

100-YEAR EMERGENCY SPILLWAY DESIGN

100-Year Inflow Q_{100} = 116.64 cfs
100-Year WSEL = 1001.95'
Emergency Spillway Elevation = 1002.45' (0.5 ft above 100-year WSEL)
Emergency Spillway Width = 50'
 $Q = CLH^{1.5}$ 116.64 = (3.1)(50)(H)^{1.5}
Clogged 100-Year Emergency Spillway Flow Depth, H = 0.75'
Clogged 100-Year WSEL = 1003.20'
Detention Basin Berm Elevation = 1004.20' (1.0 ft above clogged 100-year WSEL)

Design Procedure Form: WQV 40 Hour Drawdown Calculations Main Worksheet

Designer: DAF
Checked By: JDC
Company: Phelps Engineering, Inc.
Date: 2/4/2022
Project: 291 and Market Street
Location: Lee's Summit MO

I. Basin Water Quality Volume

Step 1) Tributary area to EDW, A_T (ac) A_T (ac) = 4.05
Step 2) Calculate WQv using methodology in Section 6 WQv (ac-ft) = 0.26
WQv (cf) = 11,467

IIa. Water Quality Outlet Type

Step 1) Set water quality outlet type:
Type 1 = single orifice
Type 2 = perforated riser or plate
Type 3 = v-notch weir
Outlet Type = 1

Vb. Water Quality Pool Outlet, Single Orifice

Step 1) Depth of water quality volume above permanent pool, Z_{WQ} (ft) Z_{WQ} (ft) = 2.5
Step 2) Average head of water quality volume over invert of orifice, H_{WQ} (ft) H_{WQ} (ft) = 1.3
 $H_{WQ} = 0.5 * Z_{WQ}$
Step 3) Average water quality outflow rate, Q_{WQ} (cfs) Q_{WQ} (cfs) = 0.08
 $Q_{WQ} = (WQv * 43,560) / (40 * 3,600)$
Step 4) Set value of orifice discharge coefficient, C_o
 $C_o = 0.66$ when thickness of riser/weir plate is = or < orifice diameter
 $C_o = 0.80$ when thickness of riser/weir plate is > orifice diameter
 $C_o = 0.66$
Step 5) Water quality outlet orifice diameter (minimum of 4 inches), D_o (in) D_o (in) = 1.57
 $D_o = 12 * 2 * (Q_{WQ} / C_o * \pi * (2 * g * H)^{0.5})^{0.5}$
(If orifice diameter < 4 inches, use outlet type 2 or 3)
Step 6) To size outlet orifice for EDW with an irregular stage-volume relationship, use the Single Orifice Worksheet

Proposed Detention Basin Stage/Storage			
Elevation	Surface Area (sf)	Storage Volume (cf)	
996	0	0	
997	5,095	2,548	2,553
998	6,547	6,497	8,354
999	8,195	8,119	15,662
1,000	9,840	9,820	24,631
1,001	11,528	11,563	35,321
1,002	13,346	13,399	47,768
1,003	14,829	14,933	61,846

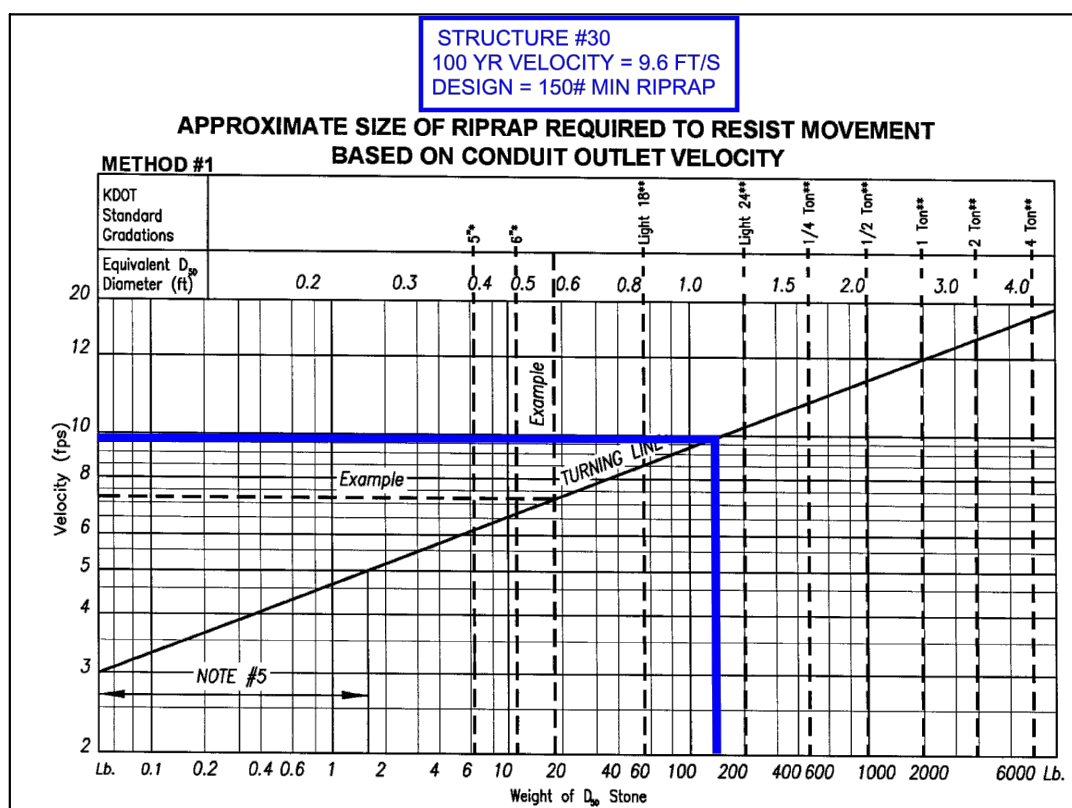
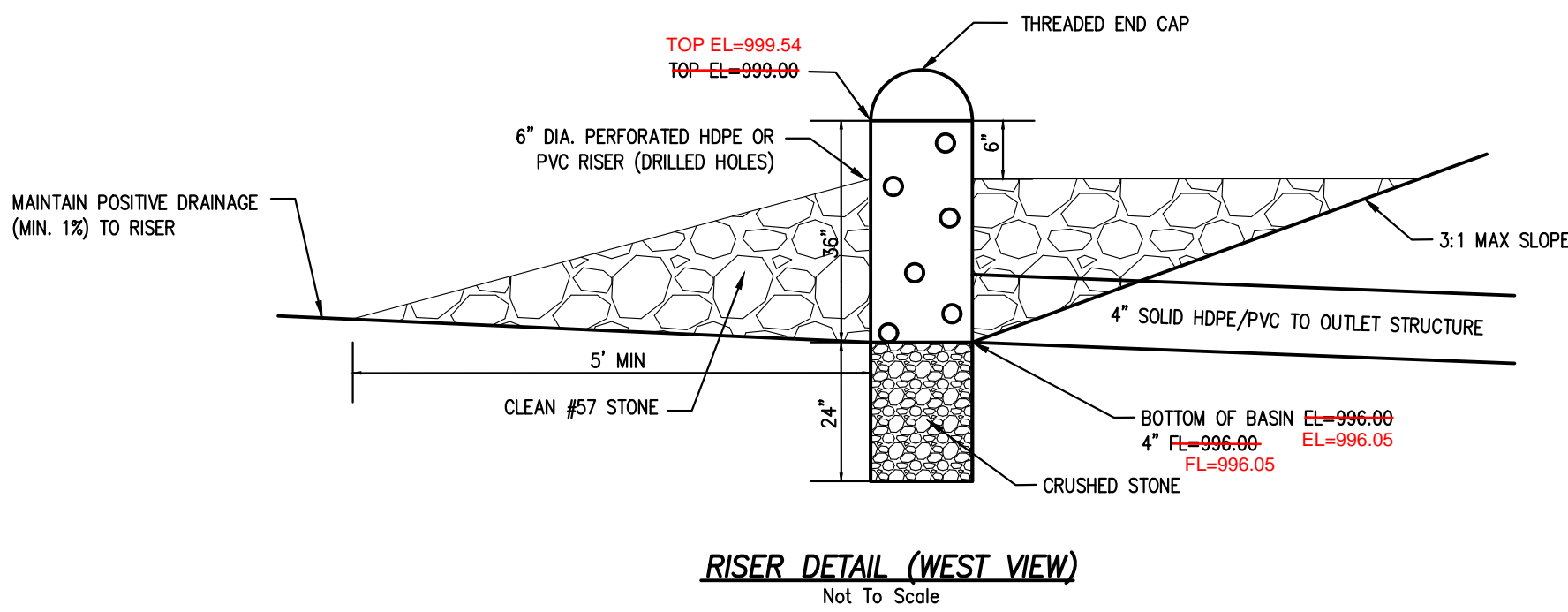
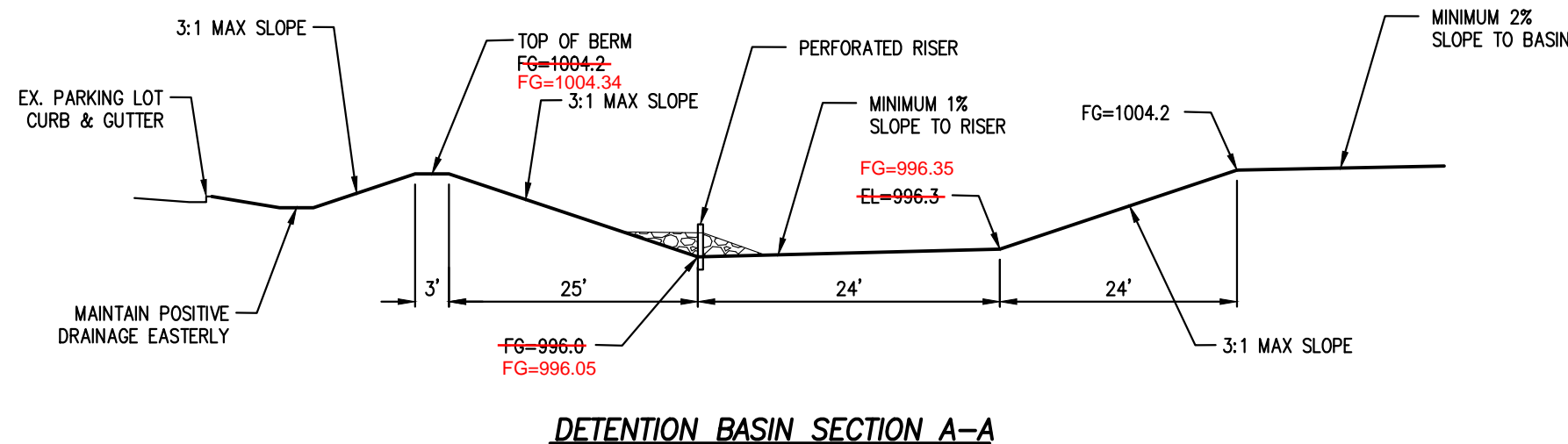
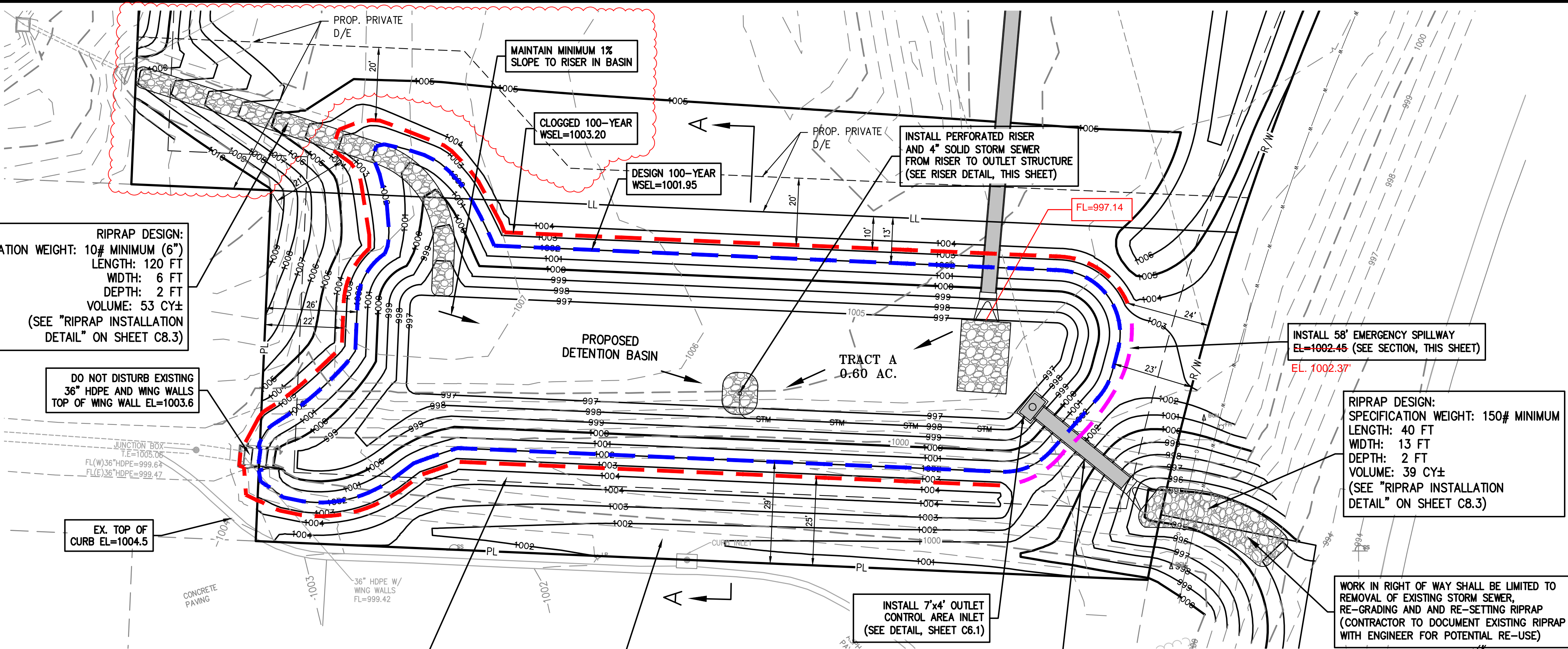
"AS-BUILT"

DATED: 11/3/22 BY: DAF

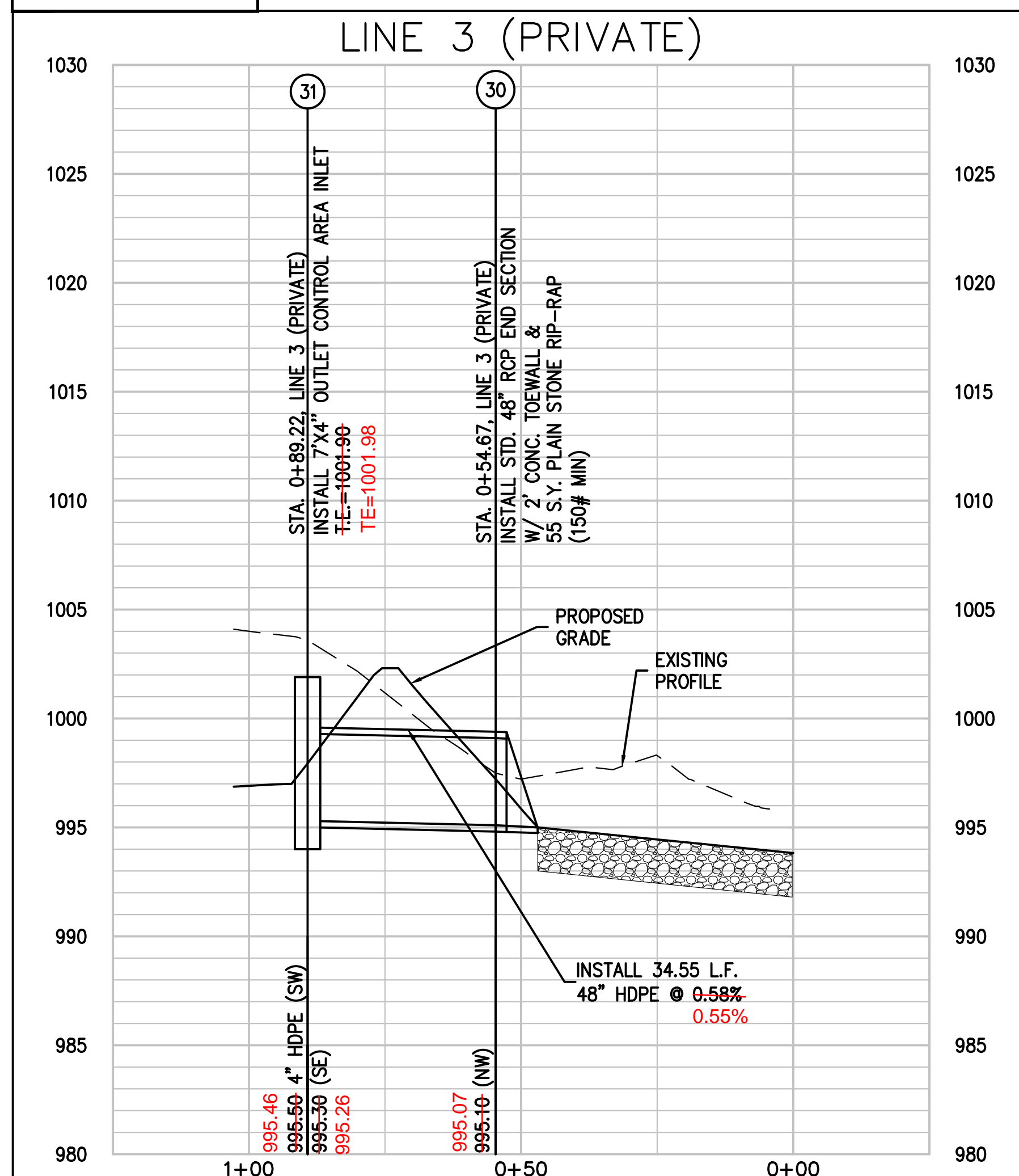
APWA Release Rate Summary						
	Site Area ¹ (acre)	Allowable Peak Rate (cfs/acre)	Allowable Peak Discharge (cfs)	Detention Outflow (cfs)	Offsite Detention Inflow (cfs) "Pass Thru"	Detention Outflow Attributed to Site (cfs)
2-Year	4.05	0.50	2.03	32.14	30.21	1.93
10-Year	4.05	2.00	8.10	55.99	47.97	8.02
100-Year	4.05	3.00	12.15	85.81	73.73	12.08

POI #1 Existing vs Proposed		
	Existing Peak Discharge (cfs)	Proposed Peak Discharge (cfs)
2-Year	37.66	33.87
10-Year	61.80	59.80
100-Year	94.73	92.26

Proposed Hydraulic Results						
	Onsite Detention Inflow (cfs)	Offsite Detention Inflow (cfs) "Pass Thru"	Total Detention Inflow (cfs)	Detention Outflow (cfs)	WSEL (ft.)	POI #1 Peak Discharge (cfs)
2-Year	16.54	30.21	46.75	32.14	1,000.04	33.87
10-Year	27.90	47.97	75.87	55.99	1,000.90	59.80
100-Year	42.91	73.73	116.64	85.81	1,001.95	92.26



SCALE: 1"=20' HORIZ.
1"= 5' VERT.



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