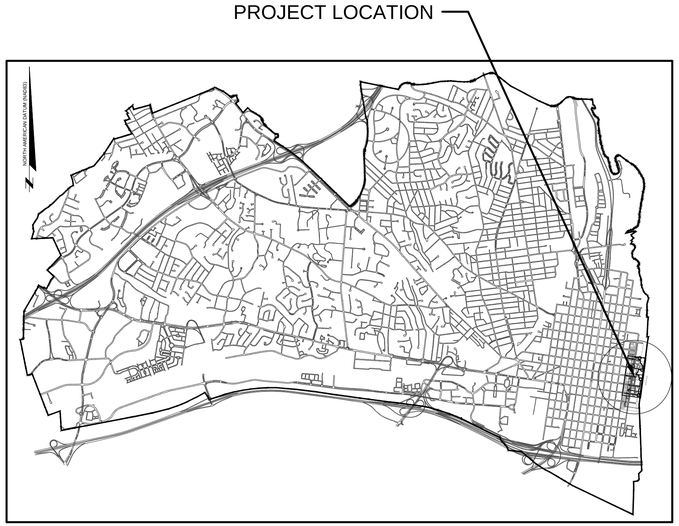
City of Alexandria, Virginia



CITY OF ALEXANDRIA
NTS

DEPARTMENT OF PROJECT IMPLEMENTATION

WATERFRONT FLOOD MITIGATION PROJECT

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SHEET 19:	TYPICAL BULKHEAD SECTION AND NOTES

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URS CORPORATION
1242 MILESTONE CENTER DRIVE, SUITE 150
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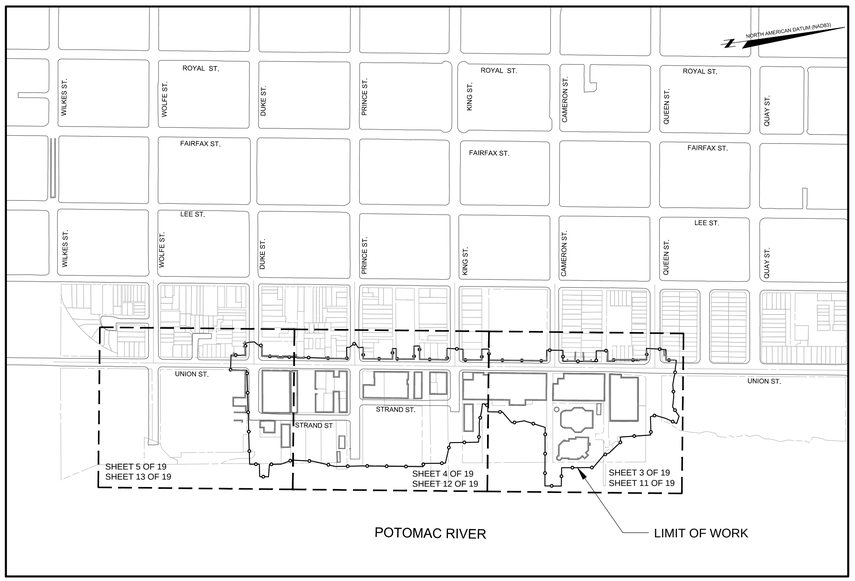
PHONE : 301-820-3358

BENCHMARKS

POINT	NORTHING	EASTING	ELEV	DESCRIPTION
HV9658	6,980,069.38	11,899,048.88	6.60	NGS BRASS DISC IN CONCRETE AT FOUNDERS PARK
105	6,979,627.06	11,898,925.14	4.92	DRILL HOLE IN SIDEWALK AT UNION AND CAMERON STREET
110	6,978,854.77	11,898,804.13	5.74	DRILL HOLE IN SIDEWALK AT UNION AND PRINCE STREET
114	6,978,380.15	11,898,735.77	11.55	IRON PIPE WITH CAP AT UNION AND DUKE STREET
115	6,978,366.49	11,898,993.00	6.39	DRILL HOLE IN CATCH BASIN AT DUKE AND STRAND STREET
116	6,978,874.17	11,899,049.11	5.47	IRON PIPE WITH CAP SET IN PARK AT STRAND AND PRINCE STREET
117	6,979,193.14	11,899,020.53	3.03	DRILL HOLE IN SIDEWALK AT STRAND AND KING STREET
119	6,979,572.98	11,899,379.48	7.11	MAG NAIL SET ON DOCK



VICINTY MAP
SCALE 1"=300'

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COVER SHEET

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LEGEND:

- EX. PROPERTY LINE
- EX. CURB AND GUTTER
- EX. CONTOURS (5)
- EX. BUILDING
- EX. GAS LINE (ABDN) (GAS)
- EX. GAS LINE (ACTIVE) (GAS GAS)
- EX. STORM DRAIN (D)
- EX. SEWER (S)
- EX. WATER LINE (W W)
- EX. RPA LINE
- EX. OVERHEAD UTILITY (OHU)
- EX. CENTER LINE OF ROAD
- EX. EDGE OF PAVING
- EX. FENCE (x x x)
- EX. LIGHT POLE
- EX. FIRE HYDRANT
- EX. WATER VALVE
- EX. WATER METER (WM)
- EX. UNDERGROUND ELEC MANHOLES (E)
- EX. UNDERGROUND UTILITY MANHOLES (U)
- EX. SPOT ELEVATION (X 4.20)
- DRAINAGE AREA INTERCEPTED AND BYPASSED VIA STORM DRAIN
- PROPOSED DRAINAGE AREA DIVIDE FOR PUMP STATIONS
- PROPOSED CONTOUR (5)
- PROPOSED BYPASS STORM DRAIN
- EXISTING STORM DRAIN TO PUMP STATION
- PROPOSED STORM DRAIN TO PUMP STATION
- BORING B-X
- EXISTING STORM DRAIN TO BE DEMOLISHED

ABBREVIATIONS:

ABDN:	ABANDONED
AC:	ACRES
ANSI:	AMERICAN NATIONAL STANDARDS INSTITUTE
ASTM:	AMERICAN SOCIETY FOR TESTING AND MATERIALS
BMP:	BEST MANAGEMENT PRACTICES
CB:	CATCH BASIN
CI:	CAST IRON
CL:	CENTERLINE
CRLD:	CERTIFIED RESPONSIBLE LAND DISTURBER
DA:	DRAINAGE AREA
E&S:	EROSION AND SEDIMENT
ELEV:	ELEVATION
EPA:	ENVIRONMENTAL PROTECTION AGENCY
EX:	EXISTING
FFE:	FIRST FLOOR ELEVATION
INV:	INVERT
LOW:	LIMIT OF WORK
MH:	MANHOLE
MUTCD:	MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
NAD83:	NORTH AMERICAN DATUM 83
NESHAPS:	NATIONAL EMISSIONS STANDARDS FOR HAZARDOUS AIR POLLUTANTS
NIOSH:	NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH
NTS:	NOT TO SCALE
O-#:	OUTFALL #
OSHA:	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OHU:	OVERHEAD UTILITY
PLA:	PLASTIC
RCP:	REINFORCED CONCRETE PIPE
RPA:	RESOURCE PROTECTION AREA
SD:	STORM DRAIN
SDMH:	STORM DRAIN MANHOLE
SG:	SURFACE GRATE
SS:	SANITARY SEWER
SSMH:	SANITARY SEWER MANHOLE
T&ES:	TRANSPORTATION AND ENVIRONMENTAL SERVICES
VDOT:	VIRGINIA DEPARTMENT OF TRANSPORTATION
VESCH:	VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK
VOSH:	VIRGINIA OCCUPATIONAL AND SAFETY HEALTH
VSWCB:	VIRGINIA STATE WATER CONTROL BOARD
W:	WATER
WRPD:	WRAPPED
WSE:	WATER SURFACE ELEVATION

EXISTING CONDITIONS SURVEY NOTES:

1. THE HORIZONTAL DATUM SHOWN HEREON IS TIED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83) AND THE VERTICAL DATUM SHOWN HEREON IS TIED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) BASED ARE BASED ON NGS MONUMENT HV9658.
2. UTILITY INFORMATION AS SHOWN HEREON, IS BASED ON A FILED RUN TOPOGRAPHIC SURVEY LOCATED VISIBLE SURFACE FEATURES PERFORMED BY CHARLES P. JOHNSON AND ASSOCIATED AND COMPLETED ON AUGUST 19, 2013. FOR EXACT LOCATIONS OF EXISTING UNDERGROUND UTILITIES, NOTIFY "MISS UTILITY" AT 1-800-257-7777 AND 811, 72 HOURS BEFORE THE START OF ANY EXCAVATION OR CONSTRUCTION. THE CONSTRUCTION WORKERS AND CONTRACOR(S) ARE ENCOURAGED TO VISIT DOMINION VIRGINIA POWER WEBSITE AT WWW.DOM.COM (KEYWORD SAFETY) FOR ADDITIONAL SAFETY INSTRUCTIONS.
3. LOCATION AND DEPTH OF ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION. CONTRACTOR/ENGINEER SHOULD DIG TEST PITS BY HAND AT ALL UTILITY CROSSINGS TO VERIFY EXACT LOCATIONS.
4. A BOUNDARY SURVEY HAS NOT BEEN PERFORMED. PROPERTY LINE INFORMATION SHOWN HEREON IS APPROXIMATE AND BASED ON G.I.S. INFORMATION OBTAINED FROM THE CITY OF ALEXANDRIA. A TITLE REPORT HAS NOT BEEN PROVIDED.
5. PROPERTY OWNERSHIP INFORMATION SHOWN HEREON (SEE PROPERTY OWNERSHIP TABLE) IS BASED ON CURRENT AVAILABLE TAX RECORDS, LAST UPDATED 12/27/2012.

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WATERFRONT FLOOD MITIGATION PROJECT

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LEGEND, ABBREVIATIONS AND GENERAL NOTES

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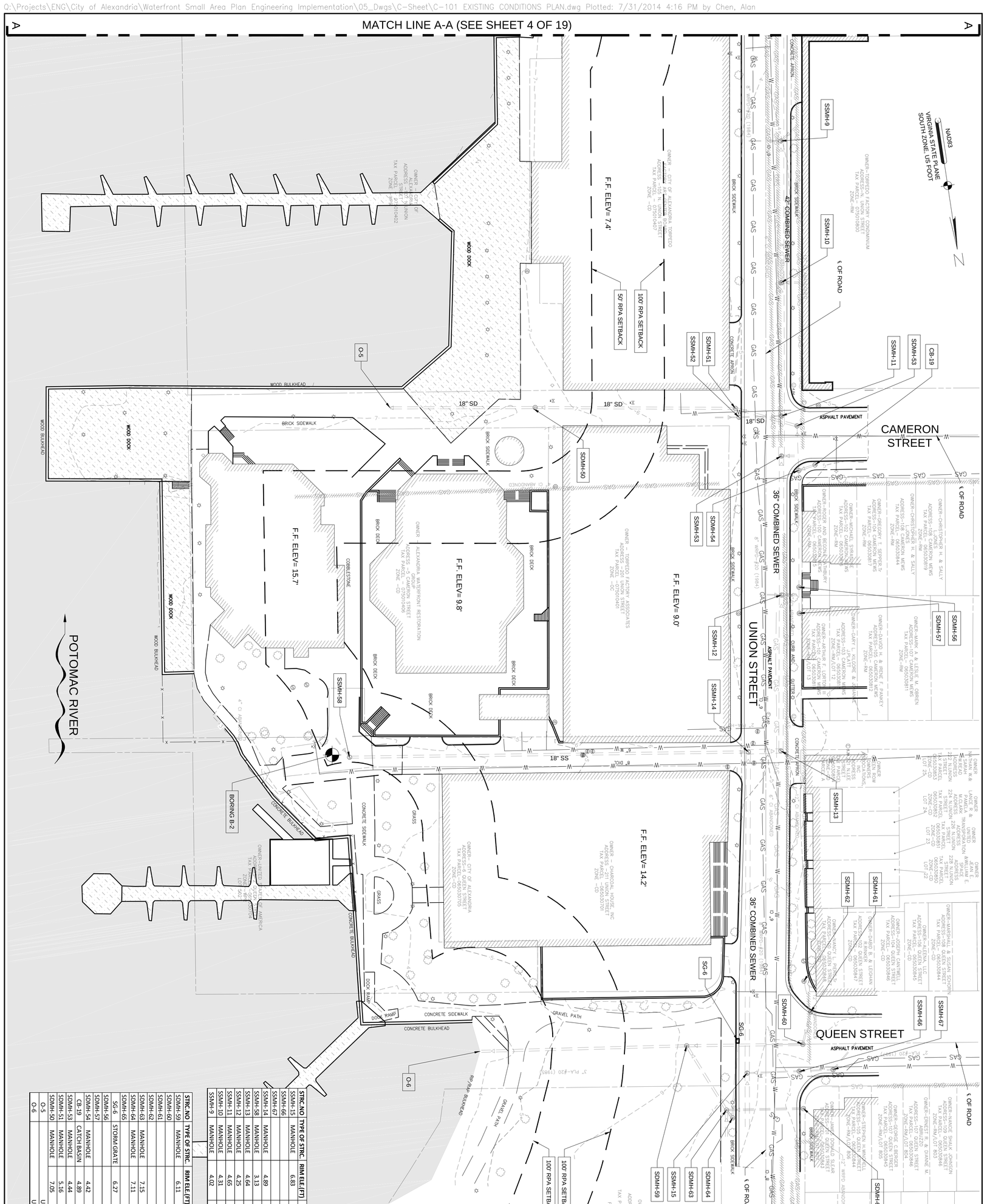
MATCH LINE A-A (SEE SHEET 4 OF 19)



STRC.NO	TYPE OF STRC.	RIM ELE.(FT)	INVERT EL. (FT)	PIPE SIZE (IN)	D/S STRC.
SSMH-15	MANHOLE	6.83	(-1.87) W, (-3.47) N, (-3.57) S	36"	SSMH-14
SSMH-66					SSMH-15
SSMH-67					SSMH-66
SSMH-14	MANHOLE	4.89	(-1.21) E, (-3.21) N, (-3.31) W	36"	SSMH-13
SSMH-58	MANHOLE	3.13	(-0.07) SE, (-0.27) W	18"	SSMH-14
SSMH-13	MANHOLE	4.64	(-.66) E, (-3.36) N, (-3.46) W	36"	SSMH-12
SSMH-12	MANHOLE	4.25	(-0.75) E, (-0.85) W, (-3.45) N, (-3.55) S	36"	SSMH-11
SSMH-11	MANHOLE	4.65	(-0.95) E, (-2.80) N, (-2.90) S	42"	SSMH-10
SSMH-10	MANHOLE	4.31	(0.21) W, (-3.19) N, (-3.29) S	42"	SSMH-9
SSMH-9	MANHOLE	4.02	(1.02) E, (0.32) SW, (-3.28) N, (-3.38) S	42"	SSMH-8

STRC.NO	TYPE OF STRC.	RIM ELE.(FT)	INVERT EL. (FT)	PIPE SIZE (IN)	D/S STRC.
SSMH-59	MANHOLE	6.11	(-1.69) W, (-1.79) NW, (-1.89) E	18"	O-6
SDMH-60					SDMH-59
SDMH-61					SDMH-60
SDMH-62					SDMH-61
SDMH-63	MANHOLE	7.15	(3.85) NW, (0.65) W, (0.35) N, (-0.05) SE	18"	SDMH-59
SDMH-64	MANHOLE	7.11	(4.31) S, (4.21) SE	12"	SDMH-63
SDMH-65					SDMH-64
SG-6	STORM GRATE	6.27	(4.67) N	12"	SDMH-64
SDMH-56					SDMH-54
SDMH-57					SDMH-56
SDMH-54	MANHOLE	4.42	(1.52) W, (1.12) N, (1.02) S		SDMH-53
CB-19	CATCH BASIN	4.89	(1.29) E		SDMH-54
SDMH-53	MANHOLE	4.44	(0.74) N, (0.64) E		SDMH-51
SDMH-51	MANHOLE	5.16	(0.04) W, (-0.04) E	18"	SDMH-50
SDMH-50	MANHOLE	7.05	(-2.25) W, (-2.35) E	18"	O-5
O-5	UNABLE TO LOCATE OUTFALL ELEVATION				
O-6	UNABLE TO LOCATE OUTFALL ELEVATION				

WATERFRONT FLOOD MITIGATION PROJECT

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EXISTING CONDITIONS PLAN

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STRC NO	TYPE OF STRC	RIM ELE.(FT)	INVERT EL. (FT)	PIPE SIZE (IN)	DS'S STRC
CB-18	CATCH BASIN	3.8	(0.90) NE, (-0.50) SE	12"	SDMH-50
SDMH-50	MANHOLE	3.41	(0.13) E, (0.03) NW	21"x 28"	SDMH-45
CB-14	CATCH BASIN	3.77	(-2.01) S	12"	SDMH-45
SDMH-45	MANHOLE	3.77	(-2.11) S, (-2.56) BOT	24"	SDMH-43
CB-15	CATCH BASIN	3.18	(-3.33) W, (-3.83) SE	24"	SDMH-43
SDMH-38	MANHOLE	2.99	FULL OF H2O, (-4.21) BOT	24"	SDMH-39
SDMH-39	MANHOLE	2.79	FULL OF H2O, (-4.70) BOT	24"	O-4
SDMH-44	MANHOLE	3.2	FULL OF H2O, (-4.70) BOT	21"	SDMH-69
CB-12	CATCH BASIN	3.27	FULL OF H2O, (-0.70) BOT	21"	SDMH-69
CB-13	CATCH BASIN	3.83	(0.13) N	12"	SDMH-69
SDMH-69	MANHOLE	3.85	(-0.25) N	10"	SDMH-44
SDMH-40	MANHOLE	3.27	FULL OF H2O, (-0.70) E	21"	SDMH-44
CB-16	CATCH BASIN	3.96	(0.66) S, (0.56) W, (-0.66) E	15"	SDMH-46
SDMH-46	MANHOLE	3.36	(0.66) S, (0.56) W, (-0.66) E	15"	SDMH-47
CB-17	CATCH BASIN	3.87	(1.37) SE, (0.87) N	15"	SDMH-47
SDMH-47	MANHOLE	3.99	(2.09) NW	12"	CB-16
SG-5	STORM GRATE	1.78	FULL OF H2O, (-2.42) BOT		SDMH-38
SDMH-38	MANHOLE	3.13	FULL OF H2O, (-3.27) BOT	21"	O-3
CB-5	CATCH BASIN	3.39	(0.39) S	12"	SDMH-26
SDMH-26	MANHOLE	3.05	FULL OF H2O, (-2.55) BOT	12"	SDMH-25
CB-6	CATCH BASIN	3.47	(0.47) NW	12"	SDMH-25
SDMH-25	MANHOLE	3.36	FULL OF H2O, (-2.46) BOT	12"	SDMH-25
SDMH-27	MANHOLE	3.11	FULL OF H2O, (-2.01) BOT	12"	SDMH-25
CB-7	CATCH BASIN	3.58	(-1.58) E	12"	SDMH-27
SDMH-28	MANHOLE	3.23	(-0.93) N, (-0.13) SE	12"	SDMH-27
SDMH-29	MANHOLE	3.56	(-0.45) W, (-0.55) E	21"	SDMH-26
SDMH-30	MANHOLE	6	(-2.60) N, (-2.80) S, (-1.50) E	21"	SDMH-29
CB-10	CATCH BASIN	5.62	(3.22) SW, (3.02) S	15"	SDMH-30
SDMH-31	MANHOLE	6.13	(3.29) E, (3.59) N	12"	SDMH-30
SDMH-5	MANHOLE	6.49	(3.39) W, (3.09) N	10"	SDMH-31
CB-9	CATCH BASIN	7.77	(4.57) SW, (4.47) E	12"	SDMH-5
SDMH-32	MANHOLE	9.52	(6.72) W, (6.22) NE	12"	CB-9
O-4					

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EXISTING CONDITIONS PLAN

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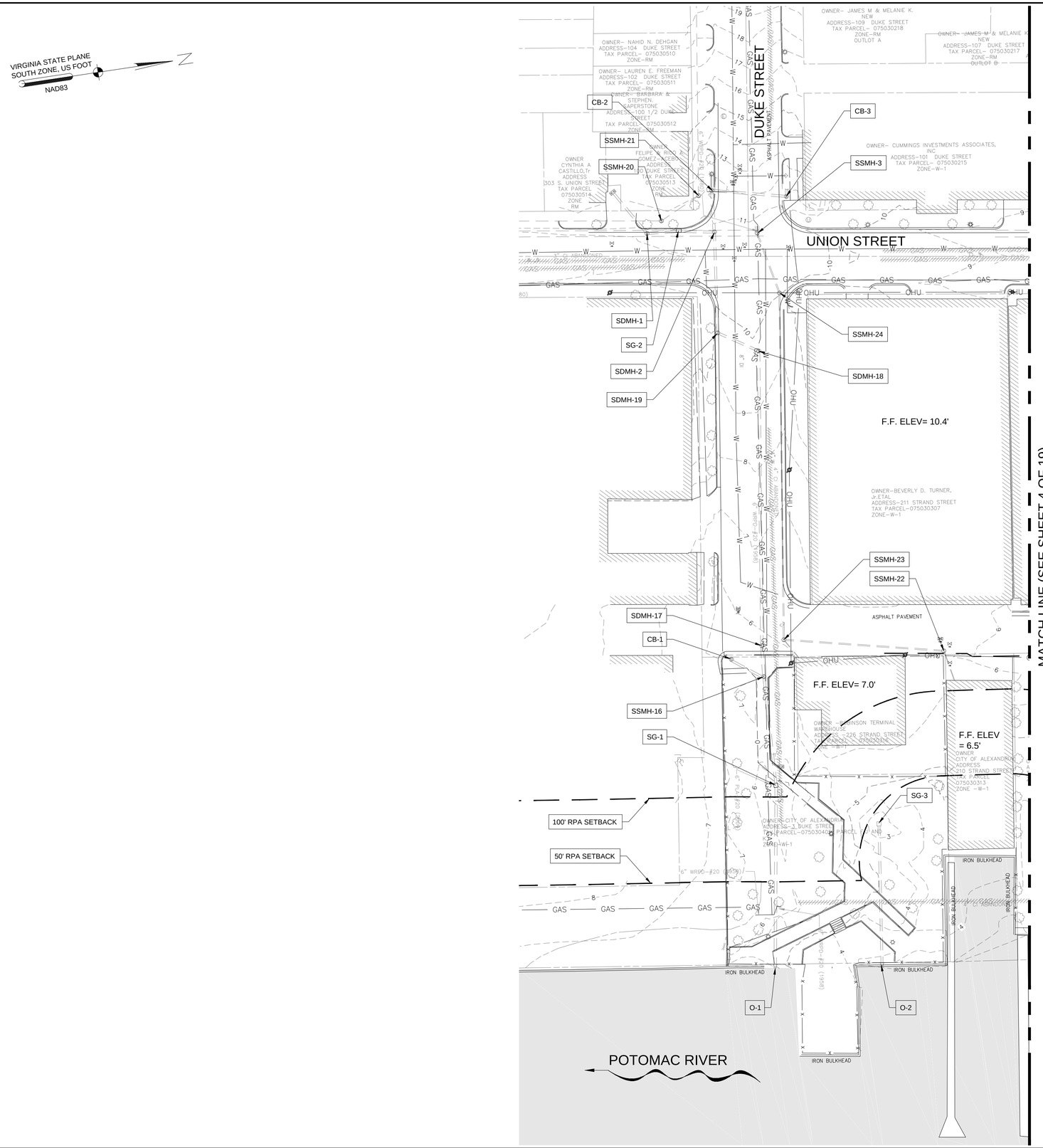

STRC.NO	TYPE OF STRC.	RIM ELE.(FT)	INVERT EL. (FT)	PIPE SIZE (IN)	D/S STRC.
SG-1	STORM GRATE	4.52	(0.72) W, (0.62) E	18"	O-1
SG-2	STORM GRATE	10.82	(5.82) S, (5.72) N	15"	SDMH-2
SG-3	STORM GRATE	2.49	(0.09) E	15"	O-2
SDMH-1	MANHOLE	11.04	(6.14) W, (6.04) N	15"	SG-2
SDMH-2	MANHOLE	11.27	(5.37) S, (5.32) W, (5.22) E	15"	SDMH-19
SDMH-16	MANHOLE	6.81	(1.11) SW, (1.01) W, (0.91) E	15"	SG-1
SDMH-17	MANHOLE	6.01	(1.51) W, (1.41) E	15"	SDMH-16
SDMH-18	MANHOLE	10.01	(4.21) S, (4.11) E	15"	SDMH-17
SDMH-19	MANHOLE	9.71	(5.01) W, (4.91) NE	15"	SDMH-18
CB-1	CATCH BASIN	6.35	(1.35) NE	15"	SDMH-16
CB-2	CATCH BASIN	12.46	(6.96) N, (6.26) W, (6.16) E	15"	SDMH-2
CB-3	CATCH BASIN	11.97	(9.87) W, (8.97) S	12"	CB-2
O-1	NOT AVAILABLE				
O-2	NOT AVAILABLE				

0 30' 60'
SCALE: 1" = 30'

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EXISTING CONDITIONS PLAN

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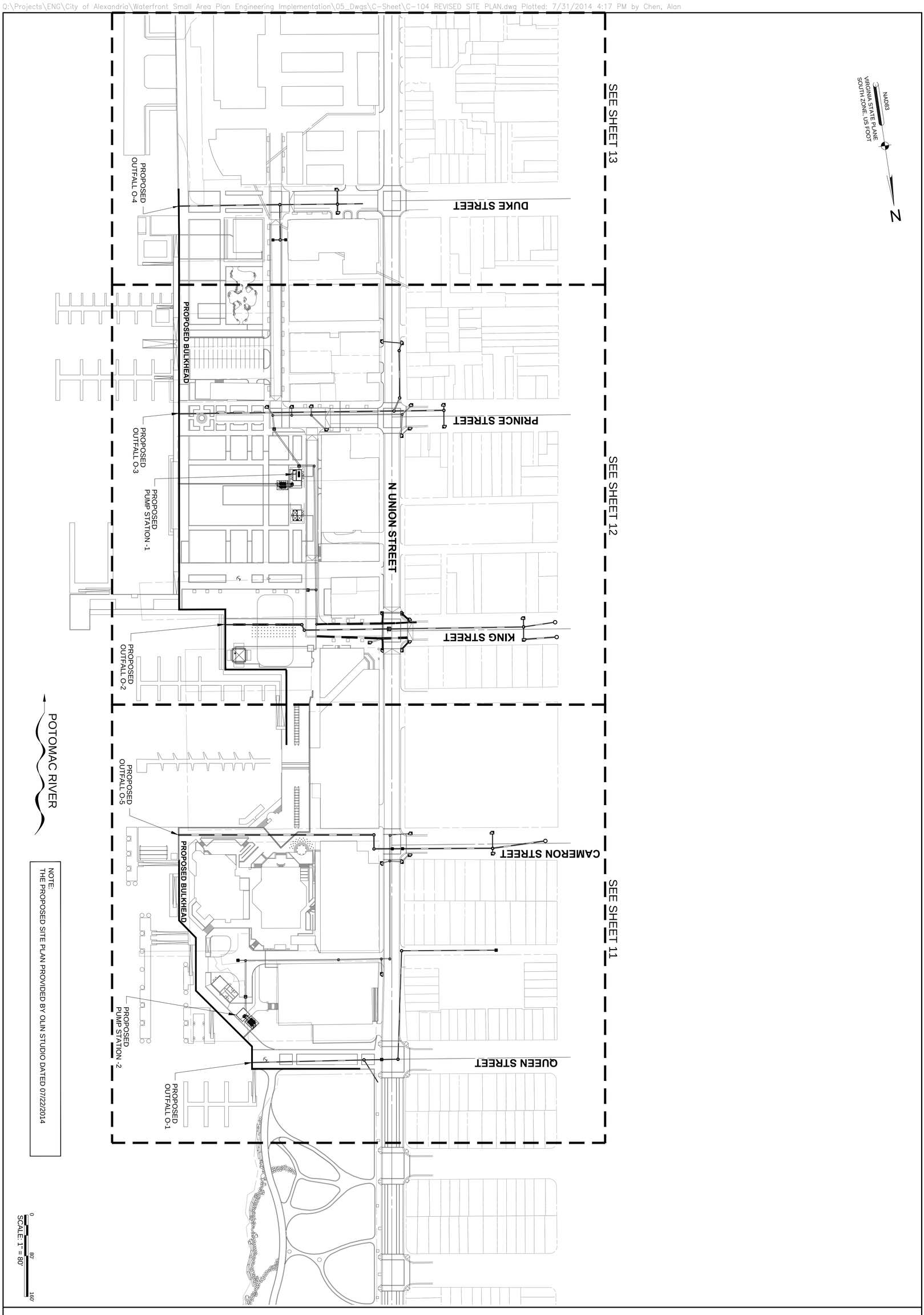

NOTE:
THE PROPOSED SITE PLAN PROVIDED BY OLIN STUDIO DATED 07/22/2014

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OVERALL PROPOSED
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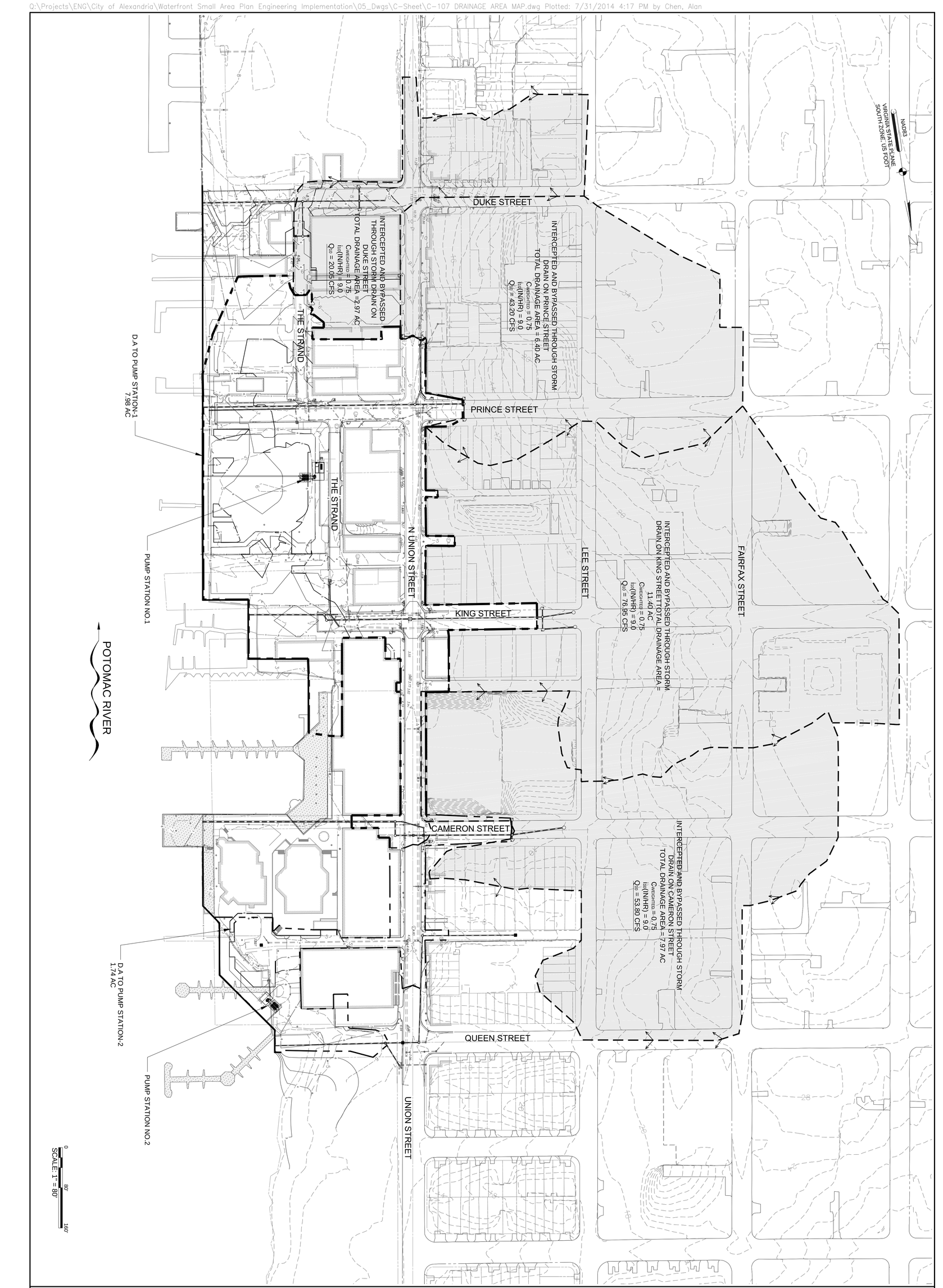

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DRAINAGE AREA MAP

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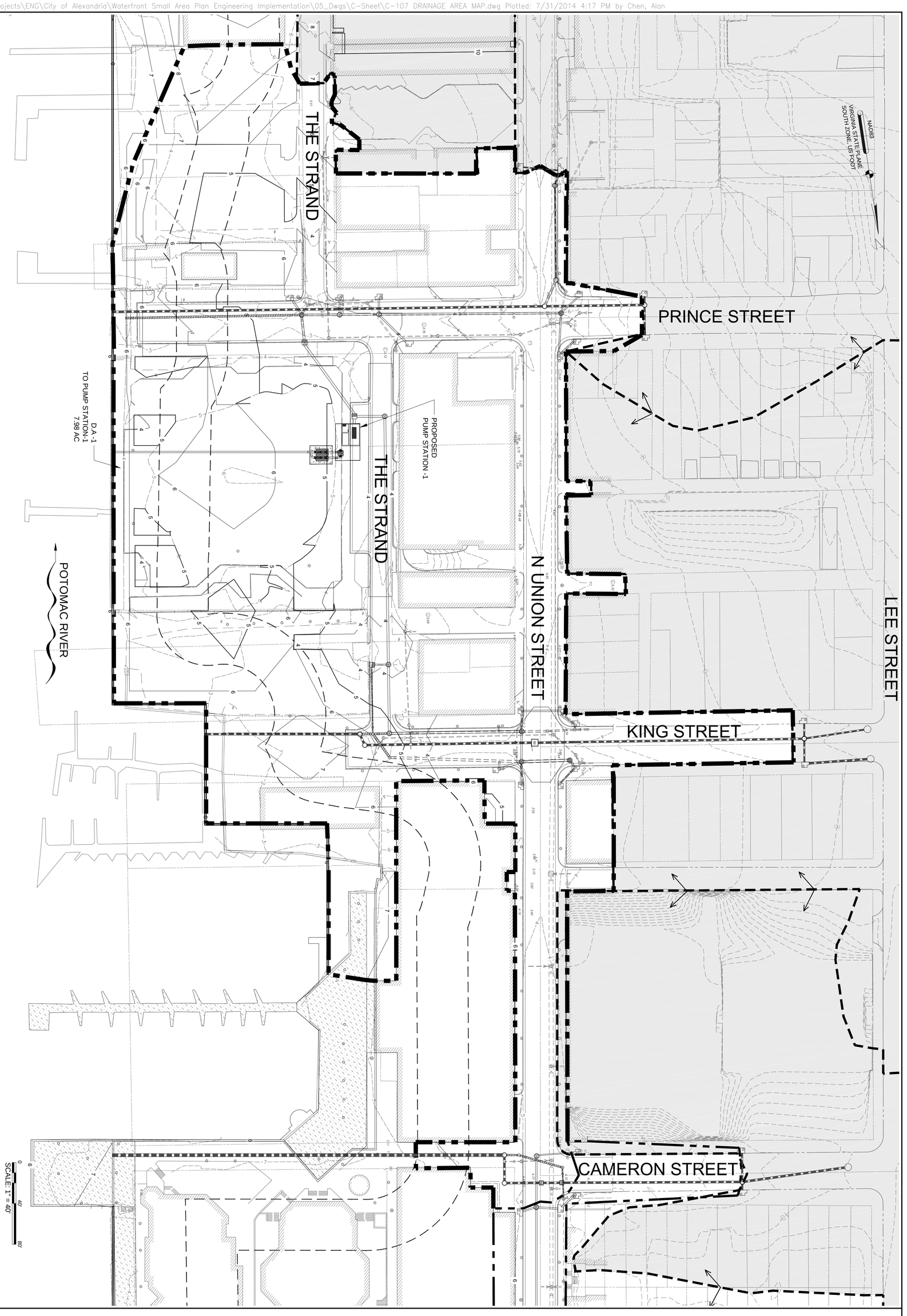

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DRAINAGE AREA TO PUMP STATION -1

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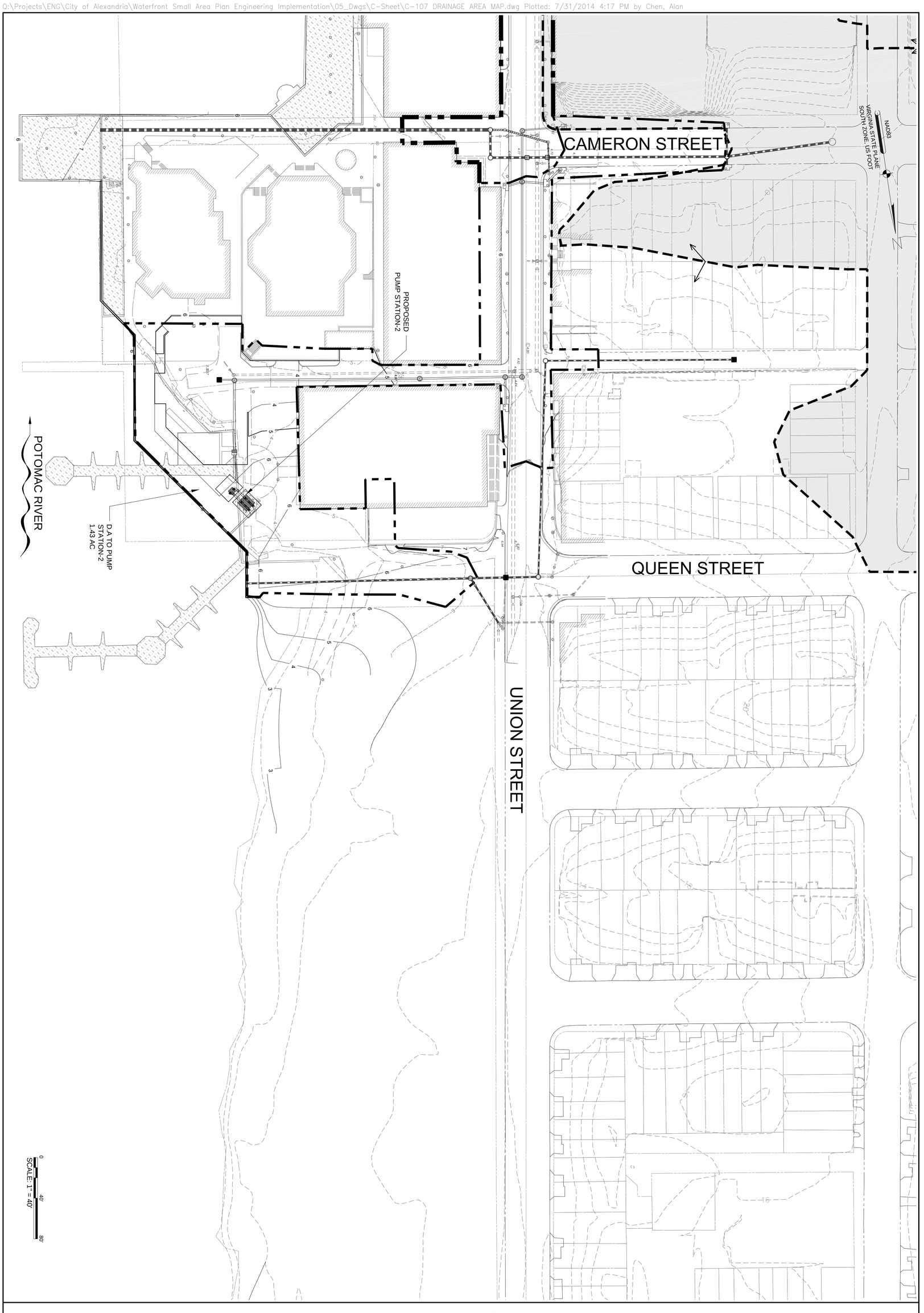

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DRAINAGE AREA TO PUMP STATION -2

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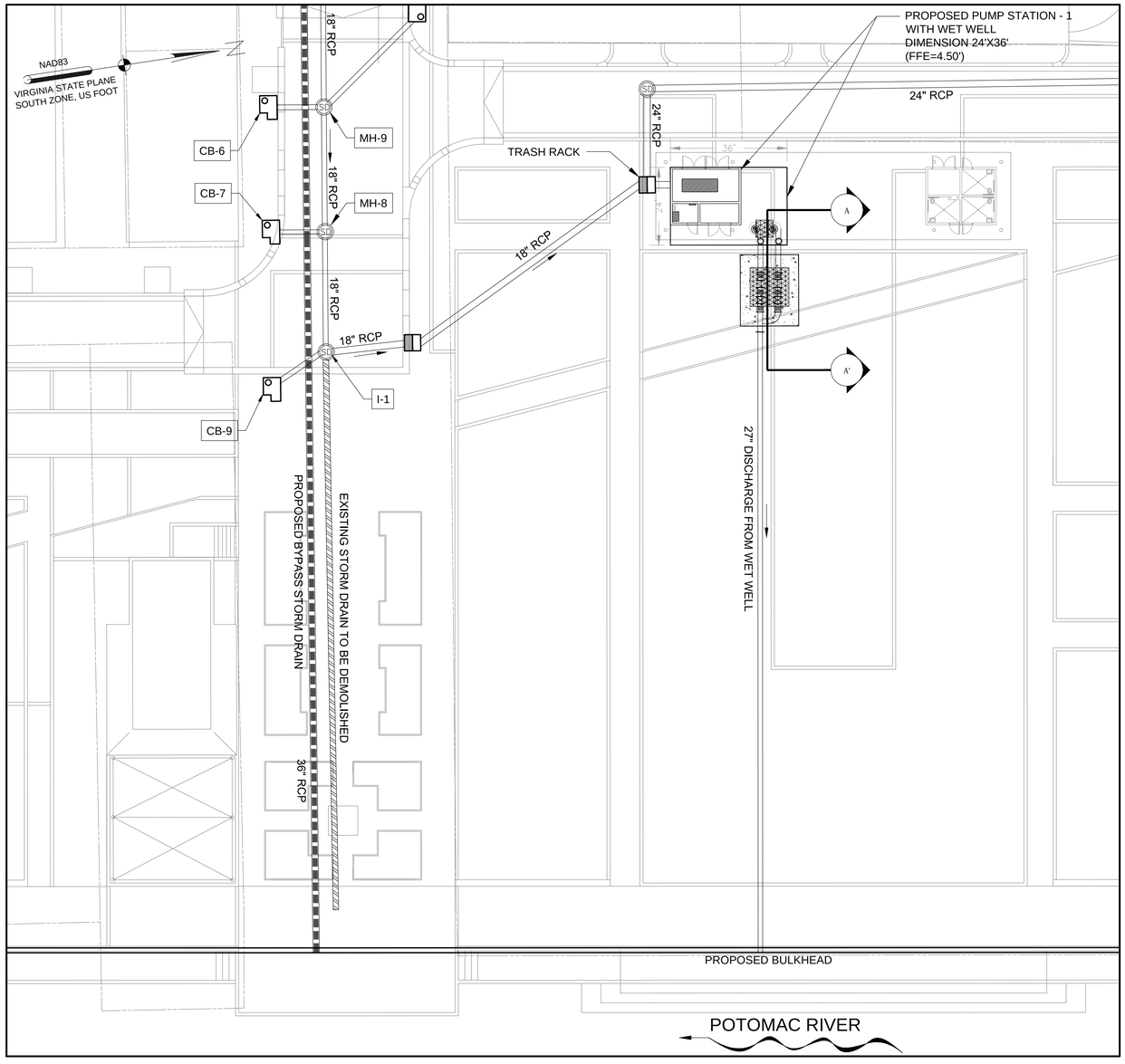
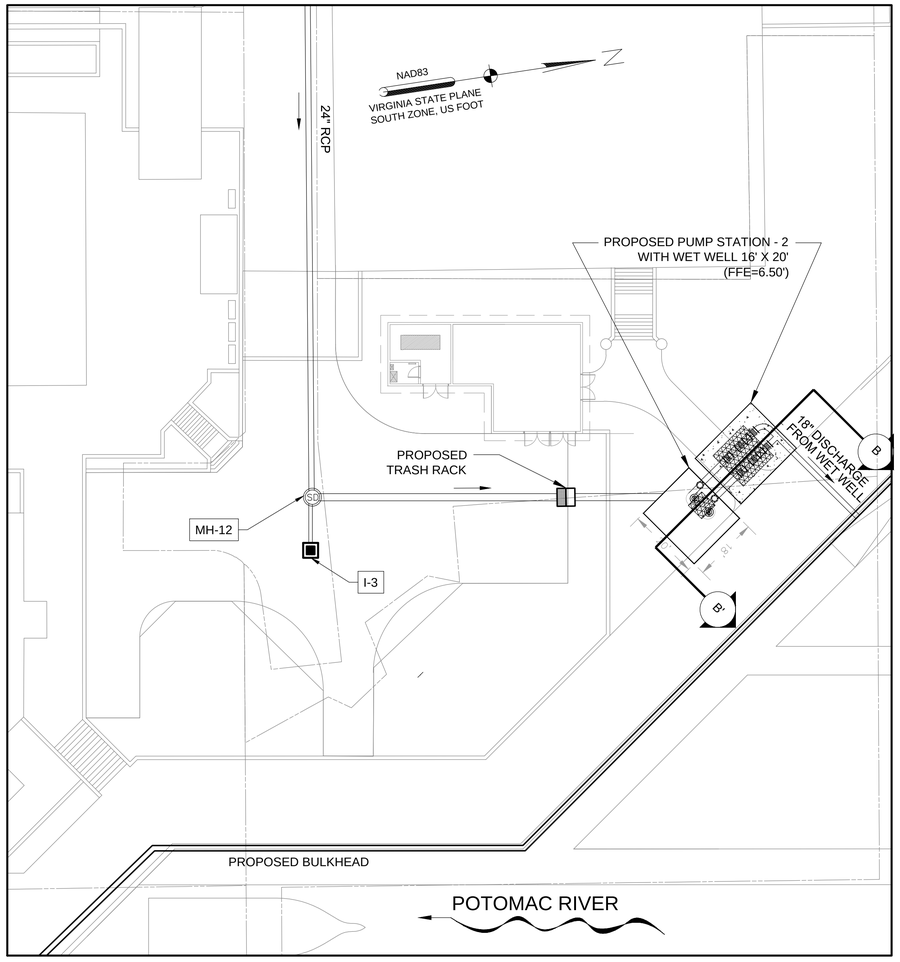
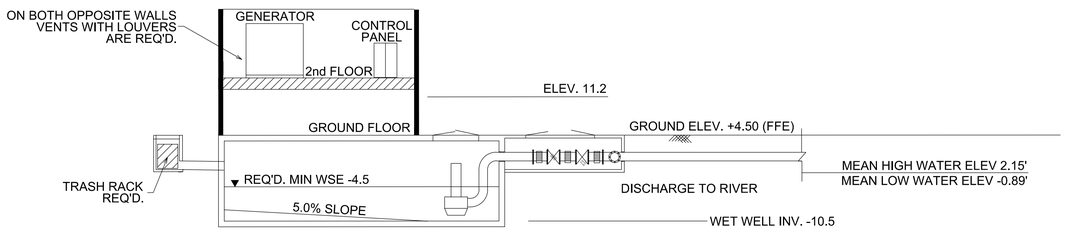


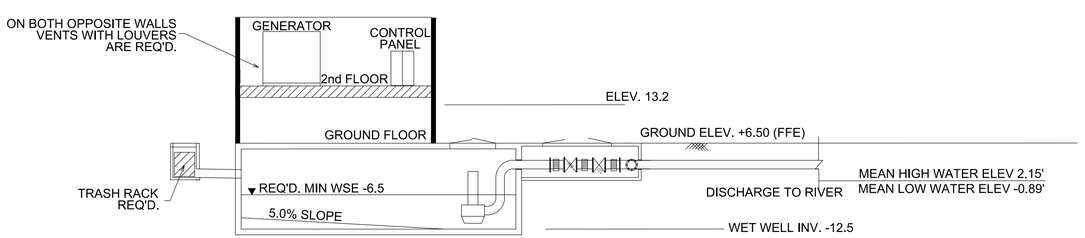
1 PUMP STATION - 1
SCALE: 1" = 20'



2 PUMP STATION - 2
SCALE: 1" = 20'



3 PROPOSED PUMP STATION-1 SECTION A-A
SCALE: N.T.S



4 PROPOSED PUMP STATION -2 SECTION B-B
SCALE: N.T.S

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WATERFRONT FLOOD MITIGATION PROJECT

PUMP STATION LAYOUT

REVISIONS
Date: INITIALS COMMENTS

URS
12420 MILESTONE CENTER DRIVE, SUITE 150
GERMANTOWN, MD 20876

Scale: AS SHOWN Project No.

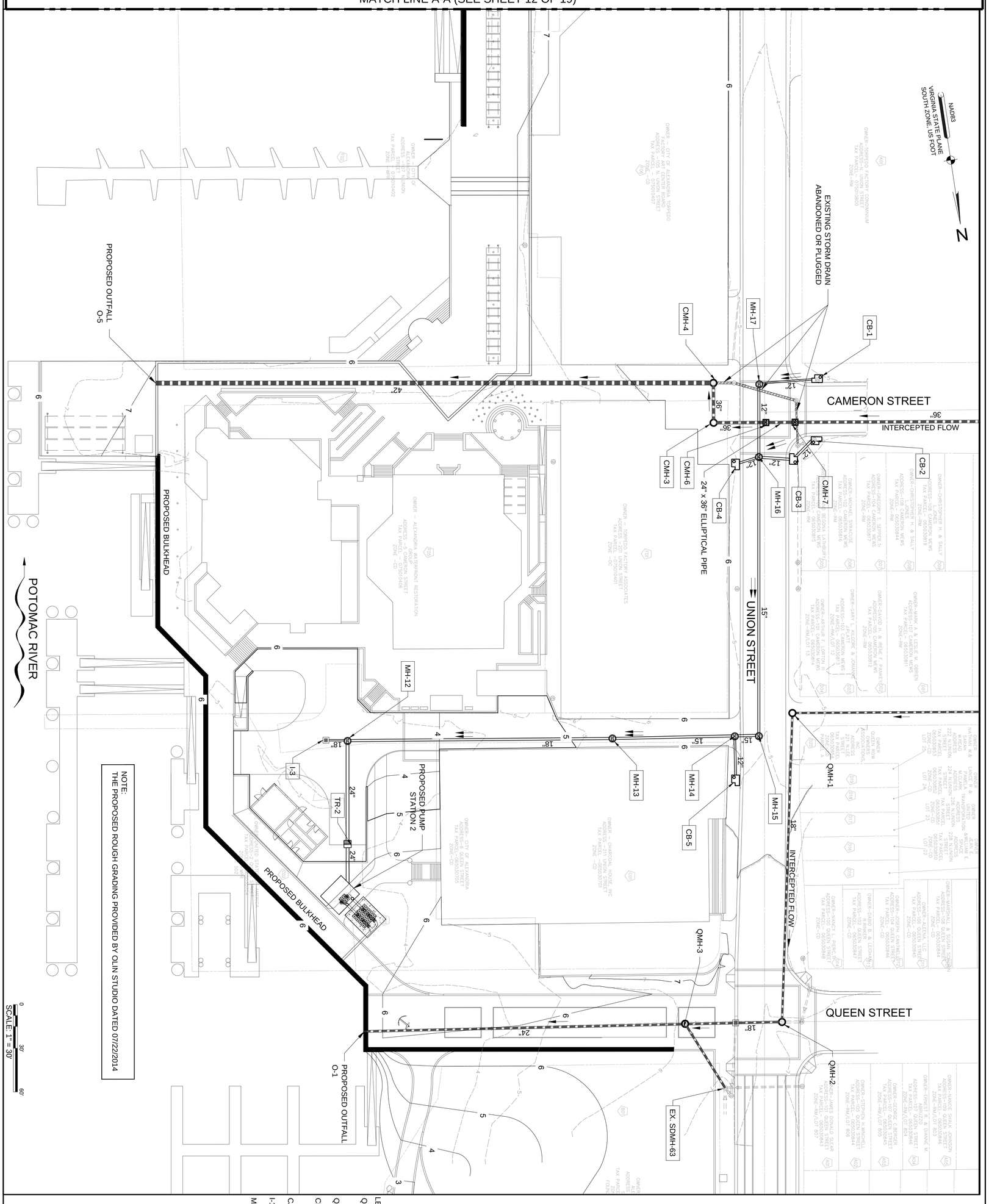
Sheet 10 of 19

CITY OF ALEXANDRIA, VIRGINIA
Department of Project Implementation
301 King St, Room 4100
Alexandria, Virginia 22314

CITY OF ALEXANDRIA VIRGINIA

Q:\Projects\ENG\City of Alexandria\Waterfront Small Area Plan Engineering Implementation\05_Dwgs\C-Sheet\C-108 PUMP STATION LAYOUT.dwg Plotted: 7/31/2014 4:18 PM by Chen, Alan

MATCH LINE A-A (SEE SHEET 12 OF 19)



LEGEND:

- QMH-4 — PROPOSED MANHOLE STRUCTURE ON QUEEN STREET
- QA-1 — PROPOSED INLET STRUCTURE ON QUEEN STREET
- CMH-1 — PROPOSED MANHOLE STRUCTURE ON CAMERON STREET
- CA-1 — PROPOSED INLET STRUCTURE ON CAMERON STREET
- I-1 — PROPOSED INLET TO PUMP STATION
- MH-1 — PROPOSED MANHOLE TO PUMP STATION

WATERFRONT FLOOD MITIGATION PROJECT

15% CONCEPT DESIGN SUBMISSION

CITY OF ALEXANDRIA, VIRGINIA
Department of Project Implementation
301 King St, Room 4100
Alexandria, Virginia 22314

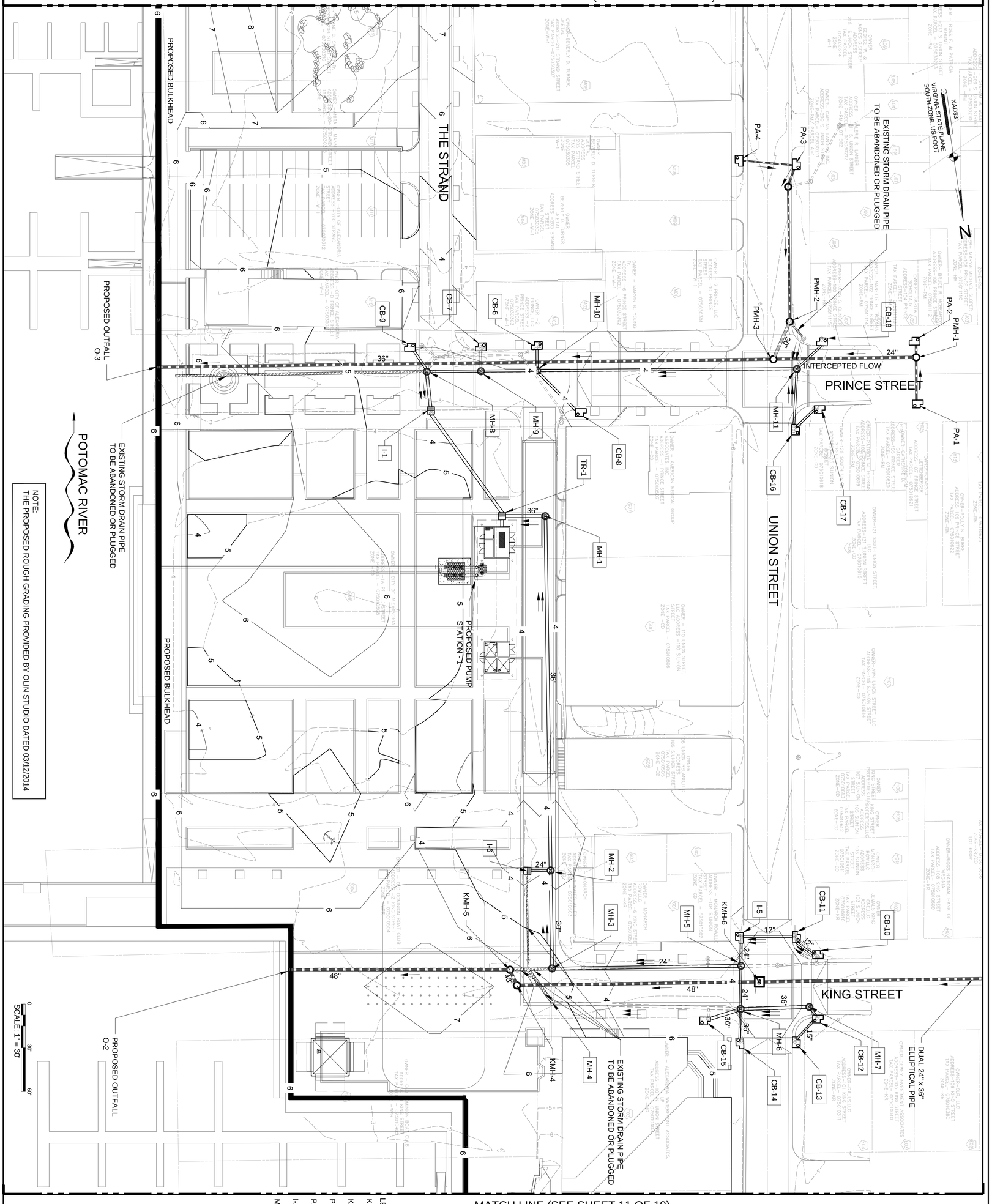
ROUGH GRADING
AND
STORM DRAIN PLAN

URS
12420 MILESTONE CENTER DRIVE, SUITE 150
GERMANTOWN, MD 20876

REVISIONS
Date: INITIALS COMMENTS

Scale: Project No.

MATCH LINE (SEE SHEET 13 OF 19)



NOTE:
THE PROPOSED ROUGH GRADING PROVIDED BY OLIN STUDIO DATED 03/12/2014

MATCH LINE (SEE SHEET 11 OF 19)

LEGEND:

- KMH-4 — PROPOSED MANHOLE STRUCTURE ON KING STREET
- KA-1 — PROPOSED INLET STRUCTURE ON KING STREET
- PMH-1 — PROPOSED MANHOLE STRUCTURE ON PRINCE STREET
- PA-1 — PROPOSED INLET STRUCTURE ON PRINCE STREET
- I-1 — PROPOSED INLET TO PUMP STATION
- MH-1 — PROPOSED MANHOLE TO PUMP STATION

WATERFRONT FLOOD MITIGATION PROJECT

15% CONCEPT DESIGN SUBMISSION

CITY OF ALEXANDRIA, VIRGINIA
Department of Project Implementation
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Alexandria, Virginia 22314

ROUGH GRADING
AND
STORM DRAIN PLAN

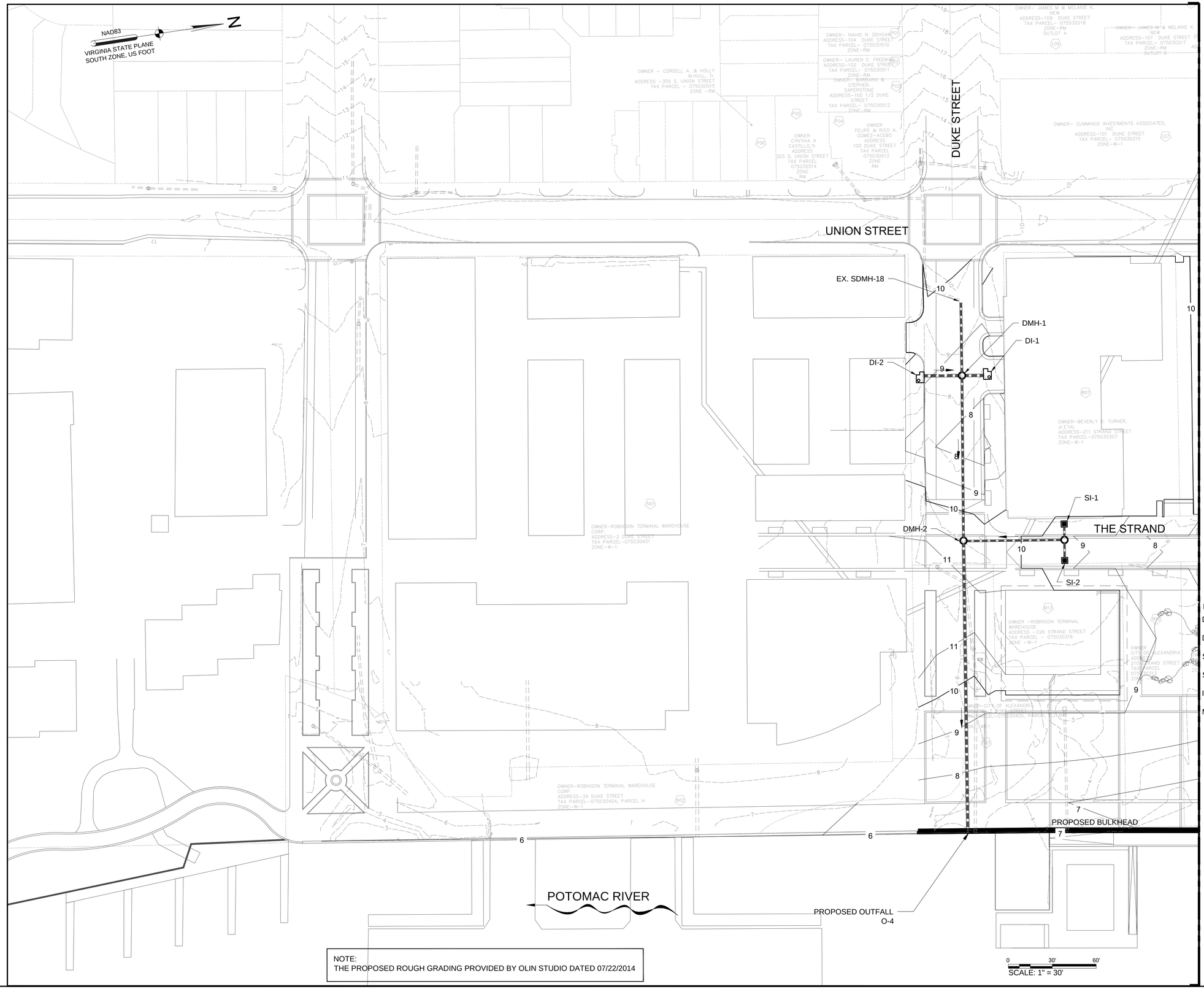
URS
12420 MILESTONE CENTER DRIVE, SUITE 150
GERMANTOWN, MD 20876

REVISIONS
Date: INITIALS COMMENTS

Scale: Project No.

Sheet 12 of 19

Q:\Projects\ENG\City of Alexandria\Waterfront Small Area Plan Engineering Implementation\05_Dwgs\C-Sheet\C-109 TO C-111 STORM DRAIN PLAN.dwg Plotted: 7/31/2014 4:18 PM by Chen, Alan



NOTE:
THE PROPOSED ROUGH GRADING PROVIDED BY OLIN STUDIO DATED 07/22/2014

15% CONCEPT DESIGN SUBMISSION

ROUGH GRADING AND STORM DRAIN PLAN

WATERFRONT FLOOD MITIGATION PROJECT

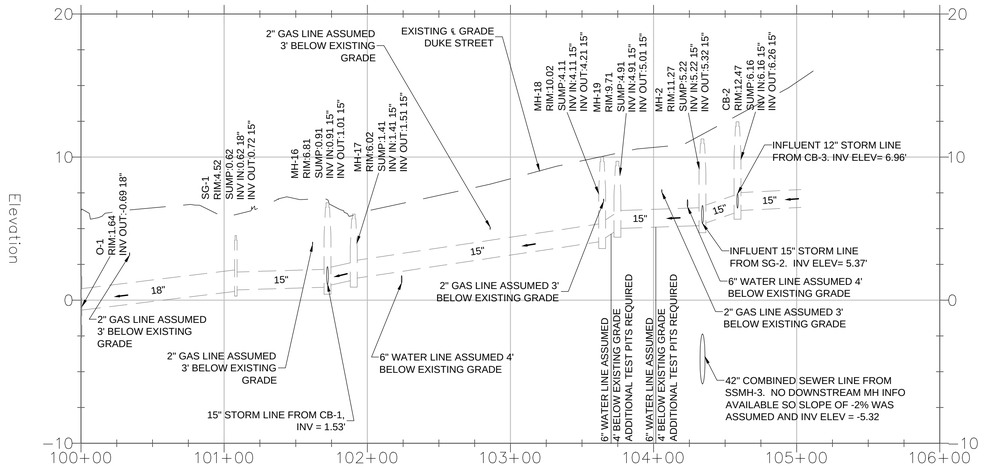
URS
12420 MILESTONE CENTER DRIVE, SUITE 150
GERMANTOWN, MD 20876

REVISIONS
Date: INITIALS COMMENTS

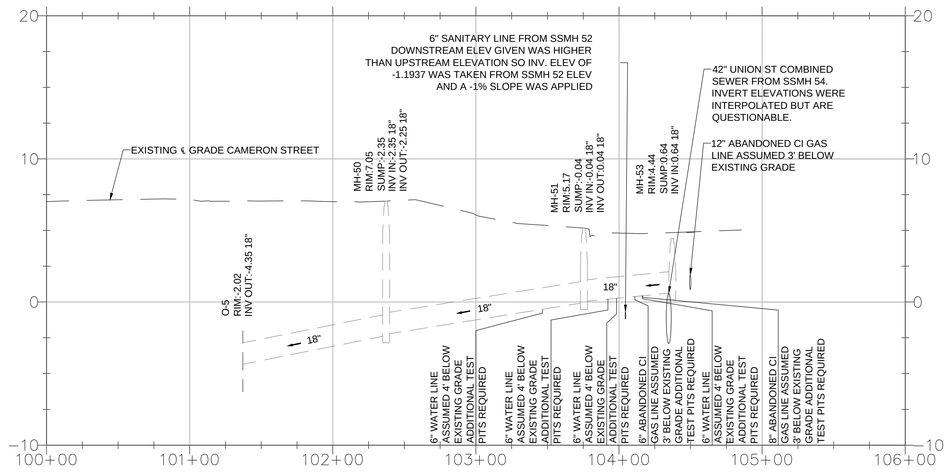
Scale: Project No.

Sheet 13 of 19

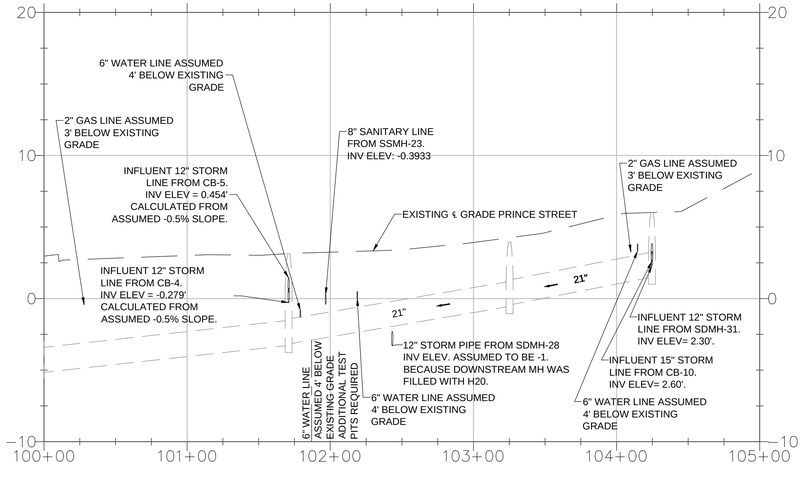
CITY OF ALEXANDRIA, VIRGINIA
Department of Project Implementation
301 King St, Room 4100
Alexandria, Virginia 22314



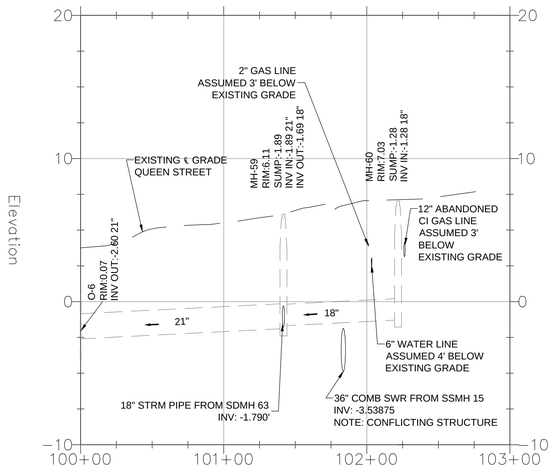
1 DUKE STREET EXISTING STORM DRAIN
FROM O-1 TO CB-2



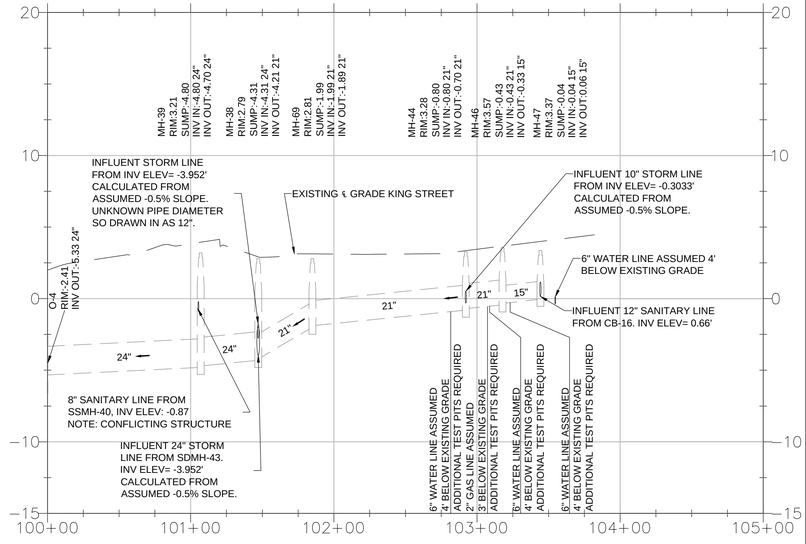
2 CAMERON STREET EXISTING STORM DRAIN
FROM O-5 TO MH-53



3 PRINCE STREET EXISTING STORM SEWER PROFILE
FROM O-3 TO MH-36



4 QUEEN STREET STORM SEWER PROFILE
FROM O-6 TO MH-60



5 KING STREET EXISTING STORM DRAIN PROFILE
FROM O-4 TO MH-47

NOTE:
WE RECOMMEND A THOROUGH INSPECTION OF EXISTING STORM DRAIN SYSTEM TO ENSURE THE INTEGRITY OF THE STORM DRAIN PIPES AND STRUCTURES

HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 5'

15% CONCEPT DESIGN SUBMISSION

WATERFRONT FLOOD MITIGATION PROJECT

EXISTING STORM DRAIN PROFILES

URS
12420 MILESTONE CENTER DRIVE, SUITE 150
GERMANTOWN, MD 20876

REVISIONS
Date: INITIALS COMMENTS

Scale: Project No.

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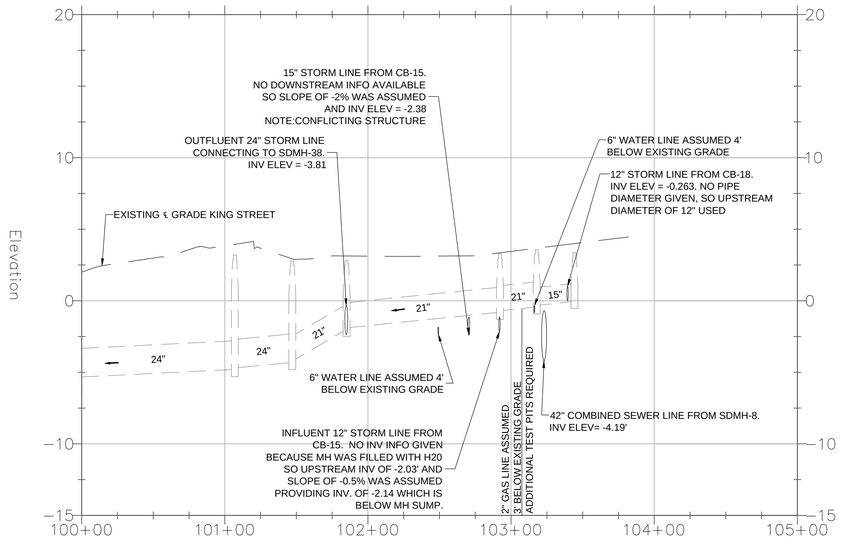
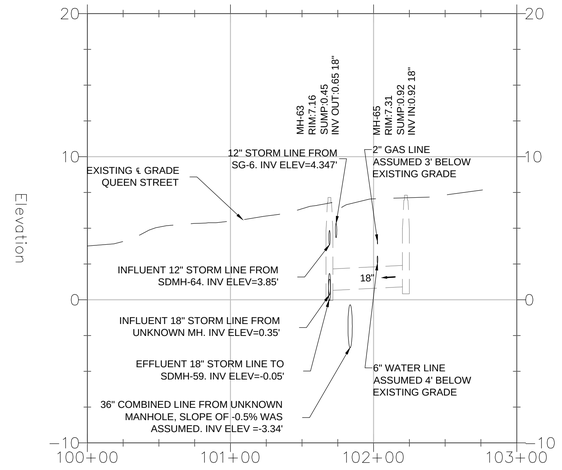
CITY OF ALEXANDRIA, VIRGINIA
Department of Project Implementation
301 King St, Room 4100
Alexandria, Virginia 22314

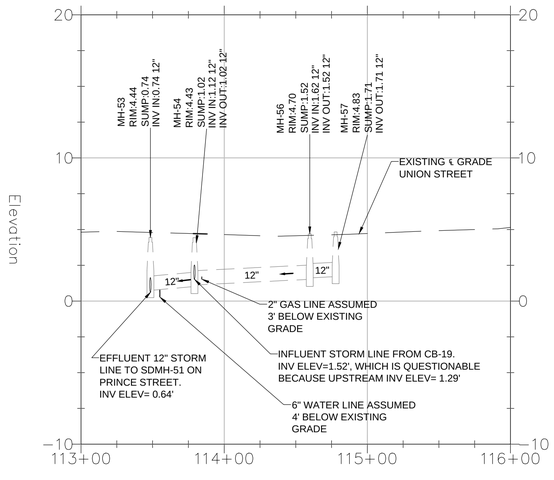
Q:\Projects\ENG\City of Alexandria\Waterfront Small Area Plan Engineering Implementation\05_Dwgs\C-Sheet\C-200 EXISTING GRADE PROFILES.dwg Plotted: 7/31/2014 4:19 PM by Chen, Alan



1 KING STREET EXISTING STORM DRAIN FROM MH-45 TO MH50 1" = 50' HOR, 1" = 5' VERT



2 QUEEN STREET EXISTING STORM DRAIN FROM O-5 TO MH-53 1" = 50' HOR, 1" = 5' VERT



3 UNION STREET - PRINCE STREET EXISTING STORM DRAIN FROM MH-53 TO MH-57 1"=50' HCR, 1"=5' VERT

ABBREVIATIONS

CB- CATCH BASIN
CI- CAST IRON
ELEV- ELEVATION
INV- INVERT
MH- MANHOLE
O-6- OUTFALL
SDMH- STORM DRAIN MANHOLE
SG- SURFACE GRATE
SSMH- SANITARY SEWER MANHOLE

NOTE:
WE RECOMMEND A THOROUGH INSPECTION OF EXISTING STORM DRAIN SYSTEM TO ENSURE THE INTEGRITY OF THE STORM DRAIN PIPES AND STRUCTURES

0 50' 100'
HORIZONTAL SCALE: 1" = 50'
0 5' 10'
VERTICAL SCALE: 1" = 5'

15% CONCEPT DESIGN SUBMISSION

WATERFRONT FLOOD MITIGATION PROJECT

EXISTING STORM DRAIN PROFILES

CITY OF ALEXANDRIA, VIRGINIA
Department of Project Implementation
301 King St, Room 4100
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URS
12420 MILESTONE CENTER DRIVE, SUITE 150
GERMANTOWN, MD 20876

Date:	REVISIONS INITIALS	COMMENTS

Scale: Project No.

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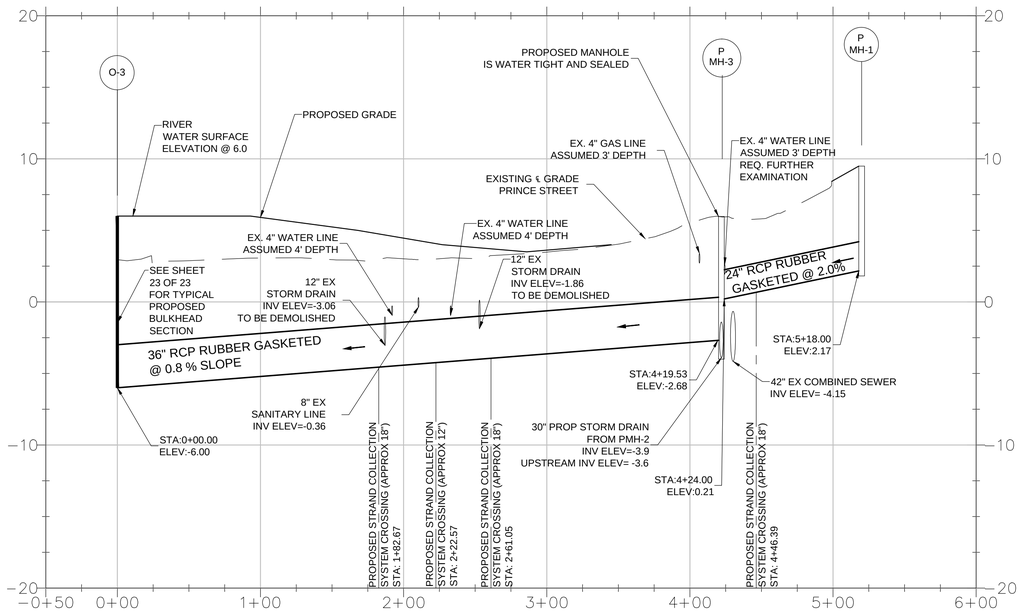
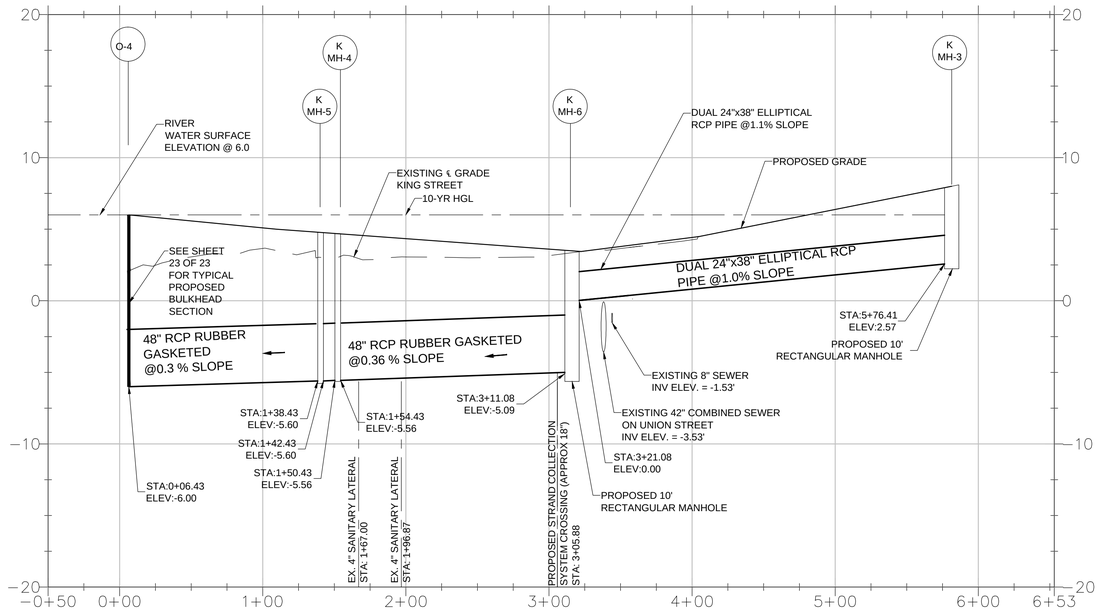
Q:\Projects\ENG\City of Alexandria\Waterfront Small Area Plan Engineering Implementation\05_Dwgs\C-Sheet\C-202 EXISTING GRADE SIDE STREETS.dwg Plotted: 7/31/2014 4:19 PM by Chen, Alan



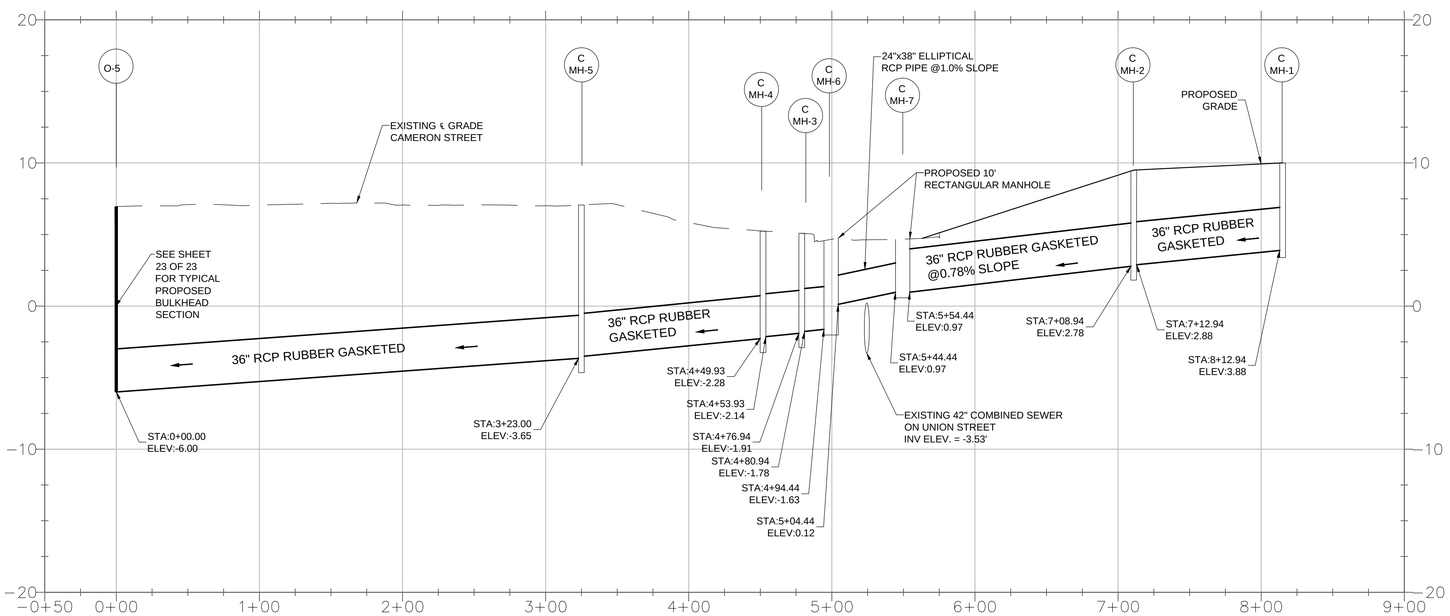
1 PRINCE STREET BY-PASS STORM DRAIN

1" = 50' HOR, 1" = 5' VERT



2 KING STREET BY-PASS STORM DRAIN

1" = 50' HOR, 1" = 5' VERT



3 CAMERON STREET BY-PASS STORM DRAIN

1" = 50' HOR, 1" = 5' VERT

NOTE:
BEFORE THE CONSTRUCTION OF THE PROPOSED STORM DRAIN SYSTEM, WE RECOMMEND A THOROUGH INSPECTION OF EXISTING STORM DRAIN SYSTEM TO ENSURE THE INTEGRITY OF THE STORM DRAIN PIPES AND STRUCTURES

0 50' 100'
HORIZONTAL SCALE: 1" = 50'

0 5' 10'
VERTICAL SCALE: 1" = 5'

15% CONCEPT DESIGN SUBMISSION

WATERFRONT FLOOD MITIGATION PROJECT

PROPOSED STORM DRAIN PROFILES

CITY OF ALEXANDRIA, VIRGINIA
Department of Project Implementation
301 King St, Room 4100
Alexandria, Virginia 22314

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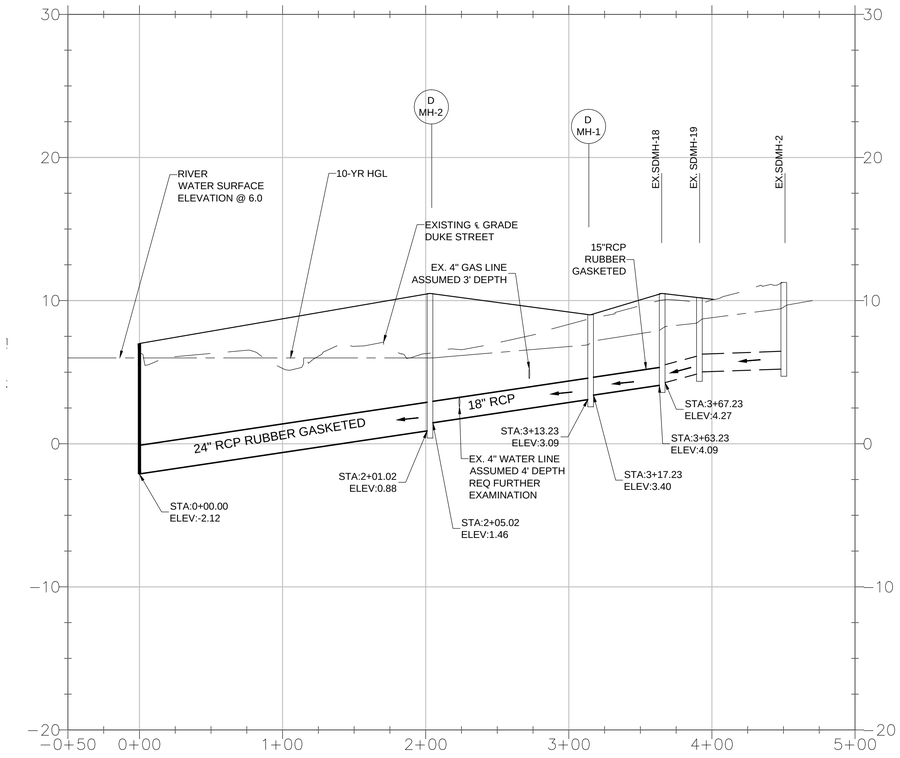
GERMANTOWN, MD 20876

REVISIONS COMMENTS
Date: INITIALS

Scale: Project No.

Sheet 16 of 19

Q:\Projects\ENG\City of Alexandria\Waterfront Small Area Plan Engineering Implementation\05_Dwgs\C-Sheet\C-202-PROPOSED STORM DRAIN BY-PASS PROFILES.dwg Plotted: 7/31/2014 4:20 PM by Chen, Alon



1 DUKE STREET BY-PASS STORM DRAIN

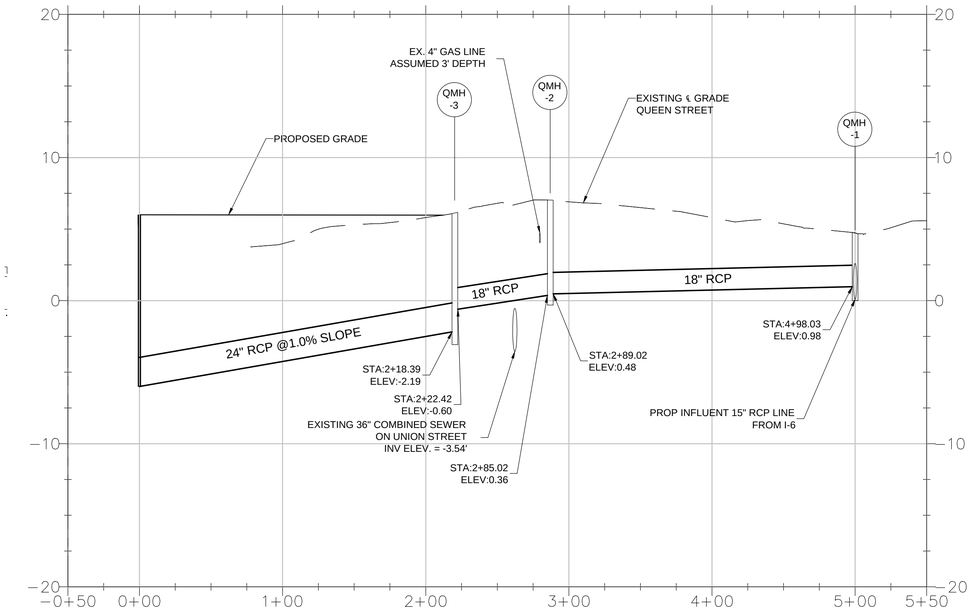
1" = 50' HOR, 1" = 5' VERT

STORM DRAIN DESIGN COMPUTATIONS FOR CAMERON ST PUMP STATION

From Structure	To Structure	Drainage Area	Runoff Coeff.	CA	Accum. Area	Accum. CA	Inlet Time	Rainfall Intensity	Runoff Q	Invert Elevations		Length	Slope	Dia.	Type	Man-	Capacity	Velocity
		Acres	C	Incre.	Acres		Min	In./hr.	cfs	Upper End	Lower End	ft.	ft./ft.	In.		n	cfs	fps
CB-1	MH-17	0.11	0.75	0.083	0.11	0.08	5.00	9.00	0.74	0.84	0.47	41.2	0.90%	12	RCP	0.013	3.37	4.30
CB-2	CB-3	0.09	0.75	0.068	0.09	0.07	5.00	9.00	0.61	1.14	1.10	12.5	0.32%	12	RCP	0.013	2.01	2.56
CB-3	MH-16	0.15	0.75	0.113	0.24	0.18	5.00	9.00	1.62	1.10	1.04	19.4	0.31%	12	RCP	0.013	1.98	2.52
MH-17	MH-16	0.00	0.75	0.000	0.11	0.08	5.00	9.00	0.74	1.10	1.04	19.4	0.31%	12	RCP	0.013	1.98	2.52
CB-4	MH-16	0.18	0.75	0.135	0.18	0.18	5.00	9.00	1.62	1.15	1.10	15.0	0.33%	15	RCP	0.013	3.73	3.04
MH-16	MH-15	0.00	0.75	0.000	0.53	0.44	5.00	9.00	3.98	1.04	0.01	187.8	0.55%	15	RCP	0.013	4.79	3.90
MH-15	MH-14	0.00	0.75	0.000	0.53	0.44	5.00	9.00	3.98	0.07	0.00	12.5	0.56%	15	RCP	0.013	4.83	3.93
CB-5	MH-14	0.10	0.75	0.075	0.10	0.08	5.00	9.00	0.68	-2.35	-2.92	27.0	2.11%	12	RCP	0.013	5.17	6.59
MH-14	MH-13	0.00	0.75	0.000	0.63	0.52	5.00	9.00	4.66	-3.02	-3.82	80.1	1.00%	15	RCP	0.013	6.45	5.26
MH-13	MH-12	0.00	0.75	0.000	0.63	0.52	5.00	9.00	4.66	-3.92	-4.45	178.0	0.30%	18	RCP	0.013	5.73	3.24
I-3	MH-12	1.11	0.75	0.833	1.11	0.83	5.00	9.00	7.49	-4.30	-4.45	14.8	1.01%	18	RCP	0.013	10.57	5.99
MH-12	TR-2	0.00	0.75	0.000	1.74	1.35	5.00	9.00	12.15	-4.55	-4.80	66.9	0.37%	24	RCP	0.013	13.83	4.40
TR-2	PS	0.00	0.75	0.000	1.74	1.35	5.00	9.00	12.15	-4.90	-5.00	24.1	0.42%	24	RCP	0.013	14.58	4.64

STORM DRAIN DESIGN COMPUTATIONS FOR STRAND ST PUMP STATION

From Structure	To Structure	Drainage Area	Runoff Coeff.	CA	Accum. Area	Accum. CA	Inlet Time	Rainfall Intensity	Runoff Q	Invert Elevations		Length	Slope	Dia.	Type	Man-ning's	Capacity	Velocity
		Acres	C (weighted)	Incre.	Acres		Min	In./hr.	cfs	Upper End	Lower End	ft.	ft./ft.	In.		n	cfs	fps
CB-17	CB-16	0.14	0.75	0.105	0.14	0.11	5.00	9.00	0.95	1.62	1.45	17.2	0.99%	12	RCP	0.013	3.54	4.51
CB-16	MH-11	0.21	0.75	0.158	0.35	0.26	5.00	9.00	2.36	1.35	0.97	38.7	0.98%	12	RCP	0.013	3.53	4.50
CB-18	MH-11	0.34	0.75	0.255	0.34	0.26	5.00	9.00	2.30	-0.51	-3.26	25.6	10.74%	12	RCP	0.013	11.67	14.87
MH-11	MH-10	0.00	0.75	0.000	0.69	0.52	5.00	9.00	4.66	0.46	-2.10	174.0	1.47%	15	RCP	0.013	7.83	6.39
CB-8	MH-10	1.05	0.75	0.788	1.05	0.79	5.00	9.00	7.09	-1.41	-1.80	39.2	0.99%	18	RCP	0.013	10.47	5.93
CB-6	MH-10	0.31	0.75	0.233	0.31	0.23	5.00	9.00	2.09	-1.63	-1.80	16.7	1.02%	12	RCP	0.013	3.59	4.58
MH-10	MH-9	0.00	0.75	0.000	2.05	1.54	5.00	9.00	13.84	-3.41	-3.75	34.5	0.99%	30	RCP	0.013	40.71	8.30
CB-7	MH-9	0.13	0.75	0.098	0.13	1.64	5.00	9.00	14.72	-4.73	-4.89	15.7	1.02%	24	RCP	0.013	22.83	7.27
CB-9	MH-8	1.15	0.75	0.863	1.28	0.86	5.00	9.00	34.48	-3.90	-4.13	18.2	1.26%	30	RCP	0.013	46.10	9.40
MH-9	MH-8	0.00	0.75	0.000	2.18	3.17	5.00	9.00	33.15	-4.23	-4.33	33.2	0.30%	36	RCP	0.013	36.63	5.18
MH-8	I-1	0.00	0.75	0.000	3.46	4.04	5.00	9.00	36.32	-4.33	-4.40	23.0	0.30%	36	RCP	0.013	36.79	5.21
I-1	TR-1	0.94	0.75	0.705	4.40	4.74	5.00	9.00	42.66	-4.76	-4.97	81.8	0.26%	42	RCP	0.013	50.97	5.30
CB-10	CB-11	0.14	0.75	0.105	0.14	0.11	5.00	9.00	0.95	0.48	0.28	20.1	1.00%	12	RCP	0.013	3.55	4.53
CB-11	I-5	0.11	0.75	0.083	0.25	0.19	5.00	9.00	1.69	0.18	-0.20	37.9	1.00%	12	RCP	0.013	3.57	4.54
I-5	MH-5	0.19	0.75	0.143	0.44	0.33	5.00	9.00	2.97	-0.30	-0.80	50.0	1.00%	24	RCP	0.013	22.62	7.20
CB-13	CB-12	0.11	0.75	0.083	0.11	0.08	5.00	9.00	0.55	0.55	0.50	17.6	0.28%	12	RCP	0.013	1.90	2.42
CB-12	MH-7	0.14	0.75	0.105	0.25	0.19	5.00	9.00	1.69	0.49	0.47	5.1	0.39%	12	RCP	0.013	2.23	2.84
MH-7	MH-6	0.00	0.75	0.000	0.25	0.19	5.00	9.00	1.69	0.13	0.00	43.2	0.30%	18	RCP	0.013	5.76	3.26
CB-14	MH-6	0.63	0.75	0.473	0.63	0.47	5.00	9.00	4.25	-0.13	-0.34	20.8	1.01%	18	RCP	0.013	10.55	5.97
MH-6	MH-5	0.00	0.75	0.000	1.32	0.99	5.00	9.00	8.91	-0.74	-0.82	25.6	0.31%	24	RCP	0.013	12.66	4.03
CB-15	MH-5	0.09	0.75	0.068	0.09	0.07	5.00	9.00	0.61	-0.58	-0.66	7.8	1.03%	18	RCP	0.013	10.63	6.02
MH-5	MH-3	0.00	0.75	0.000	1.41	1.06	5.00	9.00	9.52	-3.60	-6.03	107.0	2.27%	24	RCP	0.013	34.08	10.85
MH-3	MH-2	0.00	0.75	0.000	1.50	1.13	5.00	9.00	10.13	-6.13	-6.78	67.2	0.97%	30	RCP	0.013	40.33	8.22
I-6	MH-2	2.27	0.75	1.703	2.27	1.70	5.00	9.00	15.32	-6.62	-6.78	15.9	1.01%	24	RCP	0.013	22.69	7.23
MH-2	MH-1	0.00	0.75	0.000	3.77	2.83	5.00	9.00	25.45	-6.90	-8.09	242.8	0.49%	36	RCP	0.013	46.69	6.61
MH-1	TR-1	0.00	0.75	0.000	3.77	2.83	5.00	9.00	25.45	-4.89	-4.97	25.5	0.31%	36	RCP	0.013	37.39	5.29
TR-1	PS	0.00	0.75	0.000	8.17	7.57	5.00	9.00	68.11	-4.97	-5.00	5.2	0.58%	42	RCP	0.013	76.71	7.98



2 QUEEN STREET BY-PASS STORM DRAIN

1" = 50' HOR, 1" = 5' VERT

STORM DRAIN DESIGN COMPUTATIONS FOR DUKE ST BYPASS LINE

From Structure	To Structure	Drainage Area	Runoff Coeff.	CA	Accum. Area	Accum. CA	Inlet Time	Rainfall Intensity	Runoff Q	Invert Elevations		Length	Slope	Dia.	Type	Man-ning's	Capacity	Velocity
		Acres	C (weighted)	Incre.	Acres		Min	In./hr.	cfs	Upper End	Lower End	ft.	ft./ft.	In.		n	cfs	fps
DMH-1	DMH-2	1.75	0.75	1.313	1.75	1.31	5.00	9.00	11.81	3.09	1.46	112.9	1.44%	18	RCP	0.013	12.62	7.14
DMH-2	O-4	0.29	0.75	0.218	2.04	1.53	5.00	9.00	13.77	0.88	-2.12	199.9	1.50%	24	RCP	0.013	27.71	8.82

STORM DRAIN DESIGN COMPUTATIONS FOR PRINCE ST BYPASS LINE

From Structure	To Structure	Drainage Area	Runoff Coeff.	CA	Accum. Area	Accum. CA	Inlet Time	Rainfall Intensity	Runoff Q	Invert Elevations		Length	Slope	Dia.	Type	Man-ning's	Capacity	Velocity
		Acres	C (weighted)	Incre.	Acres		Min	In./hr.	cfs	Upper End	Lower End	ft.	ft./ft.	In.		n	cfs	fps
PMH-2	PMH-3	3.79	0.75	2.843	3.79	2.84	5.00	9.00	25.58	-3.60	-3.90	27.9	1.08%	30	RCP	0.013	42.56	8.67
PMH-1	PMH-3	2.77	0.75	2.078	2.77	2.08	5.00	9.00	18.70	2.17	0.21	97.8	2.00%	24	RCP	0.013	32.02	10.20
PMH-3	O-3	0.00	0.75	0.000	6.56	4.92	5.00	9.00	44.28	-2.68	-6.00	421.0	0.79%	36	RCP	0.013	59.23	8.38

STORM DRAIN DESIGN COMPUTATIONS FOR KING ST BYPASS LINE

From Structure	To Structure	Drainage Area	Runoff Coeff.	CA	Accum. Area	Accum. CA	Inlet Time	Rainfall Intensity	Runoff Q	Invert Elevations		Length	Slope	Dia.	Type	Man-ning's	Capacity	Velocity
		Acres	C (weighted)	Incre.	Acres		Min	In./hr.	cfs	Upper End	Lower End	ft.	ft./ft.	In.		n	cfs	fps
KMH-3	KMH-6	11.10	0.75	8.325	11.10	8.33	5.00	9.00	74.93	2.57	0.00	258.4	0.99%	2x30"	RCP	0.013	82.04	8.36
KMH-6	KMH-4	0.00	0.75	0.000	11.10	8.33	5.00	9.00	74.93	-5.00	-5.57	156.7	0.36%	48	RCP	0.013	86.65	6.90
KMH-4	KMH-5	0.00	0.75	0.000	11.10	8.33	5.00	9.00	74.93	-5.56	-5.60	8.0	0.50%	48	RCP	0.013	101.57	8.09
KMH-5	O-4	0.00	0.75	0.000	11.10	8.33	5.00	9.00	74.93	-5.60	-6.00	132.0	0.30%	48	RCP	0.013	79.07	6.30

NOTE: 36" RCP PIPE FROM KMH-7 TO KMH-6 SUBSTITUTED WITH DUAL 24"x38" ELLIPTICAL RCP PIPE, WHICH ARE INDIVIDUALLY EQUIVALENT TO A ROUND 30" PIPE.

STORM DRAIN DESIGN COMPUTATIONS FOR CAMERON ST BYPASS LINE

From Structure	To Structure	Drainage Area	Runoff Coeff.	CA	Accum. Area	Accum. CA	Inlet Time	Rainfall Intensity	Runoff Q	Invert Elevations		Length	Slope	Dia.	Type	Man-ning's	Capacity	Velocity
		Acres	C (weighted)	Incre.	Acres		Min	In./hr.	cfs	Upper End	Lower End	ft.	ft./ft.	In.		n	cfs	fps
CMH-1	CMH-2	7.97	0.75	5.978	7.97	5.98	5.00	9.00	53.80	3.88	2.88	100.0	0.70%	36	RCP	0.013	55.80	7.90
CHM-2	CMH-7	0.00	0.75	0.000	7.97	5.98	5.00	9.00	53.80	2.78	0.97	232.4	0.78%	36	RCP	0.013	58.86	8.33
CHM-7	CMH-6	0.00	0.75	0.000	7.97	5.98	5.00	9.00	53.80	0.97	0.12	40.0	2.00%	30	RCP	0.013	58.00	11.82
CHM-6	CMH-3	0.00	0.75	0.000	7.97	5.98	5.00	9.00	53.80	-1.63	-1.78	13.5	1.11%	36	RCP	0.013	70.30	9.95
CMH-3	CMH-4	0.00	0.75	0.000	7.97	5.98	5.00	9.00	53.80	-1.91	-2.14	27.4	0.84%	36	RCP	0.013	61.10	8.65
CMH-4	CMH-5	0.00	0.75	0.000	7.97	5.98	5.00	9.00	53.80	-2.28	-3.51	123.5	1.00%	36	RCP	0.013	66.56	9.42
CMH-5	O-5	0.00	0.75	0.000	7.97	5.98	5.00	9.00	53.80	-3.65	-6.00	321.5	0.73%	42	RCP	0.013	86.01	8.94

NOTE: 30" RCP PIPE FROM CMH-7 TO CMH-6 SUBSTITUTED WITH A 24"x38" ELLIPTICAL RCP PIPE, WHICH IS EQUIVALENT TO A ROUND 30" PIPE.

NOTE:
BEFORE THE CONSTRUCTION OF THE PROPOSED STORM DRAIN SYSTEM, WE RECOMMEND A THOROUGH INSPECTION OF EXISTING STORM DRAIN SYSTEM TO ENSURE THE INTEGRITY OF THE STORM DRAIN PIPES AND STRUCTURES

0 50' 100'
HORIZONTAL SCALE: 1" = 50'

0 5' 10'
VERTICAL SCALE: 1" = 5'

15% CONCEPT DESIGN SUBMISSION

WATERFRONT FLOOD MITIGATION PROJECT

PROPOSED STORM DRAIN PROFILES

REVISIONS
Date: INITIALS COMMENTS

URS
12420 MILESTONE CENTER DRIVE, SUITE 150
GERMANTOWN, MD 20876

Scale: Project No.

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Department of Project Implementation
301 King St, Room 4100
Alexandria, Virginia 22314

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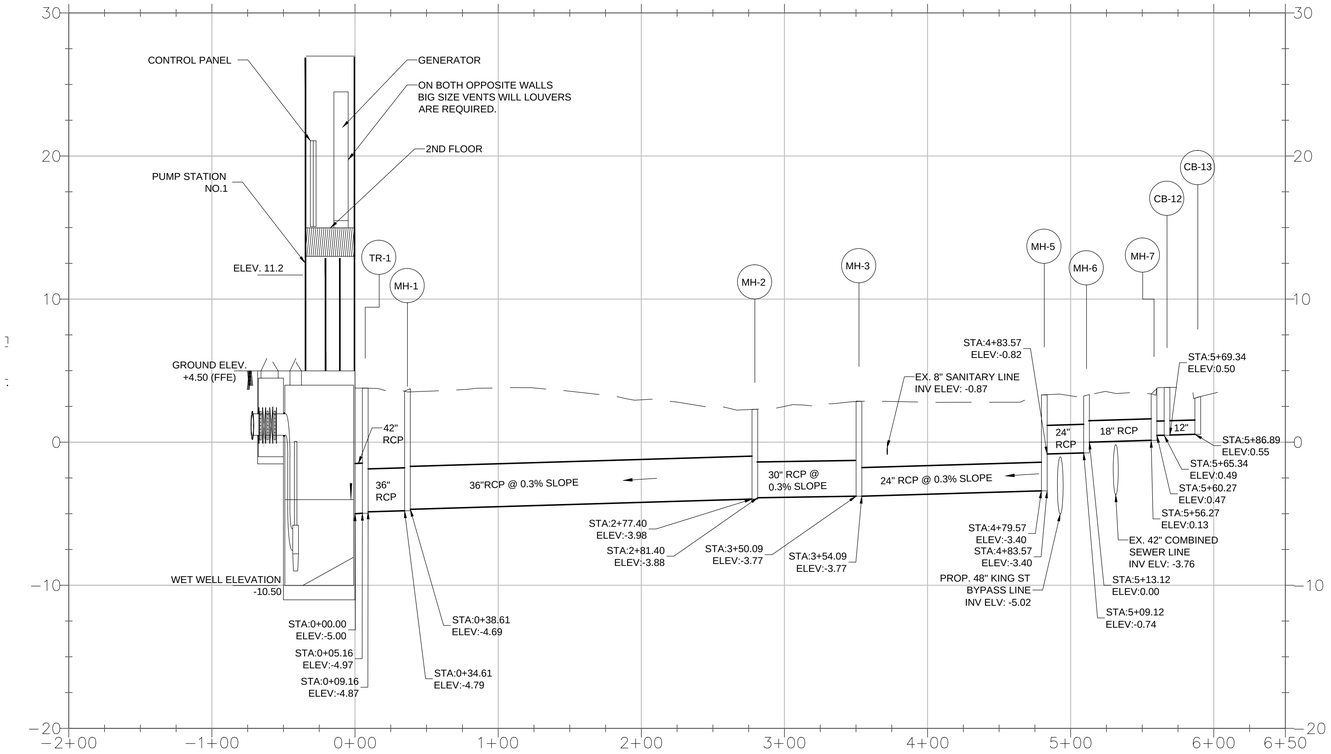


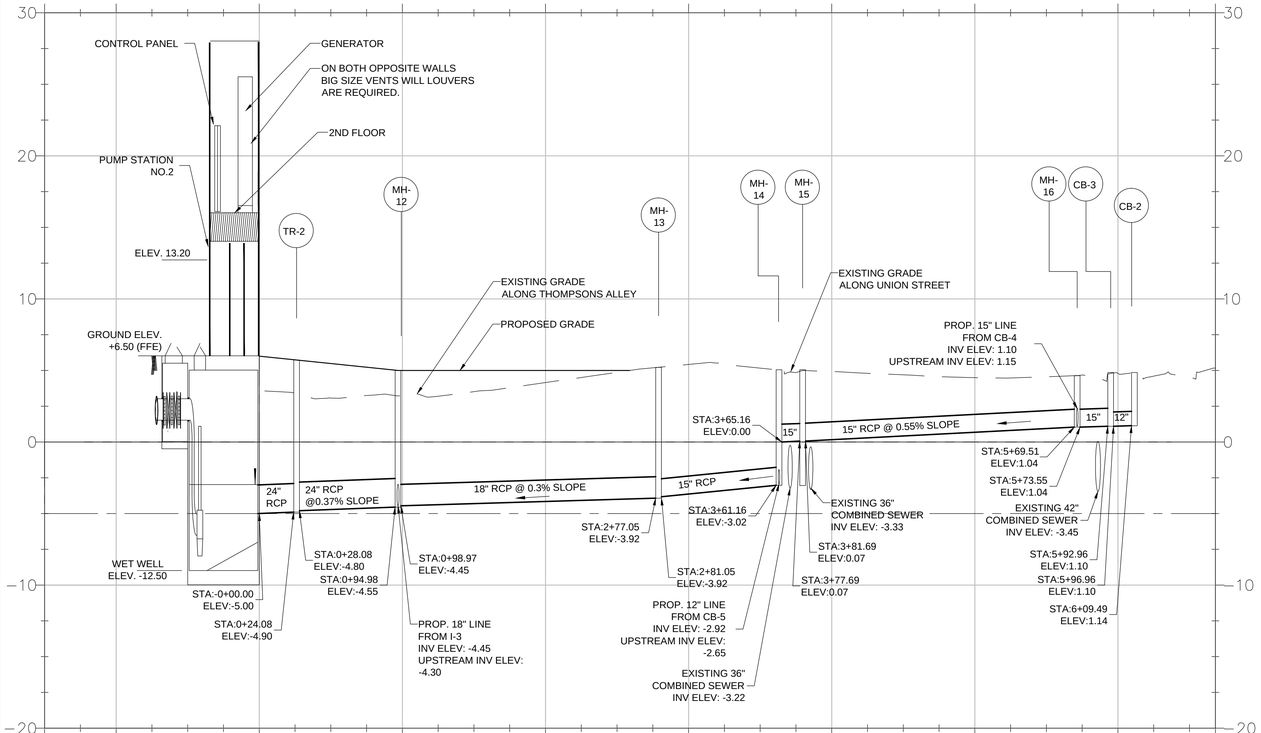
1 EXISTING STORM DRAIN FROM KING STREET DIVERTED TO PUMP STATION -1

1" = 50' HOR, 1" = 5' VERT

NOTE:
BEFORE THE CONSTRUCTION OF THE PROPOSED STORM DRAIN SYSTEM, WE RECOMMEND A THOROUGH INSPECTION OF EXISTING STORM DRAIN SYSTEM TO ENSURE THE INTEGRITY OF THE STORM DRAIN PIPES AND STRUCTURES

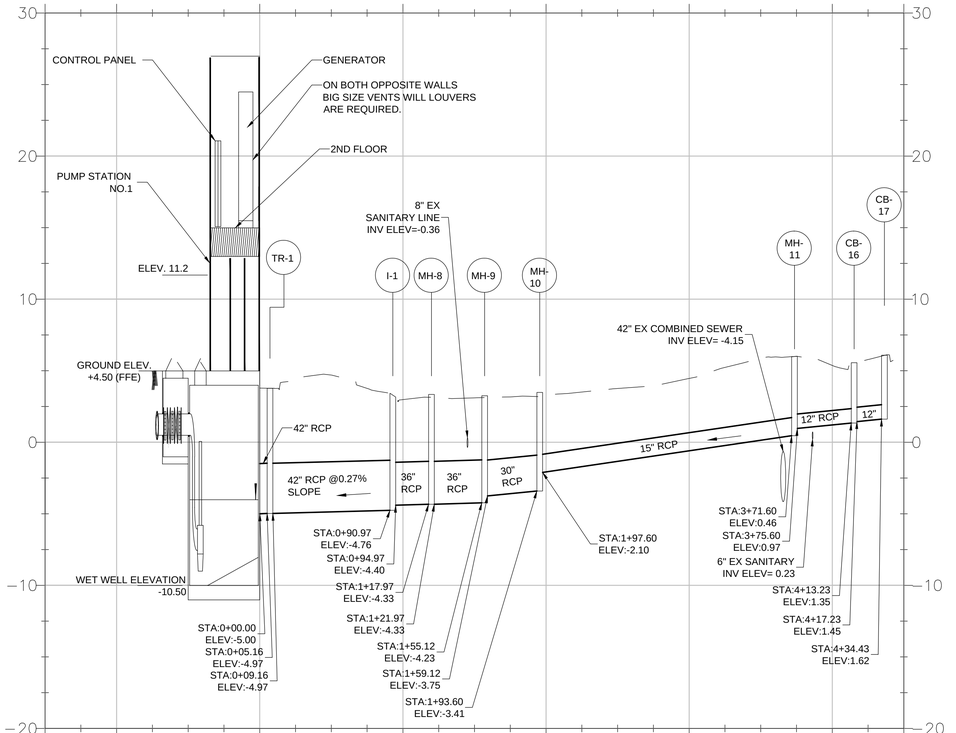
0 50' 100'
HORIZONTAL SCALE: 1" = 50'

0 5' 10'
VERTICAL SCALE: 1" = 5'



2 PROPOSED STORM DRAIN FROM CAMERON STREET TO PUMP STATION-2

1" = 50' HOR, 1" = 5' VERT



3 PROPOSED STORM DRAIN FROM PRINCE ST TO PUMP STATION-1

1" = 50' HOR, 1" = 5' VERT

15% CONCEPT DESIGN SUBMISSION

WATERFRONT FLOOD MITIGATION PROJECT

PROPOSED STORM DRAIN PROFILES

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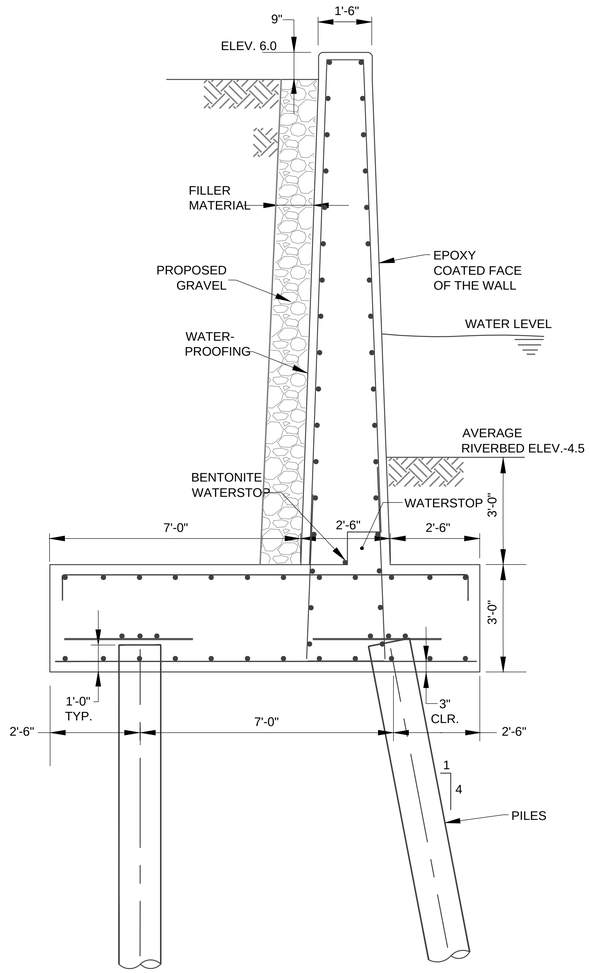

1 PROPOSED ALTERNATIVE BULKHEAD SECTION

SCALE : 1/2" = 1'-0"

NOTE:
PROPOSED BULKHEAD IS CURRENTLY PLANNED TO BE DESIGNWED WITH SHEET PILES AND TIEBACKS.

GENERAL NOTES:

CODES

1. INTERNATIONAL BUILDING CODE (IBC), 2009
2. AMERICAN CONCRETE INSTITUTE (ACI), "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE (ACI 318-08).
3. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICAILS (AASHTO) "STANDARD SPECIFICATION FOR HIGHWAY BRIDGES 17TH EDITION DATED 2002"

DESIGN LOADS

1. DEAD LOADS
   COMPONENTS AND EQUIPMENT - ACTUAL WEIGHT
2. LIVE LOADS
   AASHTO HS-20 TRUCK LOADING
3. EARTH PRESSURE DESIGN PARAMETERS

   EARTH PRESSURE CALCULATED BASED ON COULOMB THEORY.

   ANGLE OF INTERNAL FRICTION:
   33 DEGREES - FOR EXCELLENT SOIL
   30 DEGREES - FOR GOOD AND POOR SOILS
   FOR RETAINING WALLS, PASSIVE EARTH PRESSURE FROM TOP OF FOOTING TO BOTTOM OF FOOTING WAS UTILIZED IN THE DESIGN

FOUNDATION

1. 12" or 14"Ø CONCRETE PILES, EVERY 6'-0" ALONG THE WALL.

FORMWORK

1. FORMWORK SHALL BE DESIGNED IN ACCORDANCE WITH ACI 347 "GUIDE TO FORMWORK FOR CONCRETE."

CONCRETE

1. CONCRETE SHALL BE DETAILED AND CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE SPECIFICATION SECTION.
2. CONCRETE FACE OF THE WALL ALONG WATER WILL BE COATED WITH EPOXY.
3. REINFORCING STEEL SHALL BE DETAILED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AMERICAN CONCRETE INSTITUTE, (ACI 315-04) "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES," AND (ACI SP-66) "ACI DETAILING MANUAL 2004."
4. MATERIALS

   CONCRETE - STRENGTHS LISTED SHALL BE THE MINIMUM COMPRESSIVE STRENGTHS TO BE ACHIEVED AT 28 DAYS.

   ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI.

   NORMAL WEIGHT CONCRETE SHALL WEIGH NOT MORE THAN 150 POUNDS/CUBIC FOOT (PCF)

   REINFORCING STEEL - AMERICAN INSTITUTE FOR TESTING AND MATERIALS (ASTM) SPECIFICATION A615, DEFORMED, GRADE 60. ALL REINFORCING STEEL SHALL BE EPOXY COATED STEEL.
5. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4 INCH UNLESS OTHERWISE NOTED.
6. MINIMUM REINFORCING COVER SHALL BE AS FOLLOWS, UNLESS NOTED OTHERWISE ON THE DRAWINGS:

CONCRETE EXPOSED TO EARTH & WEATHER	2"
CONCRETE CAST PERMANENTLY AGAINST EARTH	3"
CONCRETE PERMANENTLY EXPOSED TO WATER	3"

7. HOOKS FOR REINFORCING NOT SHOWN ON THESE DRAWINGS SHALL BE DETAILED AS ACI STANDARD HOOKS.
8. THE WALL WILL HAVE CONTROL JOINTS EVERY 25 FEET AND EXPANSION JOINTS EVERY 90 FEET. ALL THE JOINT SHALL HAVE WATERSTOP IN THEM.

15% CONCEPT DESIGN SUBMISSION

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TYPICAL BULKHEAD SECTION AND NOTES

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