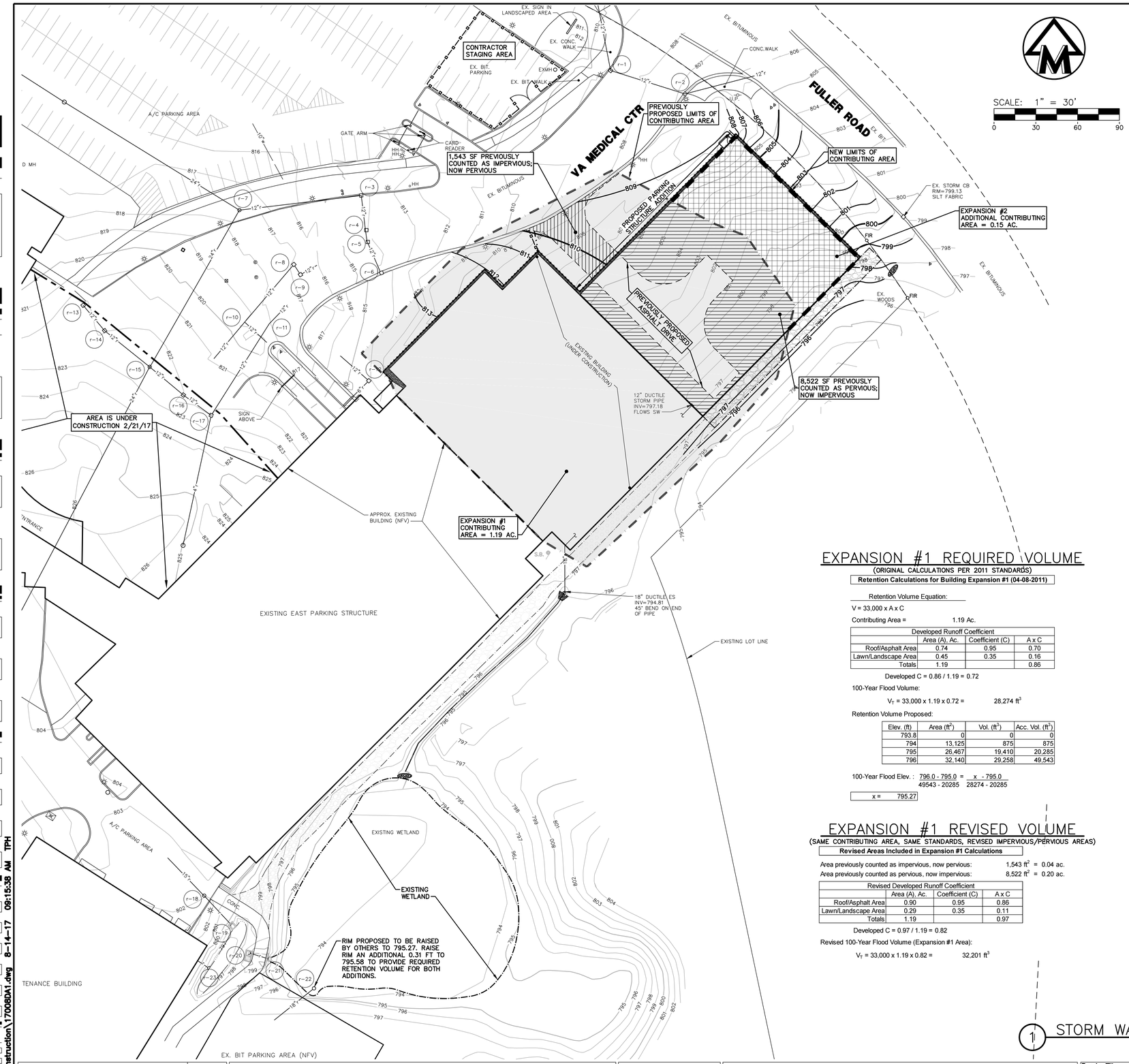

SCALE: 1" = 30'

0 30 60 90

EXISTING STORM SEWER SCHEDULE

No.	TYPE	RIM	INVERTS				NOTES
r-1	CB	808.14	12" NW 801.44	12" SE 801.14			
r-2	CB	806.86	12" NW 800.19	12" NE 800.19			
r-3	CB	813.69	12" W 807.44	12" S 810.19	4" W 810.49		
r-4	CB	814.05	12" N 809.87	12"S 809.87	4" E 809.97		
r-5	CB	814.10	12" N 810.35	12" S 810.35	4" W 810.95		
r-6	INLET	813.88	12" N 810.61	4" W 811.01			
r-7	MH	817.70	24" SW 793.70	24" NW 793.70	12" E 804.85		
r-8	CB	816.86	12" SW 812.07	12" SE 810.62			
r-9	CB	816.74	12" NW 812.94	12" NE 810.74			
r-10	MH	818.46	12" NE 814.46	12" SE 814.46	12" SW 814.56		HDPE PIPE
r-11	MH	818.04	12" NE 809.64	12" SW 808.69			HDPE PIPE
r-12	INLET	814.17	6" SW 812.07	12" NW 810.62			PVC PIPE
r-13	INLET	822.16	12" SE 817.46				
r-14	CB	821.66	12" SE 816.96	12" NW 816.96	4" SW 817.76		
r-15	MH	823.39	24" SW 795.00	24" NE 795.00	12" SE 812.59	12" NW 816.59	
r-16	CB	821.74	12" NW 812.44	12" SE 812.44			
r-17	INLET	821.96	12" NW 812.46	4" SW 815.36			
r-18	CB	801.79	12" SE 797.39	12" NW 797.49			
r-19	END-SECTION	797.27	15" NW 797.27				
r-20	END-SECTION	799.07	15" SE 795.75				
r-21	END-SECTION	795.72	15" NW 795.72				
r-22	INLET	793.81	18" SW 787.71				**RAISE RIM TO 795.58**
r-23	END-SECTION	797.61	8" NW 797.61				

LEGEND

- 838 — EXIST. CONTOUR
- 838 — PROVIDE CONTOUR
- ×836.2 — EXIST. SPOT ELEVATION
- 36.60× — PROVIDE SPOT ELEVATION
- U.P. — EXIST. UTILITY POLE
- GP — EXIST. GUY POLE
- GUY WIRE
- ELEC. TRANSFORMER
- OH — EXIST. OVERHEAD UTILITY LINE
- EXIST. LIGHT POLE
- t — EXIST. TELEPHONE LINE
- e — EXIST. ELECTRIC LINE
- g — EXIST. GAS LINE
- EXIST. GAS VALVE
- f.o. — EXIST. FIBER OPTIC LINE
- w — EXIST. WATER MAIN
- W — PROVIDE WATER MAIN
- EXIST. HYDRANT
- PROVIDE HYDRANT
- EXIST. GATE VALVE IN BOX
- PROVIDE GATE VALVE IN BOX
- EXIST. GATE VALVE IN WELL
- PROVIDE GATE VALVE IN WELL
- EXIST. CURB STOP & BOX
- PROVIDE CURB STOP & BOX
- EXIST. BLOW-OFF
- PROVIDE BLOW-OFF
- r — EXIST. STORM SEWER
- R — PROVIDE STORM SEWER
- EXIST. CATCH BASIN OR INLET
- PROVIDE CATCH BASIN OR INLET
- END SECTION
- HEAD WALL
- CULVERT
- s — EXIST. SANITARY SEWER
- S — PROVIDE SANITARY SEWER
- EXIST. CLEANOUT
- PROVIDE CLEANOUT
- C/L OF DITCH
- DRAINAGE DIRECTION
- T — ENCLOSED TRASH AREA
- SIGN
- MAILBOX
- TELEPHONE RISER
- CABLE TELEVISION RISER
- ELECTRIC METER
- WATER METER
- GAS METER
- GAS LINE MARKER
- FIBER OPTIC MARKER
- PEDESTRIAN CROSSING SIGNAL
- TRAFFIC SIGNAL CONTROL BOX
- POST
- FENCE
- SINGLE TREE
- TREE OR BRUSH LIMIT
- SECTION CORNER
- SB-1 — SOIL BORING LOCATION
- SET IRON PIPE
- FOUND IRON PIPE
- FOUND MONUMENT
- FPK — FOUND P.K.
- SET IRON ROD
- FIR — FOUND IRON ROD
- CONTROL PT.

EXPANSION #1 REQUIRED VOLUME

(ORIGINAL CALCULATIONS PER 2011 STANDARDS)

Retention Calculations for Building Expansion #1 (04-08-2011)

Retention Volume Equation:

V = 33,000 x A x C

Contributing Area = 1.19 Ac.

Developed Runoff Coefficient			
	Area (A), Ac.	Coefficient (C)	A x C
Roof/Asphalt Area	0.74	0.95	0.70
Lawn/Landscape Area	0.45	0.35	0.16
Totals	1.19		0.86

Developed C = 0.86 / 1.19 = 0.72

100-Year Flood Volume:

V_T = 33,000 x 1.19 x 0.72 = 28,274 ft³

Retention Volume Proposed:

Elev. (ft)	Area (ft²)	Vol. (ft³)	Acc. Vol. (ft³)
793.8	0	0	0
794	13,125	875	875
795	26,467	19,410	20,285
796	32,140	29,258	49,543

100-Year Flood Elev. : 796.0 - 795.0 = x - 795.0
49543 - 20285 28274 - 20285

x = 795.27

EXPANSION #1 REVISED VOLUME

(SAME CONTRIBUTING AREA, SAME STANDARDS, REVISED IMPERVIOUS/PERVIOUS AREAS)

Revised Areas Included in Expansion #1 Calculations

Area previously counted as impervious, now pervious: 1,543 ft² = 0.04 ac.

Area previously counted as pervious, now impervious: 8,522 ft² = 0.20 ac.

Revised Developed Runoff Coefficient			
	Area (A), Ac.	Coefficient (C)	A x C
Roof/Asphalt Area	0.90	0.95	0.86
Lawn/Landscape Area	0.29	0.35	0.11
Totals	1.19		0.97

Developed C = 0.97 / 1.19 = 0.82

Revised 100-Year Flood Volume (Expansion #1 Area):

V_T = 33,000 x 1.19 x 0.82 = 32,201 ft³

EXPANSION #2 REQUIRED VOLUME

(PER CURRENT COUNTY STANDARDS)

Building Addition #2 Added Imperviousness

Impervious Area (ft²)	Impervious Area (ac.)
6,734	0.15
Impervious CN	**P = 100-yr Intensity (in/hr)**
98	5.11

Impervious Cover Runoff Calcs:

	S (in)
S = 1000/CN - 10 =	0.20
	Q_{100} (in)
Q_{100} = (P-0.2*S)² / (P+0.8*S) =	4.87
	V_{100} (ft³)
V_{100} = Q_{100}*(1/12)*(A) =	2,735

Retention Volume Required:

	V_{ret} (ft³)
V_{ret} = 2*V_{100} =	5,469
	$V_{ret-120\%}$ (ft³)
$V_{ret-120\%}$ = 1.2*V_{ret} =	6,563

* SINCE POORLY DRAINED SOILS EXIST ON SITE, NO INFILTRATION IS PROPOSED. THEREFORE, THE DESIGN RETENTION VOLUME SHALL BE 120% OF THE REQUIRED VOLUME AS CALCULATED PER CURRENT WASHTENAW COUNTY WATER RESOURCES COMMISSIONER STANDARDS.

Expansion #1 100-Year Flood Volume (see "Expansion #1 Required Volume") = 28,274 ft³

Expansion #1 Revised 100-Year Flood Volume (see "Expansion #1 Revised Volume") = 32,201 ft³

Additional Volume Required (see "Expansion #2 Required Volume") = 6,563 ft³

Total Retention Volume Required (Revised Volume + Additional Volume) = 38,764 ft³

RETENTION VOLUME PROVIDED

Elev. (ft)	Area (ft²)	Vol. (ft³)	Acc. Vol. (ft³)
793.8	0	0	0
794	13126	875	875
795	27,388	19,825	20,700
796	34,615	30,931	51,631

100-Year Flood Elev. : 796.0 - 795.0 = x - 795.0
51631 - 20700 38764 - 20700

x = 795.58

NOTES:

1. CONTRACTOR TO OBTAIN GRADING, SOIL EROSION CONTROL, AND R.O.W. PERMITS PRIOR TO START OF CONSTRUCTION.
2. SEE C-501 FOR ADDITIONAL DETAILS

Know what's below. Call before you dig.

1 STORM WATER MANAGEMENT PLAN

Revisions	Date
100% FINAL BID DOCUMENTS	08-18-2017
100% BID DOCUMENTS-NOT FOR CONSTRUCTION	07-24-2017
95% CONSTRUCTION DOCUMENTS SUBMISSION	06-15-2017
65% DESIGN DEVELOPMENT SUBMISSION	04-19-2017
35% SCHEMATIC DESIGN SUBMISSION	03-06-2017

CONSULTANTS:

WALKER PARKING CONSULTANTS
325 Ann Arbor, Suite 1
Ann Arbor, MI 48108

MIDWESTERN CONSULTING
3815 Plaza Drive Ann Arbor, Michigan 48108
(734) 995-0200 • www.midwesternconsulting.com
Land Development • Land Survey • Institutional • Municipal
Wireless Communications • Transportation • Landfill Services

KEYPLAN

ARCHITECT + ENGINEERS:

BANCROFT ARCHITECTS + ENGINEERS
700 Nicholas Blvd., Suite 300
Elk Grove Village, IL 60007
Telephone : 847.952.9362
www.bancroft-ae.com
Bancroft-AE Project No. 16-121

VA CONTRACT NO. VA250-17-C-0008

Drawing Title: STORM WATER MANAGEMENT PLAN

Approved: Project Director

Project Title: CONSTRUCT NORTH PARKING STRUCTURE

Location: ANN ARBOR, MICHIGAN

Date: 08-18-2017 | Checked: RCW | Drawn: TPH

Project Number: 506-331

Building Number: 29

Drawing Number: CG-103

Office of Construction and Facilities Management
Department of Veterans Affairs

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VA FORM 08-6231

100% FINAL BID DOCUMENTS