number & Runoff

Project: Dean Drive			By: MRP	Date: 3/8/21	
Location: Prince William County			Checked: MRA	Date:	
Check One:	X	Present	X	Developed	Basin: **Outfall #4**
Check One:	X	Tc		Tt through subarea	

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

		Segment ID	SF-1		
1. Surface description (table 3-1)			Grass		
2. Mannings roughness coefficient, n (table 3-1)			0.24		
3. Flow Length, L (total L ≤ 300 ft)		ft	300		
4. Two-year 24-hour rainfall, P_2		in	3.18		
5. Land Slope,		ft/ft	0.03		Total
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,S^{0.4}}$	Compute T_t	hr	0.489		0.49

		Segment ID	SCF-1		
7. Surface description (paved or unpaved)			Unpaved		
8. Flow length, L		ft	1200		
9. Watercourse slope, s		ft/ft	0.015		
10. Average velocity, V (figure3-1)		ft/s	1.9		Total
11. $T_t = \frac{L}{3600\,V}$	Compute T_t	hr	0.18		0.18

		Segment ID	CF-1		
12. Cross sectional flow area, a		ft^2	8		
13. Wetted perimeter, pw		ft	6		
14. Hydraulic radius, r = a / pw Compute r		ft	1.333		
15. Channel slope, s		ft/ft	0.015		
16. Manning's roughness coefficient, n			0.020		
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	11.05		
18. Flow length, L		ft	2000		
19. $T_t = \frac{L}{3600\,V}$	Compute T_t	hr	0.05		Total
					0.05
20. Watershed or subarea T_c or T_t (add T_t in steps 6,11, and 19)				Hr	0.71

SOILS MAP UNIT LEGEND	
MAP UNIT SYMBOL	MAP UNIT NAME
4B	ARCOLA SILT LOAM, 2%–7% SLOPES
5C	ARCOLA–NESTORIA COMPLEX, 7%–15% SLOPES
11B	CALVERTON SILT LOAM, 0%–7% SLOPES
35B	MANASSAS SILT LOAM, 2%–7% SLOPES
46B	PANORAMA SILT LOAM, 2%–7% SLOPES

ROADWAY LEGEND

PROPOSED IMPERVIOUS AREA = 0.07 ACRES

PROJECT CONTRIBUTING DRAINAGE AREA = 0.24 ACRES

OUTFALL DRAINAGE AREA = 101.99 ACRES
(OUTFALL #1 – 94.23 + OUTFALL #4 ADDITIONAL – 7.87 ACRES)

GRAPHIC SCALE IN FEET
0 25 50 100

NORTH

100% DESIGN SUBMITTAL

DEAN DRIVE EXTENDED (T-030)

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

REVISIONS

DESCRIPTION	BY	DATE

MANASSAS PROJECT NO.:	T-030
DATE OF PLAN ISSUANCE:	TBD
CONSULTANT PROJECT ID.:	594000
DESIGNED BY: MP	DATE: 1/15/2020
DRAWN BY: DB	DATE: 2/18/2020
CHECKED BY: SH	DATE: 2/21/2020
APPROVED BY: CS	DATE: 5/8/2020

Kimley»Horn
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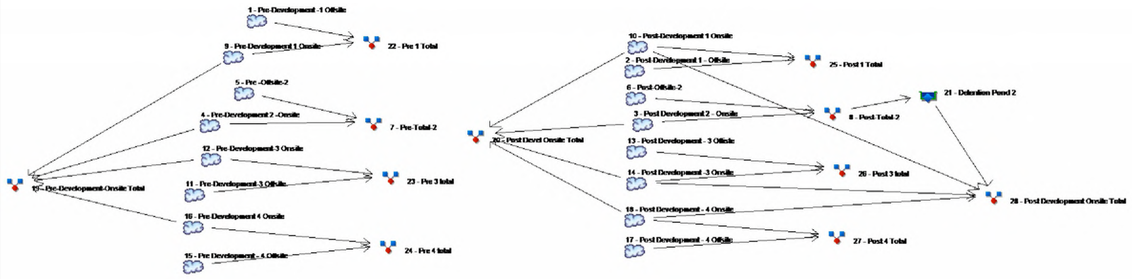
SHEET
5B(4) – OUTFALL AREA 4

SCALE 1:50

WATERSHED MODEL SCHEMATIC



Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs) 1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Hydrograph Description
1	SCS Runoff	-----	55.69	83.12	-----	-----	177.41	-----	-----	391.61	Pre-Development -1 Offsite
2	SCS Runoff	-----	54.32	81.09	-----	-----	173.07	-----	-----	382.04	Post-Development 1 - Offsite
3	SCS Runoff	-----	2.744	3.761	-----	-----	7.035	-----	-----	13.64	Post Development 2 - Onsite
4	SCS Runoff	-----	0.869	1.268	-----	-----	2.675	-----	-----	5.879	Pre-Development 2 -Onsite
5	SCS Runoff	-----	3.271	4.579	-----	-----	10.82	-----	-----	23.28	Pre -Offsite-2
6	SCS Runoff	-----	4.669	7.049	-----	-----	15.55	-----	-----	35.00	Post-Offsite-2
7	Combine	4, 5,	4.007	6.066	-----	-----	12.83	-----	-----	28.21	Pre-Total-2
8	Combine	3, 6,	7.329	10.78	-----	-----	22.44	-----	-----	48.64	Post-Total-2
9	SCS Runoff	-----	2.016	3.170	-----	-----	5.180	-----	-----	9.284	Pre-Development 1 Onsite
10	SCS Runoff	-----	2.717	3.429	-----	-----	5.599	-----	-----	10.02	Post-Development 1 Onsite
11	SCS Runoff	-----	2.180	3.280	-----	-----	7.179	-----	-----	16.12	Pre-Development-3 Offsite
12	SCS Runoff	-----	0.920	1.280	-----	-----	2.537	-----	-----	5.231	Pre-Development-3 Onsite
13	SCS Runoff	-----	1.709	2.577	-----	-----	5.621	-----	-----	12.63	Post Development - 3 Offsite
14	SCS Runoff	-----	0.217	0.303	-----	-----	0.591	-----	-----	1.213	Post Development -3 Onsite
15	SCS Runoff	-----	7.756	11.43	-----	-----	24.11	-----	-----	52.45	Pre Development - 4 Offsite
16	SCS Runoff	-----	0.618	0.853	-----	-----	1.639	-----	-----	3.315	Pre-Development 4 Onsite
17	SCS Runoff	-----	7.756	11.43	-----	-----	24.11	-----	-----	52.45	Post Development - 4 Offsite
18	SCS Runoff	-----	0.496	0.670	-----	-----	1.220	-----	-----	2.366	Post Development - 4 Onsite
19	Combine	4, 9, 12,	4.807	6.482	-----	-----	11.80	-----	-----	23.19	Pre-Development-Onsite Total
20	Combine	3, 13, 14, 16, 8	5.866	7.758	-----	-----	13.74	-----	-----	28.24	Post Devel Onsite Total
21	Reservoir	18	4.827	6.139	-----	-----	11.15	-----	-----	48.67	Detention Pond 2
22	Combine	1, 9,	55.95	83.46	-----	-----	177.94	-----	-----	392.61	Pre 1 Total
23	Combine	11, 12,	3.048	4.543	-----	-----	9.874	-----	-----	21.21	Pre 3 total
24	Combine	15, 16,	8.037	11.87	-----	-----	24.92	-----	-----	54.03	Pre 4 total
25	Combine	2, 10,	54.62	81.46	-----	-----	173.65	-----	-----	383.12	Post 1 Total
26	Combine	13, 14,	1.844	2.793	-----	-----	6.093	-----	-----	13.55	Post 3 total
27	Combine	17, 18,	7.969	11.76	-----	-----	24.70	-----	-----	53.57	Post 4 Total
28	Combine	19, 14, 18, 21,	5.995	8.524	-----	-----	13.74	-----	-----	55.67	Post Development Onsite Total

Proj. file: Hydraflow.gpw | Tuesday, 04 / 30 / 2019

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	55.68	2	738	288,932	-----	-----	-----	Pre-Development -1 Offsite
2	SCS Runoff	54.32	2	738	281,872	-----	-----	-----	Post-Development 1 - Offsite
3	SCS Runoff	2.744	2	720	7,137	-----	-----	-----	Post Development 2 - Onsite
4	SCS Runoff	0.869	2	720	1,997	-----	-----	-----	Pre-Development 2 -Onsite
5	SCS Runoff	3.271	2	724	9,827	-----	-----	-----	Pre -Offsite-2
6	SCS Runoff	4.669	2	724	13,858	-----	-----	-----	Post-Offsite-2
7	Combine	4.007	2	722	11,825	4, 6,	-----	-----	Pre-Total-2
8	Combine	7.329	2	722	20,866	3, 6,	-----	-----	Post-Total-2
9	SCS Runoff	2.016	2	716	5,273	-----	-----	-----	Pre-Development 1 Onsite
10	SCS Runoff	2.717	2	716	5,992	-----	-----	-----	Post-Development 1 Onsite
11	SCS Runoff	2.180	2	722	5,912	-----	-----	-----	Pre-Development-3 Offsite
12	SCS Runoff	0.920	2	720	2,106	-----	-----	-----	Pre-Development-3 Onsite
13	SCS Runoff	1.709	2	722	4,832	-----	-----	-----	Post Development - 3 Offsite
14	SCS Runoff	0.217	2	718	435	-----	-----	-----	Post Development -3 Onsite
15	SCS Runoff	7.756	2	724	22,632	-----	-----	-----	Pre Development - 4 Offsite
16	SCS Runoff	0.618	2	718	1,240	-----	-----	-----	Pre-Development 4 Onsite
17	SCS Runoff	7.756	2	724	22,632	-----	-----	-----	Post Development - 4 Offsite
18	SCS Runoff	0.496	2	716	1,002	-----	-----	-----	Post Development - 4 Onsite
19	Combine	4.807	2	718	10,616	4, 9, 12, 16,	-----	-----	Pre-Development-Onsite Total
20	Combine	5.866	2	718	14,268	3, 13, 14, 16,	-----	-----	Post Devel Onsite Total
21	Reservoir	4.827	2	730	20,905	18	212.39	3,724	Detention Pond 2
22	Combine	55.95	2	738	294,204	1, 9,	-----	-----	Pre 1 Total
23	Combine	3.048	2	720	8,018	11, 12,	-----	-----	Pre 3 total
24	Combine	8.037	2	722	23,872	15, 16,	-----	-----	Pre 4 total
25	Combine	54.62	2	738	287,584	2, 10,	-----	-----	Post 1 Total
26	Combine	1.844	2	720	6,067	13, 14,	-----	-----	Post 3 total
27	Combine	7.969	2	722	23,635	17, 18,	-----	-----	Post 4 Total
28	Combine	5.995	2	720	28,114	19, 14, 18, 21,	-----	-----	Post Development Onsite Total

Hydraflow.gpw | Return Period: 1 Year | Tuesday, 04 / 30 / 2019

SWM BUOYANCY COMPUTATIONS

TOTAL STRUCTURE VOLUME: 6.33' D = 3.16' R² x Π x 7.84' H = 246 CF OF DISPLACEMENT
TOTAL BUOYANT FORCE = 246 CF x 62.4 LB/CF (CONC) = 19.770 LBS
19,770 LBS > 1.25 x 15,350 LBS = 19,188 LBS

SWM NARRATIVE

THE DEAN DRIVE EXTENDED PROJECT UTILIZED TECHNICAL CRITERIA OF PART IIB (9VAC25-870-62) FOR DETERMINING ITS POST-DEVELOPMENT STORMWATER MANAGEMENT DESIGN.

USING THE DEQ RUNOFF REDUCTION SPREADSHEET FOR REDEVELOPMENT, THE TOTAL PHOSPHORUS LOAD REDUCTION REQUIRED WAS FOUND TO BE 2.49 LB/YR. HOWEVER, WITH THE INTRODUCTION OF THE DRY DETENTION POND THE REQUIRED REMAINING PHOSPHOROUS LOAD REDUCTION IS 2.07 LB/YR. THE REMAINING BALANCE OF NUTRIENT CREDITS WILL BE PURCHASED TO MEET THE WATER QUALITY REQUIREMENTS FOR THIS PROJECT.

TO MEET THE QUANTITY REQUIREMENTS, THIS PROJECT ANALYZED THE EXISTING AND PROPOSED CONDITIONS TO DETERMINE THE ADEQUACY OF THE STORM SYSTEM TO THE LIMITS OF ANALYSIS. THE EXISTING MANMADE OUTFALLS FLOW INTO THE UNNAMED TRIBUTARY OF CANNON BRANCH, A RESTORED STORMWATER CONVEYANCE SYSTEM. THE PROJECT DISTURBED AREA IS APPROXIMATELY 2.92 ACRES, AND THE UPSTREAM DRAINAGE AREA IS APPROXIMATELY 403 ACRES. THEREFORE, THE 1% ANALYSIS POINT IS REACHED WHERE THE PROPOSED STORMWATER CONVEYANCE SYSTEMS FROM THE DEAN DRIVE ROADWAY DRAINAGE SYSTEM AND THE PROPOSED CULVERT EXTENSION FLOW MEET AS DEPICTED ON SHEETS 5B-5E OF THE PLAN SET. THE 2-YEAR STORM EVENT WAS USED TO VERIFY CHANNEL PROTECTION, WHILE THE 10-YEAR EVENT WAS USED TO VERIFY FLOOD PROTECTION. THE OUTFALL ANALYSIS POINT IS REACHED PRIOR TO ENTERING A MAPPED FLOODPLAIN. WATER QUANTITY REQUIREMENTS WILL BE MET TO THE MAXIMUM EXTENT PRACTICAL VIA A PROPOSED STORMWATER DETENTION POND LOCATED AT THE WESTERN CORNER OF DEAN DRIVE AND FOSTER DRIVE.

Overland Relief (Proposed Culvert Extension):

BASED UPON THE HY-8 ANALYSIS ABOVE THE PROPOSED DUAL 48" RCP CULVERT EXTENSION CAN ADEQUATELY FACILITATE THE 25-YEAR STORM EVENT. UNDER THE 100-YEAR STORM EVENT THE CULVERT OVERTOPS WITH APPROXIMATELY .45 FEET OF DEPTH. THE RUNOFF FROM THE OVERTOPPING WILL GENERALLY REMAIN CONFINED TO BE DIRECTLY OVERTOP OF THE EXISTING CULVERT NEAR THE LOW POINT AT STA 201+25. AT THIS LOCATION THE RUNOFF WILL OVERTOP THE CURB AND GUTTER FLOWING SOUTH AND FOLLOW EXISTING TOPOGRAPHY BACK INTO THE FLOODPLAIN FOR THE EXISTING STREAM. THE 100-YEAR EVENT WILL THEN BE FULLY CONTAINED WITHIN THE EXISTING STREAM EMBANKMENT.

COMMONWEALTH OF VIRGINIA
MARK R. PHILLIPS
Lic. No. 058611
03/30/2021
PROFESSIONAL ENGINEER

Kimley-Horn
Reston, Virginia
Hydraulic Engineer

LD-204 Stormwater Inlet Computations

LD-204 | SHEET 1 | Rev. 6-85 | PPMS# N/A | PROJECT: Dean Drive Extended | DATE March 8, 2021 | OF 1
Designed By/Checked: Mark Phillips, P.E. / Drew Wolfred, P.E.

INLET NUMBER	TYPE	LENGTH (FT)	STATION	DRAINAGE AREA (AC)	C	CA	sum CA	I (IN/HR)	Q INCR (CFS)	Qb, CARRYOVER (CFS)	Qr, GUTTER FLOW (CFS)	S, GUTTER SLOPE (FT/FT)	Sx, CROSS SLOPE (FT/FT)	T, SPREAD (FT)	W (FT)	W/T	Sw (FT/FT)	Sw/Sx	E0	a = 12W(Sw - Sx)+Local Depression	Sw' = a/(12w)	Sf = Sx + Sw'(E/)	COMPUTED LENGTH, L', (FT)	L, SPECIFIED LENGTH (FT)	L/L'	E	Qi, INTERCEPTED (CFS)	Qb, CARRYOVER (CFS)	Sag Inlets Only: d (FT)	h (FT)	d/h	T, SPREAD @ SAG (FT)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)
POST-DEVELOPMENT INLETS - ON GRADE																																
3-1	DI-3B	8	202+02	0.14	0.90	0.126	0.126	4.0	0.504	0.000	0.504	0.0221	0.0200	1.92	2	1.04	0.0833	4.17	1.00	3.52	0.147	0.167	6	8	1.33	1.00	0.50	0.000	0.1602			
3-2	DI-3B	8	202+03	0.14	0.90	0.126	0.126	4.0	0.504	0.000	0.504	0.0197	0.0200	1.96	2	1.02	0.0833	4.17	1.00	3.52	0.147	0.167	6	8	1.33	1.00	0.50	0.000	0.1637			
3-3	DI-3B	4	202+04	0.07	0.90	0.063	0.063	4.0	0.252	0.000	0.252	0.0168	0.0200	1.56	2	1.28	0.0833	4.17	1.00	3.52	0.147	0.167	4	4	1.00	1.00	0.25	0.000	0.13			
3-13	DI-3B	8	202+05	0.13	0.90	0.117	0.117	4.0	0.468	0.000	0.468	0.0125	0.0200	2.31	2	0.87	0.0833	4.17	1.00	3.52	0.147	0.167	5	8	1.60	1.00	0.47	0.000	0.1729			
3-4	DI-3B	4	202+06	0.07	0.90	0.063	0.063	4.0	0.252	0.000	0.252	0.0133	0.0200	1.63	2	1.23	0.0833	4.17	1.00	3.52	0.147	0.167	4	4	1.00	1.00	0.25	0.000	0.1358			
3-7	DI-3B	8	202+07	0.14	0.90	0.126	0.126	4.0	0.504	0.000	0.504	0.0079	0.0200	3.30	2	0.61	0.0833	4.17	0.98	3.52	0.147	0.164	4	8	2.00	1.00	0.50	0.000	0.1926			
3-8	DI-3B	8	202+08	0.14	0.90	0.126	0.126	4.0	0.504	0.000	0.504	0.0086	0.0200	3.16	2	0.63	0.0833	4.17	0.98	3.52	0.147	0.164	4	8	2.00	1.00	0.50	0.000	0.1898			
3-9	DI-3B	4	202+09	0.02	0.90	0.018	0.018	4.0	0.072	0.000	0.072	0.0219	0.0200	0.93	2	2.16	0.0833	4.17	1.00	3.52	0.147	0.167	3	4	1.33	1.00	0.07	0.000	0.0771			
3-10	DI-3B	6	202+10	0.03	0.90	0.027	0.027	4.0	0.108	0.000	0.108	0.0416	0.0200	0.96	2	2.09	0.0833	4.17	1.00	3.52	0.147	0.167	4	6	1.50	1.00	0.11	0.000	0.0799			
4-14	DI-3B	8	202+11	0.06	0.90	0.054	0.054	4.0	0.216	0.000	0.216	0.0314	0.0317	1.31	2	1.53	0.0833	2.63	1.00	3.24	0.135	0.167	5	8	1.60	1.00	0.22	0.000	0.1091			
4-15	DI-3B	8	202+12	0.08	0.90	0.072	0.072	4.0	0.288	0.000	0.288	0.0242	0.0200	1.53	2	1.31	0.0833	4.17	1.00	3.52	0.147	0.167	5	8	1.60	1.00	0.29	0.000	0.1276			
4-16	DI-3B	4	202+13	0.10	0.90	0.090	0.090	4.0	0.360	0.000	0.360	0.0068	0.0200	2.44	2	0.82	0.0833	4.17	1.00	3.52	0.147	0.166	4	4	1.00	1.00	0.36	0.000	0.1755			
4-17	DI-3B	4	202+14	0.04	0.90	0.036	0.036	4.0	0.144	0.000	0.144	0.0068	0.0200	1.50	2	1.34	0.0833	4.17	1.00	3.52	0.147	0.167	3	4	1.33	1.00	0.14	0.000	0.1247			
4-18	DI-3B	8	202+15	0.09	0.90	0.081	0.081	4.0	0.324	0.000	0.324	0.0073	0.0350	2.00	2	1.00	0.0833	2.38	1.00	3.16	0.132	0.167	4	8	2.00	1.00	0.32	0.000	0.1668			
POST-DEVELOPMENT INLETS - IN SAG																																
3-12	DI-3C	10	107+94	0.05	0.90	0.041	0.041	4.0	0.162	0.000	0.162	0.0067	0.0200	4.20	2	0.48	0.0833	4.17	0.94	3.52	0.147	0.158	2.97	10	3.36	1.00	0.16	0.000		0.048	0.458	0.104	3.284
3-12	DI-3C	10	107+94	0.05	0.90	0.041	0.041	4.0	0.162	0.000	0.162	0.0114	0.0200	4.20	2	0.48	0.0833	4.17	0.96	3.52	0.147	0.161	3.42	10	2.92	1.00	0.16	0.000				
3-5	DI-3C	10	11+14	0.04	0.90	0.032	0.032	4.0	0.126	0.000	0.126	0.0084	0.0200	4.20	2	0.48	0.0833	4.17	0.94	3.52	0.147	0.158	2.86	10	3.49	1.00	0.13	0.000		0.040	0.458	0.088	2.009
3-5	DI-3C	10	11+15	0.04	0.90	0.032	0.032	4.0	0.126	0.000	0.126	0.0108	0.0200	4.20	2	0.48	0.0833	4.17	0.96	3.52	0.147	0.161	3.03	10	3.30	1.00	0.13	0.000				

Project: Dean Drive Extended
Locality: City of Manassas
Post-development Storm Drain Design Calculations **Date:** 3/8/2021
VDOT LD-229 **Project #:** T-030
Designed By/Checked: Mark Phillips, P.E. / Drew Wolfred, P.E.

FROM POINT	TO POINT	DRAINAGE AREA	RUNOFF COEFFICIENT	CA inlet	CA accum	INLET TIME	RAINFALL	RUNOFF	INVERT ELEVATIONS upper end	INVERT ELEVATIONS lower end	LENGTH	SLOPE	SIZE	PIPE CAPACITY	Q / Qf	VELOCITY	FLOW TIME incr	FLOW TIME accum	REMARKS
		acres	C			min	in/hr	cfs	ft	ft	ft	%	in	cfs	%	fps	min		
3-7	3-8	0.14	0.90	0.126	0.126	0.08	6.80	0.86	213.62	212.92	41	1.70%	15	8.49	10%	0.70	0.00	4.98	
3-8	3-9	0.14	0.90	0.126	0.252	0.08	6.48	1.65	212.16	211.99	35	0.50%	15	4.49	37%	1.34	0.00	5.94	
3-9	3-10	0.02	0.90	0.018	0.270	0.08	6.35	1.73	211.79	211.61	35	0.50%	15	4.61	38%	1.41	0.00	6.38	
3-10	3-15	0.03	0.90	0.027	0.297	0.08	6.23	1.87	211.41	210.25	18	4.30%	15	13.39	14%	1.52	0.00	6.80	
3-11	3-12	5.38	0.40	2.152	2.152	0.30	4.26	9.23	214.62	213.11	20	7.50%	18	28.86	32%	14.53	0.00	18.00	
3-12	3-5	0.09	0.90	0.081	2.233	0.08	4.25	9.58	212.91	212.69	41	0.50%	21	11.65	82%	3.98	0.00	18.02	
3-13	3-4	0.13	0.90	0.117	0.117	0.08	6.80	0.80	213.63	213.43	41	0.50%	12	2.50	32%	1.02	0.00	4.98	
3-1	3-2	0.14	0.90	0.126	0.126	0.08	6.80	0.86	217.50	217.28	41	0.50%	15	4.72	18%	2.93	0.00	4.98	
3-2	3-3	0.14	0.90	0.126	0.252	0.08	6.72	1.71	217.08	215.42	109	1.50%	15	7.97	21%	5.17	0.01	5.21	
3-3	3-4	0.07	0.90	0.063	0.315	0.08	6.60	2.10	215.22	213.43	124	1.40%	15	7.75	27%	5.37	0.01	5.56	
3-4	3-5	0.07	0.90	0.063	0.495	0.00	6.48	3.23	213.23	212.69	72	0.70%	15	5.59	58%	2.64	0.00	5.95	
3-5	3-14	0.07	0.90	0.063	2.791	0.08	4.24	11.92	212.49	212.39	14	0.50%	24	16.00	75%	3.79	0.00	18.19	
4-18	EX-1	0.09	0.90	0.081	0.081	0.08	6.80	0.55	211.91	211.50	75	0.50%	15	4.68	12%	2.56	0.01	4.98	
4-14	4-15	0.06	0.90	0.054	0.054	0.08	6.80	0.37	217.79	214.37	145	2.40%	15	9.93	4%	3.86	0.01	4.98	
4-15	4-16	0.08	0.90	0.072	0.126	0.08	6.59	0.84	214.17	213.74	85	0.50%	15	4.60	18%	2.85	0.01	5.60	
4-16	4-17	0.10	0.90	0.090	0.216	0.08	6.44	1.40	213.74	213.20	32	1.10%	15	6.85	20%	4.39	0.00	6.10	
4-17	4-17A	0.04	0.90	0.036	0.252	0.08	6.38	1.62	213.00	212.57	99	0.50%	15	4.62	35%	3.43	0.01	6.28	

Project: Dean Drive Extended
Locality: City of Manassas
Post-development Hydraulic Grade Line Calculations **Date:** 3/8/2021
VDOT LD-347 **Project #:** T-030
Designed By/Checked: Mark Phillips, P.E. / Drew Wolfred, P.E.

INLET	OUTLET WSE	D_o	Q_o	L_o	S_{fo}	H_f	JUNCTION LOSS V_o	H_o	Q_i	V_i	Q_iV_i	$\frac{V_i^2}{2g}$	H_i	Angle	H_Δ	H_t	1.3 H_t	0.5 H_t	FINAL H	INLET WSE	RIM ELEV	AVAILABLE FREEBOARD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
3-5	215.06	24	11.92	14	0.003	0.04	3.79	0.06	9.58	3.98	38.13	0.25	0.09	83.3	0.17	0.31	0.31	0.15	0.20	215.26	216.92	1.66
3-4	215.26	15	3.23	72	0.003	0.22	2.64	0.03	2.10	1.71	3.59	0.05	0.02	22.7	0.01	0.06	0.07	0.04	0.25	215.51	217.33	1.82
3-3	215.51	15	2.10	124	0.004	0.50	5.37	0.11	1.71	3.68	6.29	0.21	0.07	26.9	0.07	0.25	0.33	0.16	0.66	216.17	219.69	3.52
3-2	216.42	15	1.71	109	0.014	1.53	5.17	0.10	0.86	2.42	2.08	0.09	0.03	102.1	0.07	0.20	0.26	0.13	1.66	218.08	221.84	3.76
3-1	218.28	15	0.86	41	0.005	0.20	2.93	0.04	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.04	0.05	0.03	0.23	218.51	221.85	3.34
3-12	215.26	21	9.58	41	0.004	0.16	3.98	0.06	9.23	5.23	48.27	0.42	0.15	48.2	0.21	0.42	0.42	0.21	0.37	215.63	216.94	1.31
3-11	215.63	18	9.23	20	0.020	0.41	14.53	0.98	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.98	1.28	0.64	1.05	216.67	217.33	0.66
3-13	215.51	12	0.80	41	0.001	0.04	1.02	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.01	0.00	0.04	215.55	217.32	1.77
3-10	215.06	15	1.87	18	0.001	0.02	1.52	0.01	1.73	1.41	2.44	0.03	0.01	14.9	0.01	0.03	0.03	0.01	0.03	215.09	215.32	0.23
3-9	215.09	15	1.73	35	0.001	0.04	1.41	0.01	1.65	1.34	2.21	0.03	0.01	32.7	0.01	0.03	0.03	0.01	0.05	215.14	215.79	0.65
3-8	215.14	15	1.65	35	0.001	0.04	1.34	0.01	0.86	0.70	0.60	0.01	0.00	53.1	0.00	0.01	0.02	0.01	0.04	215.18	217.35	2.17
3-7	215.18	15	0.86	41	0.000	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	215.19	217.37	2.18
4-18	212.50	15	0.55	75	0.000	0.00	2.56	0.03	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.03	0.04	0.02	0.02	212.52	216.11	3.59
4-17	213.57	15	1.62	99	0.001	0.10	3.43	0.05	1.40	3.13	4.38	0.15	0.05	30.5	0.05	0.15	0.20	0.10	0.20	213.77	216.90	3.13
4-16	214.20	15	1.40	32	0.011	0.35	4.39	0.07	0.84	1.76	1.48	0.05	0.02	16.1	0.01	0.10	0.13	0.07	0.42	214.62	217.49	2.87
4-15	214.74	15	0.84	85	0.004	0.34	2.85	0.03	0.37	2.64	0.98	0.11	0.04	9.4	0.01	0.08	0.11	0.05	0.39	215.13	219.01	3.88
4-14	215.37	15	0.37	145	0.023	3.33	3.86	0.07	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.07	0.09	0.05	3.38	218.75	222.63	3.88

100% DESIGN SUBMITTAL

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

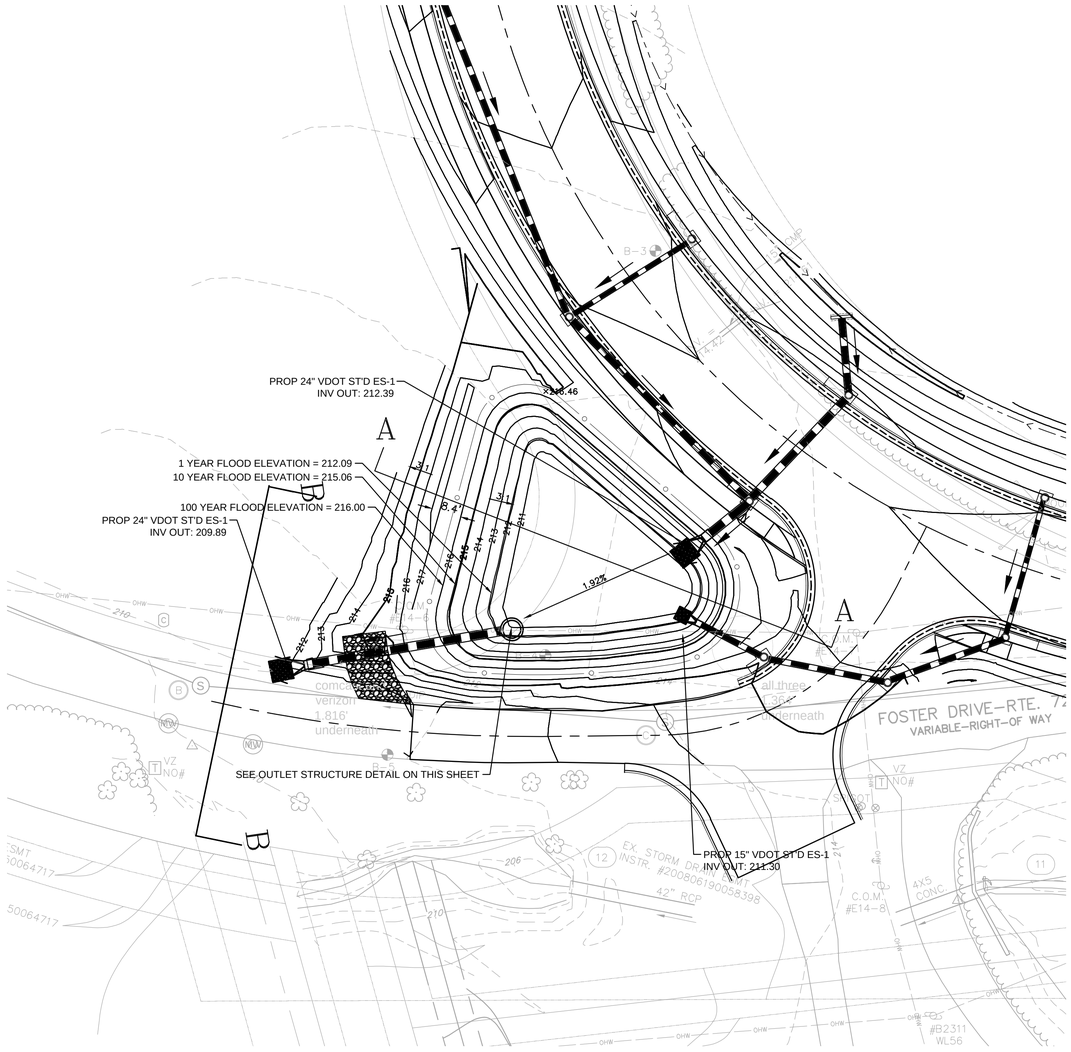
REVISIONS
DESCRIPTION | BY | DATE

MANASSAS PROJECT NO.: T-030
DATE OF PLAN ISSUANCE: TBD
CONSULTANT PROJECT ID.: 594000
DESIGNED BY: MP DATE: 1/15/2020
DRAWN BY: DB DATE: 2/18/2020
CHECKED BY: SH DATE: 2/21/2020
APPROVED BY: CS DATE: 5/6/2020

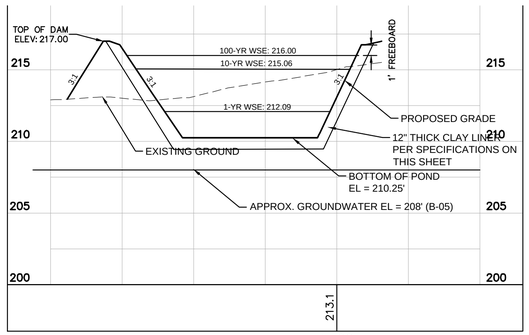
DEAN DRIVE EXTENDED (T-030)

Kimley»Horn
11400 COMMERCE PARK DRIVE SUITE #400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

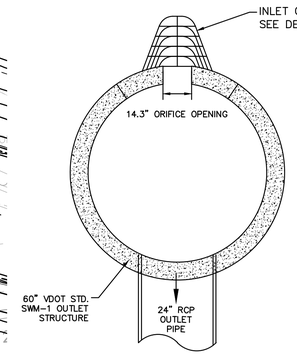
SHEET
5C(1) – STORMWATER MANAGEMENT DETAILS
SCALE H 1:25 V 1:5

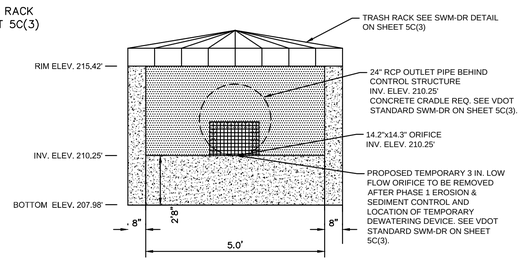


DRY DETENTION POND DETAIL
SCALE 1' = 20'

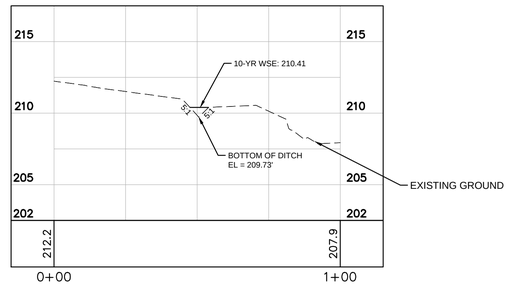


SECTION A-A





1 OUTLET STRUCTURE DETAIL
N.T.S.



SECTION B-B

Clay Liner Specifications

Clay Liner Property	Specification
Permeability	Less than 1 x 10^{-6} cm/sec
Plasticity Index of Clay	Not less than 15%
Liquid Limit of Clay	Not less than 30%
Clay Particles Passing	Not less than 30%
Clay Compaction	95% of standard proctor density

COMMONWEALTH OF VIRGINIA
MARK R. PHILLIPS
Lic. No. 058611
03/30/2021
PROFESSIONAL ENGINEER

Kimley-Horn
Reston, Virginia
Hydraulic Engineer

100% DESIGN SUBMITTAL

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

REVISIONS
DATE | BY | DESCRIPTION

MANASSAS PROJECT NO.: T-030
DATE OF PLAN ISSUANCE: TBD
CONSULTANT PROJECT ID.: 594000
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DRAWN BY: DB DATE: 2/18/2020
CHECKED BY: SH DATE: 2/21/2020
APPROVED BY: CS DATE: 5/8/2020

Kimley»Horn
11400 COMMERCE PARK DRIVE SUITE #400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
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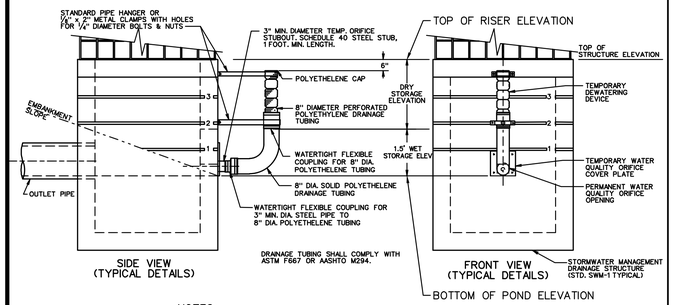
DEAN DRIVE EXTENDED (T-030)

SHEET
5C(2) - STORMWATER MANAGEMENT DETAILS

SCALE H 1:25
V 1:5

2016 ROAD & BRIDGE STANDARDS

SWM-DR



NOTES:

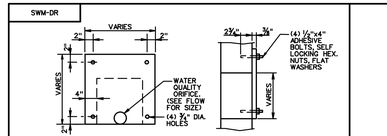
1. THESE DETAILS ARE TO BE USED TO MODIFY THE PERMANENT STORMWATER MANAGEMENT DRAINAGE STRUCTURE WHERE THE STORMWATER MANAGEMENT BASIN IS TO BE USED FOR A TEMPORARY SEDIMENT BASIN DURING PROJECT CONSTRUCTION.
2. GRADE STORMWATER MANAGEMENT BASIN AS SHOWN IN PLANS.
3. ALL OPENINGS (IF ANY) IN SIDE OF STRUCTURE (OTHER THAN PERMANENT WATER QUALITY ORIFICE) ARE TO BE COVERED WITH SOLID METAL PLATES WHILE THE BASIN IS BEING USED FOR SEDIMENT CONTROL.
4. DEWATERING DEVICE AND COMPONENTS AND TEMPORARY METAL PLATES (IF ANY), AS SHOWN IN THE DETAIL, ARE TO BE REMOVED AND PERMANENT STEEL PLATE WITH WATER QUALITY ORIFICE IS TO BE INSTALLED WHEN BASIN IS NO LONGER NEEDED FOR SEDIMENT CONTROL.
5. SIMILAR DEVICE MAY ALSO BE USED ON OTHER STORMWATER MANAGEMENT DRAINAGE STRUCTURES.
6. COST OF TEMPORARY DEWATERING DEVICE AND TEMPORARY METAL PLATES (IF ANY) SHALL BE INCLUDED IN THE BID PRICE FOR STORMWATER MANAGEMENT DRAINAGE STRUCTURE.
7. THE TEMPORARY 8" DIA. POLYETHELENE DRAINAGE TUBING IS TO BE SOLID FOR THE LENGTH BELOW WET STORAGE ELEVATION AND IS TO BE PERFORATED ABOVE THE WET STORAGE ELEVATION. THE COUPLING IS TO BE WATERTIGHT.

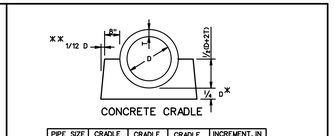
VDOT ROAD AND BRIDGE STANDARDS		STORMWATER MANAGEMENT (SWM) DETAILS	SPECIFICATION REFERENCE
SHEET 1 OF 5	REVISION DATE	VIRGINIA DEPARTMENT OF TRANSPORTATION	302
114.04			

2016 ROAD & BRIDGE STANDARDS

2016 ROAD & BRIDGE STANDARDS

SWM-DR



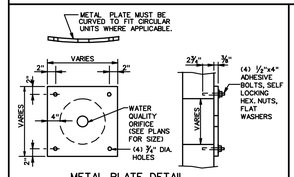


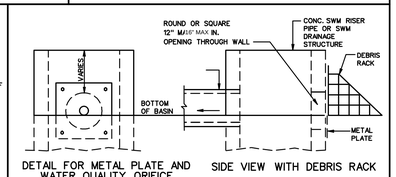
PIPE SIZE INCHES	CRADLE BOTTOM WIDTH (INCHES)	CRADLE HEIGHT (INCHES)	CRADLE TOP WIDTH (INCHES)	INCREMENT, IN CUBIC YARDS, PER LINEAR FOOT OF PIPE
12	34	14	32	0.093
15	38	15.75	35.5	0.110
18	42	17.5	39	0.129
24	50	21	46	0.168
30	58	26	53	0.233
36	66	31	60	0.307
42	74	36	67	0.390

** CONCRETE SHALL BE CLASS A3
*, BUT NOT LESS THAN 8"
*, ** IF THE PIPE IS LAID IN AN EXCAVATED TRENCH, THEN THE SIDE WALLS MAY CONFORM TO THE TRENCH SHAPE (IE THE TRENCH MAY BECOME THE CRADLE FORM).

CONCRETE CRADLE IS TO BE INSTALLED UNDER THE ENTIRE LENGTH OF CULVERT AT EACH STORMWATER MANAGEMENT BASIN.

CONCRETE CRADLE IS TO BE PAID FOR AS MISCELLANEOUS CONCRETE AND SUMMARIZED IN CUBIC YARDS FOR EACH PIPE LOCATION



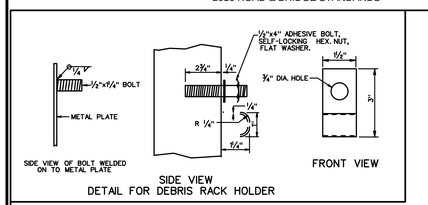


VDOT ROAD AND BRIDGE STANDARDS		STORMWATER MANAGEMENT (SWM) DETAILS	SPECIFICATION REFERENCE
SHEET 3 OF 5	REVISION DATE	DEBRIS RACK, METAL PLATE, WATER QUALITY ORIFICE, CONCRETE CRADLE (FOR SWM DRAINAGE STRUCTURES, SWM RISER PIPES AND SWM DAMS) VIRGINIA DEPARTMENT OF TRANSPORTATION	302
114.06			

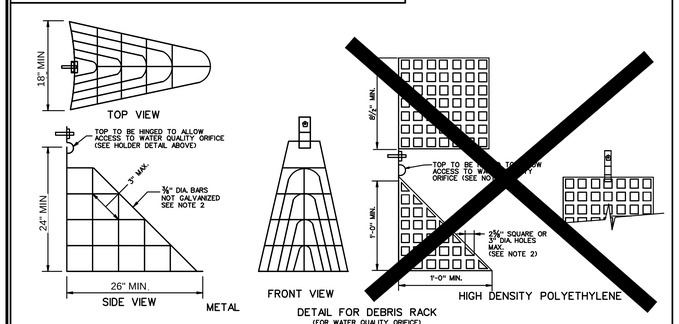
2016 ROAD & BRIDGE STANDARDS

2016 ROAD & BRIDGE STANDARDS

SWM-DR



1. COST OF DEBRIS RACK, METAL PLATE, AND DEBRIS RACK HOLDER TO BE INCLUDED IN THE BID PRICE FOR THE SWM DRAINAGE STRUCTURE.
2. DEBRIS RACK MAY BE FABRICATED FROM WELDED ¾" DIAMETER BARS OR ½" THICK HIGH DENSITY POLYETHYLENE. METAL COMPONENTS OF DEBRIS RACK MUST NOT BE GALVANIZED.
3. DEBRIS RACK TO BE HINGED AS SHOWN OR CONTRACTOR MAY SUBSTITUTE A COMPARABLE DESIGN AS APPROVED BY THE ENGINEER.
4. THE LOCATION OF THE DEBRIS RACK HOLDER MAY BE ADJUSTED FOR VARIABLE CONDITIONS. WHEN HOLDER BOLT IS LOCATED ON THE METAL PLATE THE ½" DIA. BOLT LENGTH IS TO BE REDUCED ½" LG. AND WELDED TO THE PLATE. DEBRIS RACK HOLDER AND ALL HARDWARE IS TO BE GALVANIZED.

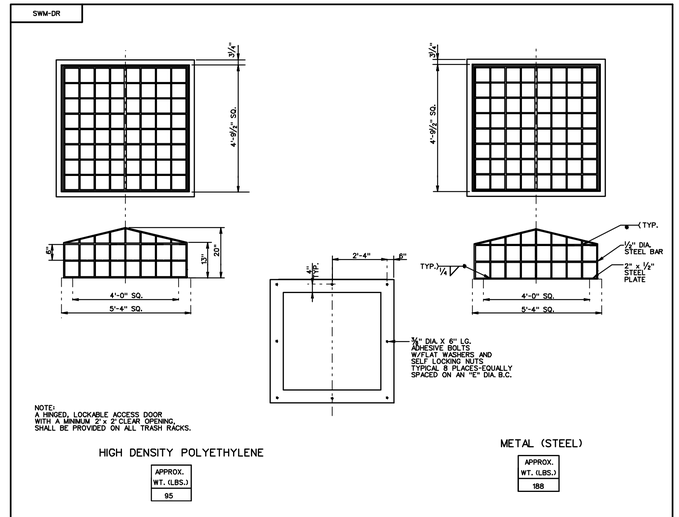


SPECIFICATION REFERENCE	STORMWATER MANAGEMENT (SWM) DETAILS	VDOT ROAD AND BRIDGE STANDARDS	
302	DEBRIS RACK, METAL PLATE, WATER QUALITY ORIFICE, CONCRETE CRADLE (FOR SWM DRAINAGE STRUCTURES, SWM RISER PIPES AND SWM DAMS) VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE	SHEET 2 OF 5
			114.05

2016 ROAD & BRIDGE STANDARDS

2016 ROAD & BRIDGE STANDARDS

SWM-DR

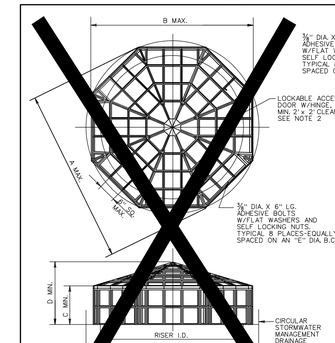


VDOT ROAD AND BRIDGE STANDARDS		STORMWATER MANAGEMENT DETAILS TRASH RACK FOR SWM DRAINAGE STRUCTURES	SPECIFICATION REFERENCE
SHEET 5 OF 5	REVISION DATE	VIRGINIA DEPARTMENT OF TRANSPORTATION	302
114.08			

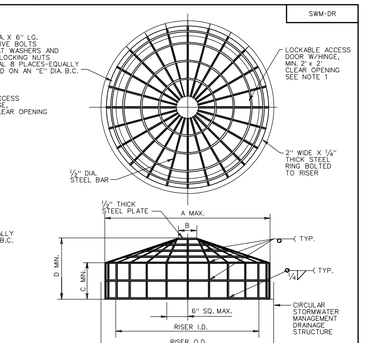
2016 ROAD & BRIDGE STANDARDS

2016 ROAD & BRIDGE STANDARDS

SWM-DR



RISER I.D.	RISER O.D.	DIMENSION A	B	C	D	E
24	30	31	28⅝	7	11	27
36	44	45	41½	13	19	40
48	58	59	54½	13	21	53
60	72	73	67½	17	28	66
72	86	87	80⅝	23	35	79
84	100	101	93¼	25	39	92
96	114	115	106¼	22	38	105



RISER I.D.	RISER O.D.	DIMENSION A	B	C	D	E	SEGMENT	APPROX. WT. (LBS.)
24	30	30	6	7	10	27	15	46
36	44	42	6	13	18	40	22	82
48	58	55	9	13	20	53	29	120
60	72	68	9	17	26	66	36	169
72	86	81	9	23	34	79	42	227
84	100	94	12	25	37	92	49	290
96	114	107	12	22	36	105	56	341

NOTES:

1. ALL METAL TRASH RACKS 36" IN DIAMETER AND LARGER OR WITH A TOTAL WEIGHT OF 75 LBS OR GREATER SHALL HAVE A HINGED, LOCKABLE ACCESS DOOR WITH A MINIMUM 2' X 2' CLEAR OPENING.
2. ALL HIGH DENSITY POLYETHYLENE TRASH RACKS 48" IN DIAMETER AND LARGER SHALL HAVE A HINGED, LOCKABLE ACCESS DOOR WITH A MINIMUM 2' X 2' CLEAR OPENING.
3. ANTI-VORTEX PLATE IS TO BE USED WHEN SPECIFIED ON THE PLANS. COST OF FURNISHING AND PLACING THE ANTI-VORTEX PLATE IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.

SPECIFICATION REFERENCE	STORMWATER MANAGEMENT DETAILS TRASH RACK FOR SWM DRAINAGE STRUCTURES	VDOT ROAD AND BRIDGE STANDARDS	
302	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE	SHEET 4 OF 5
		07/16	114.07

2016 ROAD & BRIDGE STANDARDS

COMMONWEALTH OF VIRGINIA
MARK R. PHILLIPS
Lic. No. 058611
03/30/2021
PROFESSIONAL ENGINEER

Kimley-Horn
Reston, Virginia
Hydraulic Engineer

100% DESIGN SUBMITTAL

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING
8500 PUBLIC WORKS DRIVE
MANASSAS, VIRGINIA 20110

DEAN DRIVE EXTENDED (T-030)

REVISIONS

DESCRIPTION	BY	DATE

MANASSAS PROJECT NO.: T-030
DATE OF PLAN ISSUANCE: TBD
CONSULTANT PROJECT ID.: 594000
DESIGNED BY: MP DATE: 1/15/2020
DRAWN BY: DB DATE: 2/18/2020
CHECKED BY: SH DATE: 2/21/2020
APPROVED BY: CS DATE: 5/8/2020

Kimley»Horn
11400 COMMERCE PARK DRIVE SUITE #400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

SHEET
5C(3) – STORMWATER MANAGEMENT DETAILS

SCALE H 1:25
V 1:5

AFFIDAVIT OF NUTRIENT CREDIT PURCHASE

Exhibit A

AFFIDAVIT OF PHOSPHORUS CREDIT SALE

Riverbanks VA, LLC, a Virginia limited liability company (the "Company"), hereby certifies the following:

1. Pursuant to that certain Nutrient Credit Purchase and Sale Agreement (the "Agreement"), between the Company ("Seller") and **City of Manassas** ("Buyer"), the Company, for the benefit of the Buyer, agreed to sell from its Potomac Tucker Hill Nutrient Bank in Westmoreland County, Virginia, **2.07** pounds of nonpoint source phosphorus Credits to Buyer and retire the associated ratio of nonpoint source nitrogen credits at the credit generating facility in the amount of **32.393** pounds of nitrogen credits;

2. The Company and the Buyer, as of the date hereof, have closed the transaction contemplated by the Agreement and the Company has sold to Buyer the **2.07** pounds of phosphorus Credits.

WITNESS the following signature:

Riverbanks VA, LLC, a Virginia limited liability company

By: _____
John H. Morris, IV, Manager

Date: 3/29/2021

Commonwealth of Virginia

County of Westmoreland, to-wit:

Sworn to and subscribed before me this 29th day of March, 2021, by John H. Morris, IV, Manager, on behalf of Riverbanks VA, LLC, a Virginia limited liability company.

My commission expires: 4/30/2024

SHERRY R. GREEN
NOTARY PUBLIC
REGISTRATION # 174705
COMMONWEALTH OF VIRGINIA

Notary Public

Project Name: Dean Drive, City of Manassas, VA 20110
Permit #: Pending
Permittee: City of Manassas
Phosphorus Credits: 2.07 lbs.
Associated Nitrogen Credit: 32.393 lbs.

7

VRRM SPREADSHEET EXCERPT

Project Name: Dean Drive Roadway Improvements
Date: 3/8/2021
Linear Development Project? Yes

CLEAR ALL (Ctrl+Shift+R)

data input cells
constant values
calculation cells
final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area *(acres)* → 2.92

Maximum reduction required:	*20%*
The site's net increase in impervious cover (acres) is:	*0.89*
Post-Development TP Load Reduction for Site (lb/yr):	*2.49*

Check:
BMP Design Specifications List: 2013 Draft Stds & Specs
Linear project? Yes
Land cover areas entered correctly? ✔
Total disturbed area entered? ✔

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed forest/open space	0.00	0.00	0.00	1.24	1.24
Managed Turf (acres) -- disturbed, graded for yards or other turf to be	0.00	0.00	0.00	0.80	0.80
Impervious Cover (acres)	0.00	0.00	0.00	0.88	0.88
					2.92

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be	0.00	0.00	0.00	1.15	1.15
Impervious Cover (acres)	0.00	0.00	0.00	1.77	1.77
Area Check	OK.	OK.	OK.	OK.	2.92

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	2.20
Linear Project TP Load Reduction Required (lb/yr):	2.49

Nitrogen Loads (Informational Purposes Only)

Pre-ReDevelopment TN Load (lb/yr)	17.91	Final Post-Development TN Load (Post-ReDevelopment & New Impervious) (lb/yr)	32.13

Site Results (Water Quality Compliance)

Area Checks	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	AREA CHECK
FOREST/OPEN SPACE (ac)	0.00	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	1.15	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	1.15	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA (ac)	0.49	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA TREATED (ac)	0.49	0.00	0.00	0.00	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft^3) 7,147

Runoff Reduction Volume and TP By Drainage Area

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	TOTAL
RUNOFF REDUCTION VOLUME ACHIEVED (ft^3)	0	0	0	0	0	0
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	2.77	0.00	0.00	0.00	0.00	2.77
TP LOAD REDUCTION ACHIEVED (lb/yr)	0.42	0.00	0.00	0.00	0.00	0.42
TP LOAD REMAINING (lb/yr)	2.36	0.00	0.00	0.00	0.00	2.36
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	1.98	0.00	0.00	0.00	0.00	1.98

Total Phosphorus

		LINEAR PROJECT:
FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	--	4.49
TP LOAD REDUCTION REQUIRED (lb/yr)	--	2.49
TP LOAD REDUCTION ACHIEVED (lb/yr)	--	0.42
TP LOAD REMAINING (lb/yr):	--	4.08
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	--	2.07

Total Nitrogen (For Information Purposes)

POST-DEVELOPMENT LOAD (lb/yr)	32.13
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	1.98
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	30.15

COMMONWEALTH OF VIRGINIA
MARK R. PHILLIPS
Lic. No. 058611
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100% DESIGN SUBMITTAL

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DEAN DRIVE EXTENDED (T-030)

SHEET
5C(4) – STORMWATER MANAGEMENT DETAILS

SCALE H 1:25
V 1:5