

January 21, 2024

City of Bryant Attn: Engineering Department 210 SW 3<sup>rd</sup>. Street, Bryant, AR 72022

Re: Panera Bread - Drainage Letter CT Job #: 24304000

Mr. Wilson,

The following information concerns a new Panera Bread being proposed to be constructed just north of the David's Burgers at 23140 I-30 W Bryant, AR. This project is part of a larger commercial development (Reynolds Centre) that was designed by Holloway Engineering previously. A portion of the Panera Bread site will remain unimproved to allow for future development.

As part of the previous development of David's Burgers/Reynolds Centre, regional underground detention chambers were designed and constructed to provide detention for the overall development. This underground detention design accounted for the commercial development of the property upon which this project sits.

The original design for this site was a large retail center with associated parking. The development of the Panera Bread will have a smaller runoff coefficient than that of the original designed retail center. A portion of the site will remain unimproved to allow for future development. Because of the original retail design and conservative runoff coefficient, the Panera Bread and the future development (once constructed) will have no negative impact upon Bryant's stormwater system. A summary of the runoff coefficients is shown below:

Runoff Coefficient							
	10 YR	25 YR	100 YR				
	Storm	Storm	Storm				
Original Design Retail							
Center (By Others)	0.9	0.93	0.95				
Panera Bread with							
unimproved remaining							
future development area	0.59	0.64	0.72				

Should you have any questions, please feel free to contact us at your earliest convenience.

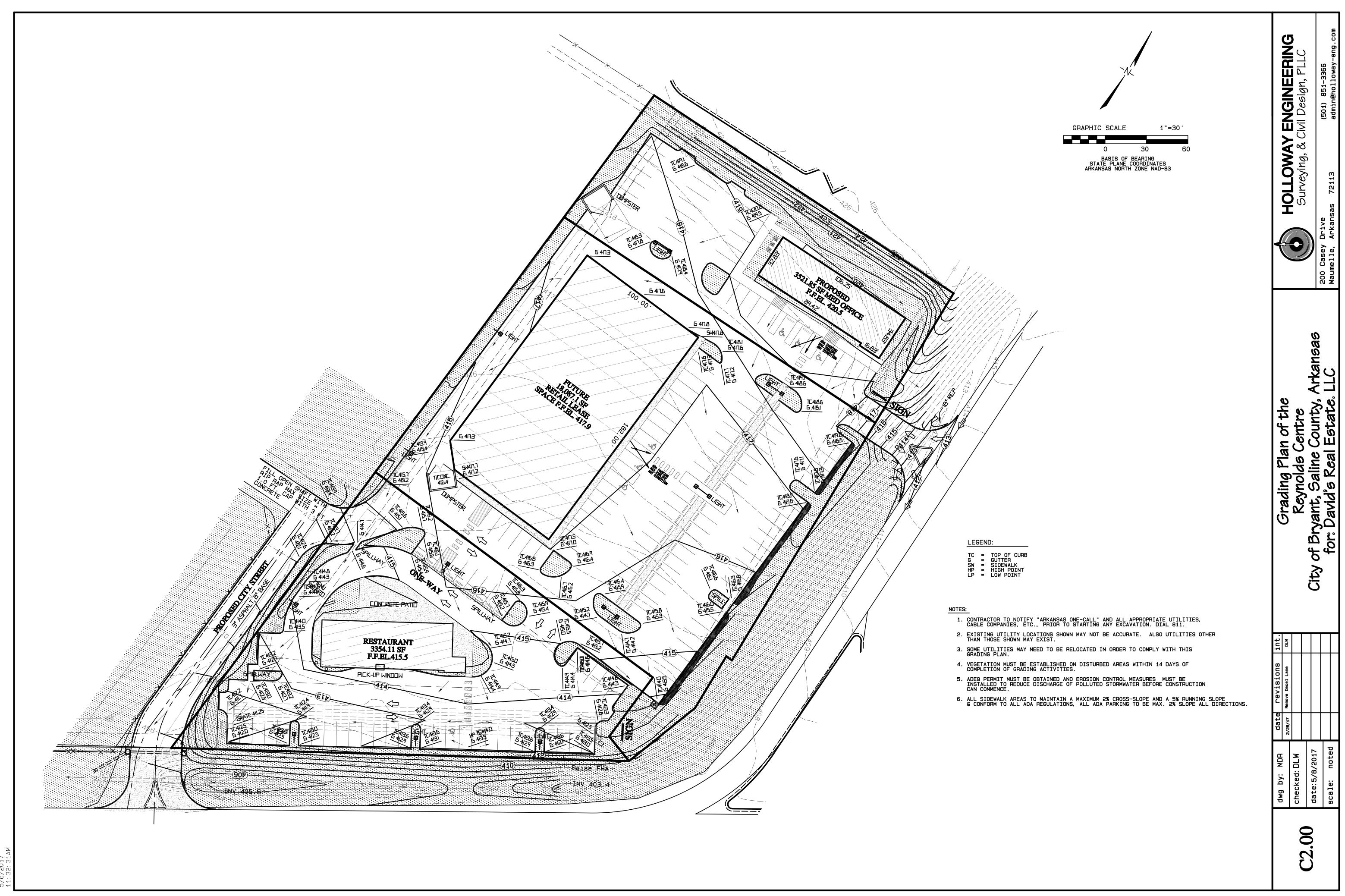
Sincerely,

Caroline Gardner, PE Project Engineer Crafton Tull



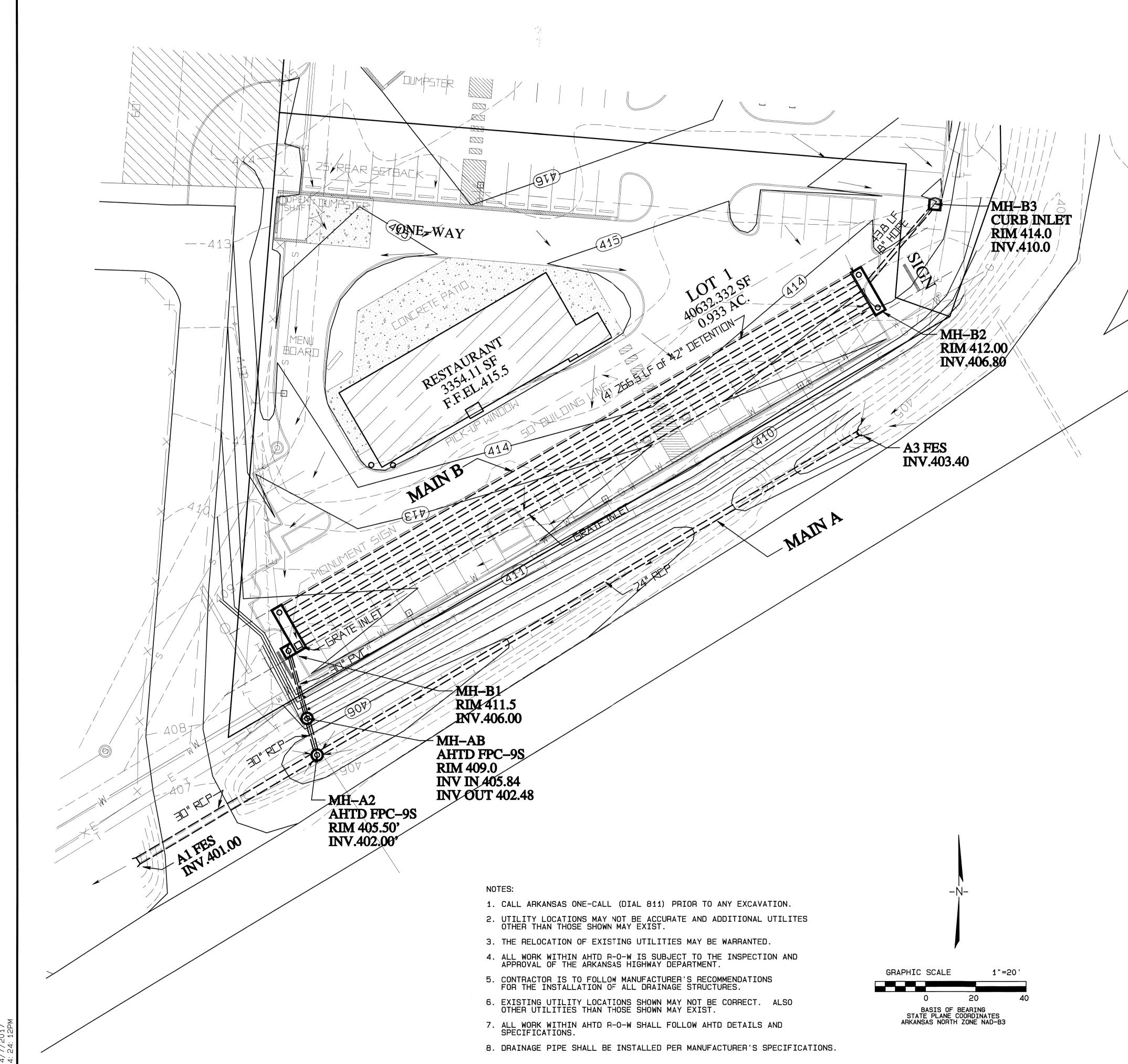
# REYNOLDS CENTER APPLICABLE PLAN SHEETS (BY OTHERS)

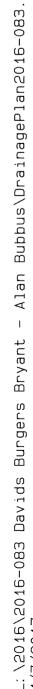


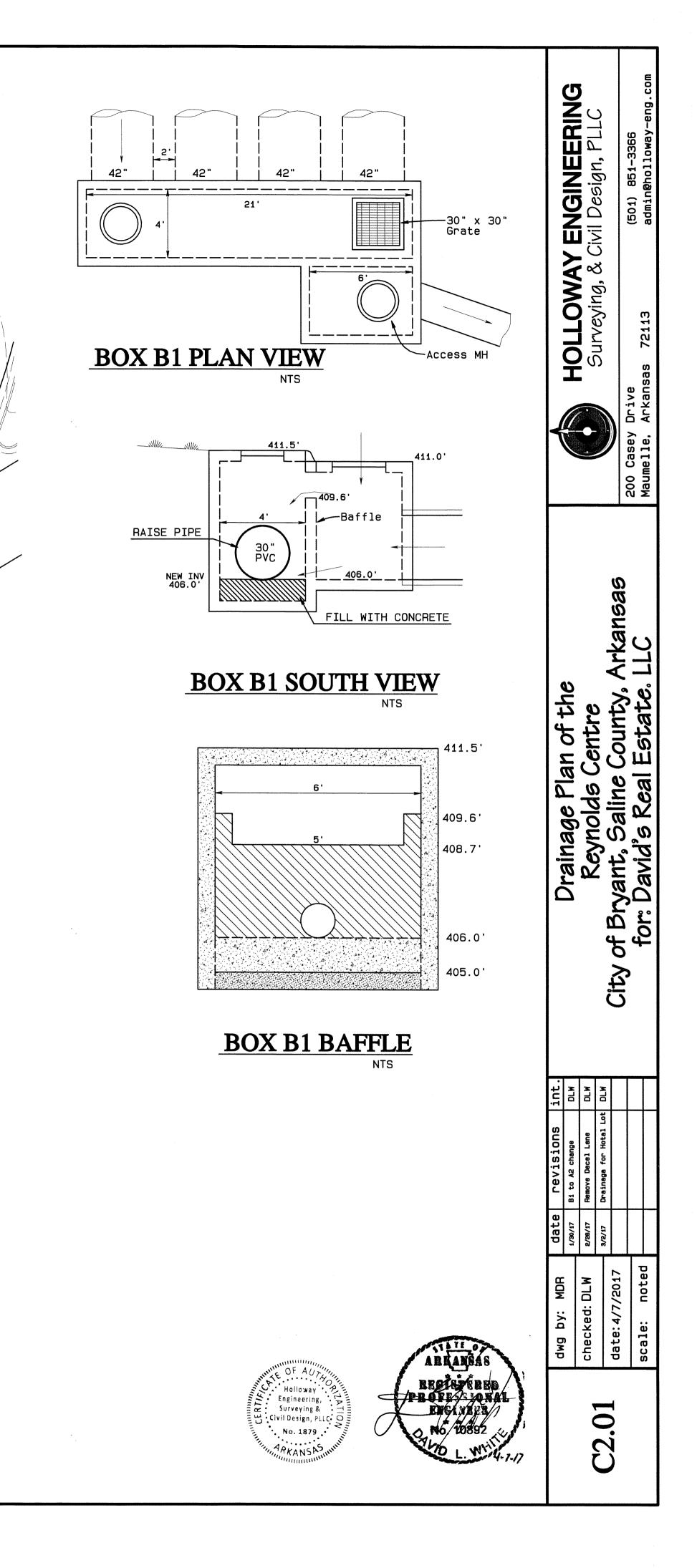


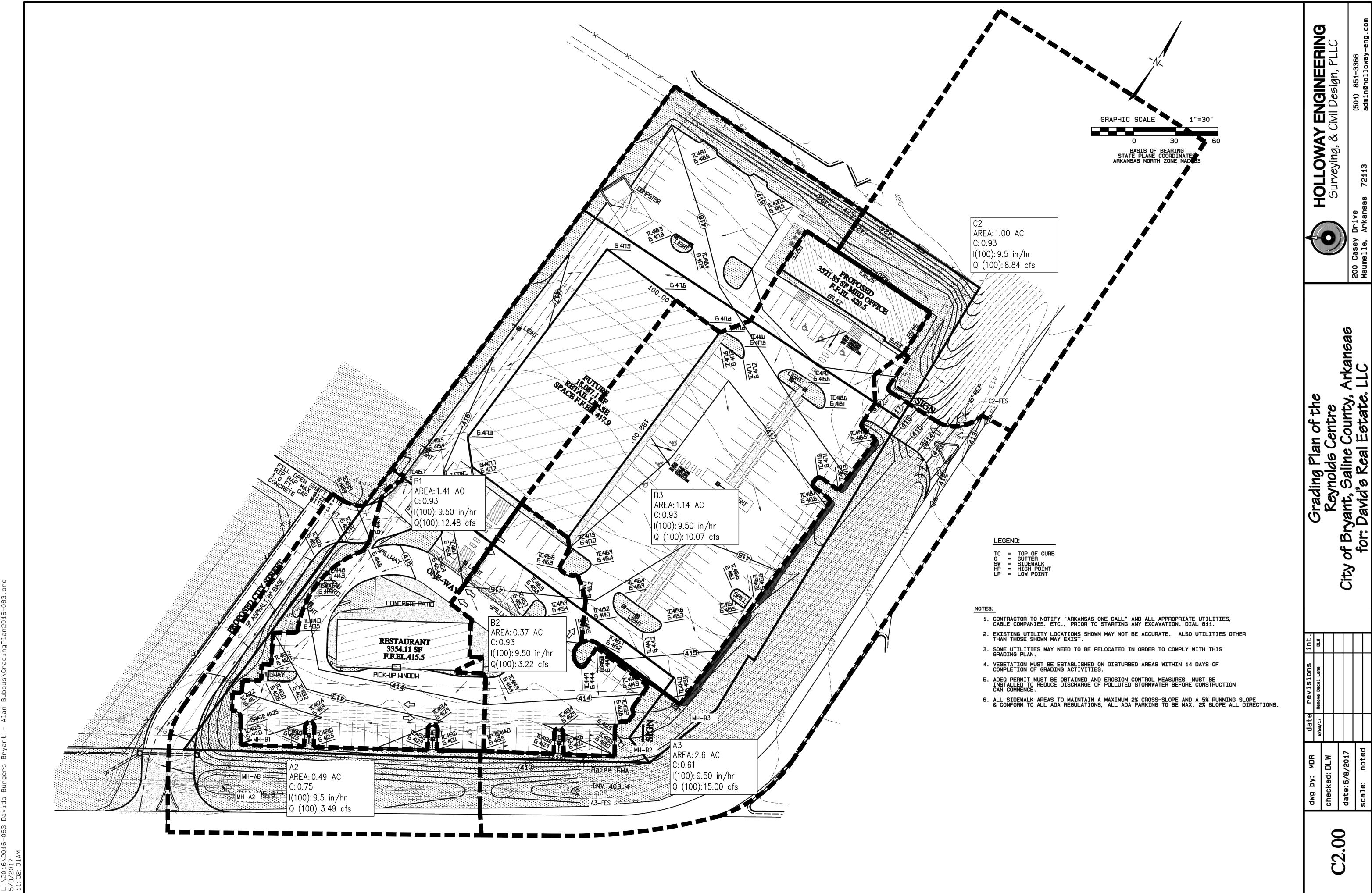
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## PIPES

Design based on 100-year Storm

Inlet	Drainage Area ac	Area Q req'd cfs	Pipe	Q req'd cfs	Pipe Dia in	Area ft^2	W.P. ft	Rh	Slope ft/ft	n	Max Velocity fps	Full Flow Capacity cfs	Vel Head v²/2g ft	Fig 3-1 Flow Depth ft	H.E.G ft	Rim Elev ft
B3	1.14	10.07	B3 to B2	10.07	18	1.77	4.71	0.375	0.045	0.013	12.66	22.36	2.5			
B2	0.37	3.22	B2 to B1	13.30	42	9.62	10.99	0.875	0.003	0.013	5.74	55.20	0.5			
B1 AB	1.41 0.00	12.48 0.00	B1 to AB AB to A2	25.78 25.78	30 30	4.91 4.91	7.85 7.85	0.625 0.625	0.005 0.015	0.010 0.013		17.66 5.67	0.9 1.6			
A3	2.60	15.00	A3 to A2	15.00	24	3.14	6.28	0.5	0.005	0.013	5.09	15.99	0.4	1.6		
A2	0.49	3.49	A2 to A1	44.27	30	4.91	7.85	0.625	0.012	0.013	9.16	44.96	1.3	2.0	405.3	405.5
C2	1.00	8.84	C2 to C1	8.84	18	1.77	4.71	0.375	0.019	0.013	8.24	14.55	1.1	0.8		
	B3 B2 B1 AB A3 A2	Area ac           B3         1.14           B2         0.37           B1         1.41           AB         0.00           A3         2.60           A2         0.49	Area ac         Q req'd cfs           B3         1.14         10.07           B2         0.37         3.22           B1         1.41         12.48           AB         0.00         0.00           A3         2.60         15.00           A2         0.49         3.49	Area ac         Q req'd cfs         Pipe           B3         1.14         10.07         B3 to B2           B2         0.37         3.22         B2 to B1           B1         1.41         12.48         B1 to AB           AB         0.00         0.00         AB to A2           A3         2.60         15.00         A3 to A2           A2         0.49         3.49         A2 to A1	Area ac         Q req'd cfs         Pipe Pipe Cfs         Q req'd cfs           B3         1.14         10.07         B3 to B2         10.07           B2         0.37         3.22         B2 to B1         13.30           B1         1.41         12.48         B1 to AB         25.78           AB         0.00         0.00         AB to A2         25.78           A3         2.60         15.00         A3 to A2         15.00           A2         0.49         3.49         A2 to A1         44.27	Area ac         Q req'd cfs         Pipe Pipe         Q req'd cfs         Pipe Dia in           B3         1.14         10.07         B3 to B2         10.07         18           B2         0.37         3.22         B2 to B1         13.30         42           B1         1.41         12.48         B1 to AB         25.78         30           AB         0.00         0.00         AB to A2         25.78         30           A3         2.60         15.00         A3 to A2         15.00         24           A2         0.49         3.49         A2 to A1         44.27         30	Area ac         Q req'd cfs         Pipe pic         Q req'd cfs         Pipe Dia in         Area ft^2           B3         1.14         10.07         B3 to B2         10.07         18         1.77           B2         0.37         3.22         B2 to B1         13.30         42         9.62           B1         1.41         12.48         B1 to AB         25.78         30         4.91           AB         0.00         0.00         AB to A2         25.78         30         4.91           A3         2.60         15.00         A3 to A2         15.00         24         3.14           A2         0.49         3.49         A2 to A1         44.27         30         4.91	Area ac         Q req'd cfs         Pipe sin         Q req'd ft         Pipe ft         Area ft^2         W.P. ft           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85           AB         0.00         0.00         AB to A2         25.78         30         4.91         7.85           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28           A2         0.49         3.49         A2 to A1         44.27         30         4.91         7.85	Area ac         Q req'd cfs         Pipe Cfs         Q req'd cfs         Pipe Dia in         Area ft^2         W.P. ft         Rh           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625           AB         0.00         AB to A2         25.78         30         4.91         7.85         0.625           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5           A2         0.49         3.49         A2 to A1         44.27         30         4.91         7.85         0.625	Area ac         Q req'd cfs         Pipe ft         Q req'd ft         Pipe Dia in         Area ft/2         W.P. ft         Rh ft         Slope ft/ft           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003           B1         1.41         12.48         B1 to AB 0.00         25.78         30         4.91         7.85         0.625         0.005           AB         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.005           A2         0.49         3.49         A2 to A1         44.27         30         4.91         7.85         0.625         0.012	Area ac         Q req'd cfs         Pipe cfs         Pipe Dia in         Area ft^2         W.P. ft         Rh ft         Slope ft/ft         n           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010           AB         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.005         0.013           A2         0.49         3.49         A2 to A1         44.27         30         4.91         7.85         0.625         0.012         0.013	Area ac         Q req'd cfs         Pipe ff         Q req'd in         Pipe Dia ft^2         Area ft         W.P. ft         Rh ft/ft         Slope ft/ft         n         Velocity fps           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013         12.66           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013         5.74           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010         7.69           AB         0.00         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013         10.25           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.012         0.013         9.16           A2         0.49         3.49         A2 to A1         44.27         30         4.91         7.85         0.625         0.012         0.013         9.16 <th>Area ac         Q req'd cfs         Pipe cfs         Q req'd in         Pipe Dia ft/2         Area ft/2         W.P. ft         Rh         Slope ft/ft         n         Velocity fps         Capacity cfs           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013         12.66         22.36           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013         5.74         55.20           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010         7.69         37.73           AB         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013         10.25         50.27           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.013         5.09         15.99           A2         0.49         3.49         A2 to A1         44.27         30         4.91         7.85         <td< th=""><th>Area ac         Q req'd cfs         Pipe cfs         Q req'd cfs         Pipe Dia in         Area ft/2         W.P. ft         Rh         Slope ft/ft         n         Velocity fps         Capacity cfs         v'/2g ft           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013         12.66         22.36         2.5           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013         5.74         55.20         0.5           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010         7.69         37.73         0.9           AB         0.00         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013         10.25         50.27         1.6           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.013         5.09         15.99         0.4           A2         0.49</th><th>Drainage Area ac         Area Q req'd cfs         Pipe of s         Q req'd cfs         Pipe Dia in         Area ft^2         W.P. ft         Rh         Slope ft/ft         n         Max Velocity fps         Full Flow Capacity cfs         Vel Head v<sup>2</sup>/2g ft         Flow Depth ft           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013         12.66         22.36         2.5           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013         5.74         55.20         0.5           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010         7.69         37.73         0.9           AB         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013         10.25         50.27         1.6           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.013         5.09         15.99         0.4</th><th>Drainage Area ac         Area Creq'd cfs         Pipe (fs)         Q req'd cfs         Pipe Dia in         Area ft^2         W.P. ft         Rh         Slope ft/ft         n         Max Velocity fps         Full Flow Capacity cfs         Vel Head tf         Flow Depth ft         H.E.G ft           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013         12.66         22.36         2.5           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013         5.74         55.20         0.5           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010         7.69         37.73         0.9           AB         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013         10.25         50.27         1.6           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.013         5.09         1.3</th></td<></th>	Area ac         Q req'd cfs         Pipe cfs         Q req'd in         Pipe Dia ft/2         Area ft/2         W.P. ft         Rh         Slope ft/ft         n         Velocity fps         Capacity cfs           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013         12.66         22.36           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013         5.74         55.20           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010         7.69         37.73           AB         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013         10.25         50.27           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.013         5.09         15.99           A2         0.49         3.49         A2 to A1         44.27         30         4.91         7.85 <td< th=""><th>Area ac         Q req'd cfs         Pipe cfs         Q req'd cfs         Pipe Dia in         Area ft/2         W.P. ft         Rh         Slope ft/ft         n         Velocity fps         Capacity cfs         v'/2g ft           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013         12.66         22.36         2.5           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013         5.74         55.20         0.5           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010         7.69         37.73         0.9           AB         0.00         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013         10.25         50.27         1.6           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.013         5.09         15.99         0.4           A2         0.49</th><th>Drainage Area ac         Area Q req'd cfs         Pipe of s         Q req'd cfs         Pipe Dia in         Area ft^2         W.P. ft         Rh         Slope ft/ft         n         Max Velocity fps         Full Flow Capacity cfs         Vel Head v<sup>2</sup>/2g ft         Flow Depth ft           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013         12.66         22.36         2.5           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013         5.74         55.20         0.5           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010         7.69         37.73         0.9           AB         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013         10.25         50.27         1.6           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.013         5.09         15.99         0.4</th><th>Drainage Area ac         Area Creq'd cfs         Pipe (fs)         Q req'd cfs         Pipe Dia in         Area ft^2         W.P. ft         Rh         Slope ft/ft         n         Max Velocity fps         Full Flow Capacity cfs         Vel Head tf         Flow Depth ft         H.E.G ft           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013         12.66         22.36         2.5           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013         5.74         55.20         0.5           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010         7.69         37.73         0.9           AB         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013         10.25         50.27         1.6           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.013         5.09         1.3</th></td<>	Area ac         Q req'd cfs         Pipe cfs         Q req'd cfs         Pipe Dia in         Area ft/2         W.P. ft         Rh         Slope ft/ft         n         Velocity fps         Capacity cfs         v'/2g ft           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013         12.66         22.36         2.5           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013         5.74         55.20         0.5           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010         7.69         37.73         0.9           AB         0.00         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013         10.25         50.27         1.6           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.013         5.09         15.99         0.4           A2         0.49	Drainage Area ac         Area Q req'd cfs         Pipe of s         Q req'd cfs         Pipe Dia in         Area ft^2         W.P. ft         Rh         Slope ft/ft         n         Max Velocity fps         Full Flow Capacity cfs         Vel Head v <sup>2</sup> /2g ft         Flow Depth ft           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013         12.66         22.36         2.5           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013         5.74         55.20         0.5           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010         7.69         37.73         0.9           AB         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013         10.25         50.27         1.6           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.013         5.09         15.99         0.4	Drainage Area ac         Area Creq'd cfs         Pipe (fs)         Q req'd cfs         Pipe Dia in         Area ft^2         W.P. ft         Rh         Slope ft/ft         n         Max Velocity fps         Full Flow Capacity cfs         Vel Head tf         Flow Depth ft         H.E.G ft           B3         1.14         10.07         B3 to B2         10.07         18         1.77         4.71         0.375         0.045         0.013         12.66         22.36         2.5           B2         0.37         3.22         B2 to B1         13.30         42         9.62         10.99         0.875         0.003         0.013         5.74         55.20         0.5           B1         1.41         12.48         B1 to AB         25.78         30         4.91         7.85         0.625         0.005         0.010         7.69         37.73         0.9           AB         0.00         AB to A2         25.78         30         4.91         7.85         0.625         0.015         0.013         10.25         50.27         1.6           A3         2.60         15.00         A3 to A2         15.00         24         3.14         6.28         0.5         0.013         5.09         1.3

H.E.G. = Inv + Vel Head + Flow Depth

Q req'd = (Drainage Area) x (9.5 in/hr) x (0.93)

Flow Depth from LR Drainage Manual Fig 3-1

Velocity = ((1.49/n) (Rh)^0.66 (Slope)^0.5) Capacity = Q = Area x Velocity

A2 - Q req'd = (0.49)(9.5)(0.75) = 3.49 cfs

Offsite Drainage into A3:	1) Waffle House Lot	A = 0.90 ac	2) Ditch & Pavem	ent of Ramp Road	A = 0.90 ac
L1 =	300 ft L2 = 525 ft Lo = 825 ft	Δh = 20 ft	Slope = 2.5%	Tc = 30 min	
	l = 5.5 in/hr	Q = CIA = (0.75)	)(5.5)(1.80) = 7.4 cfs		

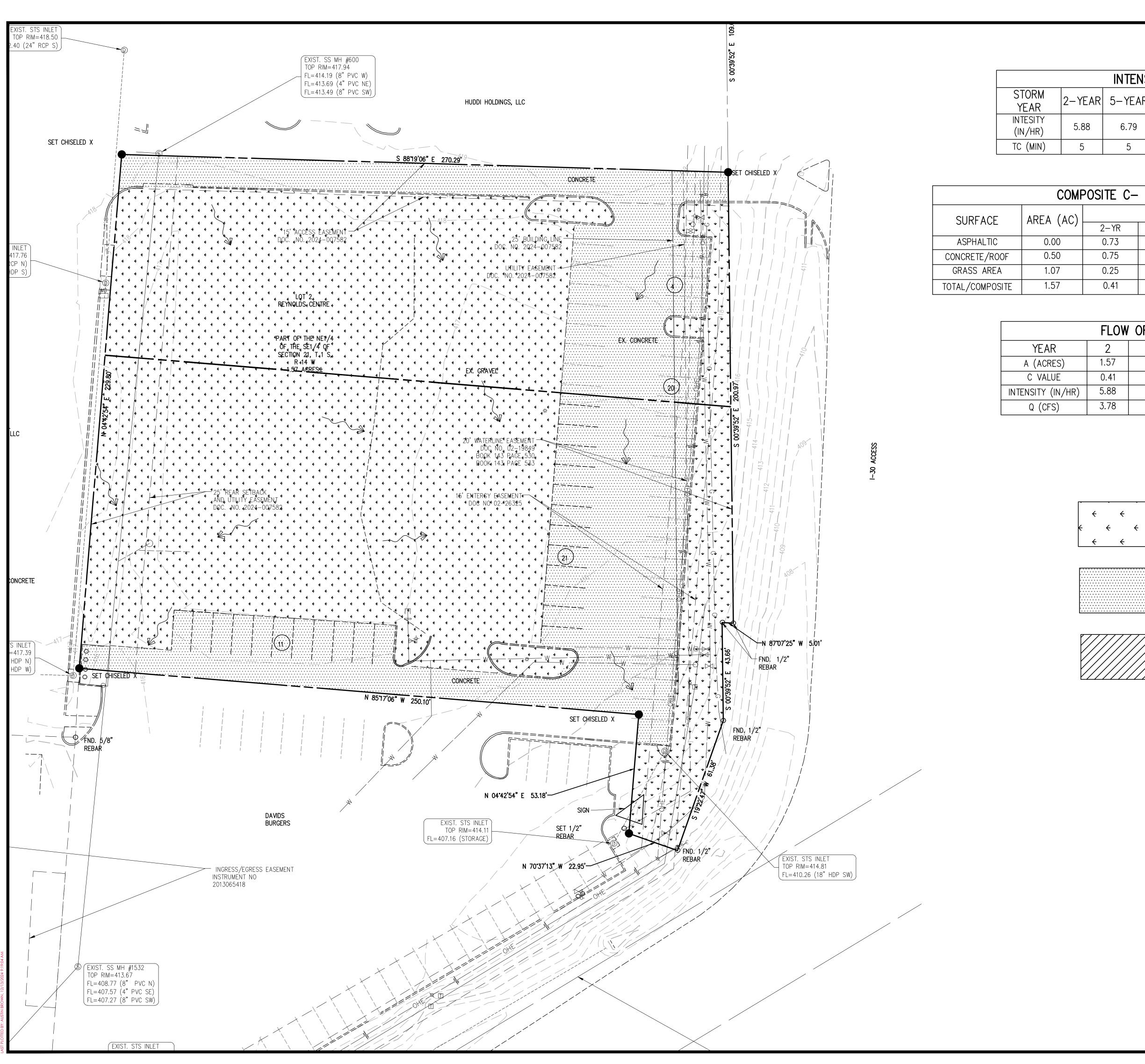
3) Interstate Area A = 0.85 ac

Q = CIA = (0.90)(10.0)(0.85) = 7.6 cfs

A3 - 15.0 cfs

# PREDEVELOPMENT DRAINAGE EXHIBIT





	INTENSITY CALCULATIONS										
ΈAR	EAR 5-YEAR 10-YEAR 25-YEAR 50-YEAR 100-YEA										
88	6.79	7.58	8.53	9.45	10.00						
5	5	5	5	5	5						

POSITE C- VALUE (PRE-DEV)									
	C VALUE								
2-YR	5-YR	10-YR	25-YR	50-YR	100-YR				
0.73	0.77	0.81	0.86	0.90	0.95				
0.75	0.80	0.83	0.88	0.92	0.97				
0.25	0.28	0.30	0.34	0.37	0.41				
0.41	0.45	0.47	0.51	0.55	0.59				

FLOW OFF OF SITE (PRE-DEV)										
2	5	10	25	50	100					
1.57	1.57	1.57	1.57	1.57	1.57					
0.41	0.45	0.47	0.51	0.55	0.59					
5.88	6.79	7.58	8.53	9.45	10.00					
3.78	4.75	5.58	6.86	8.09	9.24					

GRASS/LAWN

CONCRETE PAVED/BUILDING

PAVED/ASPHALT



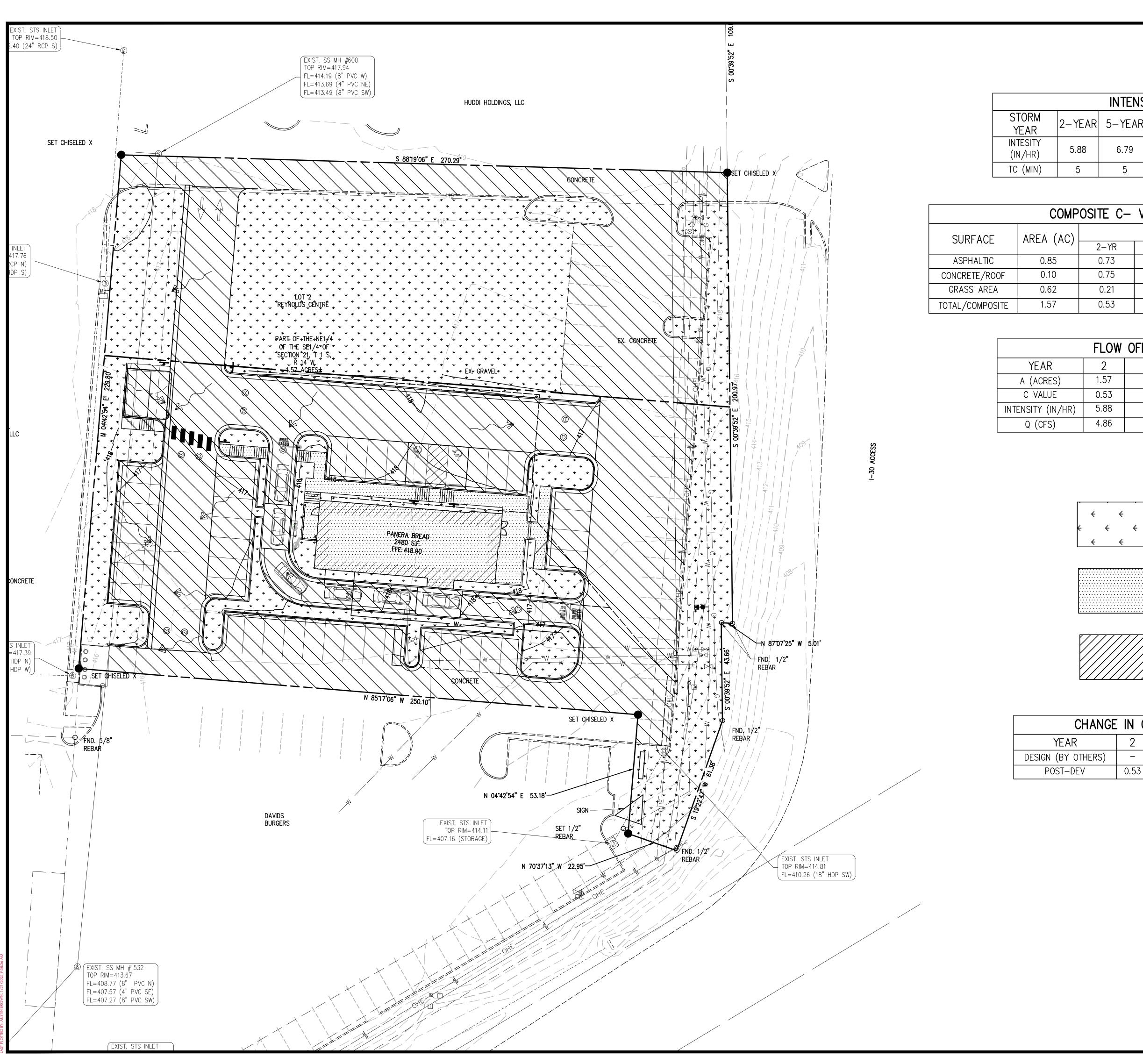


Know what's **below**. Call before you dig.

¢;	Crafton Tull engineering   surveying 501.664.3245 t 501.664.6704 f www.craftontull.com
CERTIFICATE OF A	ASSOCIATES, INC. No. 109
GF 20'	RAPHIC SCALE IN FEET
P	ANERA BREAD bryant, ar
Key Plan	
No.	Description Date
herein, as an i property of Cr used, in whole	t, and the ideas and designs incorporated nstrument of professional service, is the rafton, Tull & Associates, Inc., and is not to b e or in part, for any other project, without th rization of Crafton, Tull & Associates, Inc.
CONTACT: T.T. QC by: QC Date: PRELIM PLA	V20/24     O     THIS     Y       OLLEY     O     DOCUMENT IS       PRELIMINARY IN     PRELIMINARY IN       NATURE AND IS NOT       INARY     A FINAL, SIGNED

# POST DEVELOPMENT DRAINAGE EXHIBIT





	INTENSITY CALCULATIONS									
AR	AR 5-YEAR 10-YEAR 25-YEAR 50-YEAR 100-YEAR									
3	6.79	7.58	8.53	9.45	10.00					
	5	5	5	5	5					
	5	5	5	5	5					

OSITE C- VALUE (POST-DEV)									
	C VALUE								
2-YR	5-YR	10-YR	25-YR	50-YR	100-YR				
0.73	0.77	0.81	0.86	0.90	0.95				
0.75	0.80	0.83	0.88	0.92	0.97				
0.21	0.23	0.25	0.29	0.32	0.36				
0.53	0.56	0.59	0.64	0.67	0.72				

FLOW	FLOW OFF OF SITE (POST-DEV)								
2	5	10	25	50	100				
1.57	1.57	1.57	1.57	1.57	1.57				
0.53	0.56	0.59	0.64	0.67	0.72				
5.88	6.79	7.58	8.53	9.45	10.00				
4.86	5.96	7.02	8.52	9.97	11.28				

GRASS/LAWN

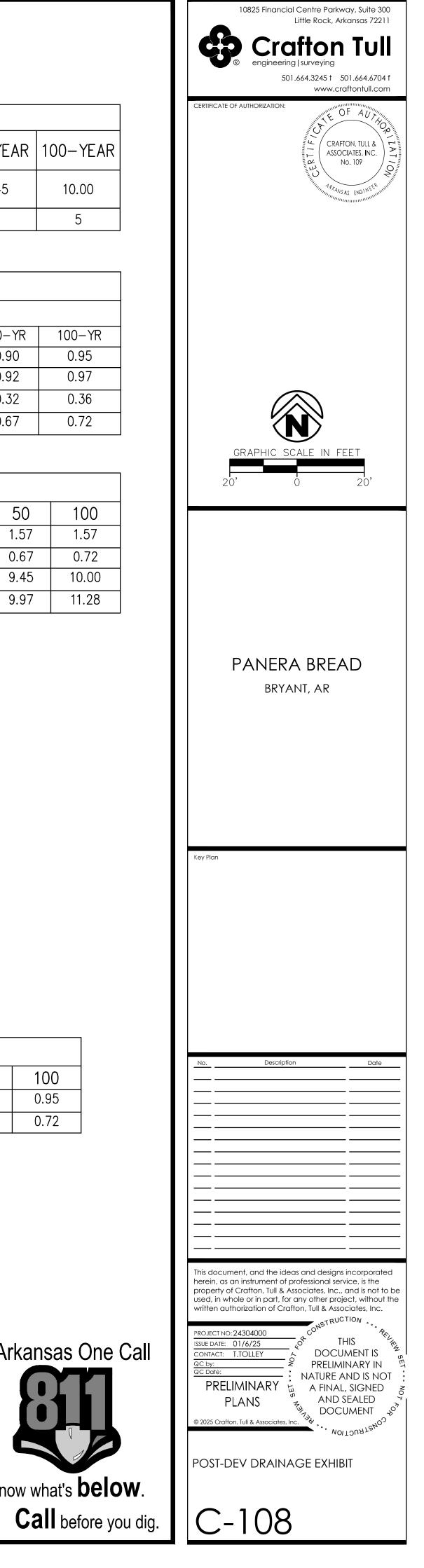
CONCRETE PAVED/BUILDING

PAVED/ASPHALT

HANGE IN C (RUNOFF COEFFICIENT)	
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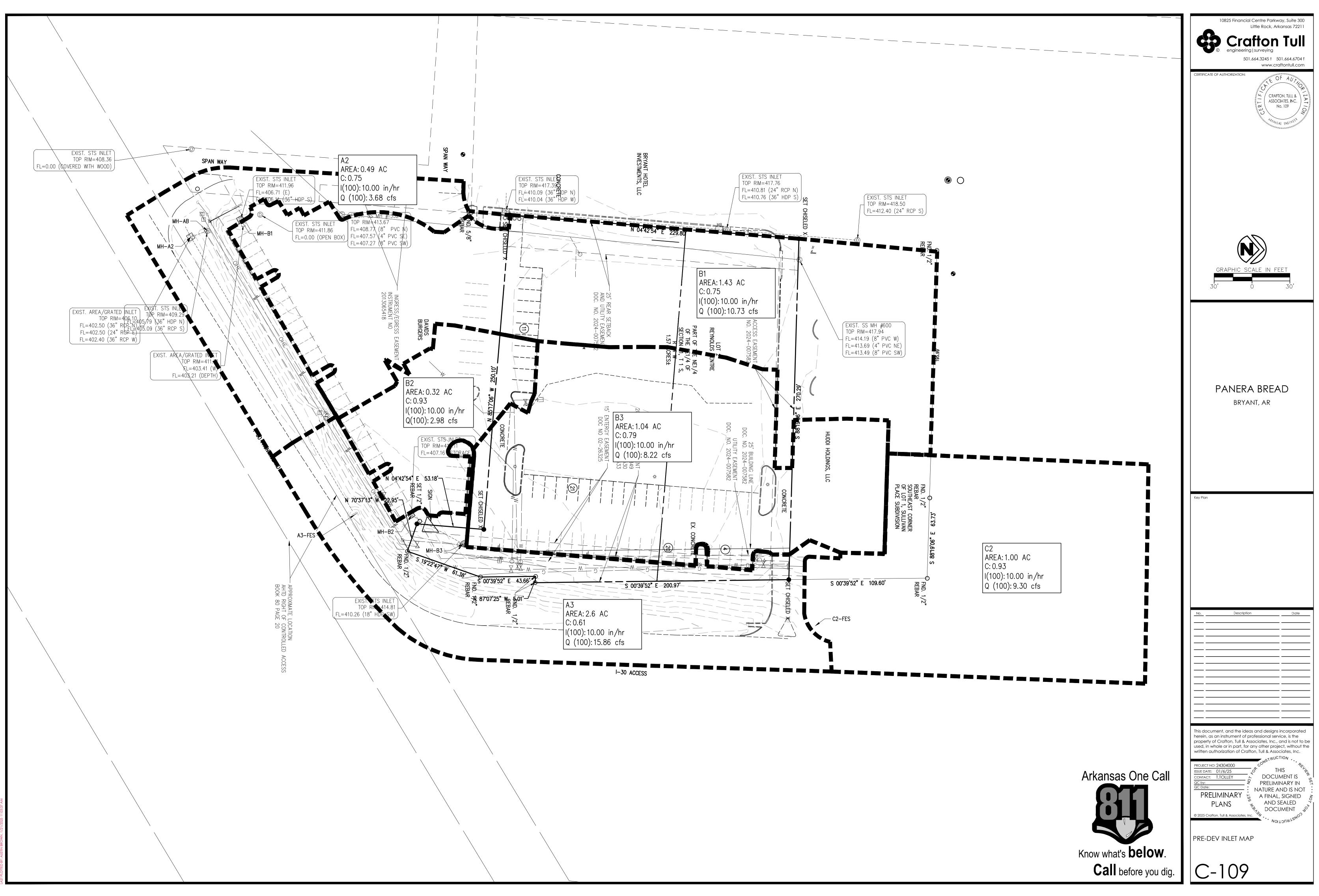
	2	5	10	25	50	100
THERS)	_	_	0.90	0.93	_	0.95
V	0.53	0.56	0.59	0.64	0.67	0.72





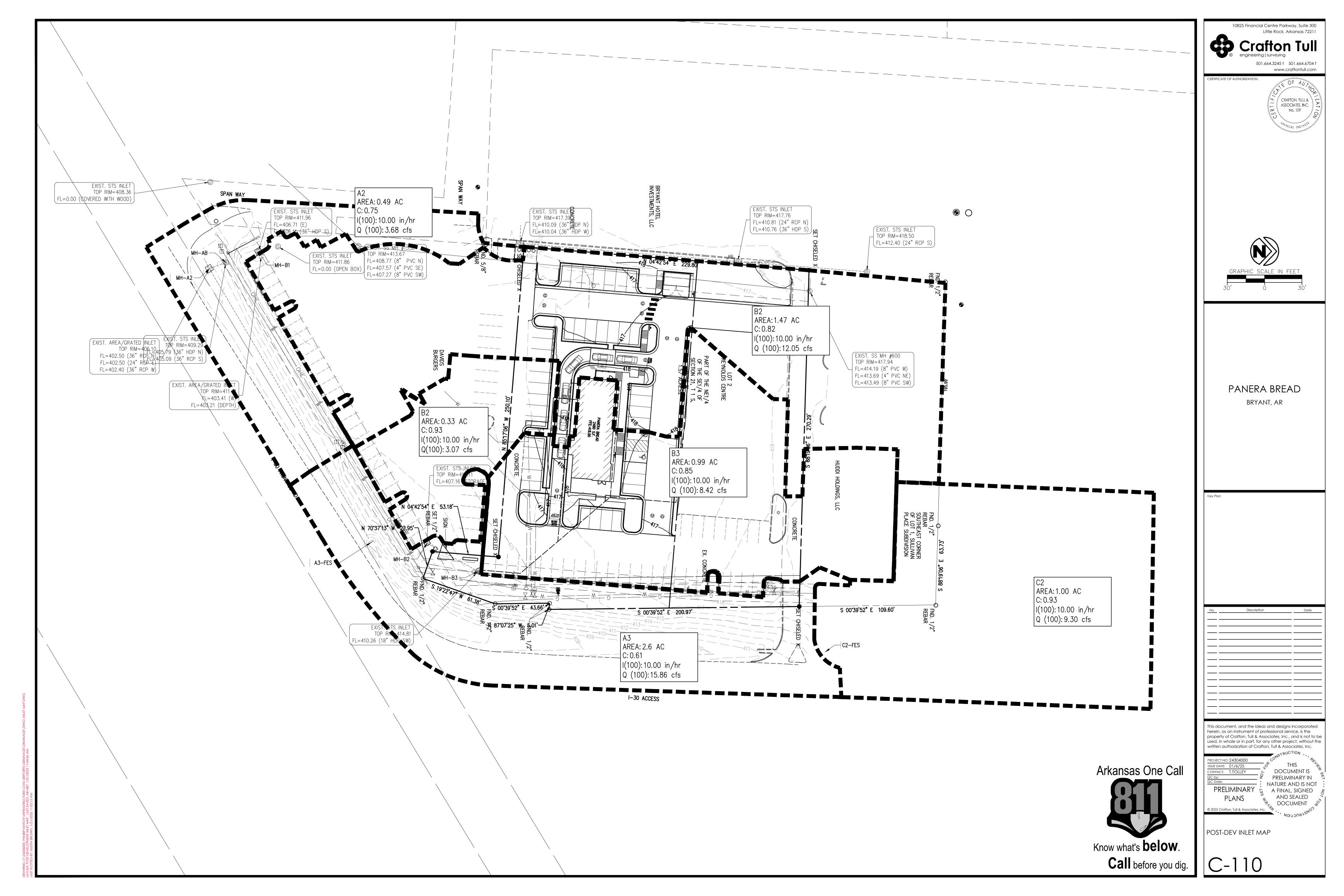
# PREDEVELOPMENT INLET AREA MAP





# POST DEVELOPMENT INLET AREA MAP





# INLET CALCULATIONS





Job Description:	Panera Bryant	Date:	January 16, 2024
CTA Job Number:	24304000	By:	Austin Brown, El

### CATCH BASINS IN A SUMP: DESIGN (10 - YEAR STORM EVENT)

	INLET	INLET	AREA	TYPE OF	AREA	С	TOTAL	*	RUNOFF	CARRY-OVER	TOTAL	INLET	AREA	**	**	DEPTH	DEPTH	RDWY	SPREAD	SPREAD	TOTAL
	NUMBER	LOCATION	Тс	INLET	(ac)		Тс	I.	AT INLET	FROM	FLOW	LENTGTH	OPENING	CAPAC.	CAPAC	AT CURB	AT GRATE	CROSS	AT	AT	RUNOFF
			(min)				(min)	(in/hr)	(CA)	UPSTREAM	Qt	(ft)	(sf^2)	Qp	Qp	d	d	SLOPE	INLET	GRATE	(CA)
										INLET	(cfs)			(cfs)	(cfs)	(ft)	(ft)	(ft/ft)	(ft)	(ft)	1
										(CA)				CURB	GRATE						
1	B1	Post-develop	5	Curb	0.99	0.85	5	7.58	0.84		6.38	6		6.4	0.0	0.50	0.00	0.0200	25.04	0.00	0.84
2	B2	Post-develop	5	Curb	0.33	0.93	5	7.58	0.31		2.33	4		4.2	0.0	0.33	0.00	0.0200	16.75	0.00	0.31
3	B3	Post-develop	5	Grate	1.47	0.82	5	7.58	1.21		9.14		2.5	0.0	9.5	0.00	0.46	0.0200	0.00	23.16	1.21

\* 5 MINUTES IS THE MINIMUM TIME OF CONCENTRATION FOR CATCHMENT BASINS (10 - YEAR I = 7.34 IN/HR).

\*\* CAPACITY FOR A MAXIMUM OF 6" HEADWATER







United States Department of Agriculture



Natural Resources Conservation Service A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

# Custom Soil Resource Report for Saline County, Arkansas



## Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/? cid=nrcs142p2\_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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## **How Soil Surveys Are Made**

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



	MAP L	EGEND	)	MAP INFORMATION
Area of In	terest (AOI) Area of Interest (AOI)	000	Spoil Area	The soil surveys that comprise your AOI were mapped at 1:20,000.
	Alea of Intelest (AOI)	0	Stony Spot	
Soils	Soil Map Unit Polygons	0	Very Stony Spot	Warning: Soil Map may not be valid at this scale.
~	Soil Map Unit Lines	\$	Wet Spot	Enlargement of maps beyond the scale of mapping can cause
	Soil Map Unit Points	$\triangle$	Other	misunderstanding of the detail of mapping and accuracy of soil
_	Point Features	, <b>*</b> *:	Special Line Features	line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed
అ	Blowout	Water Fea		scale.
	Borrow Pit	~	Streams and Canals	
×	Clay Spot	Transport	Rails	Please rely on the bar scale on each map sheet for map measurements.
0	Closed Depression	~	Interstate Highways	
X	Gravel Pit	~	Source of Map:	Source of Map: Natural Resources Conservation Service Web Soil Survey URL:
0 00	Gravelly Spot	~	Major Roads	Coordinate System: Web Mercator (EPSG:3857)
0	Landfill	~	Local Roads	Maps from the Web Soil Survey are based on the Web Mercator
Ā.	Lava Flow	Backgrou		projection, which preserves direction and shape but distorts
عله	Marsh or swamp	Dackgrot	Aerial Photography	distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more
~	Mine or Quarry			accurate calculations of distance or area are required.
0	Miscellaneous Water			This product is generated from the USDA-NRCS certified data as
õ	Perennial Water			of the version date(s) listed below.
~	Rock Outcrop			Soil Survey Area: Saline County, Arkansas
+	Saline Spot			Survey Area Data: Version 21, Sep 10, 2024
0.00	Sandy Spot			Soil map units are labeled (as space allows) for map scales
-	Severely Eroded Spot			1:50,000 or larger.
0	Sinkhole			Date(s) aerial images were photographed: May 1, 2022—May
3	Slide or Slip			29, 2022
ß	Sodic Spot			The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## **Map Unit Legend**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI		
29	Tiak silt loam, 3 to 8 percent slopes	1.6	100.0%		
Totals for Area of Interest		1.6	100.0%		

## **Map Unit Descriptions**

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

## Saline County, Arkansas

## 29—Tiak silt loam, 3 to 8 percent slopes

#### **Map Unit Setting**

National map unit symbol: m06q Elevation: 70 to 570 feet Mean annual precipitation: 44 to 61 inches Mean annual air temperature: 49 to 74 degrees F Frost-free period: 185 to 230 days Farmland classification: Not prime farmland

#### **Map Unit Composition**

*Tiak and similar soils:* 100 percent *Estimates are based on observations, descriptions, and transects of the mapunit.* 

#### **Description of Tiak**

#### Setting

Landform: Interfluves Down-slope shape: Convex Across-slope shape: Linear Parent material: Loamy and clayey marine deposits

## **Typical profile**

A - 0 to 7 inches: silt loam E - 7 to 9 inches: loam Bt1 - 9 to 32 inches: clay Bt2 - 32 to 72 inches: clay

## **Properties and qualities**

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.3 inches)

#### Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 3e Hydrologic Soil Group: C/D Ecological site: F133BY002TX - Seasonally Wet Upland Hydric soil rating: No

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