



TECHNICAL MEMORANDUM

To: Arnold Knox P.E., L.S. – Director of Planning and Engineering, City of Mountain Home, AR

From: Mary Salmonsens, P.E. (AR, TX) – Kimley-Horn and Associates, Inc

CC: Mitchell Jensen, P.E. (OK, TX), CFM – Kimley-Horn and Associates, Inc.
Chris Pryor, E.I.T – Kimley-Horn and Associates, Inc.

Date: July 9, 2026

Subject: ***Drainage Study – Mountain Home Industrial, Mountain Home, AR***

On behalf of Trammell Crow Company (Client), Kimley-Horn and Associates, Inc. (Kimley-Horn) has prepared a drainage study for a proposed 14.5-acre industrial development. The subject property is located at the southeast corner of the intersection of US-412 and AR-201 in the City of Mountain Home, Arkansas (City). Per FEMA effective FIRM Panel 05005C0150E, floodplain associated with Dodd Creek is located on the property. All proposed structures are elevated 21.0' above the floodplain. Proposed improvements are not intended to impact the effective floodplain. As a result, a floodplain analysis has not been included with this project.

The drainage study was prepared to evaluate the detention volume required by the City for the proposed development of the subject property.

DETENTION ANALYSIS

Hydrology

Kimley-Horn has prepared a drainage study by evaluating the subject property in existing and proposed conditions using the rational method for the 25-year storm event as defined per City Criteria. Rainfall intensity values for the subject property were obtained from the Intensity-Duration-Frequency Curve in Section 3 of the Mountain Home, AR New Development Regulations. Time of concentration values were calculated to be consistent with the methodology from TR-55.

Existing condition drainage divides and flow patterns were determined using available 1-foot on-ground survey information and supplemented with 1-foot United States Geological Survey (USGS, 2017) lidar topography. Proposed condition drainage divides and flow patterns were determined using proposed grading plan and the site plan prepared by Kimley-Horn. Drainage patterns, outfall locations, and the proposed pond location and contours can be seen on the attached ***Existing*** and ***Proposed Drainage Area Maps***.

In existing conditions, a minor portion of the subject property (approximately 2.32 acres of the 14.45 total acres for the site) sheet flows offsite to a roadside ditch along AR-201 on the west side of the property boundary (Outfall 1). Additionally, an approximate 10.15-acre area (OFF-NORTH), north of US 412, flows through an existing 1-24" RCP system and outfalls into the roadside ditch along AR 201. The 1-24" RCP

associated with US 412 was analyzed using Bently CulvertMaster and was found to be undersized. In the 10- and 25-year storm event, approximately 9.14 cfs and 13.35 cfs overtop the northern intersection of AR 201 and US 412 respectively. The flow overtopping the intersection flows west into Dodd Creek, leaving the system. The overtopping flow from the existing US 412 system has not been accounted for at Outfall 1. Culvert calculations for the US 412 system can be seen in the attached **CulvertMaster Output**.

In proposed conditions, minor portions of the subject property continue sheet flowing in the roadside ditch offsite to the west. Additionally, as part of the improvements associated with this development, 2-24" RCP have been proposed under both access drives entering the proposed development. Per ARDOT criteria for side drains, the proposed culverts have been sized to pass the 10-year storm event. The table below shows that proposed sheet flow does not exceed existing conditions. Rational method calculations and locations of these areas and proposed culverts can be seen in the drainage area map sheets included in the attached **Existing and Proposed Drainage Area Maps**.

In existing conditions, a majority of the subject property (approximately 12.13 acres of the 14.45 total acres for the site) drains toward the southern boundary of the subject property into Dodd Creek (Outfall 2). In existing conditions, this area is open space with a runoff coefficient of 0.20. In proposed conditions, approximately 9.17 acres will be detained in a proposed pond located in the southeast corner of the site. This drainage area will be developed as an industrial warehouse with parking and some open space with a weighted proposed runoff coefficient of 0.84. Existing and Proposed Landuses can be found on the attached **Existing Landuse Workmap and Proposed Landuse Workmap**

Table 1: Outfall Comparison Table

Location	Existing			Proposed			Difference (cfs)
	Area (ac)	Weighted C	Q ₂₅ (cfs)	Area (ac)	Weighted C	Q ₂₅ (cfs)	
Outfall 1	18.04	0.46	44.78 ¹	17.99	0.46	44.61 ¹	-0.16
Outfall 2	13.31	0.20	16.80	13.37	0.70	16.61 ²	-0.19

¹The overtopping flow (13.35 cfs) from the existing 1-24" RCP in US 412 System is assumed to flow west out of the system and is not accounted for at Outfall 1 and has been subtracted out.

² Proposed Q₂₅ flows for Outfall 2 consists of the outfall of the proposed pond and a 4.20-acre bypass area.

Detailed runoff calculations can be seen in the attached **Modified Rational Method Detention Calculations**.

Proposed Detention

For the detention analysis of this drainage study, the proposed pond was sized for the 25-year storm event with a proposed release rate that is less than the existing condition flow rate at Outfall 2. The resulting proposed pond volume provides 2.12 ac-ft of storage and was calculated using the modified rational method. The pond outfall pipe is proposed to be one 10" orifice restrictor plate on a 24" RCP. The discharge rating curve is based on the proposed outfall structure detailed in the attached **Modified Rational Method Detention Calculations**, developed using weir and orifice equations. Detailed calculations and design

specifications of the pond can be seen on the ***Modified Rational Method Detention Calculations*** and ***Proposed Pond Construction Plans*** that are attached to this memo.

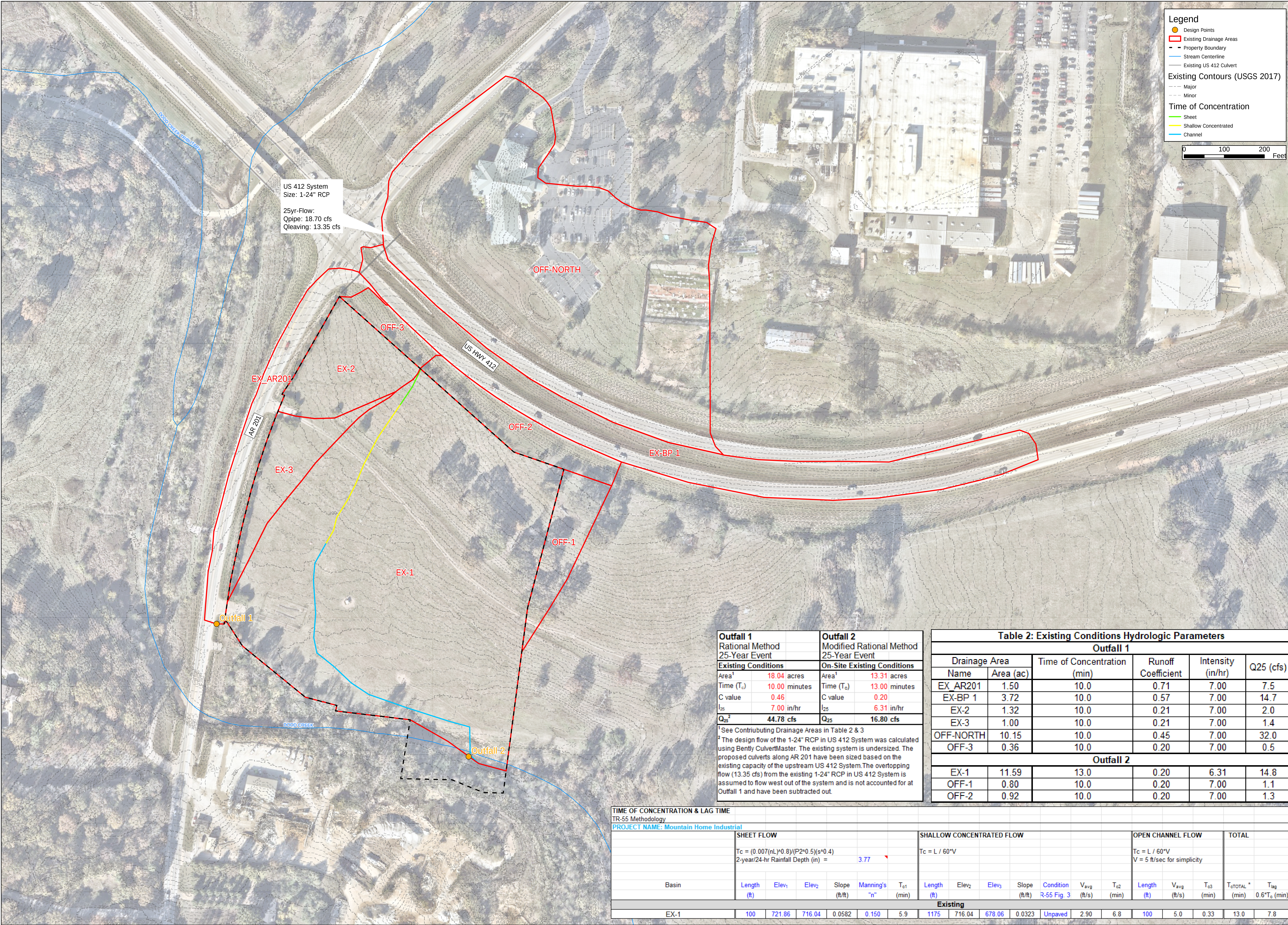
An emergency spillway has been sized to convey the undetained 100-year event inflow for the proposed pond. Emergency spillway calculations can be found in the attached ***Modified Rational Method Detention Calculations***.

Conclusion

Kimley-Horn has sized one detention facility to reduce proposed peak flow rates to existing rates at both identified outfalls of the subject property. Adverse impacts are not anticipated downstream of the proposed industrial development. As a result of this analysis, Kimley Horn requests the City's concurrence that proposed drainage design is adequate in support of the Civil Construction plans.

Attachments

- 1 – Existing Drainage Area Map
- 2 – Proposed Drainage Area Map
- 3 – Existing Landuse Workmap
- 4 – Proposed Landuse Workmap
- 5 – Modified Rational Method Detention Calculations
- 6 – CulvertMaster Output
- 7 – Proposed Pond Construction Plans



US 412 System
Size: 1-24" RCP

25yr-Flow:
Qpipe: 18.70 cfs
Qleaving: 13.35 cfs

Legend

- Design Points
- Existing Drainage Areas
- Property Boundary
- Stream Centerline
- Existing US 412 Culvert

Existing Contours (USGS 2017)

- Major
- Minor

Time of Concentration

- Sheet
- Shallow Concentrated
- Channel

0100200

Feet

Outfall 1		Outfall 2	
Rational Method		Modified Rational Method	
25-Year Event		25-Year Event	
Existing Conditions		On-Site Existing Conditions	
Area ¹	18.04 acres	Area ¹	13.31 acres
Time (T _c)	10.00 minutes	Time (T _c)	13.00 minutes
C value	0.46	C value	0.20
I ₂₅	7.00 in/hr	I ₂₅	6.31 in/hr
Q ₂₅ ²	44.78 cfs	Q ₂₅	16.80 cfs

¹ See Contributing Drainage Areas in Table 2 & 3
² The design flow of the 1-24" RCP in US 412 System was calculated using Bentley CulvertMaster. The existing system is undersized. The proposed culverts along AR 201 have been sized based on the existing capacity of the upstream US 412 System. The overtopping flow (13.35 cfs) from the existing 1-24" RCP in US 412 System is assumed to flow west out of the system and is not accounted for at Outfall 1 and have been subtracted out.

Table 2: Existing Conditions Hydrologic Parameters					
Outfall 1					
Drainage Area		Time of Concentration	Runoff	Intensity	Q25 (cfs)
Name	Area (ac)	(min)	Coefficient	(in/hr)	
EX_AR201	1.50	10.0	0.71	7.00	7.5
EX-BP 1	3.72	10.0	0.57	7.00	14.7
EX-2	1.32	10.0	0.21	7.00	2.0
EX-3	1.00	10.0	0.21	7.00	1.4
OFF-NORTH	10.15	10.0	0.45	7.00	32.0
OFF-3	0.36	10.0	0.20	7.00	0.5

Outfall 2					
EX-1	11.59	13.0	0.20	6.31	14.8
OFF-1	0.80	10.0	0.20	7.00	1.1
OFF-2	0.92	10.0	0.20	7.00	1.3

TIME OF CONCENTRATION & LAG TIME																	
TR-55 Methodology																	
PROJECT NAME: Mountain Home Industrial																	
SHEET FLOW									SHALLOW CONCENTRATED FLOW						OPEN CHANNEL FLOW		
Tc = (0.007(nL) ^{0.8})/(P ² ^{0.5} (s ^{0.4}))									Tc = L / 60*V						Tc = L / 60*V		
2-year/24-hr Rainfall Depth (in) = 3.77															V = 5 ft/sec for simplicity		
Basin	Length (ft)	Elev ₁	Elev ₂	Slope (ft/ft)	Manning's "n"	T _{c1} (min)	Length (ft)	Elev ₂	Elev ₃	Slope (ft/ft)	Condition	V _{avg} (ft/s)	T _{c2} (min)	Length (ft)	V _{avg} (ft/s)	T _{c3} (min)	T _c TOTAL * (min)
Existing																	
EX-1	100	721.86	716.04	0.0582	0.150	5.9	1175	716.04	678.06	0.0323	Unpaved	2.90	6.8	100	5.0	0.33	13.0
																T _{lag} 0.6*T _c (min)	7.8

DESIGN: CNP

DRAWN: CNP

REVIEW: MDJ

Kimley»Horn

1800 S 52ND ST SUITE 201

ROGERS, AR 72758

PHONE: 479-974-1263

CERTIFICATE OF AUTHORITY - ENGINEERING 51

PRELIMINARY

FOR REVIEW ONLY

NOT FOR CONSTRUCTION PURPOSES

Kimley»Horn

Engineers: MARY K. SALLIARD/2025

P.E. No.: 21284 Date: 07/05/2025

N

1 inch = 100 feet

MOUNTAIN HOME INDUSTRIAL

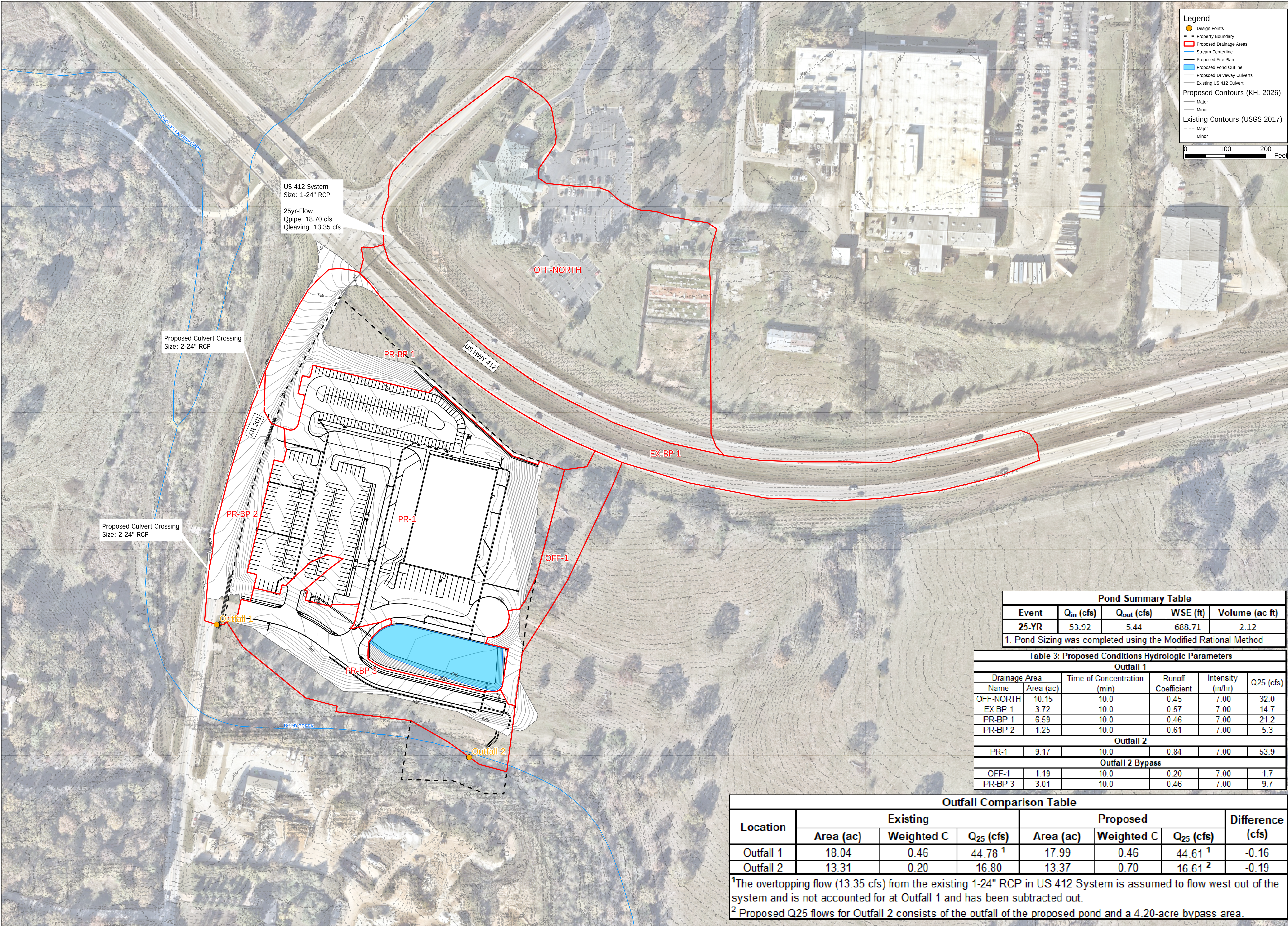
Mountain Home, Arkansas

EXISTING DRAINAGE AREA MAP

DATE: JULY 2026

PROJECT NO.: 064587901

SHEET NUMBER: 1



US 412 System
Size: 1-24" RCP

25yr-Flow:
Qpipe: 18.70 cfs
Qleaving: 13.35 cfs

Proposed Culvert Crossing
Size: 2-24" RCP

Proposed Culvert Crossing
Size: 2-24" RCP

Pond Summary Table				
Event	Q _{in} (cfs)	Q _{out} (cfs)	WSE (ft)	Volume (ac-ft)
25-YR	53.92	5.44	688.71	2.12

1. Pond Sizing was completed using the Modified Rational Method

Table 3: Proposed Conditions Hydrologic Parameters					
Outfall 1					
Drainage Area		Time of Concentration (min)	Runoff Coefficient	Intensity (in/hr)	Q ₂₅ (cfs)
Name	Area (ac)				
OFF-NORTH	10.15	10.0	0.45	7.00	32.0
EX-BP 1	3.72	10.0	0.57	7.00	14.7
PR-BP 1	6.59	10.0	0.46	7.00	21.2
PR-BP 2	1.25	10.0	0.61	7.00	5.3
Outfall 2					
PR-1	9.17	10.0	0.84	7.00	53.9
Outfall 2 Bypass					
OFF-1	1.19	10.0	0.20	7.00	1.7
PR-BP 3	3.01	10.0	0.46	7.00	9.7

Outfall Comparison Table							
Location	Existing			Proposed			Difference (cfs)
	Area (ac)	Weighted C	Q ₂₅ (cfs)	Area (ac)	Weighted C	Q ₂₅ (cfs)	
Outfall 1	18.04	0.46	44.78 ¹	17.99	0.46	44.61 ¹	-0.16
Outfall 2	13.31	0.20	16.80	13.37	0.70	16.61 ²	-0.19

¹The overtopping flow (13.35 cfs) from the existing 1-24" RCP in US 412 System is assumed to flow west out of the system and is not accounted for at Outfall 1 and has been subtracted out.

² Proposed Q₂₅ flows for Outfall 2 consists of the outfall of the proposed pond and a 4.20-acre bypass area.

DESIGN: CNP
DRAWN: CNP
REVIEW: MDJ

Kimley»Horn

1800 S 52ND ST SUITE 201
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PHONE: 479-974-1263
CERTIFICATE OF AUTHORITY - ENGINEERING 51

PRELIMINARY

FOR REVIEW ONLY
NOT FOR CONSTRUCTION PURPOSES

Kimley»Horn

Figure: MOUNTAIN HOME INDUSTRIAL
P & M: 2/2/24 Date: 07/26/2024

N

1 inch = 100 feet

MOUNTAIN HOME INDUSTRIAL
Mountain Home, Arkansas

PROPOSED DRAINAGE AREA MAP

DATE
JULY 2026

PROJECT NO.
064587901

SHEET NUMBER
2

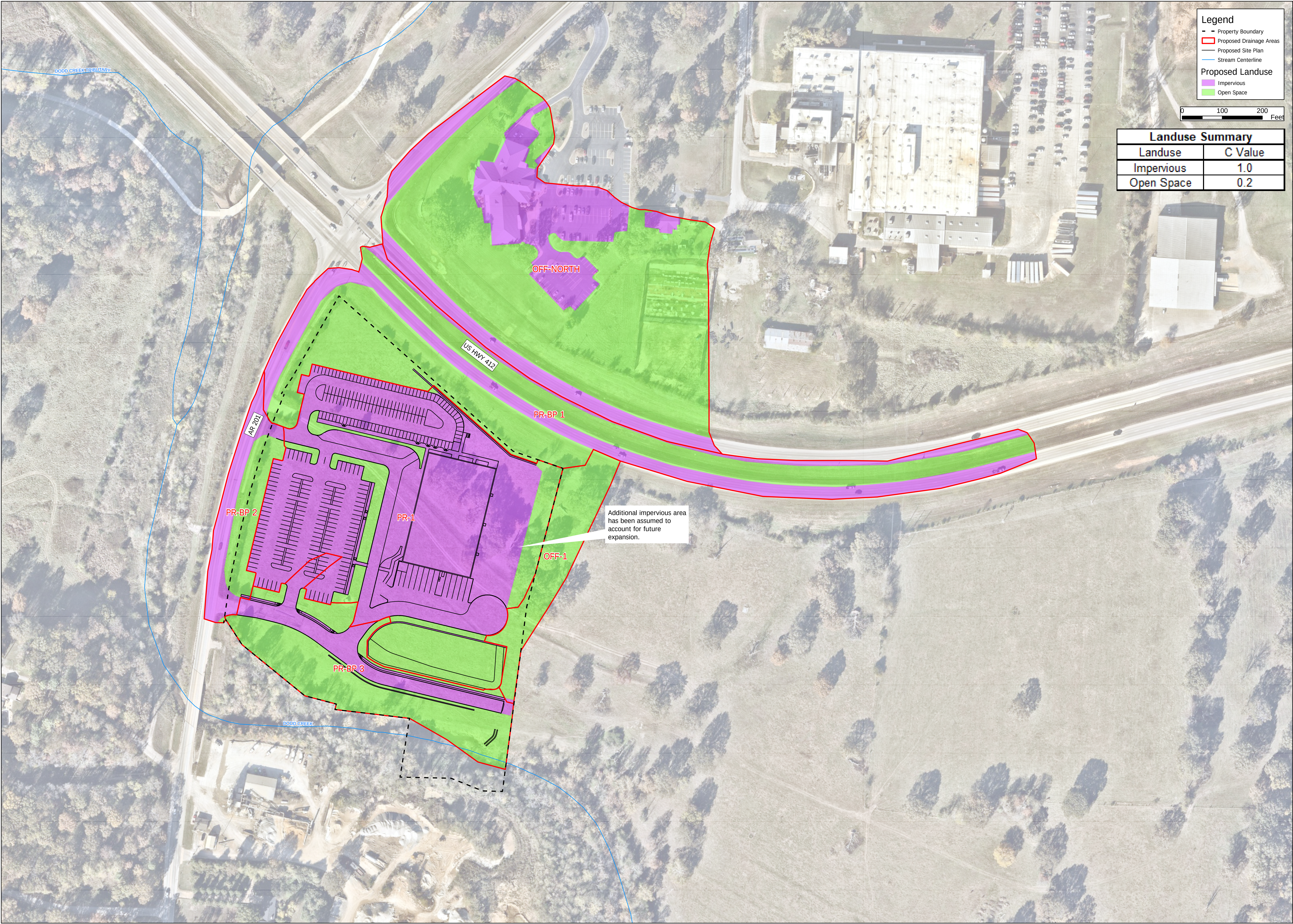


Table 1: Modified Rational Method Input Summary							
Existing Conditions				Proposed Conditions			
Drainage Area		Time of Concentration (min)	Runoff Coefficient	Drainage Area		Time of Concentration (min)	Runoff Coefficient
Name	Area (ac)			Name	Area (ac)		
Outfall 1	18.04	10.0	0.46	Outfall 1	17.99	10.0	0.46
Outfall 2	13.31	13.0	0.20	Outfall 2 Detained	9.17	10.0	0.84
Bypass	-	-	-	Outfall 2 Bypass	4.20	10.0	0.38

Table 2: Existing Conditions Hydrologic Parameters					
Outfall 1					
Drainage Area		Time of Concentration (min)	Runoff Coefficient	Intensity (in/hr)	Q25 (cfs)
Name	Area (ac)				
EX_AR201	1.50	10.0	0.71	7.00	7.5
EX-BP 1	3.72	10.0	0.57	7.00	14.7
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Outfall 2					
PR-1	9.17	10.0	0.84	7.00	53.9
Outfall 2 Bypass					
OFF-1	1.19	10.0	0.20	7.00	1.7
PR-BP 3	3.01	10.0	0.46	7.00	9.7

Outfall 1 Drainage

Rational Method

25-Year Event

Existing Conditions	
Area ¹	18.04 acres
Time (T _c)	10.0 minutes
C value	0.46
I ₂₅	7.00 in/hr
Q ₂₅ ²	44.78 cfs

Proposed Conditions	
Area ¹	17.99 acres
Time (T _c)	10.0 minutes
C value	0.46
I ₂₅	7.00 in/hr
Q ₂₅ ²	44.61 cfs

44.78 cfs

44.61 cfs

Allowable Release

Actual Release

¹ See Contributing Drainage Areas in Table 2 & 3

² The design flow of the 1-24" RCP in US 412 System was calculated using Bently CulvertMaster. The existing system is undersized. The proposed culverts along AR 201 have been sized based on the existing capacity of the upstream US 412 System. The overtopping flow (13.35 cfs) from the existing 1-24" RCP in US 412 System is assumed to flow west out of the system and is not accounted for at Outfall 1

Mountain Home Industrial Detention Calculations				
Outfall 2				
Modified Rational Method				
25-Year Event				
On-Site Existing Conditions				
Area ¹	13.31	acres		
Time (T _c)	13.00	minutes		
C value	0.20			
I ₂₅	6.31	in/hr		
Q ₂₅	16.80	cfs		
	16.8 cfs	Existing Runoff		
	11.17 cfs	Proposed Bypass		
	5.63 cfs	Allowable Detention Release		
	5.44 cfs	Actual Detention Release*		
¹ See Contriubuting Drainage Areas in Table 2				
² See Contriubuting Drainage Areas in Table 3				
*Determined using weir and orifice equations				
Proposed Detained Area			Proposed Bypass Area	
Area ²	9.17	acres	Area	4.20 acres
Time (T _c)	10.00	minutes	Time (T _c)	10.00 minutes
K	1.00		C value	0.38
C value	0.84		I ₂₅	7.00 in/hr
I ₂₅	7.00	in/hr	Q ₂₅	11.17 cfs
Q ₂₅	53.9	cfs	Developed Runoff	
Runoff per Storm Event - Developed				
Time (min.)	I ₂₅	K*C	Area (ac)	Runoff (cfs)
5	8.71	0.84	9.17	67.13
10	7.00	0.84	9.17	53.95
15	5.94	0.84	9.17	45.75
20	5.20	0.84	9.17	40.08
30	4.24	0.84	9.17	32.62
40	3.62	0.84	9.17	27.87
50	3.18	0.84	9.17	24.53
60	2.86	0.84	9.17	22.03
70	2.61	0.84	9.17	20.08
80	2.40	0.84	9.17	18.51
90	2.23	0.84	9.17	17.21
100	2.09	0.84	9.17	16.12
110	1.97	0.84	9.17	15.18
120	1.87	0.84	9.17	14.37
130	1.77	0.84	9.17	13.66
140	1.69	0.84	9.17	13.03
150	1.62	0.84	9.17	12.46
160	1.55	0.84	9.17	11.96
180	1.44	0.84	9.17	11.08
200	1.34	0.84	9.17	10.35
220	1.26	0.84	9.17	9.73
240	1.19	0.84	9.17	9.19
260	1.13	0.84	9.17	8.72
280	1.08	0.84	9.17	8.31
300	1.03	0.84	9.17	7.94
320	0.99	0.84	9.17	7.61
340	0.95	0.84	9.17	7.31
360	0.91	0.84	9.17	7.04
380	0.88	0.84	9.17	6.79
400	0.85	0.84	9.17	6.56
420	0.82	0.84	9.17	6.35
440	0.80	0.84	9.17	6.16
460	0.78	0.84	9.17	5.98
480	0.75	0.84	9.17	5.81
Inflow per Storm Event				
Storm Event	Runoff (cfs)	Inflow (ft ³)		
5	67.13	20,139		
10	53.95	32,372		
15	45.75	41,178		
20	40.08	48,093		
30	32.62	58,720		
40	27.87	66,879		
50	24.53	73,576		
60	22.03	79,301		
70	20.08	84,332		
80	18.51	88,838		
90	17.21	92,935		
100	16.12	96,701		
110	15.18	100,193		
120	14.37	103,456		
130	13.66	106,523		
140	13.03	109,420		
150	12.46	112,168		
160	11.96	114,785		
180	11.08	119,681		
200	10.35	124,195		
220	9.73	128,395		
240	9.19	132,328		
260	8.72	136,033		
280	8.31	139,540		
300	7.94	142,872		
320	7.61	146,051		
340	7.31	149,092		
360	7.04	152,010		
380	6.79	154,815		
400	6.56	157,519		
420	6.35	160,129		
440	6.16	162,653		
460	5.98	165,098		
480	5.81	167,470		

Outflow per Storm Event			
Storm	Time	Release	Outflow (ft ³)
5	15	5.44	2,448
10	20	5.44	3,264
15	25	5.44	4,080
20	30	5.44	4,896
30	40	5.44	6,528
40	50	5.44	8,160
50	60	5.44	9,792
60	70	5.44	11,424
70	80	5.44	13,056
80	90	5.44	14,688
90	100	5.44	16,321
100	110	5.44	17,953
110	120	5.44	19,585
120	130	5.44	21,217
130	140	5.44	22,849
140	150	5.44	24,481
150	160	5.44	26,113
160	170	5.44	27,745
180	190	5.44	31,009
200	210	5.44	34,273
220	230	5.44	37,537
240	250	5.44	40,801
260	270	5.44	44,065
280	290	5.44	47,330
300	310	5.44	50,594
320	330	5.44	53,858
340	350	5.44	57,122
360	370	5.44	60,386
380	390	5.44	63,650
400	410	5.44	66,914
420	430	5.44	70,178
440	450	5.44	73,442
460	470	5.44	76,707
480	490	5.44	79,971
Detention Volume			
Storm	Inflow	Outflow	Storage (ft ³)
5	20,139	2,448	17,691
10	32,372	3,264	29,108
15	41,178	4,080	37,098
20	48,093	4,896	43,197
30	58,720	6,528	52,192
40	66,879	8,160	58,718
50	73,576	9,792	63,783
60	79,301	11,424	67,877
70	84,332	13,056	71,275
80	88,838	14,688	74,150
90	92,935	16,321	76,614
100	96,701	17,953	78,748
110	100,193	19,585	80,609
120	103,456	21,217	82,239
130	106,523	22,849	83,674
140	109,420	24,481	84,939
150	112,168	26,113	86,055
160	114,785	27,745	87,040
180	119,681	31,009	88,672
200	124,195	34,273	89,922
220	128,395	37,537	90,857
240	132,328	40,801	91,526
260	136,033	44,065	91,967
280	139,540	47,330	92,210
300	142,872	50,594	92,279
320	146,051	53,858	92,194
340	149,092	57,122	91,971
360	152,010	60,386	91,624
380	154,815	63,650	91,165
400	157,519	66,914	90,604
420	160,129	70,178	89,950
440	162,653	73,442	89,211
460	165,098	76,707	88,392
480	167,470	79,971	87,500

Pond Summary Table				
Event	Q _{in} (cfs)	Q _{out} (cfs)	WSE (ft)	Volume (ac-ft)
25-YR	53.92	5.44	688.71	2.12
1. Pond Sizing was completed using the Modified Rational Method				

Pond Elevation Area Table		
Elevation (ft)	Area (ac)	Volume (ac-ft)
684.00	0.00	0.00
684.50	0.06	0.01
685.00	0.18	0.07
685.50	0.32	0.20
686.00	0.46	0.39
686.50	0.57	0.65
687.00	0.65	0.96
687.50	0.67	1.28
688.00	0.68	1.62
688.50	0.70	1.97
689.00	0.72	2.32
689.50	0.74	2.69
689.80	0.75	2.91

Pond Discharge Rating Curve	
Elevation (ft)	Outfall Discharge (cfs)
684.00	0.00
684.50	0.76
685.00	2.00
685.50	2.73
686.00	3.30
686.50	3.79
687.00	4.22
687.50	4.61
688.00	4.97
688.50	5.30
689.00	5.62
689.50	5.92
689.80	6.09
1. Pond Discharge Rating Curve was completed using weir and orifice equations. Outfall 1 consists of 1 – 10" orifice @ invert 684.0'.	

Proposed Emergency Overflow	
Area	9.17 acres
Time (T _c)	10.0 minutes
C value	0.84
I ₁₀₀	8.50 in/hr
Q ₁₀₀	65.47 cfs

Emergency Overflow		
Q ₁₀₀	65.5	cfs
H	1.00	ft
C	3.0	
L _{REQUIRED}	21.8	ft
L _{PROVIDED}	40	ft
Invert	689.8	ft

CulvertMaster Output

US 412 System (25-YR)

Existing Condition US 412 Rational Method Calculations		
Contributing Drainage Areas	OFF-NORTH	
Area	10.15	acres
Time (T _c) ¹	10.0	minutes
C value	0.45	
I ₂₅	7.00	in/hr
Q ₂₅	32.0	cfs
Q _{25_Capacity} ²	18.70	cfs
Q _{overtop}	13.35	cfs
1. T _c assumed to be a minimum of 10 minutes		
2. The capacity of the 1-24" RCP in US 412 System was calculated using Bentley CulvertMaster. The existing system is undersized. The proposed culverts along AR 201 have been sized based on the existing capacity of the upstream US 412 System.		

Culvert Designer/Analyzer - US 412 Crossing 25-YR

Watershed | Headwater | Tailwater | Grades |

Method: Peak Discharge

Peak Discharge

Design: 32.00 cfs

Check: 32.00 cfs

Design | Output | Solve All | Design Storm | Notes... | Close | Help

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-24 inch Circular	18.70 cfs	717.06 ft	8.60 ft/s
Weir	Roadway (Constant Elevation)	13.35 cfs	717.06 ft	N/A
Total		32.05 cfs	717.06 ft	N/A

Culvert Component - US 412 Crossing 25-YR: Culvert-1

Section

Shape: Circular

Material: Concrete

Size: 24 inch

Number: 1

Mannings: 0.013

Inlet

Entrance: Beveled ring, 45° bevels

Ke: 0.20

Inverts

Solve For: Slope

Invert Upstream: 714.53 ft

Invert Downstream: 712.88 ft

Length: 140.00 ft

Slope: 0.011786 ft/ft

Headwater Elevations

Computed Headwater: 717.06 ft

Inlet Control: 717.06 ft

Outlet Control: 717.03 ft

Exit Results

Discharge: 18.70 cfs

Velocity: 8.60 ft/s

Depth: 1.31 ft

Tailwater Elevation: N/A ft

OK | Cancel | Output... | Solve | Export... | Help

Overtopping Component - US 412 Crossing 25-YR: Overtopping

Method: Roadway (Constant Elevation)

Roadway Type

☒ Paved ☐ Gravel

Roadway (Constant Elevation)

Length: 50.00 ft

Crest Elevation: 716.86 ft

Roadway Width: 100.00 ft

Discharge: 13.35 cfs

Overtopping Coefficient: 2.96 US

Roadway (Constant Elevation)

Headwater Elevation: 717.06 ft

Discharge Coefficient (Cr): 2.96

Submergence Factor (Kt): 1.00

OK | Cancel | Output... | Solve | Help

CulvertMaster Output

US 412 System (10-YR)

Existing Condition US 412 Rational Method Calculations	
Contributing Drainage Areas	OFF-NORTH
Area	10.15 acres
Time (T _c) ¹	10.0 minutes
C value	0.45
I ₁₀	6.00 in/hr
Q ₁₀	27.4 cfs
Q _{10_Capacity} ²	18.3 cfs
Q _{overtop}	9.1 cfs

1. T_c assumed to be a minimum of 10 minutes

2. The capacity of the 1-24" RCP in US 412 System was calculated using Bentley CulvertMaster. The existing system is undersized. The proposed culverts along AR 201 have been sized based on the existing capacity of the upstream US 412 System.

Culvert Designer/Analyzer - US 412 Crossing 10-YR

Watershed | Headwater | Tailwater | Grades

Method: Peak Discharge

Peak Discharge

Design: 27.40 cfs

Check: 27.40 cfs

Design | Output | Solve All | Design Storm

Notes... | Close | Help

Analysis

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-24 inch Circular	18.30 cfs	717.02 ft	8.57 ft/s
Weir	Roadway (Constant Elevation)	9.14 cfs	717.02 ft	N/A
Total		27.45 cfs	717.02 ft	N/A

Culvert Component - US 412 Crossing 10-YR: Culvert-1

Section

Shape: Circular

Material: Concrete

Size: 24 inch

Number: 1

Mannings: 0.013

Inlet

Entrance: Beveled ring, 45° bevels

Ke: 0.20

Inverts

Solve For: Slope

Invert Upstream: 714.53 ft

Invert Downstream: 712.88 ft

Length: 140.00 ft

Slope: 0.011786 ft/ft

Headwater Elevations

Computed Headwater: 717.02 ft

Inlet Control: 717.02 ft

Outlet Control: 717.00 ft

Exit Results

Discharge: 18.30 cfs

Velocity: 8.57 ft/s

Depth: 1.29 ft

Tailwater Elevation: N/A ft

OK

Cancel

Output...

Solve

Export...

Help

Overtopping Component - US 412 Crossing 10-YR: Overtopping

Method: Roadway (Constant Elevation)

Roadway Type

☒ Paved ☐ Gravel

Roadway (Constant Elevation)

Length: 50.00 ft

Crest Elevation: 716.86 ft

Roadway Width: 100.00 ft

Discharge: 9.14 cfs

Overtopping Coefficient: 2.95 US

Roadway (Constant Elevation)

Headwater Elevation: 717.02 ft

Discharge Coefficient (Cr): 2.95

Submergence Factor (Ks): 1.00

OK

Cancel

Output...

Solve

Help

CulvertMaster Output

North Culvert (10-YR)

North Culvert Rational Method Calculations	
Contributing Drainage Areas	OFF-NORTH, EX-BP 1, PR-BP 1
Area	6.54 acres
Time (T _c) ¹	10.0 minutes
C value	0.46
I ₁₀	6.00 in/hr
Q ₁₀	18.1 cfs
Q ₁₀ +Q _{10_Capacity}	36.4 cfs
1. T _c assumed to be a minimum of 10 minutes	

Culvert Designer/Analyzer - AR 201 2-24" 10-YR North Culvert

Watershed | Headwater | Tailwater | Grades

Method: Peak Discharge

Peak Discharge

Design: 36.40 cfs

Check: 36.40 cfs

Design | Analysis

Output | Solve All | Design Storm

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	2-24 inch Circular	36.41 cfs	700.88 ft	9.78 ft/s
Weir	Roadway (Constant Elevation)	0.00 cfs	700.88 ft	N/A
Total		36.41 cfs	700.88 ft	N/A

Culvert Component - AR 201 2-24" 10-YR North Culvert: Culvert-1

Section

Shape: Circular

Material: Concrete

Size: 24 inch

Number: 2

Mannings: 0.013

Inlet

Entrance: Groove end projecting

Ke: 0.50

Inverts

Solve For: Slope

Invert Upstream: 698.19 ft

Invert Downstream: 696.76 ft

Length: 80.00 ft

Slope: 0.017875 ft/ft

Headwater Elevations

Computed Headwater: 700.88 ft

Inlet Control: 700.62 ft

Outlet Control: 700.88 ft

Exit Results

Discharge: 36.41 cfs

Velocity: 9.78 ft/s

Depth: 1.15 ft

Tailwater Elevation: 698.14 ft

OK | Cancel | Output... | Solve | Export... | Help

Overtopping Component - AR 201 2-24" 10-YR North Culvert: Overtopping

Method: Roadway (Constant Elevation)

Roadway Type

☒ Paved ☐ Gravel

Roadway (Constant Elevation)

Length: 50.00 ft

Crest Elevation: 700.91 ft

Roadway Width: 20.00 ft

Discharge: 0.00 cfs

Overtopping Coefficient: 2.90 US

Roadway (Constant Elevation)

Headwater Elevation: N/A ft

Discharge Coefficient (Cr): 2.90

Submergence Factor (Kt): 1.00

OK | Cancel | Output... | Solve | Help

CulvertMaster Output

South Culvert (10-YR)

South Culvert Rational Method Calculations

Contributing Drainage Areas	OFF-NORTH, EX-BP 1, PR-BP 1, PR-BP 2
Area	1.22 acres
Time (T _c) ¹	10.0 minutes
C value	0.61
I ₁₀	6.00 in/hr
Q ₁₀	4.5 cfs
Q ₁₀ +Q _{10_Capacity}	40.8 cfs
1. T _c assumed to be a minimum of 10 minutes	

Culvert Designer/Analyzer - AR 201 2-24" 10-YR South Culvert

Watershed | Headwater | Tailwater | Grades |

Method: Peak Discharge

Peak Discharge

Design: 40.80 cfs

Check: 40.80 cfs

Design | Output | Solve All | Design Storm | Notes... | Close | Help

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	2-24 inch Circular	40.80 cfs	693.39 ft	7.48 ft/s
Weir	Roadway (Constant Elevation)	0.00 cfs	693.39 ft	N/A
Total		40.80 cfs	693.39 ft	N/A

Culvert Component - AR 201 2-24" 10-YR South Culvert: Culvert-1

Section

Shape: Circular

Material: Concrete

Size: 24 inch

Number: 2

Mannings: 0.013

Inlet

Entrance: Groove end projecting

Ke: 0.50

Inverts

Solve For: Slope

Invert Upstream: 690.49 ft

Invert Downstream: 689.52 ft

Length: 140.00 ft

Slope: 0.006929 ft/ft

Headwater Elevations

Computed Headwater: 693.39 ft

Inlet Control: 693.20 ft

Outlet Control: 693.39 ft

Exit Results

Discharge: 40.80 cfs

Velocity: 7.48 ft/s

Depth: 1.62 ft

Tailwater Elevation: 690.77 ft

OK | Cancel | Output... | Solve | Export... | Help

Overtopping Component - AR 201 2-24" 10-YR South Culvert: Overtopping

Method: Roadway (Constant Elevation)

Roadway Type

☒ Paved ☐ Gravel

Roadway (Constant Elevation)

Length: 50.00 ft

Crest Elevation: 693.70 ft

Roadway Width: 20.00 ft

Discharge: 0.00 cfs

Overtopping Coefficient: 2.90 US

Roadway (Constant Elevation)

Headwater Elevation: N/A ft

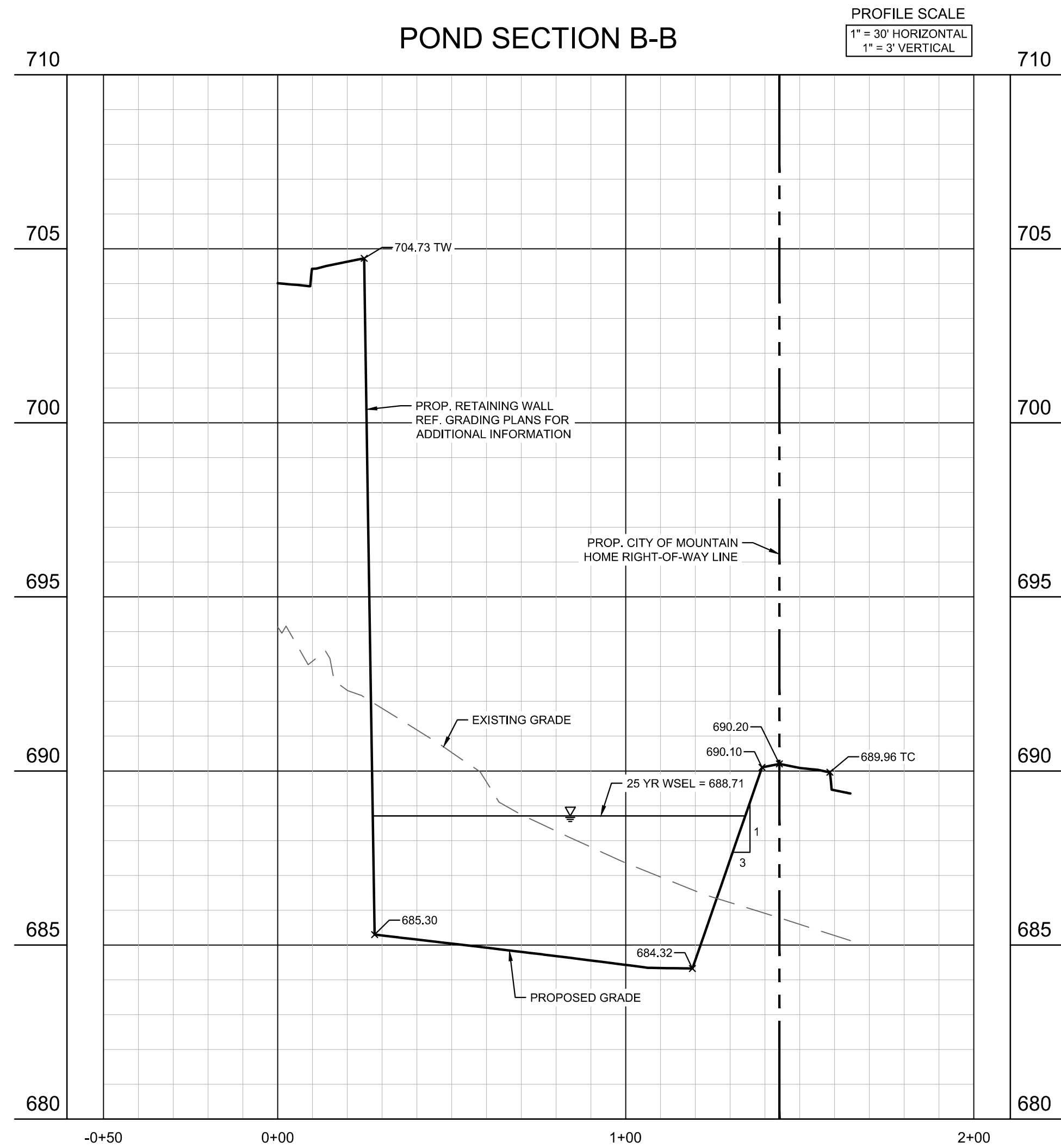
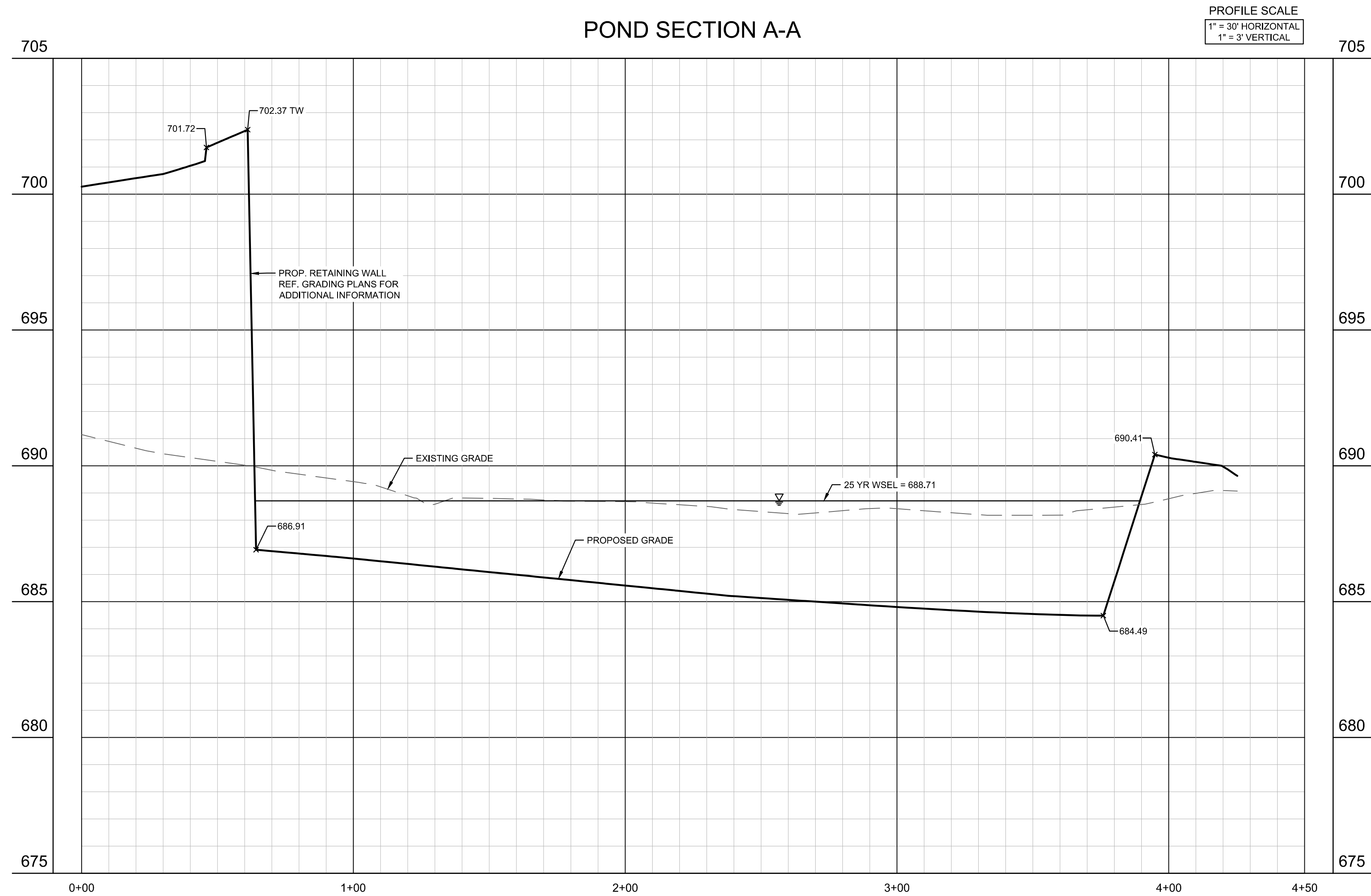
Discharge Coefficient (Cr): 2.90

Submergence Factor (Kt): 1.00

OK | Cancel | Output... | Solve | Help

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SHEET NUMBER
C-7.3

BAXTER COUNTY
ARKANSAS

CHECKED BY	MR
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PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION PURPOSES

Kimley»Hor

Engineer MARY R. SALMONSEN
P.E. No. 21284 Date 07/10/20

1800 S. 52ND STREET, SUITE 201, ROGERS, AR 72758
 PHONE: 216-505-7775
 WWW.KIMLEY-HORN.COM ARKANSAS REGISTRATION NO. 51
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