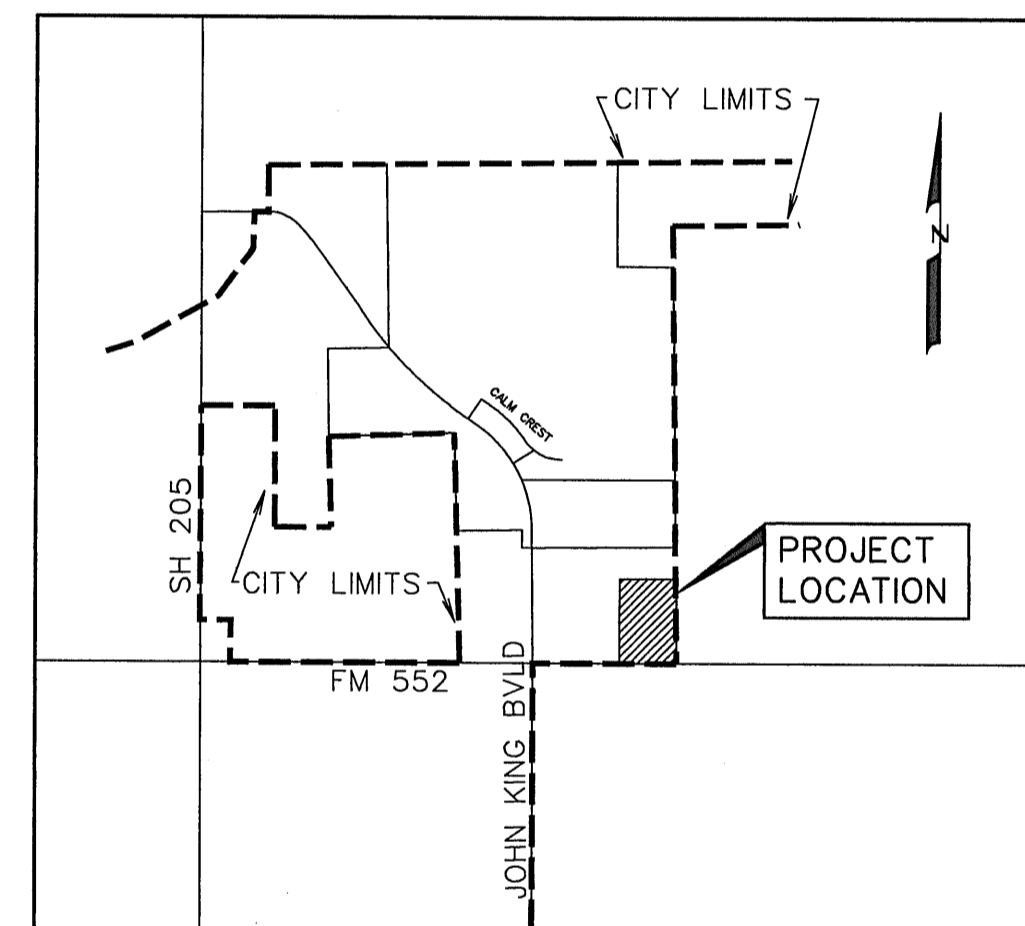


DEVELOPMENT PLANS FOR BREEZY HILL PHASE IX-A CITY OF ROCKWALL, TEXAS

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13A	FM 552 CROSS SECTIONS
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15	GRADING PLAN
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EC(3)-93	TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES CONSTRUCTION EXITS
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SETB-PD SHEET 2	SAFETY END TREATMENT FOR BOX CULVERTS TYPE I- PARALLEL DRAINAGE SHEET 2
SCC-5 & 6	SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL - SHEET 1
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TCP(1-1)-12	TRAFFIC CONTROL PLAN CONVENTIONAL SHOULDER WORK



VICINITY MAP
NOT TO SCALE

PREPARED FOR
BH 60'S POD, LTD.
8214 WESTCHESTER DRIVE, SUITE 710 DALLAS, TEXAS 75225

CORWIN ENGINEERING, INC. — CONSULTING ENGINEERS

200 W. BELMONT, SUITE E

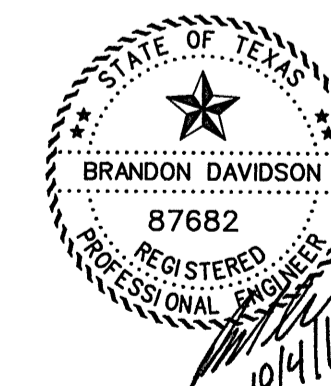
TBPE FIRM #5951

ALLEN, TEXAS 75013

NOTE:

CITY OF ROCKWALL STANDARDS
AND NCTCOG 3rd ADDITION STANDARDS
SHALL BE USED FOR REFERENCE.

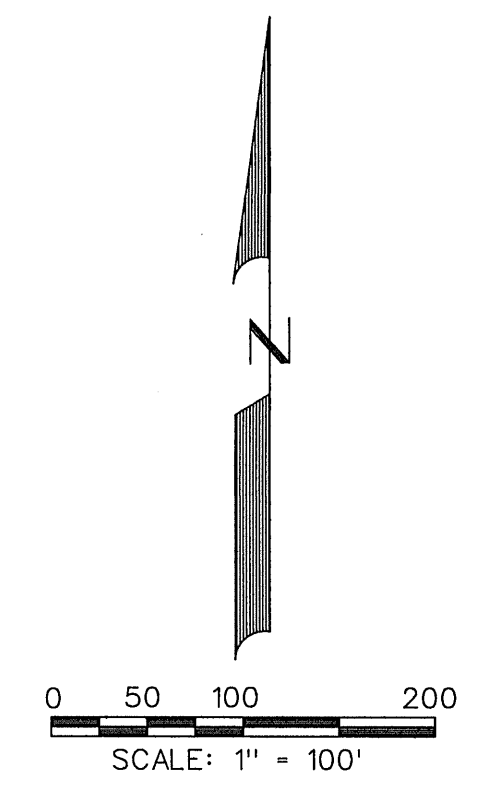
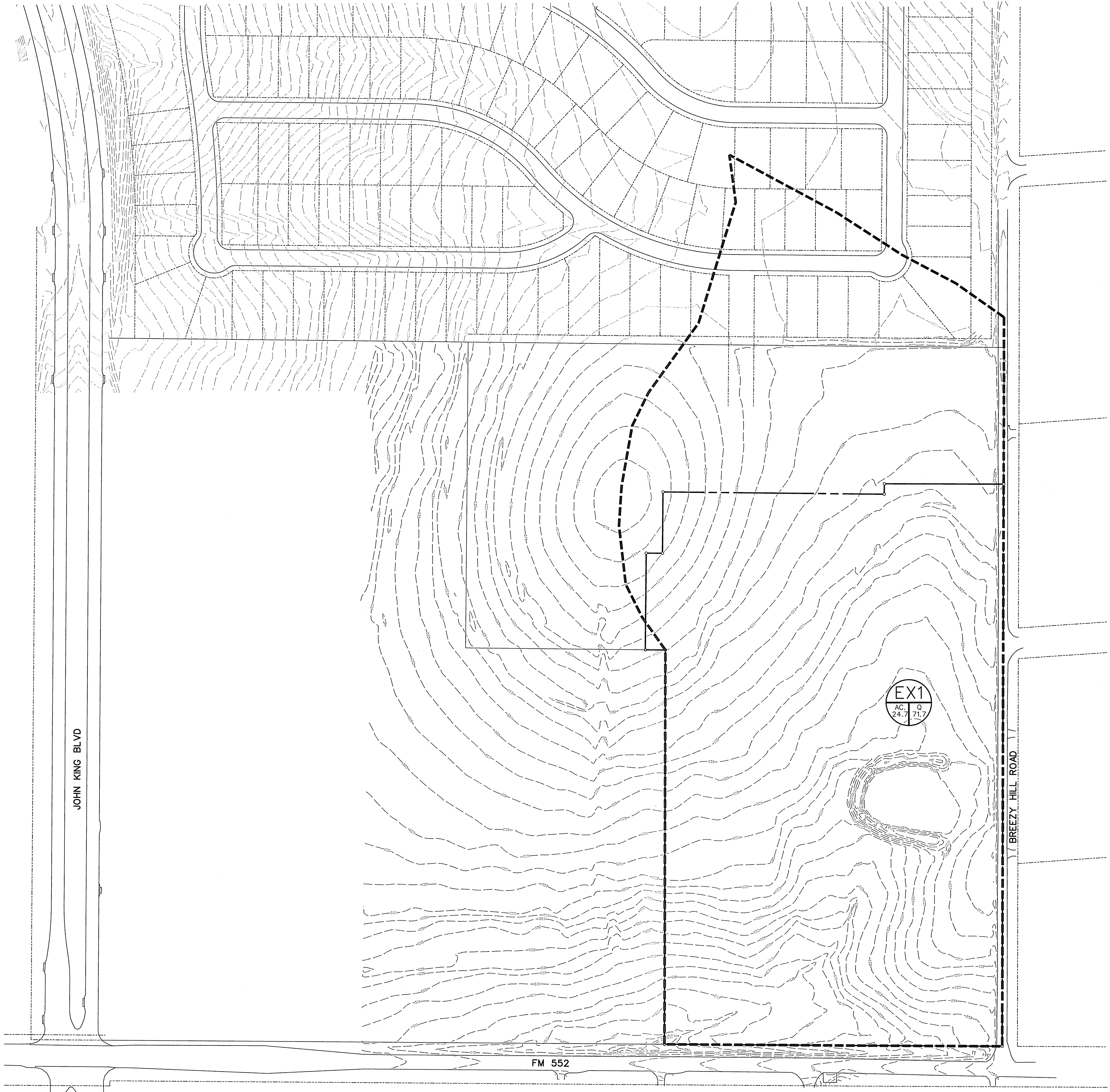
TXDOT STANDARDS AND SPECIFICATIONS SHALL
BE UTILIZED WITHIN TXDOT RIGHT OF WAY.




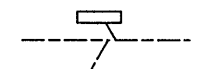
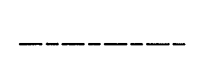
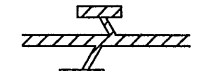


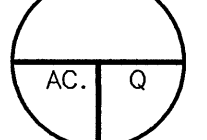
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2	TXDOT COMMENTS	05-11-15
1	CITY COMMENTS	11-25-14
NO.	REVISIONS	DATE



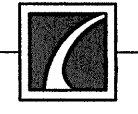
LEGEND

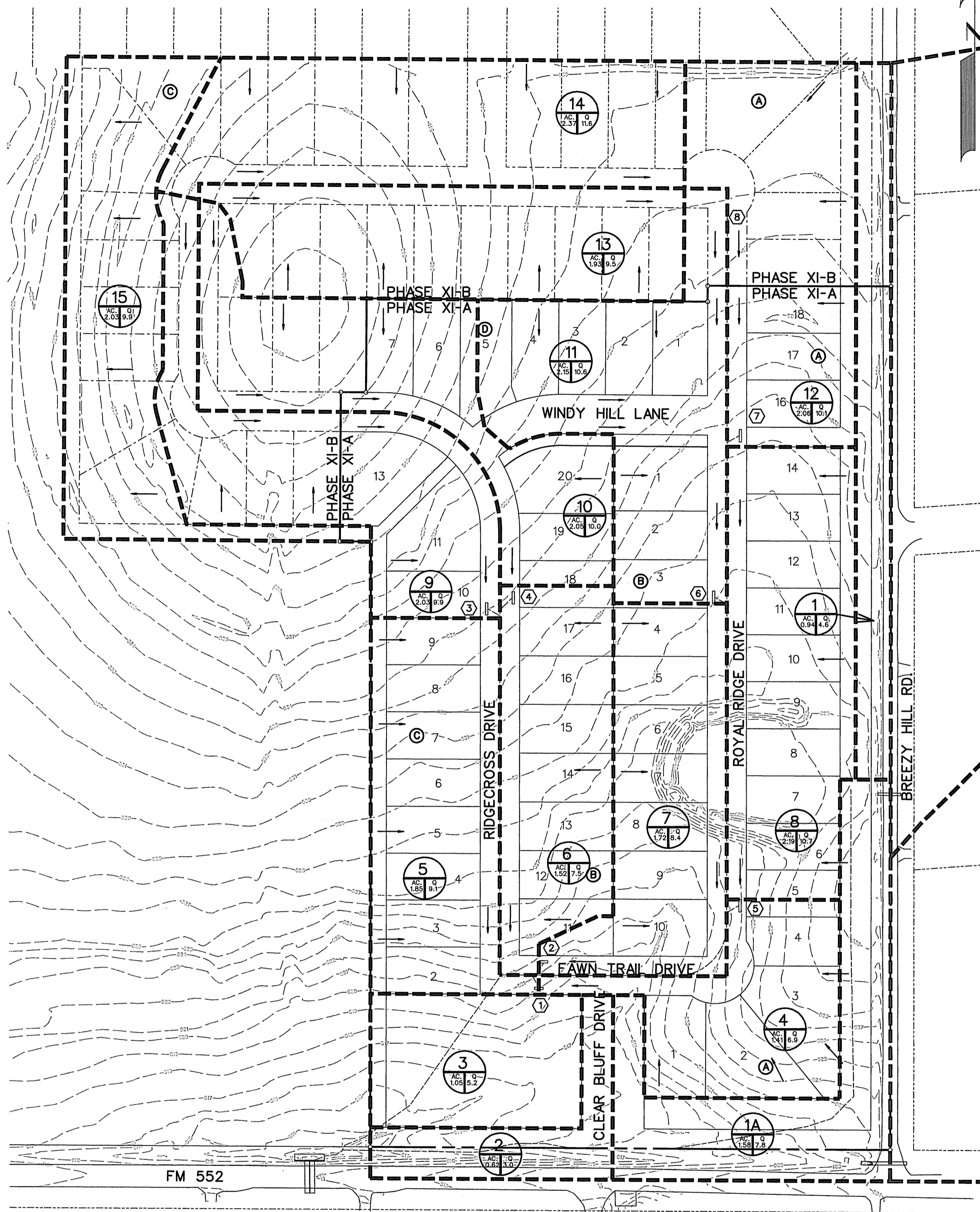
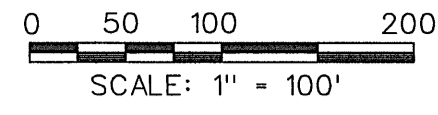
-  PROP. STORM SEWER
-  PROP. CURB INLETS
-  PROP. CONC. HEADWALL
-  EXIST. STORM SEWER
-  DRAINAGE AREA DIVIDE
-  FLOW ARROW
-  DRAINAGE AREA NO.

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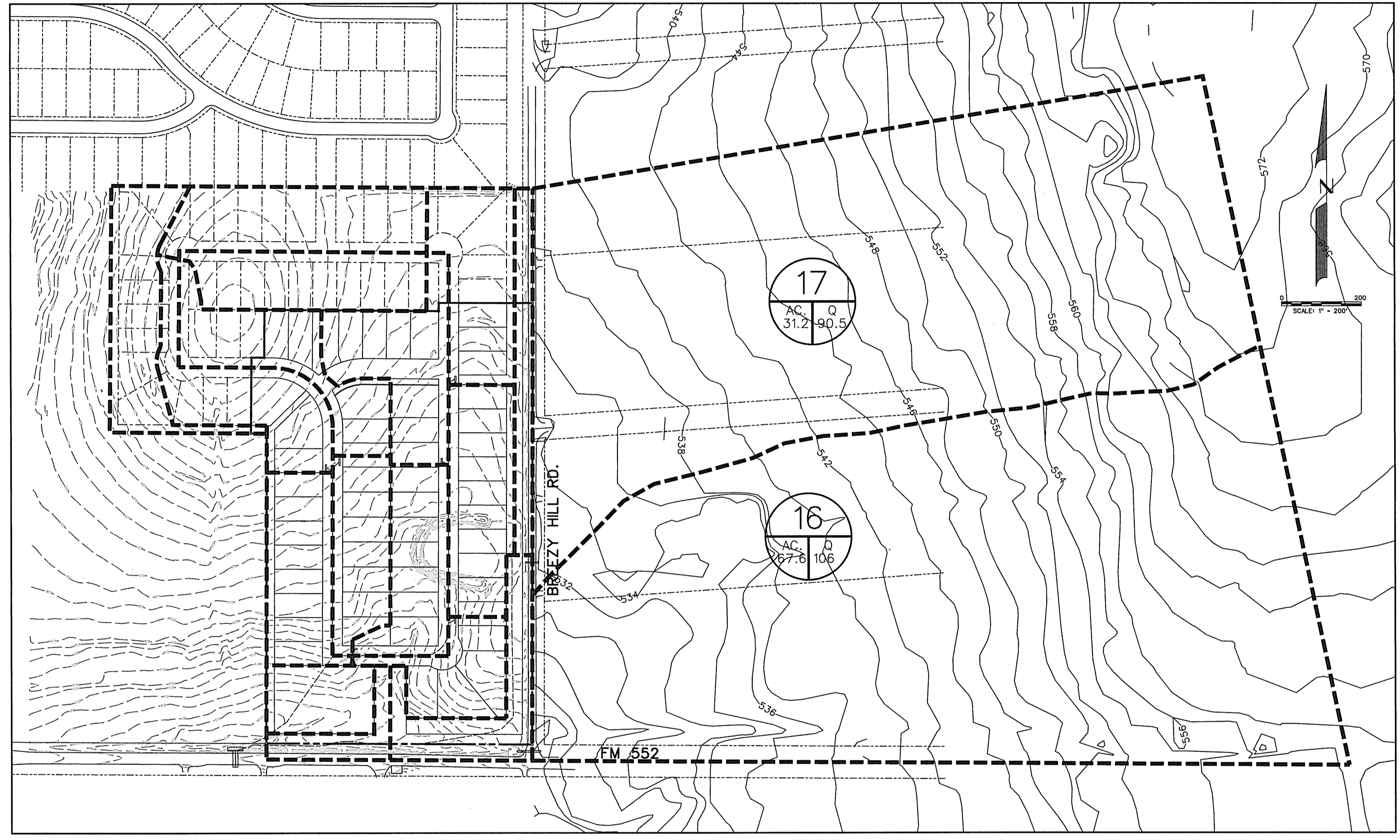
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 CORWIN ENGINEERING, INC. 200 W. BELMONT, SUITE E ALLEN, TEXAS 75013 (972)396-1200 TBPE FIRM #5951			
DEVELOPMENT PLANS FOR BREEZY HILL PHASE IX-A ROCKWALL, TEXAS			
EXISTING CONDITIONS DRAINAGE AREA MAP			
DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
JOB NUMBER	DATE	SCALE:	3 OF 17
14074	NOVEMBER 2014	1"=100'	



ONSITE DRAINAGE AREA MAP

Upstream Station	Downstream Station	Distance (ft)	AREA NO.	Total Area (Acres)	Picked Up (Acres)	C	CA	Accumulated CA	Tc (Min)	Design Storm (Years)	I (in/hr)	Q (CFS)	S (ft/ft)	Pipe Size (in)	Velocity (fps)	Head Loss (ft)	Flow Time (Min)	Time at D/S (Min)	Δ Velocity Head (ft)	Hydraulic Grade Upstream	Hydraulic Grade Downstream
Pond Outfall																					
1+43.53	0+87.19	56.34	Pond	22.34	22.34	0.35	7.82	7.82	15.00	100	9.00	57.1	0.0073	36	8.1	1.02	0.12	15.12	1.02	515.72	516.13
Line D1																					
8+34.73	8+05.07	29.66	10	2.05	2.00	0.50	1.00	1.00	10.00	100	9.80	9.8	0.0038	21	4.1	0.26	0.12	10.12	0.26	526.05	526.16
8+05.07	3+46.70	458.37	9	2.03	2.00	0.50	1.00	2.00	10.12	100	9.78	19.6	0.0152	21	8.1	1.02	0.94	11.06	0.76	526.05	525.29
3+46.70	2+80.00	66.70	D2	17.20	17.28	0.50	8.64	10.64	11.06	100	9.63	102.5	0.0104	42	10.6	1.74	0.10	11.16	0.72	518.30	517.58
Line D2																					
12+32.00	9+43.27	288.73	13,14	4.30	4.30	0.50	2.15	2.15	10.00	100	9.80	21.1	0.0087	24	6.7	0.70	0.72	10.72	0.70	531.60	531.60
9+43.27	7+43.07	200.20	12	2.06	2.06	0.50	1.03	3.18	10.72	100	9.68	30.8	0.0185	24	9.8	1.49	0.34	11.06	0.79	529.09	528.30
7+43.07	3+43.27	399.80	11	2.15	2.08	0.50	1.04	4.22	11.06	100	9.63	40.6	0.0098	30	8.3	1.07	0.80	11.86	-0.21	524.59	524.80
3+43.27	0+46.96	296.31	8	2.19	2.08	0.50	1.04	5.26	11.86	100	9.50	50.0	0.0056	36	7.1	0.78	0.70	12.56	-0.15	520.88	521.02
0+46.96	0+41.05	5.91	6,7	3.24	3.37	0.50	1.69	6.95	12.56	100	9.39	65.3	0.0096	36	9.2	1.31	0.01	12.57	0.53	519.36	518.83
0+41.05	0+00.00	41.05	4,5	3.26	3.39	0.50	1.70	8.65	12.57	100	9.39	81.2	0.0148	36	11.5	2.05	0.06	12.63	0.74	518.77	518.03
0+00.00	0+00.00	0.00	0	0.00	0.00	0.50	0.00	8.65	12.63	100	9.38	81.1	0.0148	36	10.6	1.74	0.00	12.63	-0.16	517.43	517.58



OFFSITE DRAINAGE AREA MAP

Area #	Area (sf)	Area (acres)	Runoff Coefficient	CA	Tc (min)	I(100) (in/hr)	Q(100) (cfs)	Drains To:
1	41155	0.94	0.50	0.47	10	9.80	4.8	Culvert
1A	69022	1.59	0.50	0.79	10	9.80	7.8	Culvert
2	26921	0.62	0.50	0.31	10	9.80	3.0	Existing Ditch
3	45868	1.05	0.50	0.53	10	9.80	5.2	Detention Pond
4	61487	1.41	0.50	0.71	10	9.80	6.9	Inlet #1
5	80471	1.85	0.50	0.92	10	9.80	9.1	Inlet #1
6	66293	1.52	0.50	0.76	10	9.80	7.5	Inlet #2
7	74860	1.72	0.50	0.86	10	9.80	8.4	Inlet #2
8	95370	2.19	0.50	1.09	10	9.80	10.7	Inlet #5
9	88453	2.03	0.50	1.02	10	9.80	9.9	Inlet #3
10	89257	2.05	0.50	1.02	10	9.80	10.0	Inlet #4
11	93796	2.15	0.50	1.08	10	9.80	10.6	Inlet #6
12	89796	2.05	0.50	1.03	10	9.80	10.1	Inlet #7
13	84212	1.93	0.50	0.97	10	9.80	9.5	Future Inlet
14	103123	2.37	0.50	1.18	10	9.80	11.6	Future Inlet
15	88402	2.03	0.50	1.01	10	9.80	9.9	Future Inlet
16	155794	35.4	0.35	12.74	20	8.30	106.8	Culvert
17	1357038	31.2	0.35	10.90	20	8.30	90.5	Ditch Along Breezy Hill Lane

Inlet No.	Location	Design Storm Freq. (years)	Tc (min)	Area Runoff: C-Q-CA			Carry-Over from Upstream (cfs)	Total Gutter Flow (cfs)	Gutter Capacity (cfs)	Gutter Slope (ft/100 ft)	Crown	Length (ft)	Selected Inlet			
				Intensity "I" (in/hr)	Runoff Coeff. "C"	Area (acres)							Q (cfs)	Inlet Capacity (cfs)	Carry-Over to Downstream (cfs)	
1	0+50.00 Fawn Trail	100	10	9.8	0.5	3.26	16.0	0.6	16.6	13.0	Low Pt	6" pbl	10	STD.	21.0	0.0
2	0+55.91 Fawn Trail	100	10	9.8	0.5	3.24	15.9	0.6	16.5	13.0	Low Pt	6" pbl	10	STD.	21.0	0.0
3	4+67.32 Ridgeway	100	10	9.8	0.5	2.03	9.9	0.0	9.9	29.4	2.55%	6" pbl	15	STD.	9.8	0.1
4	4+81.61 Ridgeway	100	10	9.8	0.5	2.05	10.0	0.0	10.0	29.4	2.55%	6" pbl	15	STD.	9.8	0.2
5	0+90.26 Royal Ridge	100	10	9.8	0.5	2.19	10.7	0.0	10.7	24.4	1.75%	6" pbl	15	STD.	10.2	0.5
6	4+84.05 Royal Ridge	100	10	9.8	0.5	2.15	10.6	0.0	10.6	24.4	1.75%	6" pbl	15	STD.	10.2	0.4
7	6+90.26 Royal Ridge	100	10	9.8	0.5	2.06	10.1	0.0	10.1	24.4	1.75%	6" pbl	15	STD.	10.2	0.0
8	9+63 Royal Ridge	100	15	8.3	0.35	4.57	13.3	0.0	13.3	N/A	N/A	N/A	4	WYE	29.0	0.0

LEGEND

- PROP. STORM SEWER
- PROP. CURB INLETS
- PROP. CONC. HEADWALL
- EXIST. STORM SEWER
- DRAINAGE AREA DIVIDE
- FLOW ARROW
- DRAINAGE AREA NO.

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INFORMATION PROVIDED BY CONTRACTORS (NOT FIELD VERIFIED)



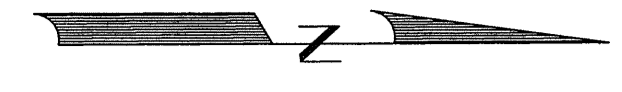
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200 W. BELMONT, SUITE E
ALLEN, TEXAS 75013 (972)396-1200
TBP E FIRM #5951

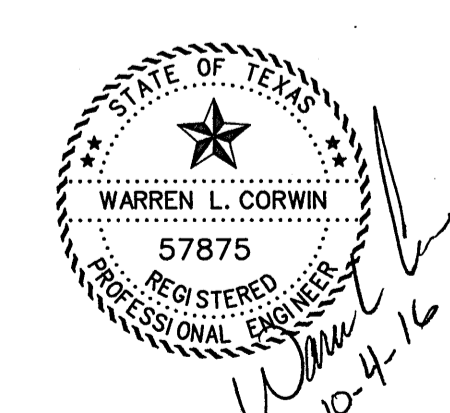
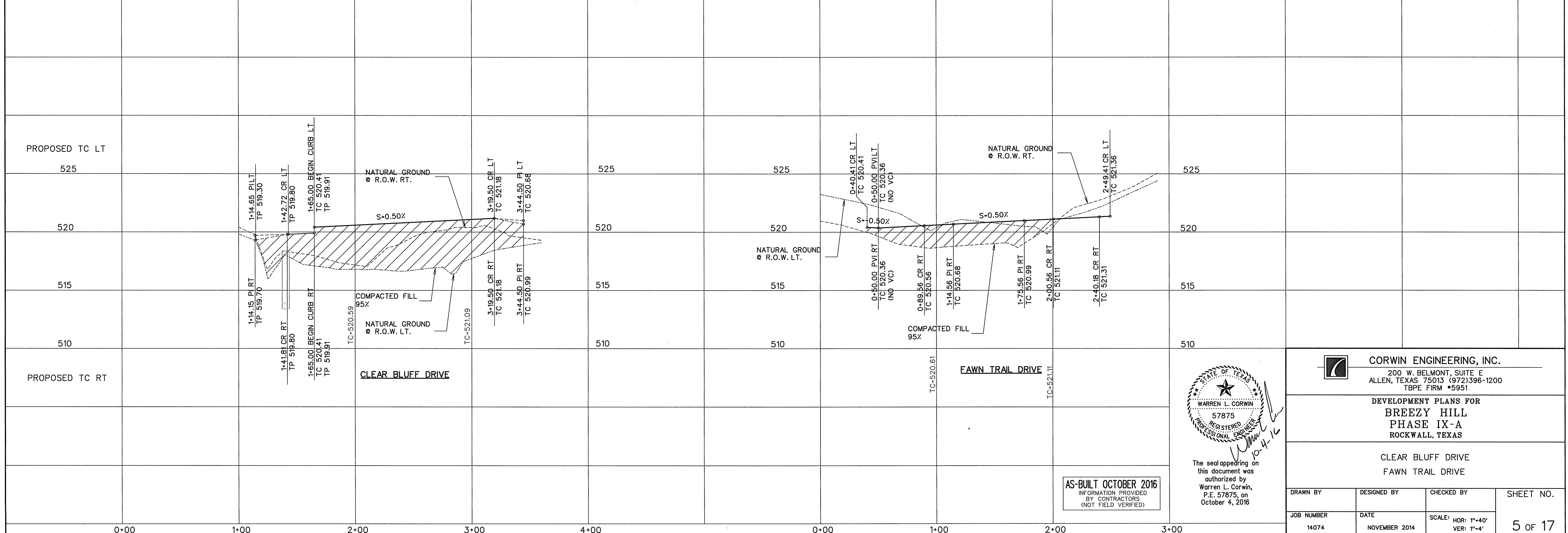
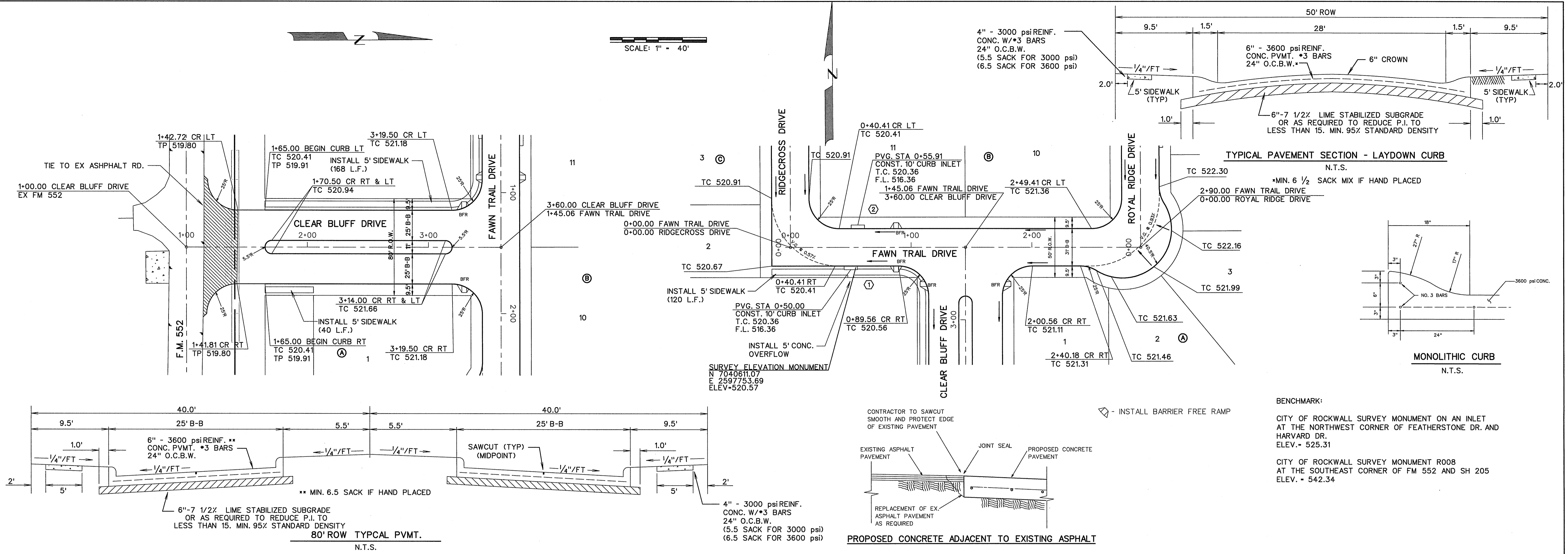
DEVELOPMENT PLANS FOR
BREEZY HILL PHASE IX-A
ROCKWALL, TEXAS

DRAINAGE AREA MAP

DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
JOB NUMBER	DATE	SCALE:	4 OF 17
14074	NOVEMBER 2014	1"=100'	



SCALE: 1" = 40'



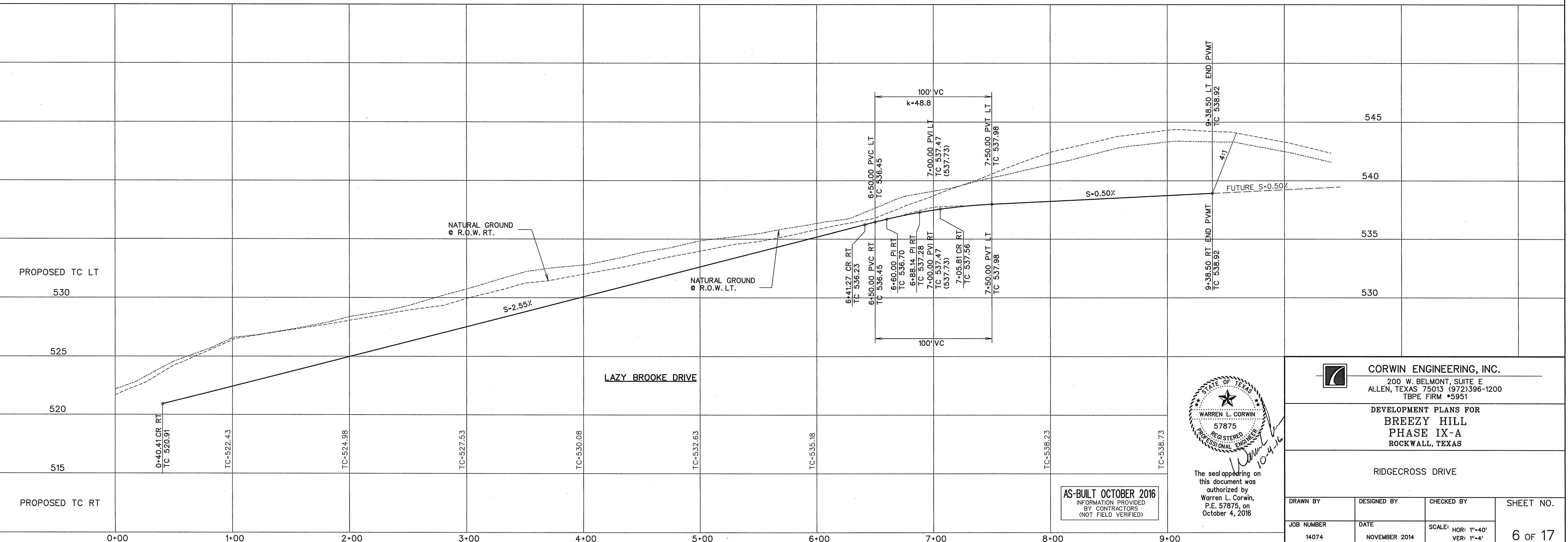
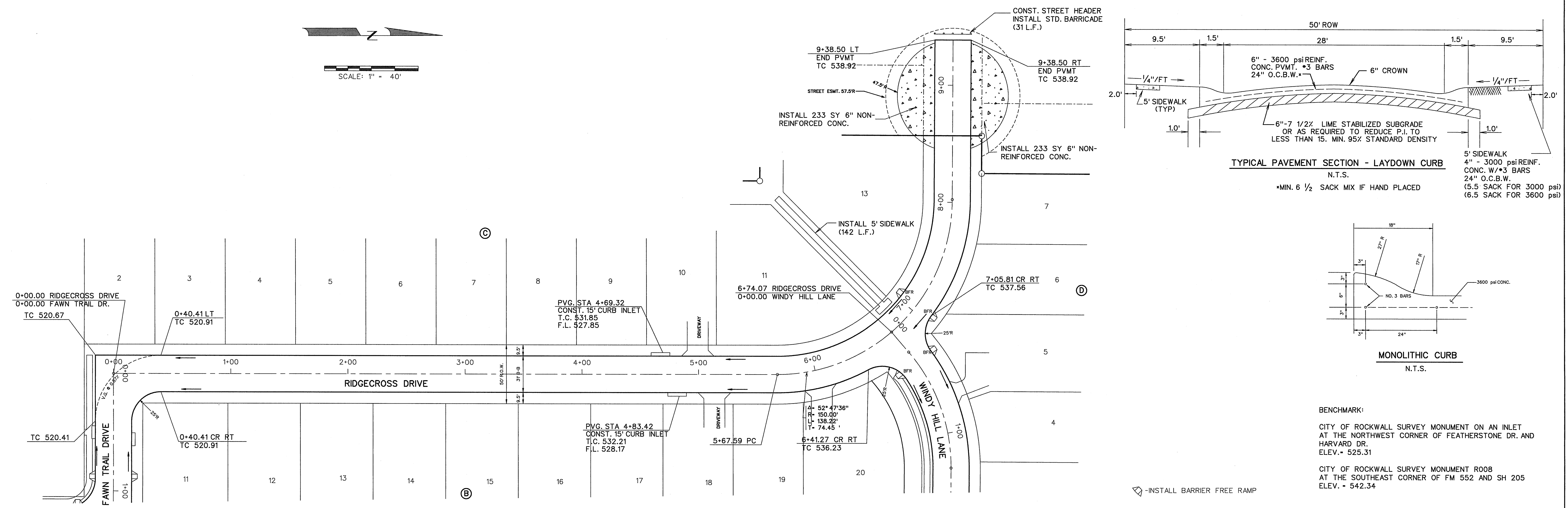
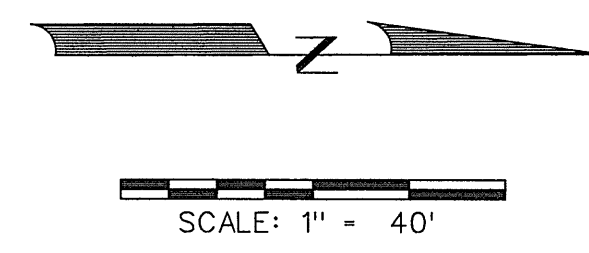
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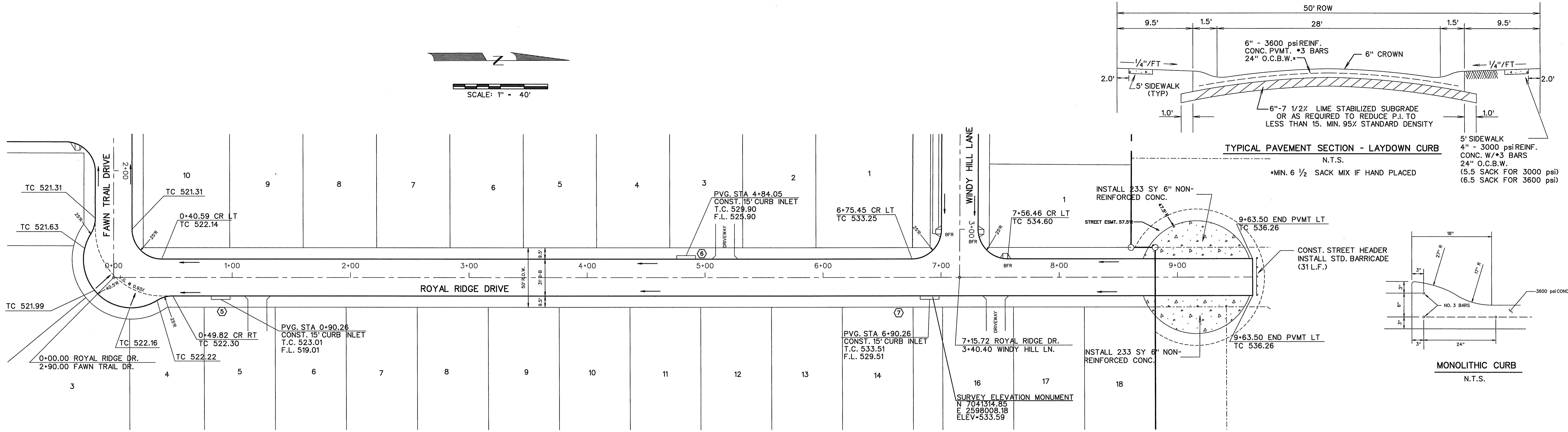
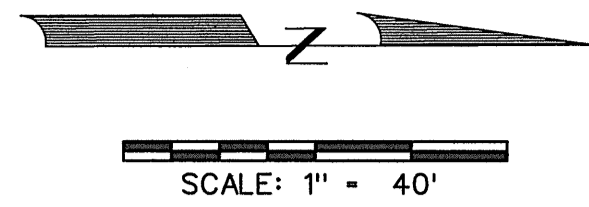
CORWIN ENGINEERING, INC.
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ALLEN, TEXAS 75013 (972)396-1200
TBPE FIRM #5951

DEVELOPMENT PLANS FOR BREEZY HILL PHASE IX-A
ROCKWALL, TEXAS

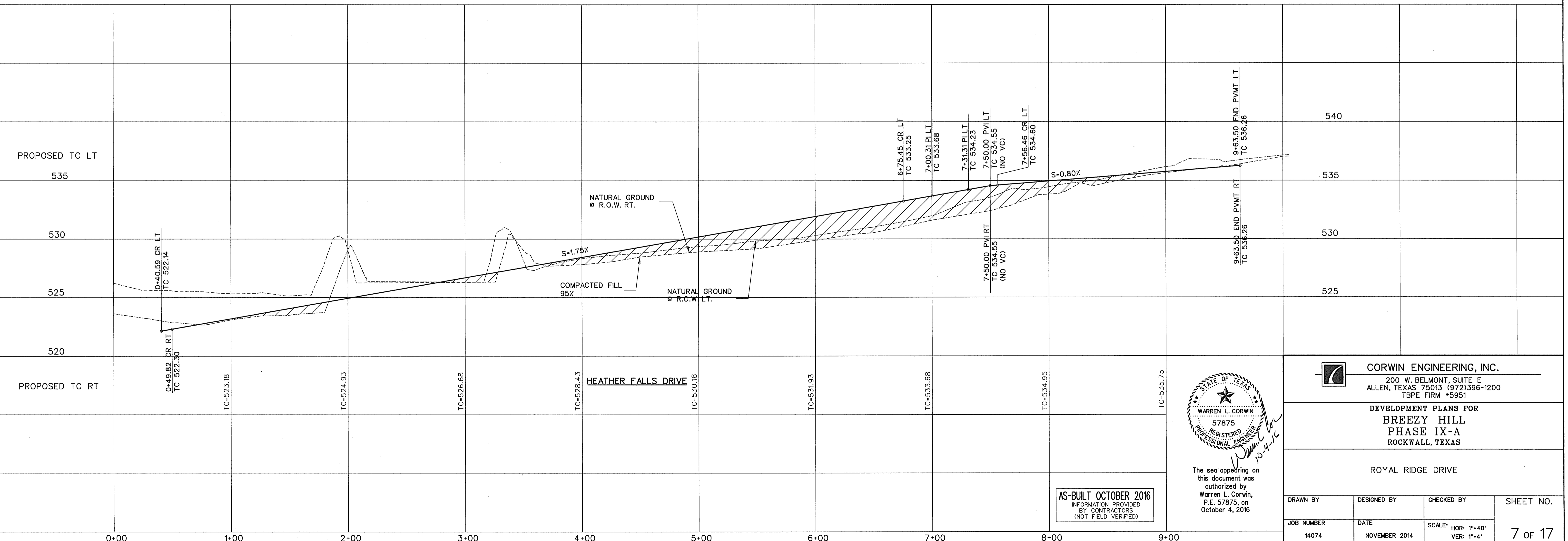
CLEAR BLUFF DRIVE
FAWN TRAIL DRIVE

DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
14074	NOVEMBER 2014	SCALE: HOR: 1"=40' VER: 1"=4'	5 OF 17





-INSTALL BARRIER FREE RAMP



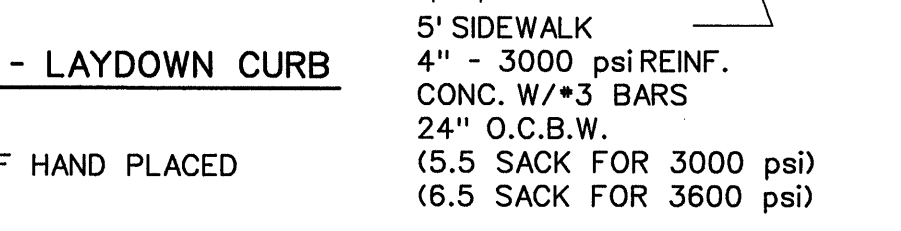
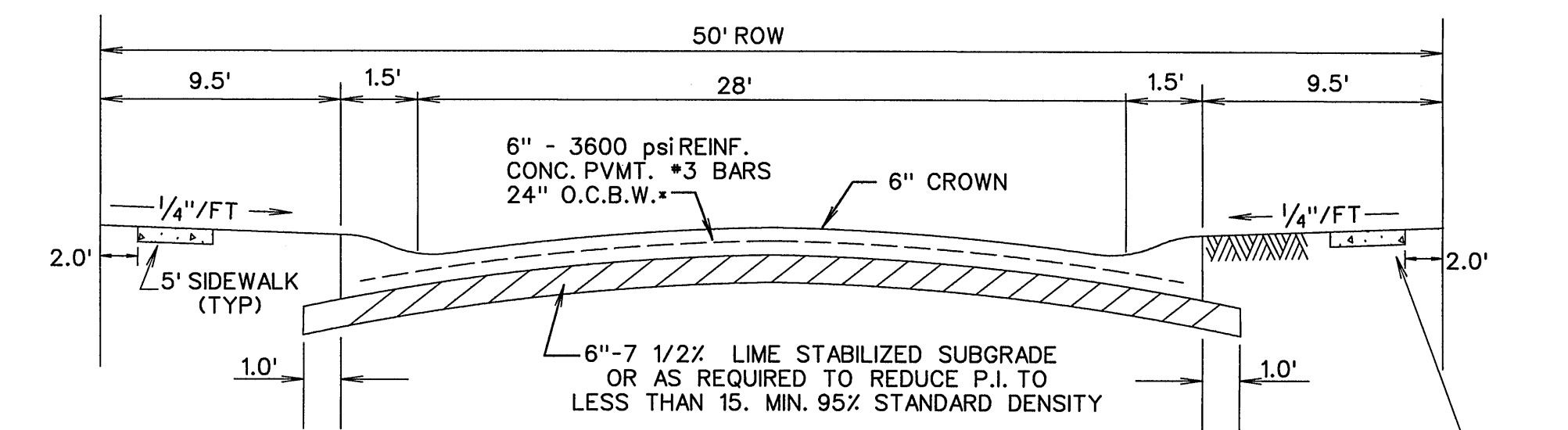
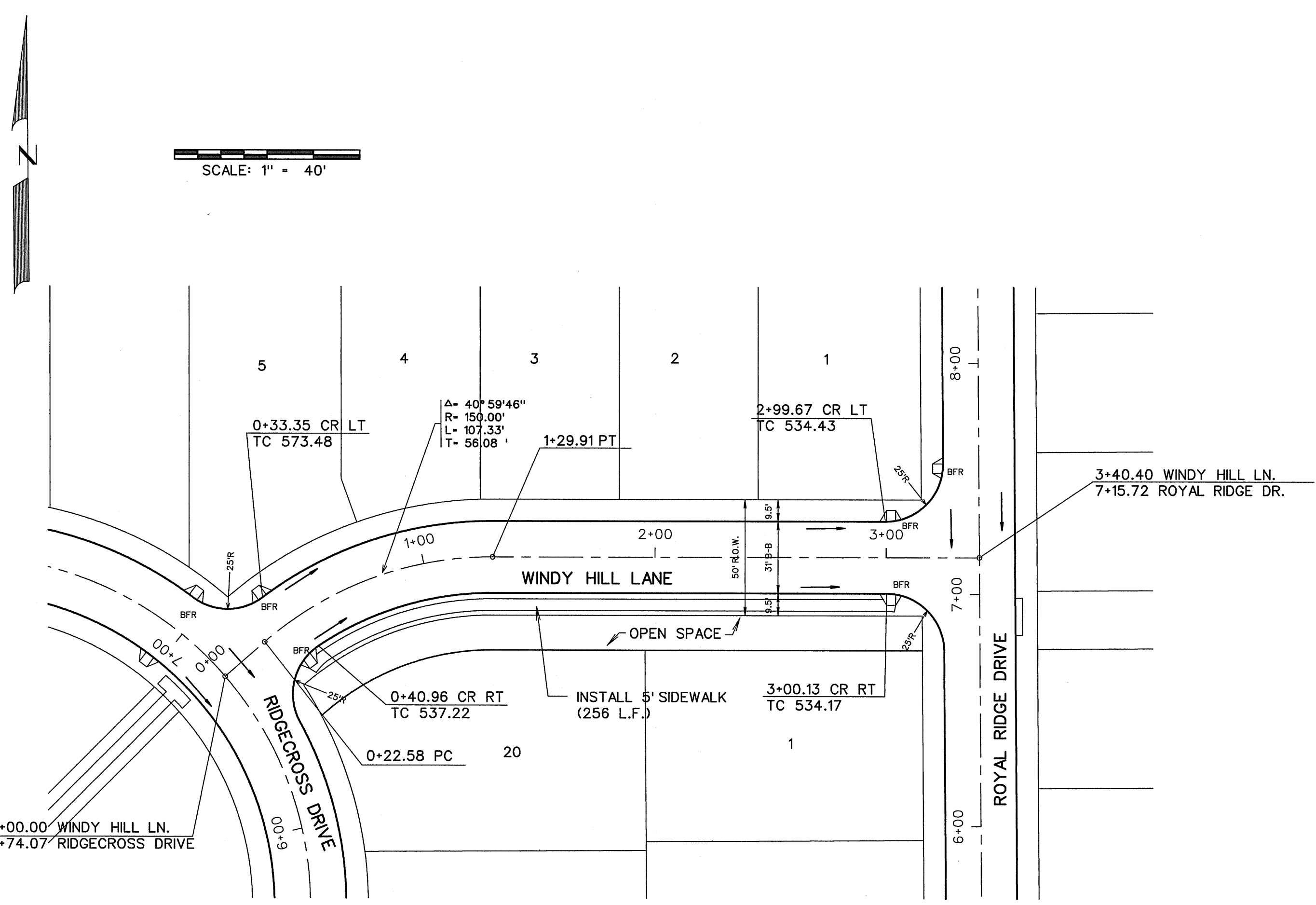
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DEVELOPMENT PLANS FOR
**BREEZY HILL
 PHASE IX-A**
 ROCKWALL, TEXAS

ROYAL RIDGE DRIVE

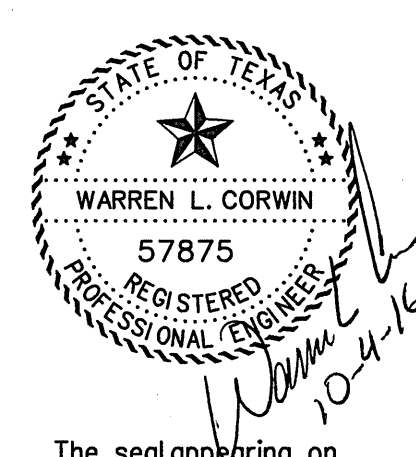
DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
14074	NOVEMBER 2014		7 OF 17



BENCHMARK:
CITY OF ROCKWALL SURVEY MONUMENT ON AN INLET AT THE NORTHWEST CORNER OF FEATHERSTONE DR. AND HARVARD DR.
ELEV. - 525.31
CITY OF ROCKWALL SURVEY MONUMENT R008 AT THE SOUTHEAST CORNER OF FM 552 AND SH 205
ELEV. - 542.34

-INSTALL BARRIER FREE RAMP

540		PROPOSED TC LT			540									
535		NATURAL GROUND @ R.O.W. LT.			535									
530		NATURAL GROUND @ R.O.W. LT.			530									
525					525									
520		PROPOSED TC RT			520									
515					515									
510					510									
505					505									
500					500									
500	0+00		1+00	2+00	3+00	4+00								



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TBPE FIRM #5951

DEVELOPMENT PLANS FOR BREEZY HILL PHASE IX-A ROCKWALL, TEXAS

WINDY HILL LANE

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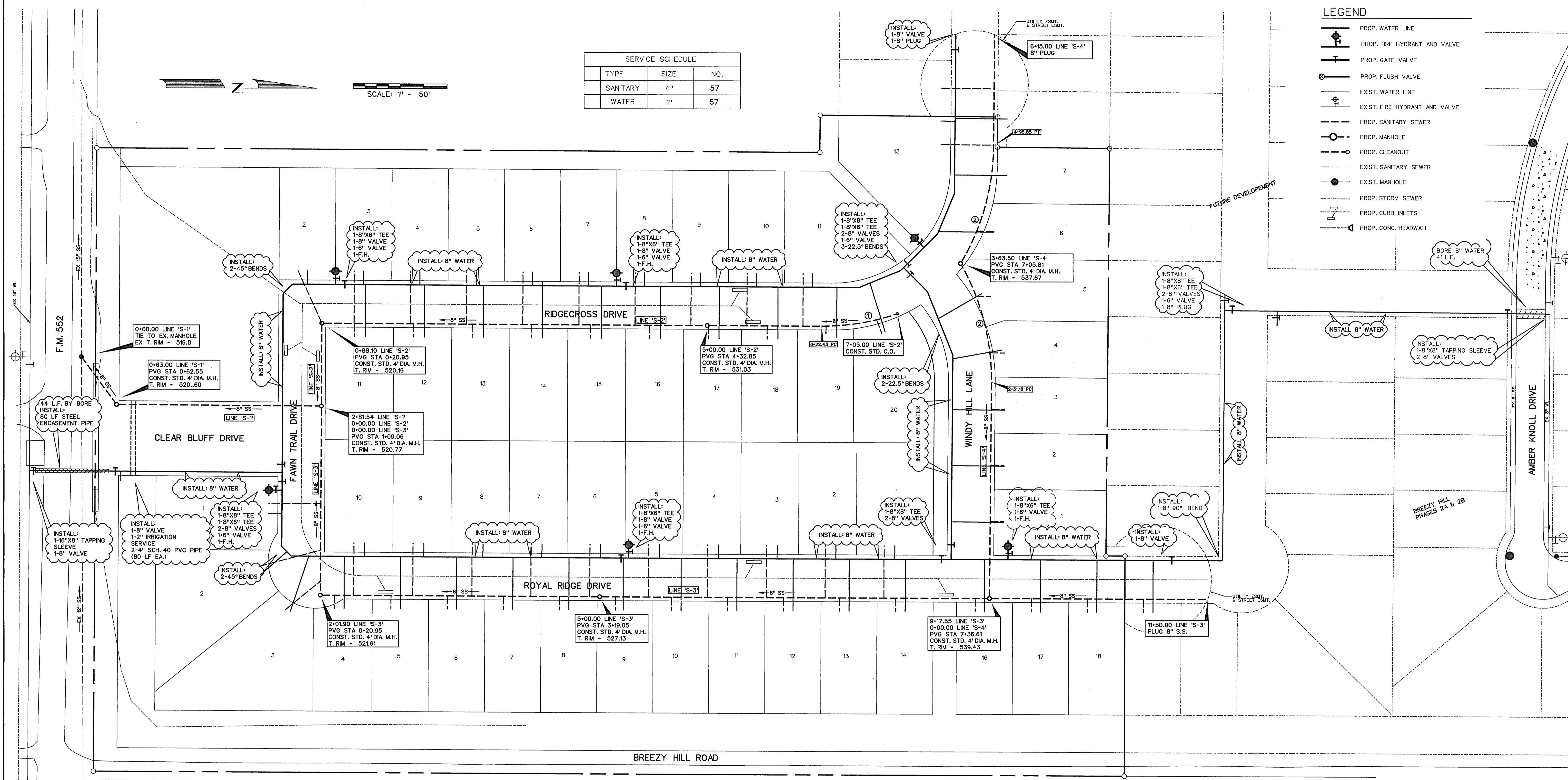
DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
			8 OF 17
JOB NUMBER	DATE	SCALE: HOR: 1"=40' VER: 1"=4'	
14074	NOVEMBER 2014		

LEGEND

- PROP. WATER LINE
- PROP. FIRE HYDRANT AND VALVE
- PROP. GATE VALVE
- PROP. FLUSH VALVE
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT AND VALVE
- PROP. SANITARY SEWER
- PROP. MANHOLE
- PROP. CLEANOUT
- EXIST. SANITARY SEWER
- EXIST. MANHOLE
- PROP. STORM SEWER
- PROP. CURB INLETS
- PROP. CONC. HEADWALL

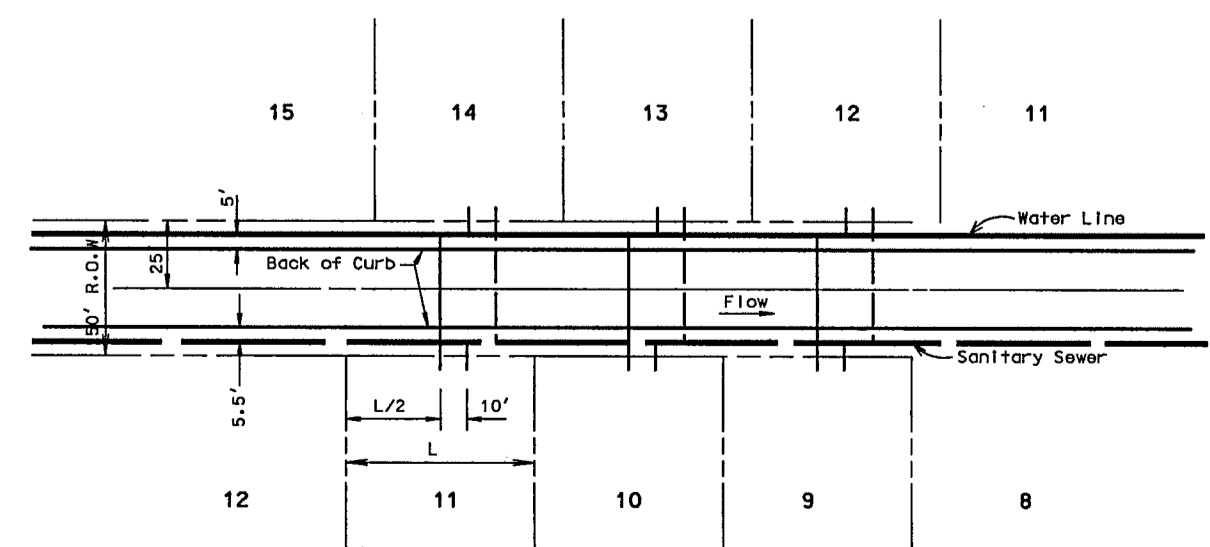
SERVICE SCHEDULE		
TYPE	SIZE	NO.
SANITARY	4"	57
WATER	1"	57

SCALE: 1" = 50'



CURVE TABLE

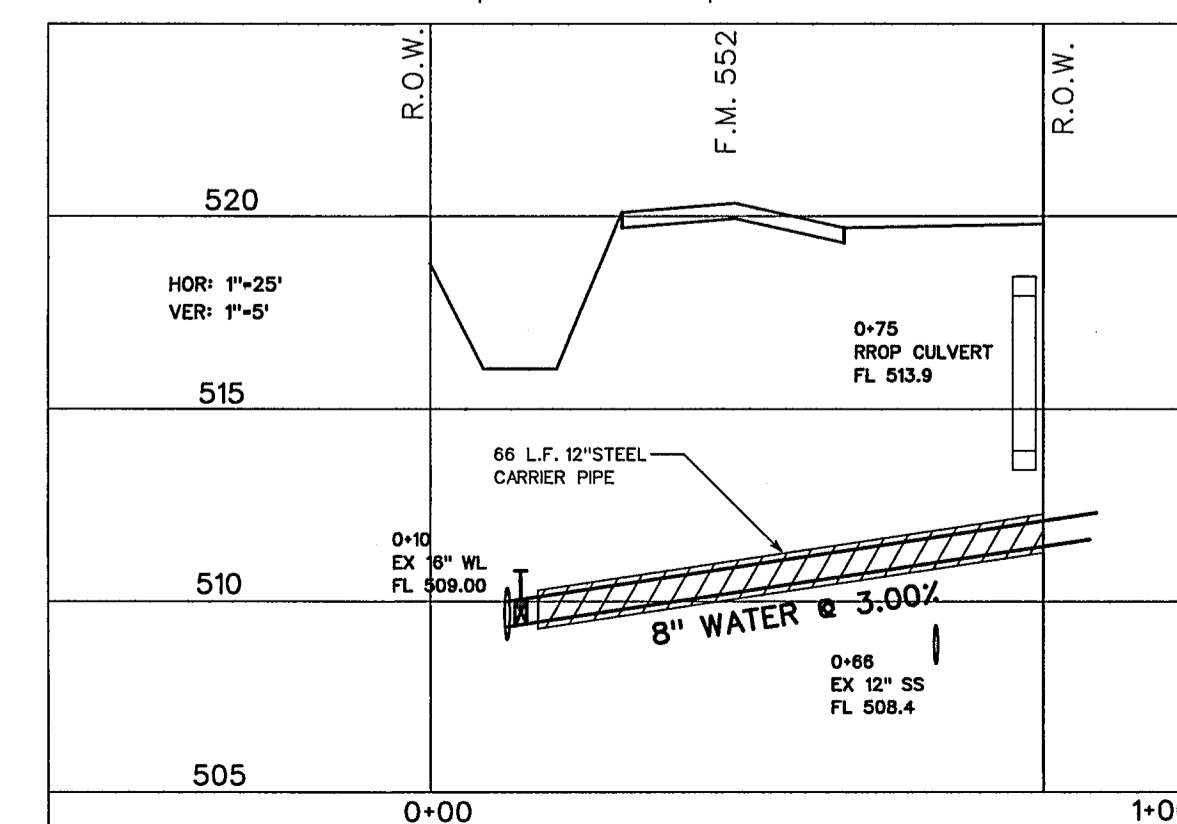
CURVE NO.	DELTA	RADIUS	LENGTH	TANGENT
1.	18°55'25"	250.00'	82.57'	41.67'
2.	30°19'51"	250.00'	132.34'	67.76'



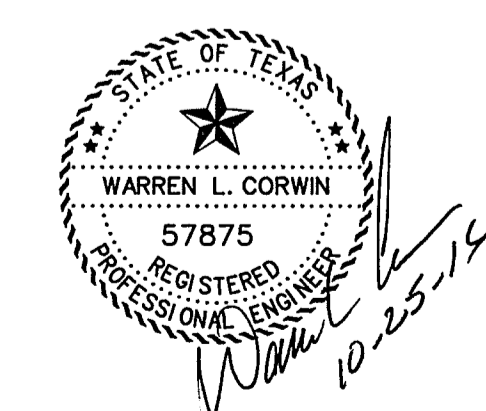
TYPICAL WATER & SEWER SERVICE LAYOUT
N.T.S.

NOTE:
CONTRACTOR SHALL VERIFY ALL EXISTING UTILITIES FOR LOCATION AND ELEVATION PRIOR TO CONSTRUCTION. EXISTING UNDERGROUND UTILITIES SHOWN ON PLAN ARE BASED ON AS-BUILT DRAWINGS.

NOTE:
ALL WATER LINES TO BE CLASS 200 PIPE SDR 14.
ALL SANITARY SEWER PIPE TO BE SDR 35 FOR 5'-10" DEEP AND SDR 26 FOR 10' AND GREATER.
INSTALL BLUE "EMS" DISK ON WATER LINE AT EVERY 250' AND CHANGE IN DIRECTION, VALVE, AND SERVICE.
INSTALL GREEN "EMS" DISK ON SANITARY SEWER LINE EVERY 250' AND AT EVERY CHANGE IN DIRECTION, MANHOLE, CLEANOUT, AND SERVICE.
ALL MANHOLES TO BE RAVEN EPOXY LINED AND SEALED.

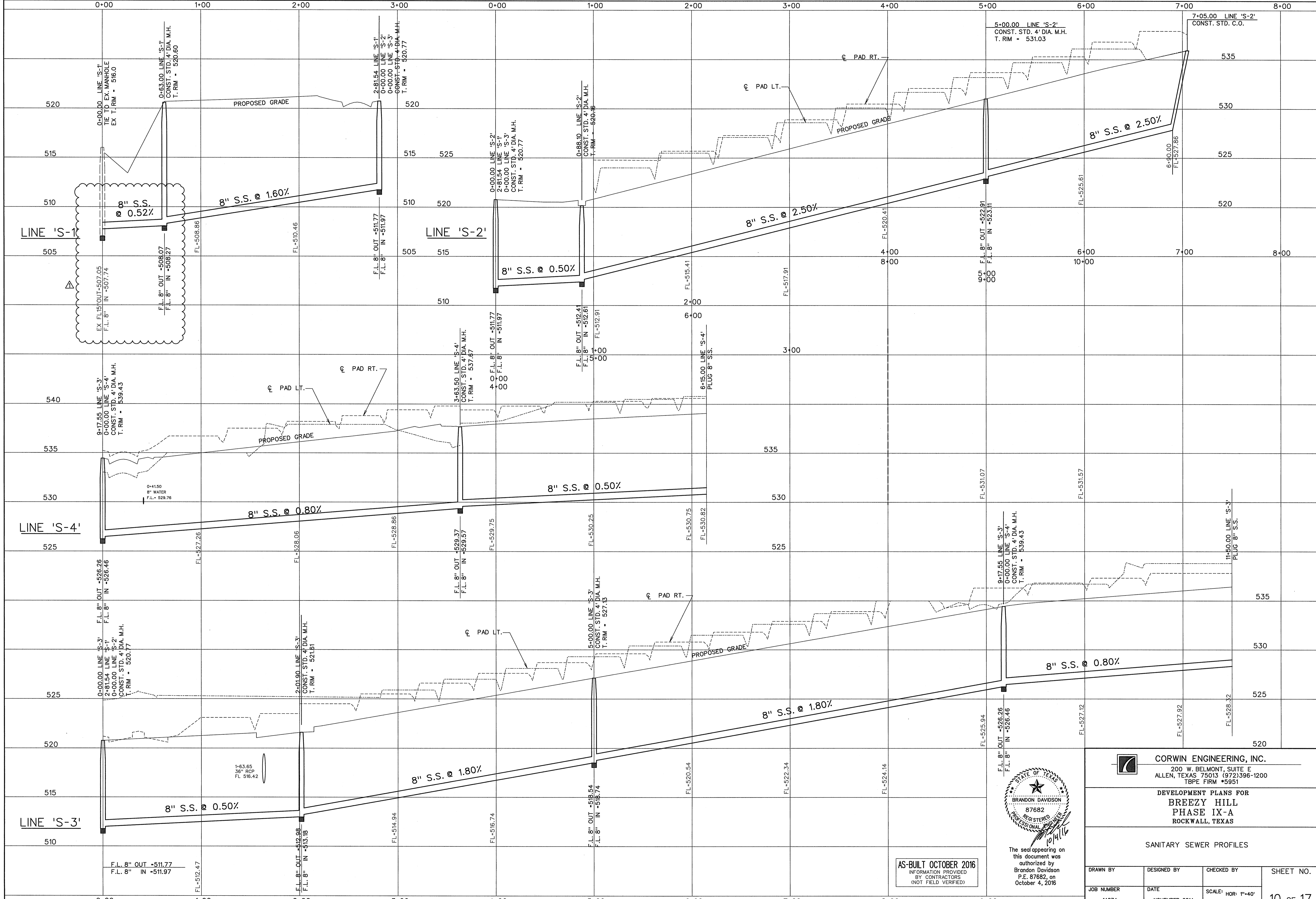


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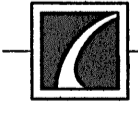
<p>CORWIN ENGINEERING, INC. 200 W. BELMONT, SUITE E ALLEN, TEXAS 75013 (972)396-1200 TBPE FIRM #5951</p>			
<p>DEVELOPMENT PLANS FOR BREEZY HILL PHASE IX-A ROCKWALL, TEXAS</p>			
<p>WATER AND SANITARY SEWER PLAN</p>			
DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
JOB NUMBER	DATE	SCALE:	9 OF 17
14074	NOVEMBER 2014	1"=50'	



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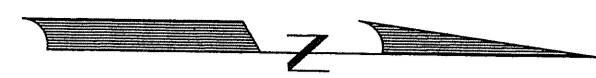


CORWIN ENGINEERING, INC.
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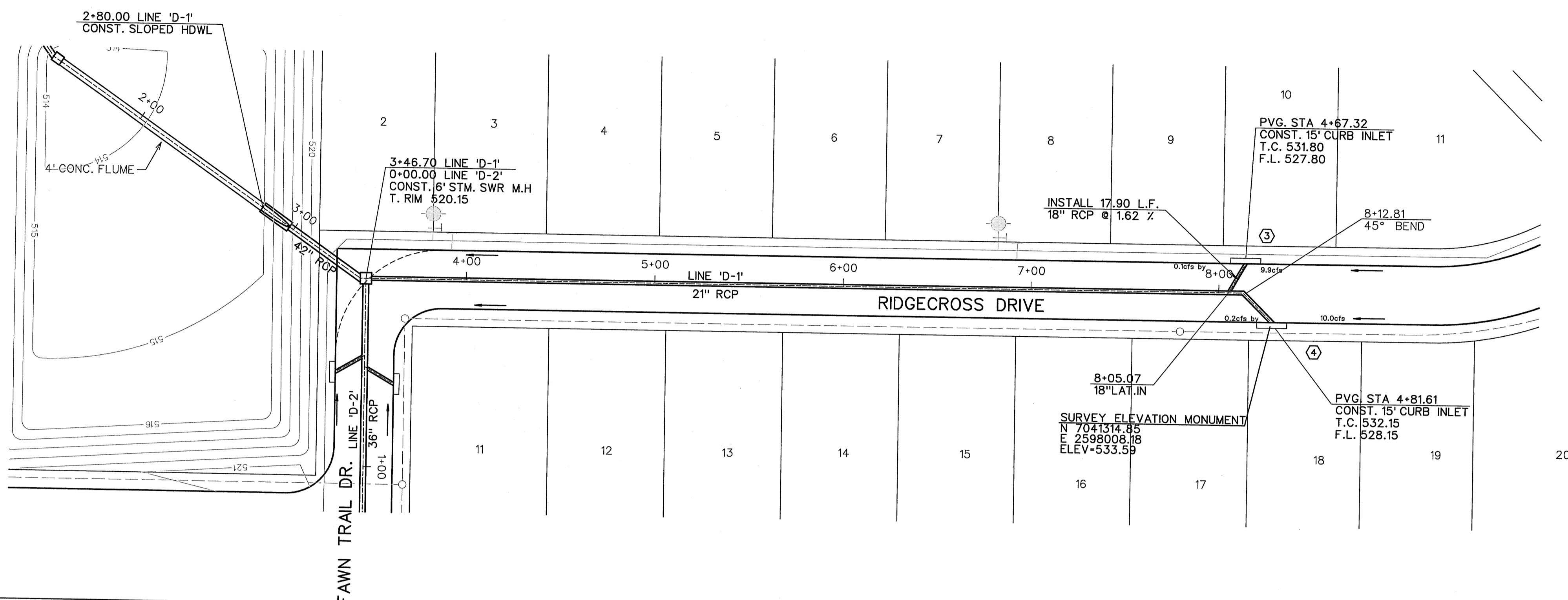
DEVELOPMENT PLANS FOR
BREEZY HILL
 PHASE IX-A
 ROCKWALL, TEXAS

SANITARY SEWER PROFILES

DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
JOB NUMBER	DATE	SCALE: HOR: 1"=40' VER: 1"=4'	10 OF 17
14074	NOVEMBER 2014		



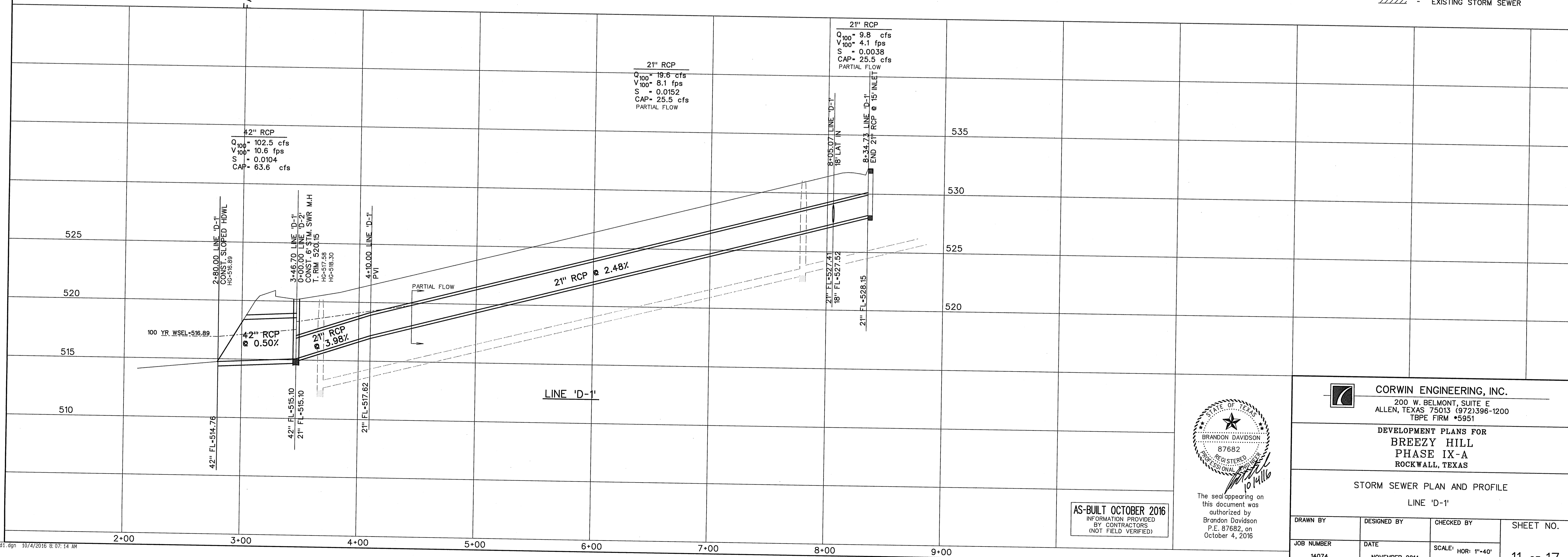
SCALE: 1" = 40'



BENCHMARK:
CITY OF ROCKWALL GPS MONUMENTS
10 AND 16.

LEGEND

- (B) - BLOCK LABEL
- (IN) - INLET NUMBER
- (C) - CURVE NUMBER
- - SANITARY SEWER
- ⊕ - WATER
- ==== - PROPOSED STORM SEWER
- ===== - EXISTING STORM SEWER



AS-BUILT OCTOBER 2016
INFORMATION PROVIDED
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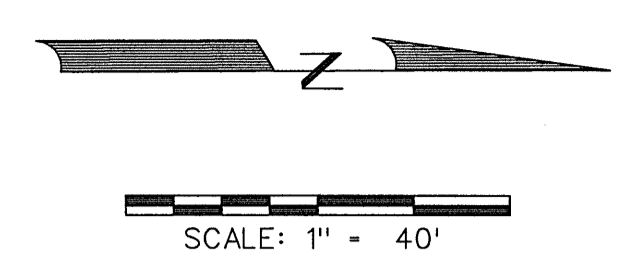
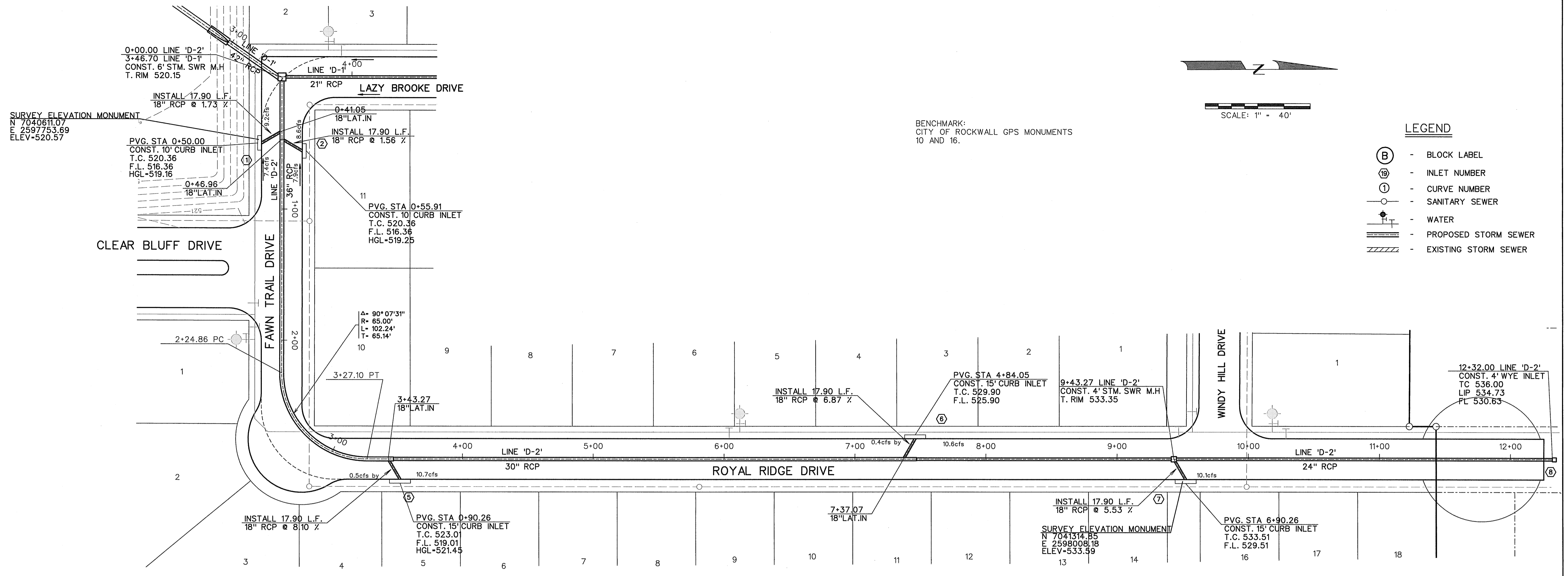
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DEVELOPMENT PLANS FOR
BREEZY HILL
PHASE IX-A
ROCKWALL, TEXAS

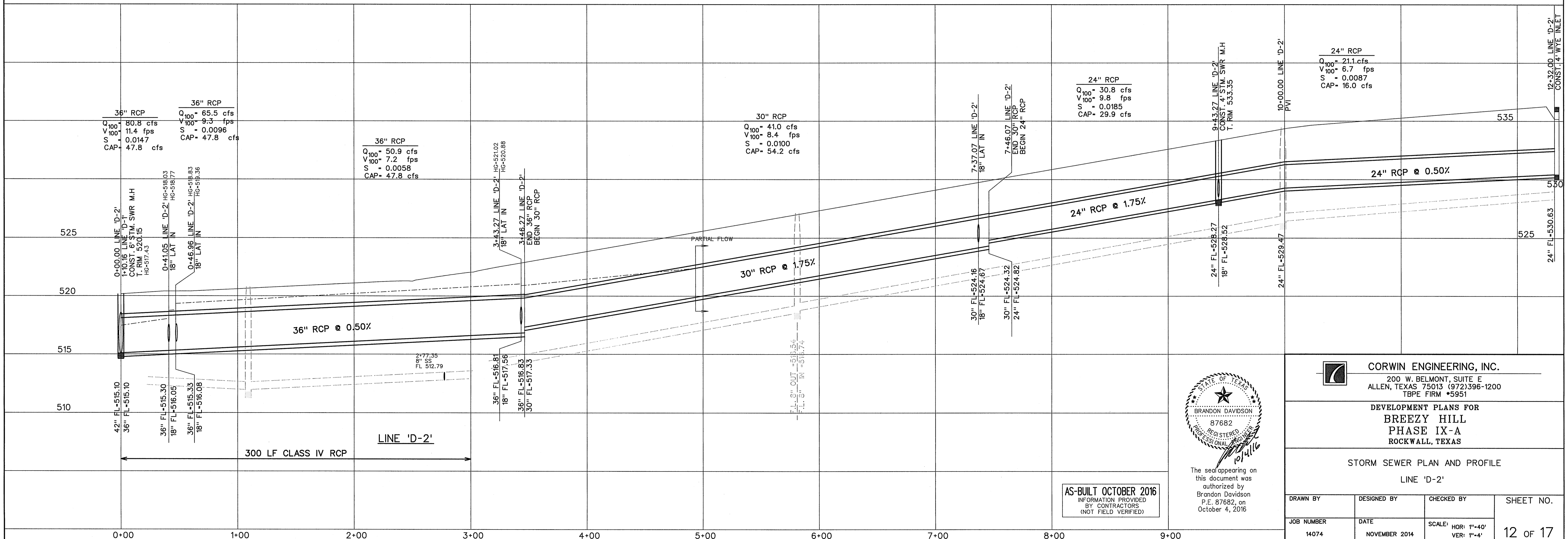
STORM SEWER PLAN AND PROFILE
LINE 'D-1'

DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
JOB NUMBER	DATE	SCALE: HOR: 1"=40' VER: 1"=4'	11 OF 17
14074	NOVEMBER 2014		

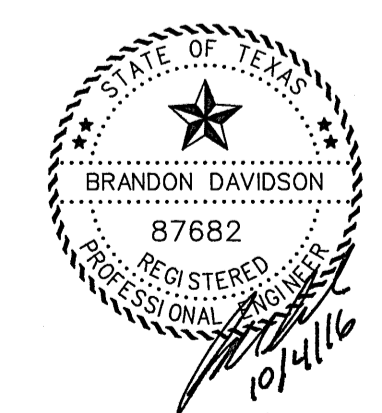


- LEGEND**
- (B) - BLOCK LABEL
 - (18) - INLET NUMBER
 - (1) - CURVE NUMBER
 - - SANITARY SEWER
 - |— - WATER
 - +— - PROPOSED STORM SEWER
 - /—/— - EXISTING STORM SEWER

BENCHMARK:
CITY OF ROCKWALL GPS MONUMENTS
10 AND 16.



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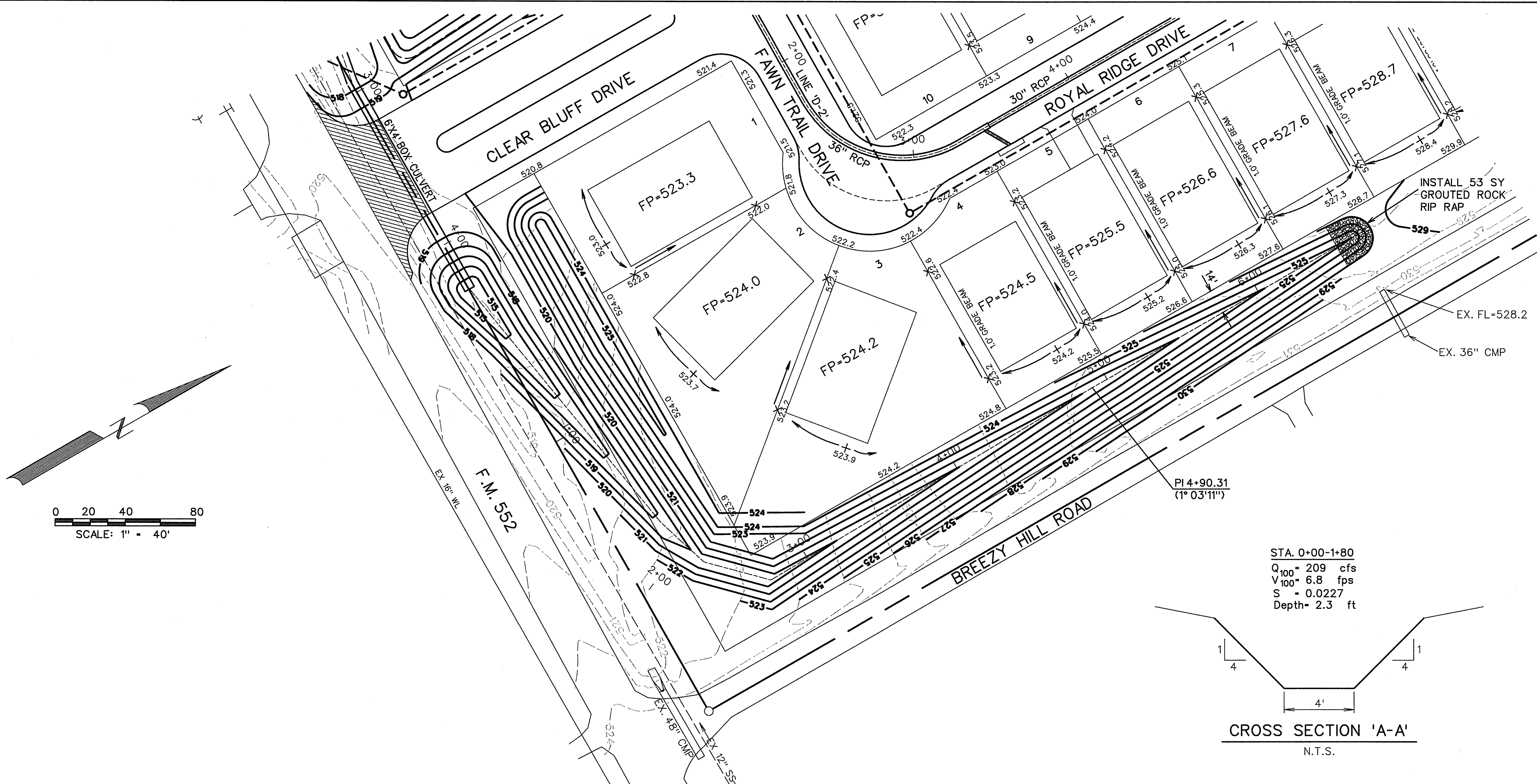
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**DEVELOPMENT PLANS FOR
BREEZY HILL
PHASE IX-A
ROCKWALL, TEXAS**

STORM SEWER PLAN AND PROFILE

LINE 'D-2'

DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
JOB NUMBER	DATE	SCALE: HOR: 1"=40' VER: 1"=4'	12 OF 17
14074	NOVEMBER 2014		

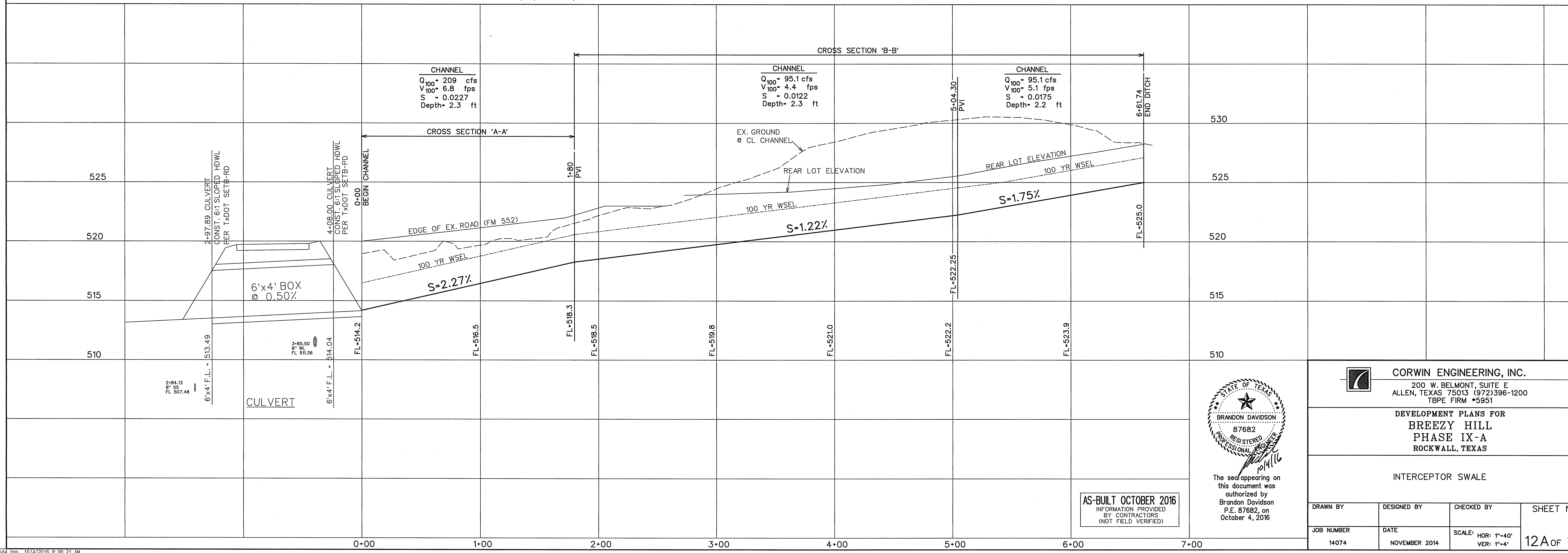
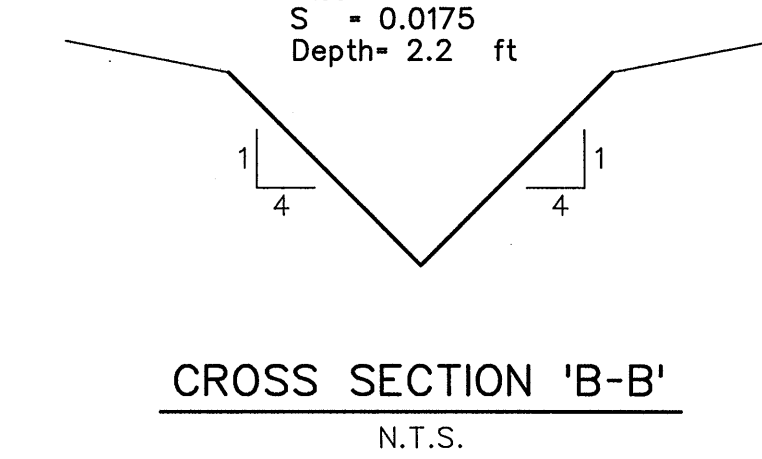
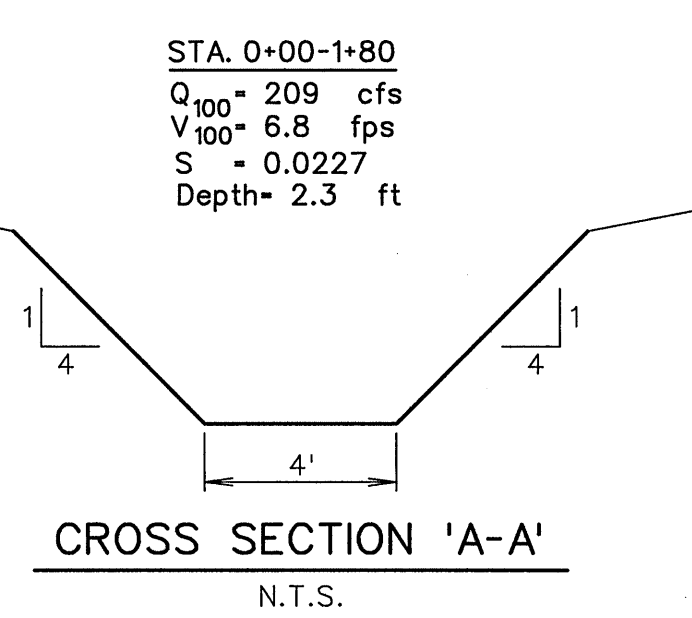


FLOW CALCULATIONS

Year	Upstream Station	Downstream Station	Area #	Incremental Q	Cumulative Q	Slope (ft/ft)	Depth (ft)	Velocity (fps)
100 Year	6+61.74	5+04.30	1,17	95.1	95.1	1.75%	2.2	5.1
	5+04.30	1+80.00	PVI	0.0	95.1	1.22%	2.3	4.4
	1+80.00	0+00.00	1A,16	113.5	208.6	2.27%	2.3	6.8
50 Year	6+61.74	5+04.30	1,17	86.0	86.0	1.75%	2.1	4.9
	5+04.30	1+80.00	PVI	0.0	86.0	1.22%	2.2	4.3
	1+80.00	0+00.00	1A,16	102.7	188.7	2.27%	2.2	6.6
25 Year	6+61.74	5+04.30	1,17	75.9	75.9	1.75%	2	4.8
	5+04.30	1+80.00	PVI	0.0	75.9	1.22%	2.1	4.2
	1+80.00	0+00.00	1A,16	90.7	166.6	2.27%	2.1	6.4
10 Year	6+61.74	5+04.30	1,17	67.7	67.7	1.75%	1.9	4.7
	5+04.30	1+80.00	PVI	0.0	67.7	1.22%	2	4.1
	1+80.00	0+00.00	1A,16	80.8	148.5	2.27%	2	6.2
5 Year	6+61.74	5+04.30	1,17	56.3	56.3	1.75%	1.8	4.4
	5+04.30	1+80.00	PVI	0.0	56.3	1.22%	1.9	3.9
	1+80.00	0+00.00	1A,16	67.3	123.6	2.27%	1.8	5.9
2 Year	6+61.74	5+04.30	1,17	45.0	45.0	1.75%	1.6	4.2
	5+04.30	1+80.00	PVI	0.0	45.0	1.22%	1.8	3.7
	1+80.00	0+00.00	1A,16	53.9	98.9	2.27%	1.7	5.6

STA. 1+80-5+04
 $Q_{100} = 95.1$ cfs
 $V_{100} = 4.4$ fps
 $S = 0.0122$
 Depth = 2.3 ft

STA. 5+04-6+62
 $Q_{100} = 95.1$ cfs
 $V_{100} = 5.15$ fps
 $S = 0.0175$
 Depth = 2.2 ft



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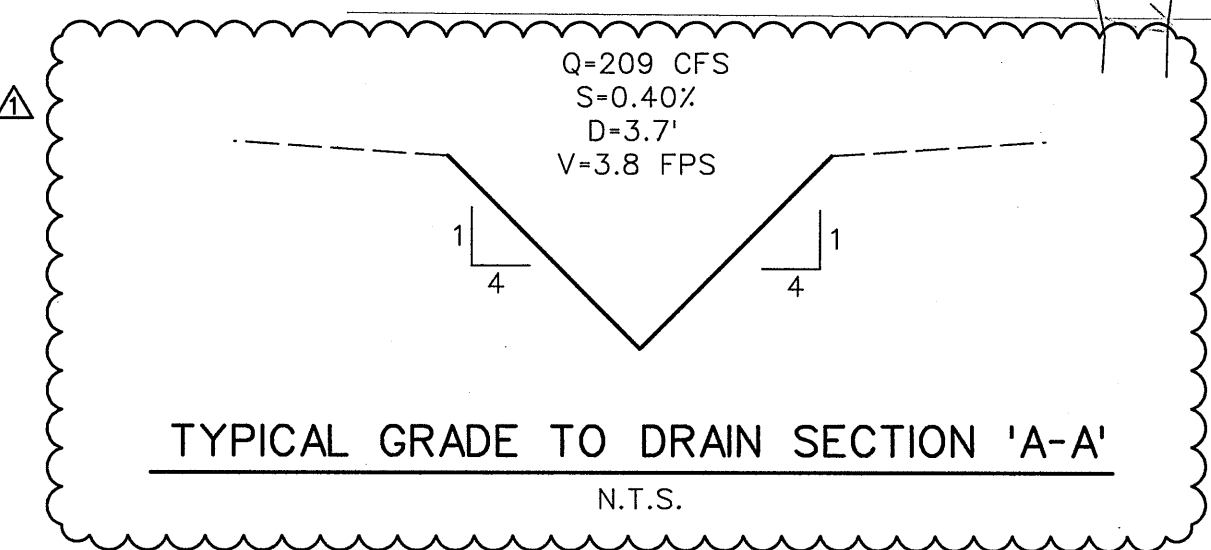
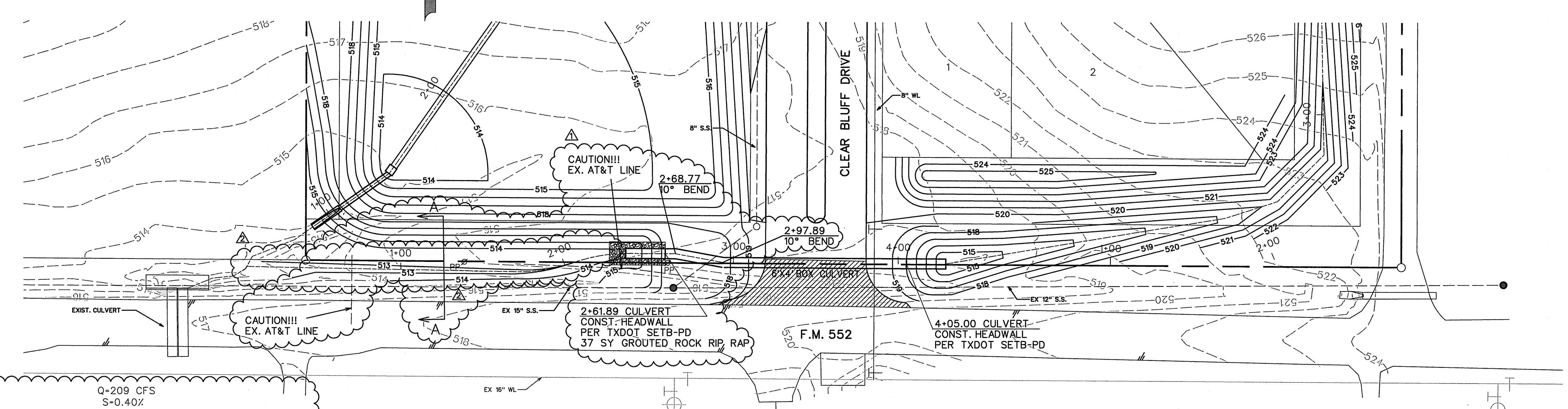
CORWIN ENGINEERING, INC.
 200 W. BELMONT, SUITE E
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DEVELOPMENT PLANS FOR
**BREEZY HILL
 PHASE IX-A**
 ROCKWALL, TEXAS

INTERCEPTOR SWALE

DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
JOB NUMBER	DATE	SCALE: HOR: 1"=40' VER: 1"=4'	12A of 17
14074	NOVEMBER 2014		

SCALE: 1" = 40'

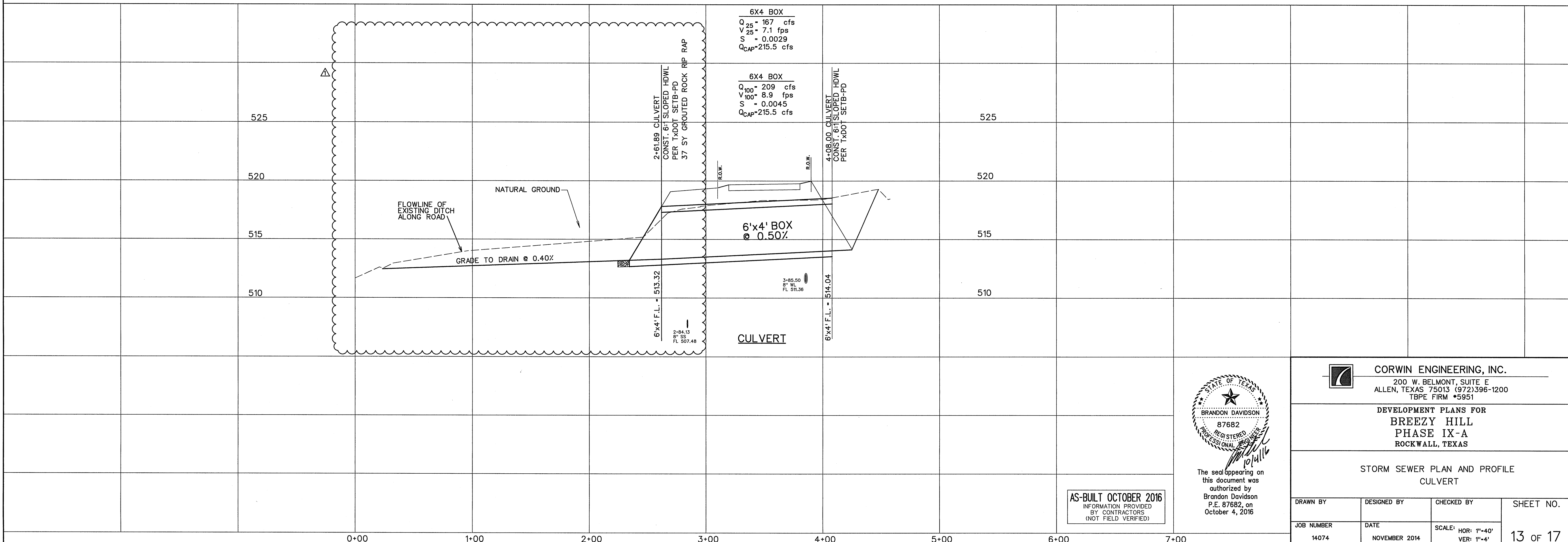


CITY OF ROCKWALL CULVERT CALCULATION

OUTLET CONTROL										INLET CONTROL									
Drainage Area (sf)	Flow (cfs)	Ditch Slope	Pipe Size (in)	No. of Barrels	Area (sf)	Full Flow Velocity (fps)	Hydraulic Slope (ft/ft)	Outlet Slope (ft/ft)	Starting Tailwater Elevation (ft)	Length @ Flowline (ft)	Headwater Elevation (ft)	Upstream Headwater Elevation (ft)	Headwater or Outlet Control?	Inlet Elevation (ft)	U/S Elev. (ft)	U/S vs. Soffit (ft)			
3052989	208.6	0.50%	6x4	1	23.3200	8.9	1.24	0.0045	513.40	517.40	518.65	518.09	3.45	514.09	518.54	Inlet Control	518.54	1.46	

TXDOT CULVERT CALCULATION

OUTLET CONTROL										INLET CONTROL												
Drainage Area (sf)	Drainage Area (acres)	Time of Concentration (min)	Runoff Coeff.	Flow (cfs)	Ditch Slope	Pipe Size (in)	No. of Barrels	Area (sf)	Full Flow Velocity (fps)	Head Slope (ft/ft)	Hydraulic Slope (ft/ft)	Outlet Flowline Elevation (ft)	Starting Tailwater Elevation (ft)	Length @ Flowline (ft)	Headwater Elevation (ft)	Upstream Headwater Elevation (ft)	Headwater or Outlet Control?	Inlet Elevation (ft)	U/S Elev. (ft)	U/S vs. Soffit (ft)		
3052989	70.1	20	0.36	166.6	0.50%	6x4	1	23.3200	7.1	0.79	0.0029	513.40	517.40	137.16	518.19	518.09	2.20	514.09	518.29	Inlet Control	518.29	0.20



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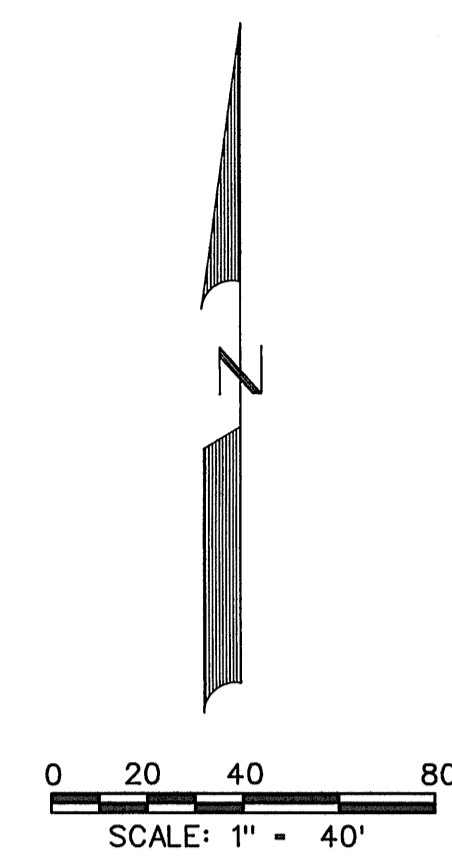
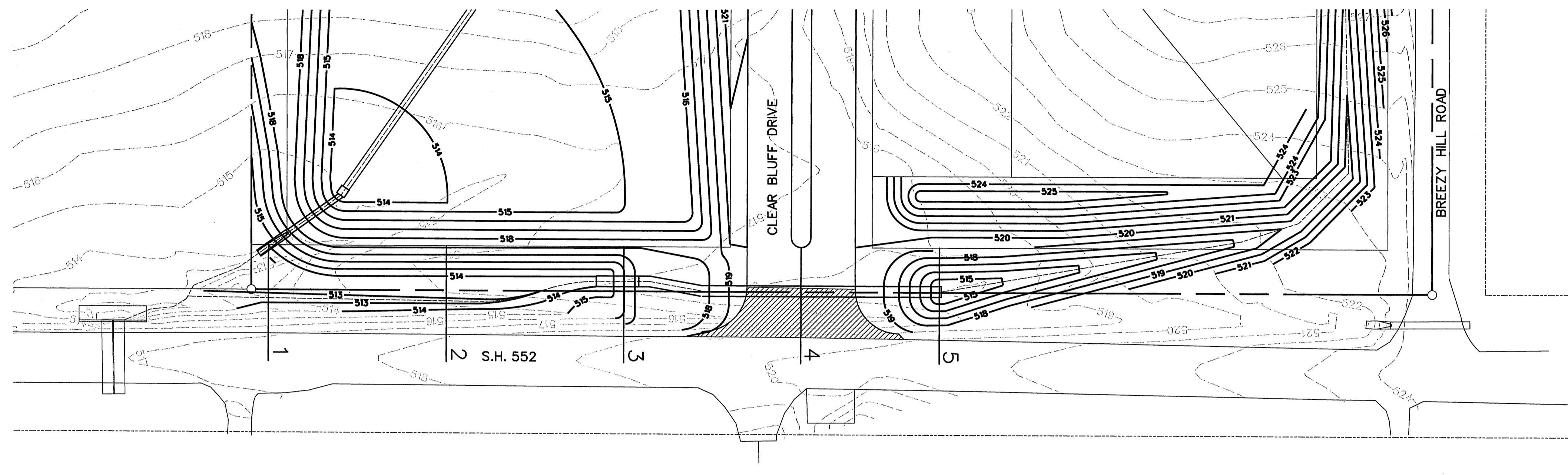
AS-BUILT OCTOBER 2016
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DEVELOPMENT PLANS FOR
BREEZY HILL
PHASE IX-A
ROCKWALL, TEXAS

STORM SEWER PLAN AND PROFILE
CULVERT

DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
JOB NUMBER	DATE	SCALE: HOR: 1"=40' VER: 1"=4'	13 OF 17
14074	NOVEMBER 2014		



520		520		520		520		520	
515	EXISTING GROUND PROPOSED GRADE	515	EXISTING GROUND PROPOSED GRADE	515	EXISTING GROUND PROPOSED GRADE	515	EXISTING GROUND PROPOSED GRADE	515	
510		510		510		510		510	
	1		2		3		4		5
0+00	1+00	0+00	1+00	0+00	1+00	0+00	1+00	0+00	1+00

EXISTING GROUND

PROPOSED GRADE

EXISTING GROUND

PROPOSED GRADE

EXISTING GROUND

PROPOSED GRADE

EXISTING GROUND

PROPOSED GRADE

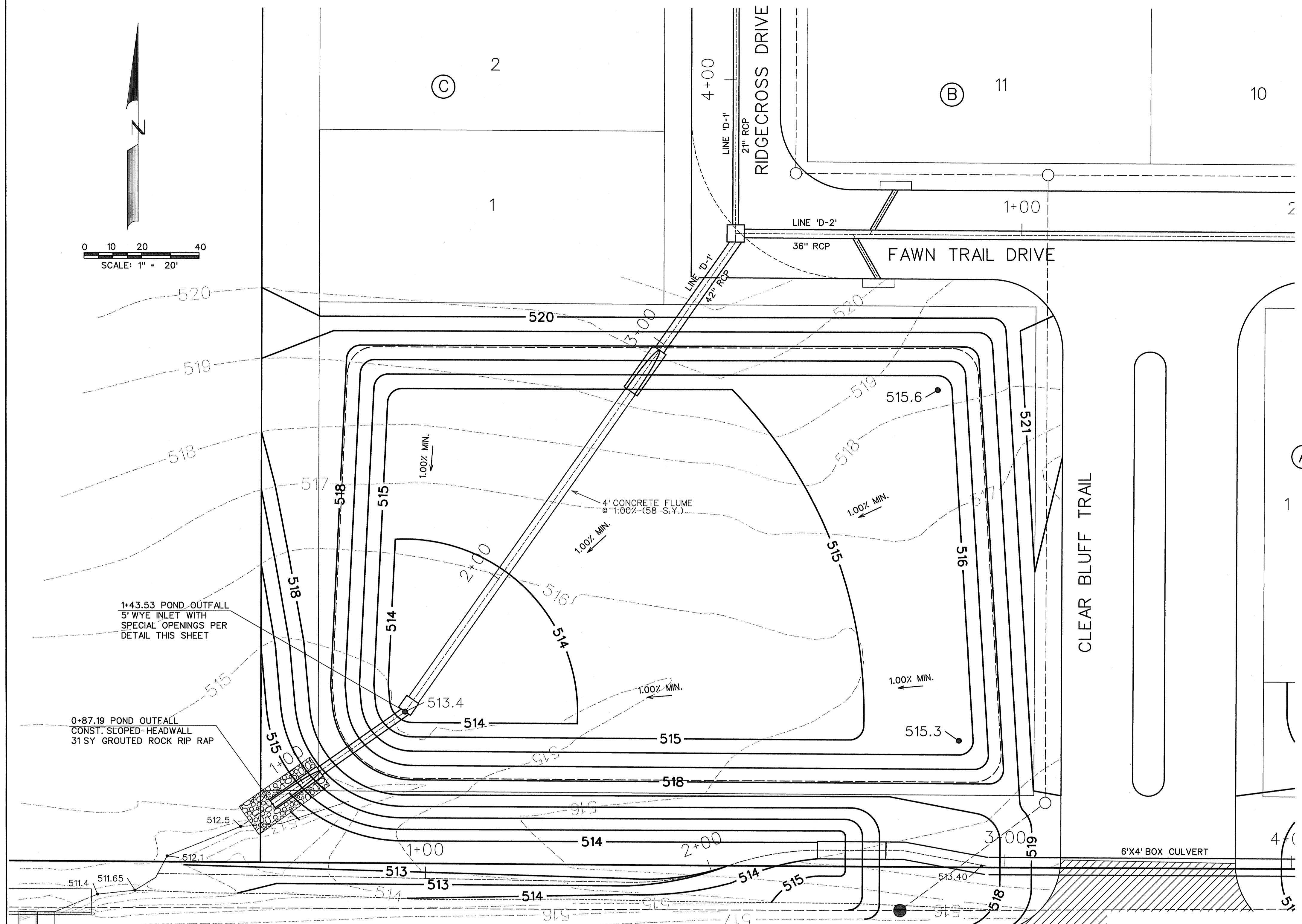
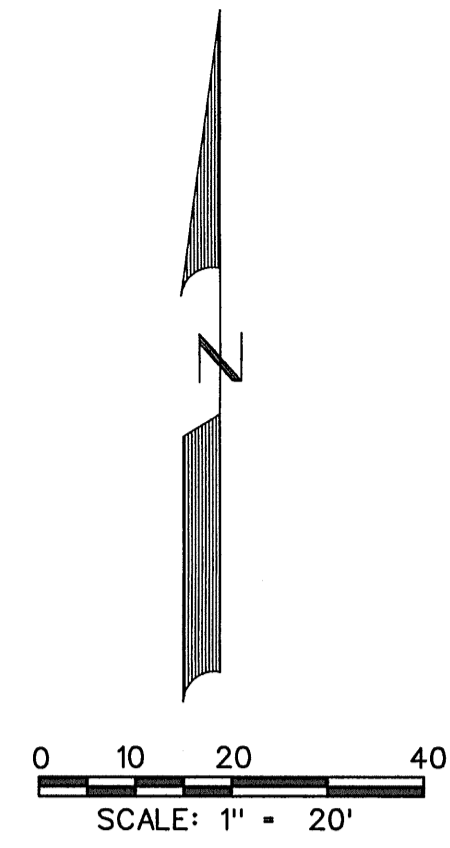
AS-BUILT OCTOBER 2016
INFORMATION PROVIDED BY CONTRACTORS (NOT FIELD VERIFIED)

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TBPE FIRM #5951

DEVELOPMENT PLANS FOR BREEZY HILL PHASE IX-A ROCKWALL, TEXAS

FM 552 CROSS SECTIONS

DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
JOB NUMBER	DATE	SCALE: HOR: 1"=40' VER: 1"=4'	13A of 17
14074	NOVEMBER 2014		



Breezy Hill Phase 9 Detention Pond
2-Year Storm

Pre-Project Runoff Calculations

Area #	Area (sf)	Area (acres)	Existing Runoff Coefficient	Tc - Existing (min)	Rainfall Intensity (in/hr)	Q - Undeveloped (cfs)
EX1	1075082	24.68	0.35	20	5.9	51.0
1	102009	2.34	0.5	10	6.2	6.2
2	26921	0.62	0.5	10	5.3	1.6
Allowed Release=						25.8

Post-Project Runoff Calculations

Area #	Area (sf)	Area (acres)	Existing Runoff Coefficient	Tc - Existing (min)	Rainfall Intensity (in/hr)	Q - Post Development (cfs)
3-14	972992	22.3	0.5	10	5.3	59.2
Allowed Release=						59.2

10-Year Storm

Pre-Project Runoff Calculations

Area #	Area (sf)	Area (acres)	Existing Runoff Coefficient	Tc - Existing (min)	Rainfall Intensity (in/hr)	Q - Undeveloped (cfs)
EX1	1075082	24.68	0.35	20	5.9	51.0
1	102009	2.34	0.5	10	7.1	8.3
2	26921	0.62	0.5	10	7.1	2.2
Allowed Release=						40.5

Post-Project Runoff Calculations

Area #	Area (sf)	Area (acres)	Existing Runoff Coefficient	Tc - Existing (min)	Rainfall Intensity (in/hr)	Q - Post Development (cfs)
3-14	972992	22.3	0.5	10	7.1	79.3
Allowed Release=						79.3

25-Year Storm

Pre-Project Runoff Calculations

Area #	Area (sf)	Area (acres)	Existing Runoff Coefficient	Tc - Existing (min)	Rainfall Intensity (in/hr)	Q - Undeveloped (cfs)
EX1	1075082	24.68	0.35	20	6.6	57.0
1	102009	2.34	0.5	10	8.3	9.7
2	26921	0.62	0.5	10	8.3	2.6
Allowed Release=						44.7

Post-Project Runoff Calculations

Area #	Area (sf)	Area (acres)	Existing Runoff Coefficient	Tc - Existing (min)	Rainfall Intensity (in/hr)	Q - Post Development (cfs)
3-14	972992	22.3	0.5	10	8.3	92.7
Allowed Release=						92.7

50-Year Storm

Pre-Project Runoff Calculations

Area #	Area (sf)	Area (acres)	Existing Runoff Coefficient	Tc - Existing (min)	Rainfall Intensity (in/hr)	Q - Undeveloped (cfs)
EX1	1075082	24.68	0.35	20	6.6	57.0
1	102009	2.34	0.5	10	9	10.5
2	26921	0.62	0.5	10	9	2.6
Allowed Release=						51.5

Post-Project Runoff Calculations

Area #	Area (sf)	Area (acres)	Existing Runoff Coefficient	Tc - Existing (min)	Rainfall Intensity (in/hr)	Q - Post Development (cfs)
3-14	972992	22.3	0.5	10	9	100.5
Allowed Release=						100.5

100-Year Storm

Pre-Project Runoff Calculations

Area #	Area (sf)	Area (acres)	Existing Runoff Coefficient	Tc - Existing (min)	Rainfall Intensity (in/hr)	Q - Undeveloped (cfs)
EX1	1075082	24.68	0.35	20	8.3	71.7
1	102009	2.34	0.5	10	9.8	11.5
2	26921	0.62	0.5	10	9.8	3.0
Allowed Release=						57.2

Post-Project Runoff Calculations

Area #	Area (sf)	Area (acres)	Existing Runoff Coefficient	Tc - Existing (min)	Rainfall Intensity (in/hr)	Q - Post Development (cfs)
3-14	972992	22.3	0.5	10	9.8	109.5
Allowed Release=						109.5

Elevation Calculations

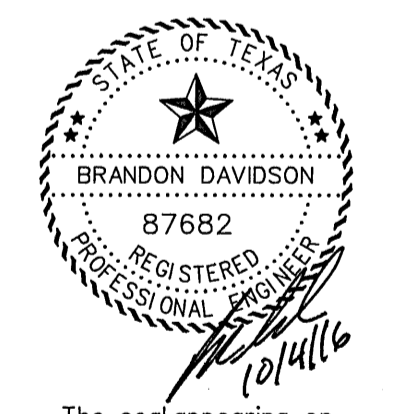
Event	Maximum Release Rate (cfs)	Storage Requirement (cu ft)	Occurs at Elevation
2-year	25.8	34232	515.93
10-year	40.5	47944	516.42
25-year	44.7	53070	516.59
50-year	51.5	57310	516.74
100-year	57.2	61636	516.89

Elevation-Storage Table

Elevation (cf)	Volume
513.4	0
514	1677
515	12771
516	32939
517	64863
518	95611

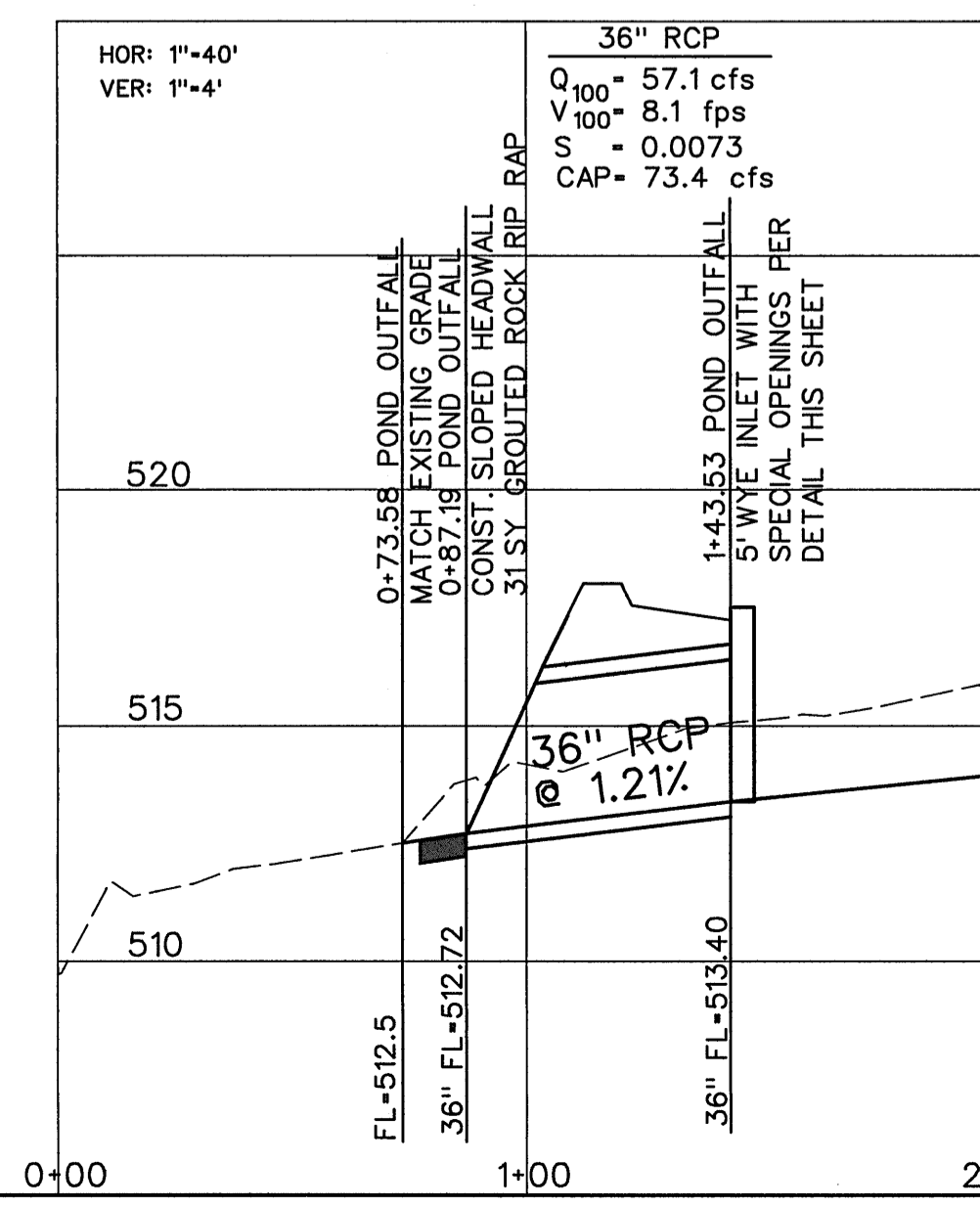
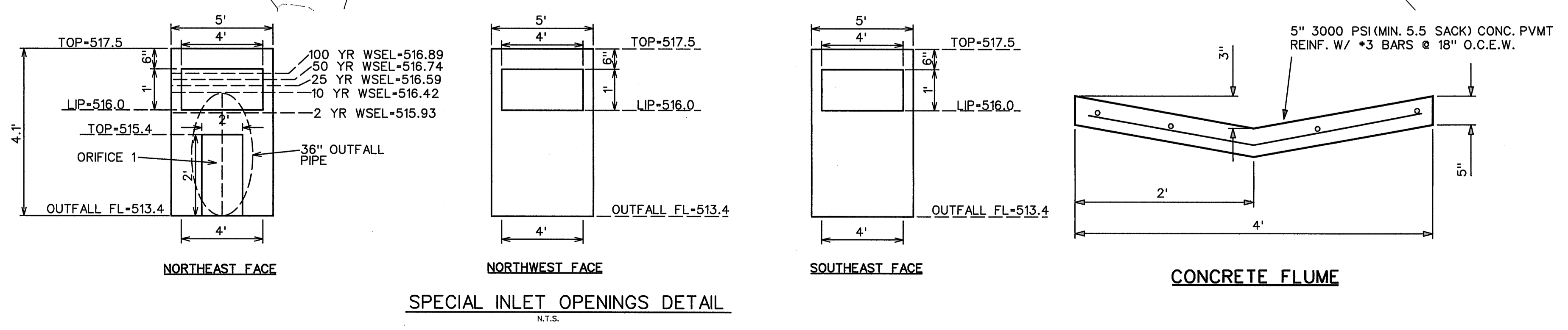
Stage-Discharge Table

Stage	H	Area	Discharge	Weir Length	Depth of Flow Over Weir	Weir Discharge	Total Discharge	Allowable Discharge	Above (Below)	
513.40	0	0	0			0.0	0.0			
514.00	0.30	1.20	3.2			0.0	3.2			
515.00	0.80	3.20	13.8			0.0	13.8			
515.93	1.82	4.00	23.8			0.0	23.8	25.8	(2.06)	2-year
516.00	1.80	4.00	24.4	12.0	0.0	0.0	24.4			
516.42	2.02	4.00	27.4	12.0	0.4	8.6	36.0	40.5	(4.49)	10-year
516.59	2.19	4.00	28.5	12.0	0.6	14.1	42.6	44.7	(2.14)	25-year
516.74	2.34	4.00	29.5	12.0	0.7	20.3	49.7	51.5	(1.73)	50-year
516.89	2.49	4.00	30.4	12.0	0.9	26.7	57.1	57.2	(0.10)	100-year
517.00	2.60	4.00	31.1	12.0	1.0	31.6	62.6			
518.00	3.60	4.00	36.5	12.0	2.0	89.3	125.8			



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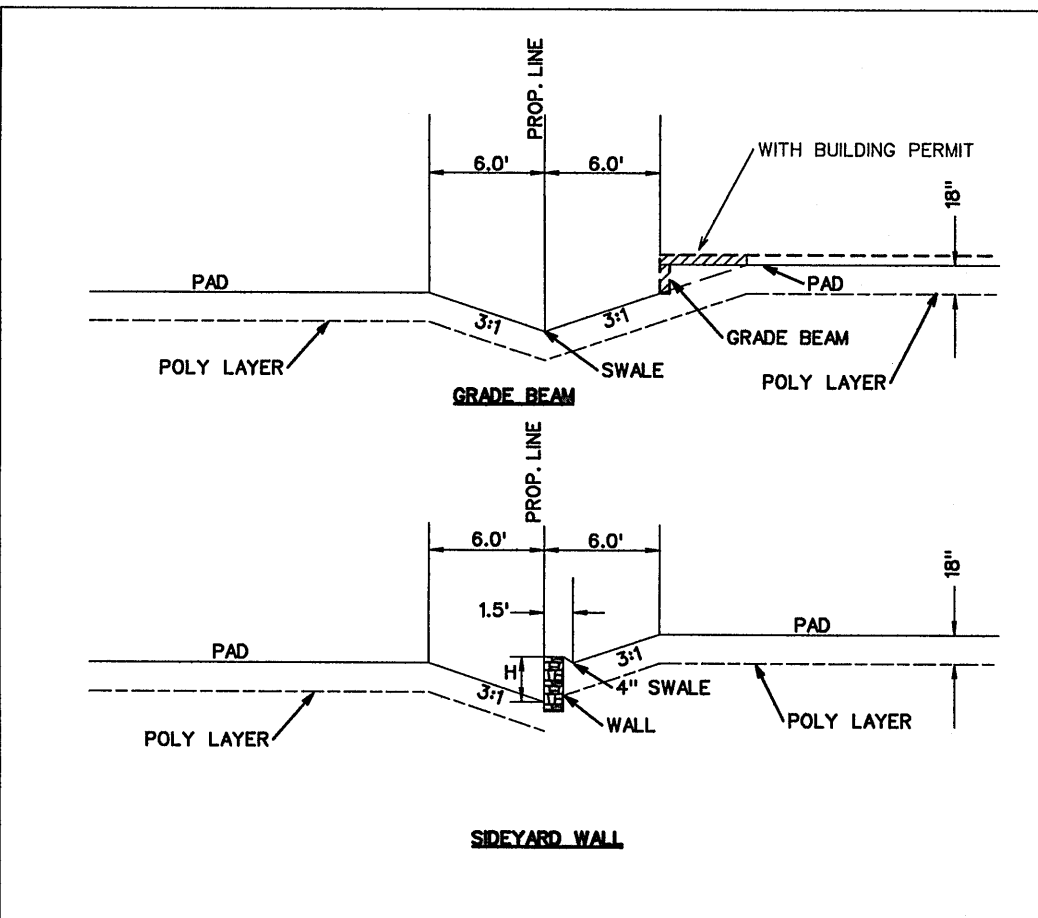
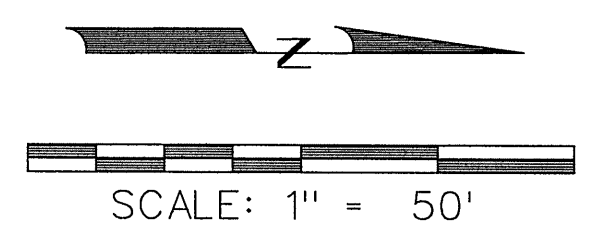


CORWIN ENGINEERING, INC.
200 W. BELMONT, SUITE E
ALLEN, TEXAS 75013 (972)396-1200
TBE FIRM #5951

DEVELOPMENT PLANS FOR BREEZY HILL PHASE IX-A
ROCKWALL, TEXAS

DETENTION POND PLAN

DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
14074	NOVEMBER 2014	SCALE: 1"=20'	14 OF 17



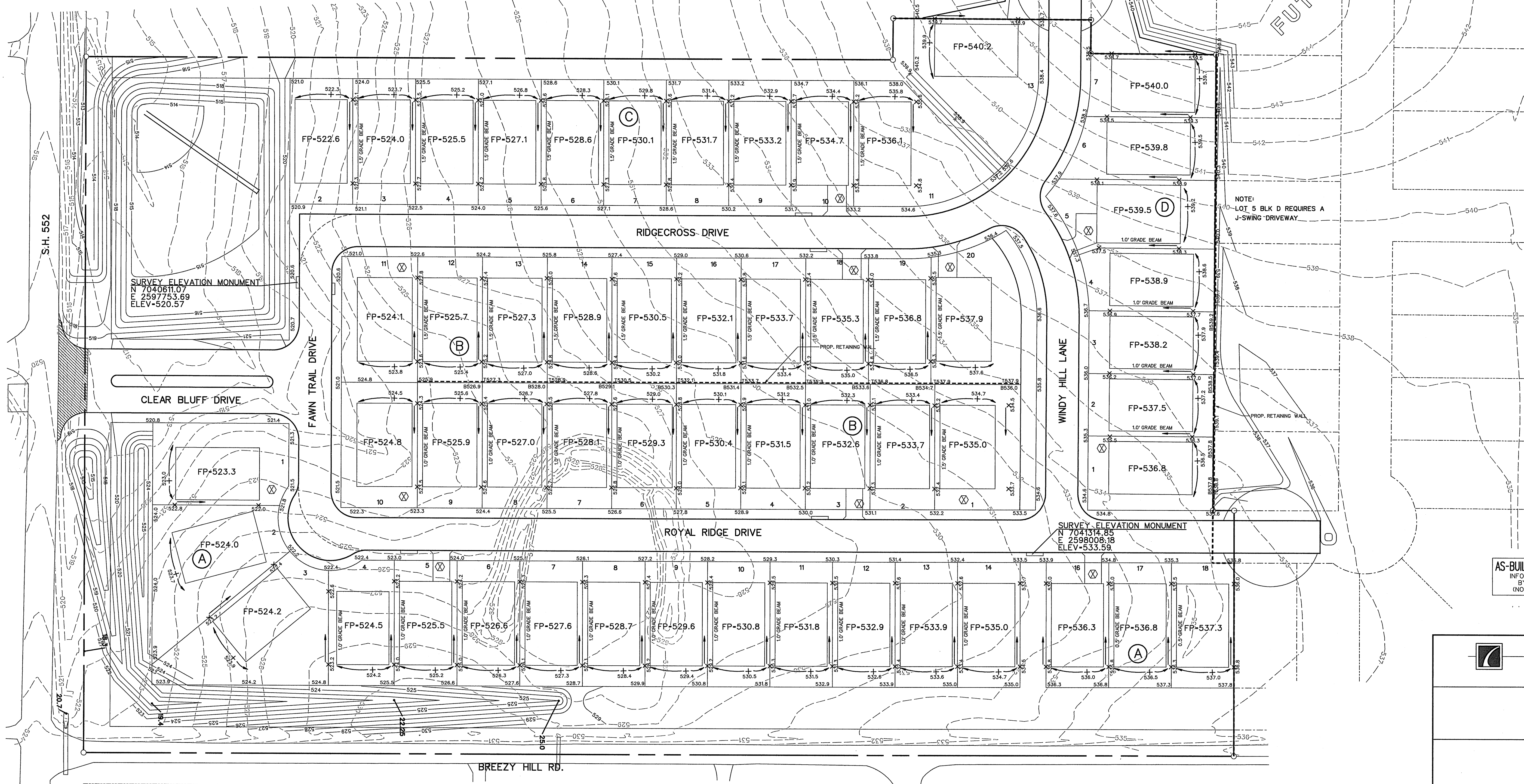
⊗ DRIVEWAY LOCATION SO MAXIMUM 14% SLOPE OR UNDER IS MAINTAINED, OR AS TO AVOID INLET AND MAINTAIN 30' MIN. FROM CURB RETURN OF INTERSECTION. (DRIVEWAY MAY BE PLACED AT ALTERNATE LOCATION WITH USE OF A DROP GARAGE AS LONG AS MAXIMUM SLOPE IS 14% OR UNDER)

- NOTES:**
1. Finish Floor Elevation to be 0.70 Feet above Finished Pad.(FP)
 2. Additional Erosion Control to be installed in Parkways as determined by the City Inspector.
 3. Finished Pad Elevations are within ± 0.3 Feet.
 4. All fill compacted to min 95% std. density using sheeps foot roller.

NOTE:
RETAINING WALLS 3' IN HEIGHT AND OVER NEED A ENGINEERED SEALED PLAN. (PLANS TO BE SUBMITTED PRIOR TO ENGINEERING APPROVAL)

ALL WALLS TO BE BUILT ON ONE LOT. NO FOOTINGS, TIE BACKS, ETC. TO EXTEND OUTSIDE OF LOT.

Note:
Each lot will need a detailed grading plan with building permit submittal. This is a general grading plan for site work only.



FUTURE PHASE

NOTE:
LOT 5 BLK D REQUIRES A J-SWING DRIVEWAY



AS-BUILT OCTOBER 2016
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TBP FIRM #5951

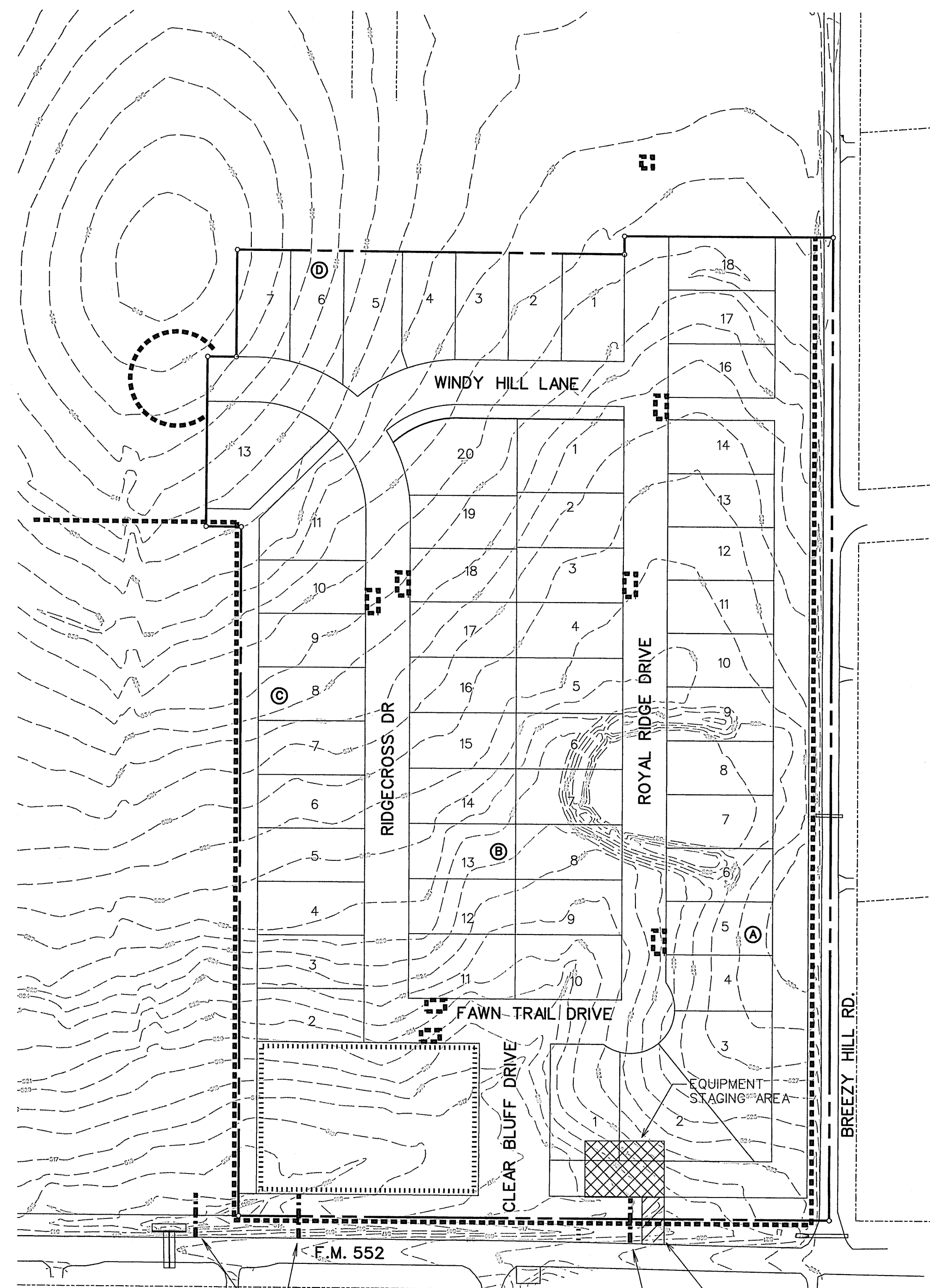
DEVELOPMENT PLANS FOR
**BREEZY HILL
PHASE IX-A
ROCKWALL, TEXAS**

GRADING PLAN

DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
JOB NUMBER	DATE	SCALE:	15 OF 17
14074	NOVEMBER 2014	1"=50'	



0 50 100 200
SCALE: 1" = 100'



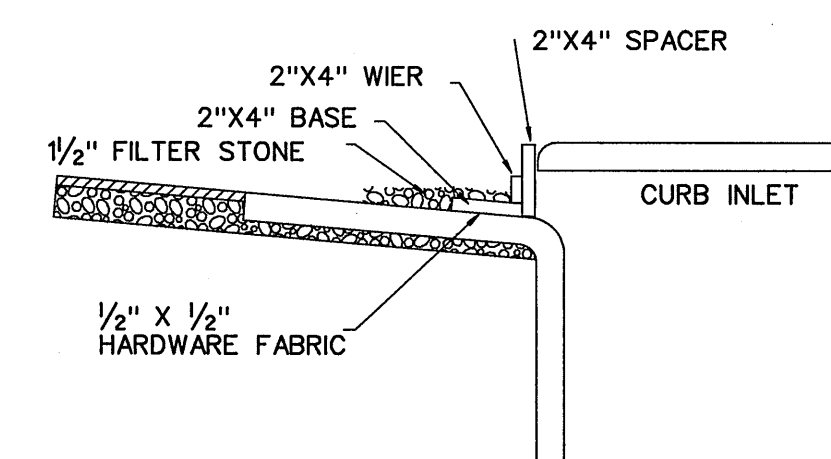
HAY BALES PER TXDOT STANDARD EC(1)-09

HAY BALES PER TXDOT STANDARD EC(1)-09

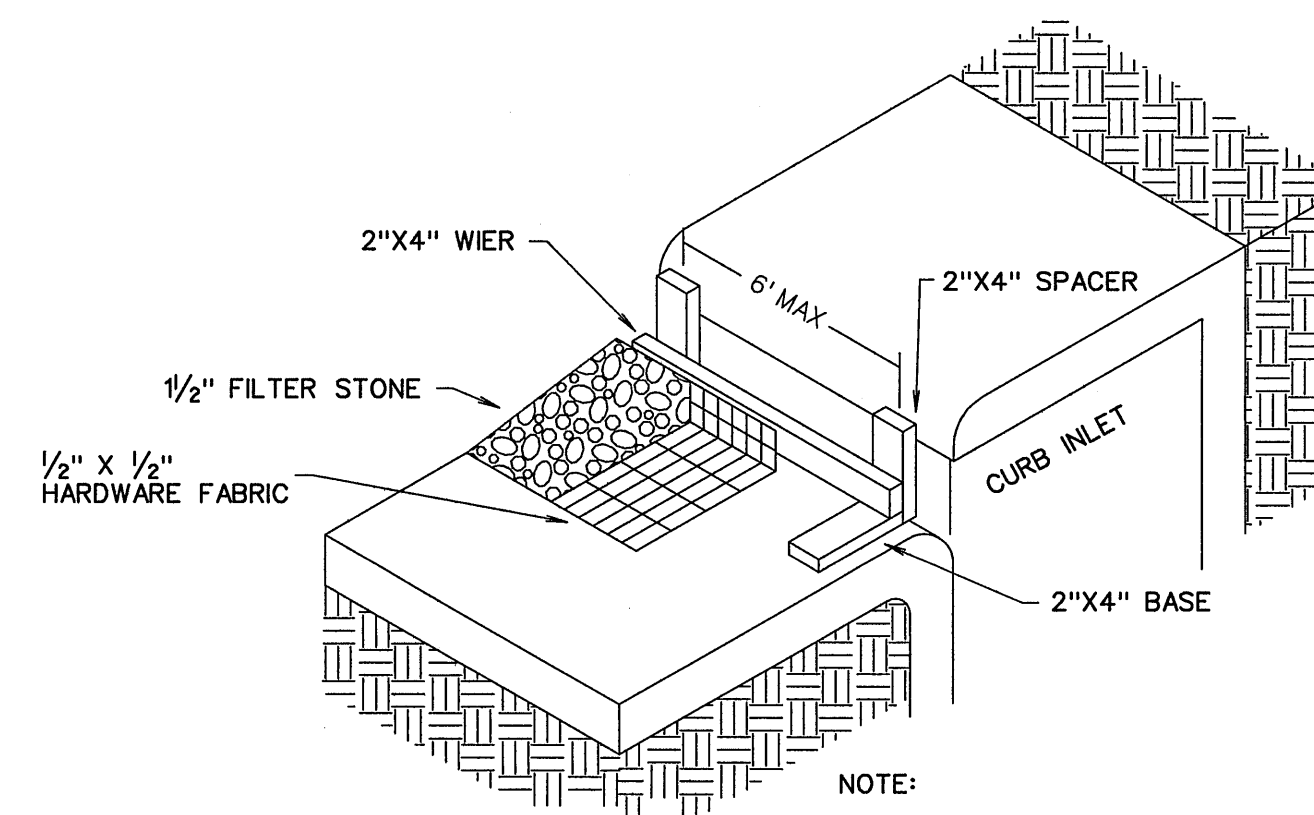
STABILIZED ENTRANCE PER TXDOT STANDARD EC(3)-93 TYPE 1



SCALE: 1" = 100'



INLET SECTION



NOTE:

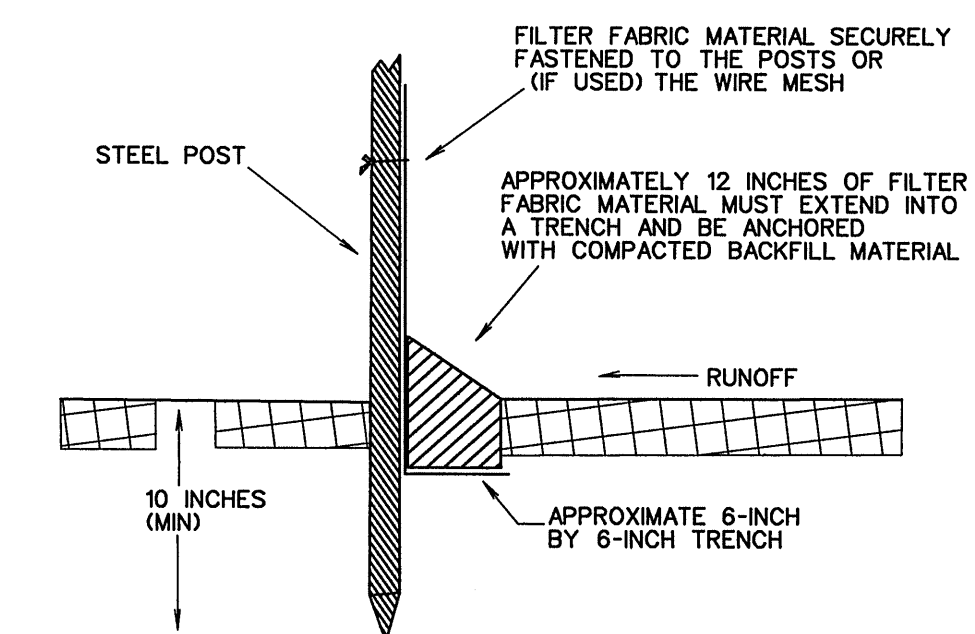
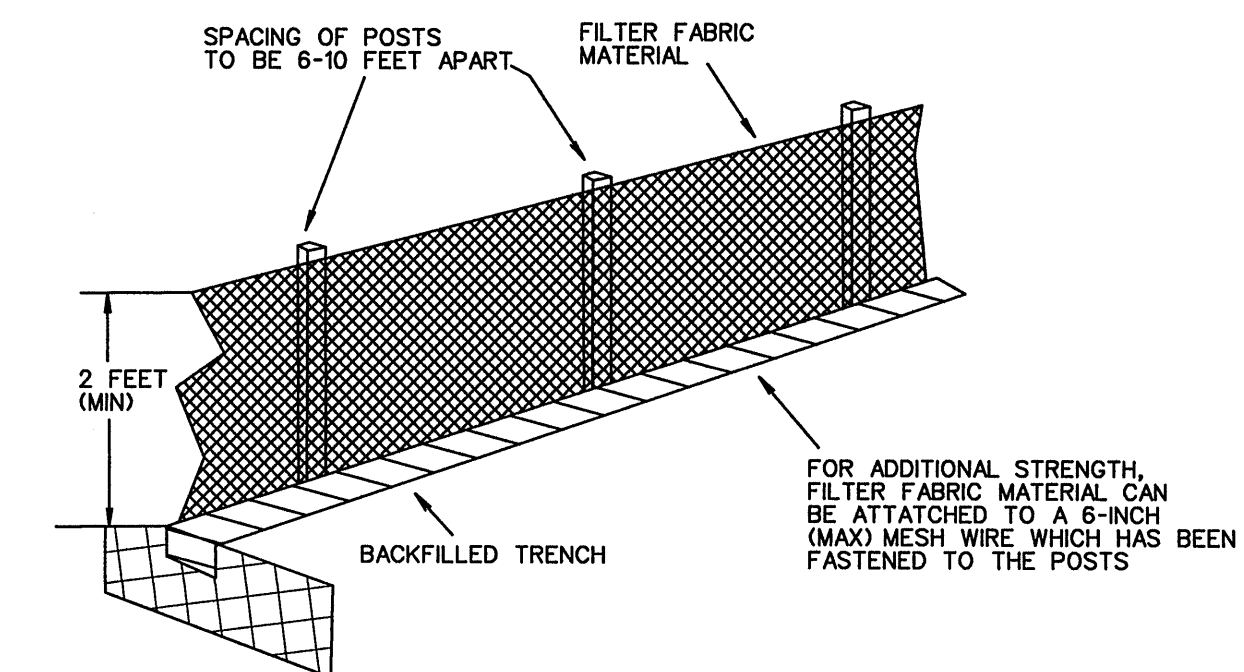
EXTEND FABRIC, FRAME AND FILTER STONE 12' BEYOND END OF INLET ON BOTH ENDS.

AS-BUILT OCTOBER 2016
INFORMATION PROVIDED BY CONTRACTORS (NOT FIELD VERIFIED)

TYPE B CURB INLET PROTECTION

CONSTRUCTION SEQUENCE

1. GRADING CONTRACTOR TO INSTALL TEMPORARY STABILIZED ENTRANCE.
2. INSTALL SILT FENCE AS SHOWN, (TS-600 POLY FELT) PER C.O.G. SPECIFICATIONS.
3. PERFORM GRADING AND UTILITY CONSTRUCTION.
4. AFTER THE INLET BOTTOMS ARE CONSTRUCTED, THE INLETS SHALL BE FILLED WITH STONE AND COVERED WITH A FILTER FABRIC (TS-600 POLY FELT OR EQUIVALENT) BY UTILITY CONTRACTOR.
5. PRIOR TO CITY RELEASING PAVING, SOD OR SEEDED CURLEX SHALL BE INSTALLED ON SIDES AND BOTTOM OF ALL DETENTION PONDS.
6. AFTER PAVING AND COMPLETION OF INLETS, INLET FILTERS SHALL BE INSTALLED IN ALL INLETS AND MAINTAINED UNTIL RE-VEGETATION HAS BEEN COMPLETED BY PAVING CONTRACTOR.
7. SILT FENCE SHALL REMAIN IN PLACE UNTIL RE-VEGETATION HAS BEEN COMPLETED.
8. PAVING CONTRACTOR SHALL REMOVE TEMPORARY STABILIZED ENTRANCE.
9. PRIOR TO CITY ACCEPTANCE THE PAVING CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING ANY MUD OR SILT WHICH COLLECTS ON THE EXISTING AND NEW PAVEMENT AND INSTALLING SILT FENCE AT BACK OF CURB THROUGHOUT THE ENTIRE SITE.
10. 75%-80% OF ALL DISTURBED AREA TO HAVE A MINIMUM 1" STAND OF GRASS PRIOR TO ENGINEERING ACCEPTANCE.
11. THE SIDES AND BOTTOM OF DETENTION POND TO BE STABILIZED WITH EITHER SEEDED ANCHOR CURLEX OR SOD PRIOR TO ANY PAVING. DETENTION SYSTEM TO BE FULLY FUNCTIONING PRIOR TO PAVING.



FILTER FABRIC FENCE DETAIL

LEGEND

- SILT FENCE (BEFORE CONSTRUCTION) - - - - -
- SILT FENCE (ADDED AFTER GRADING) - - - - -
- INLET PROTECTION [Symbol]



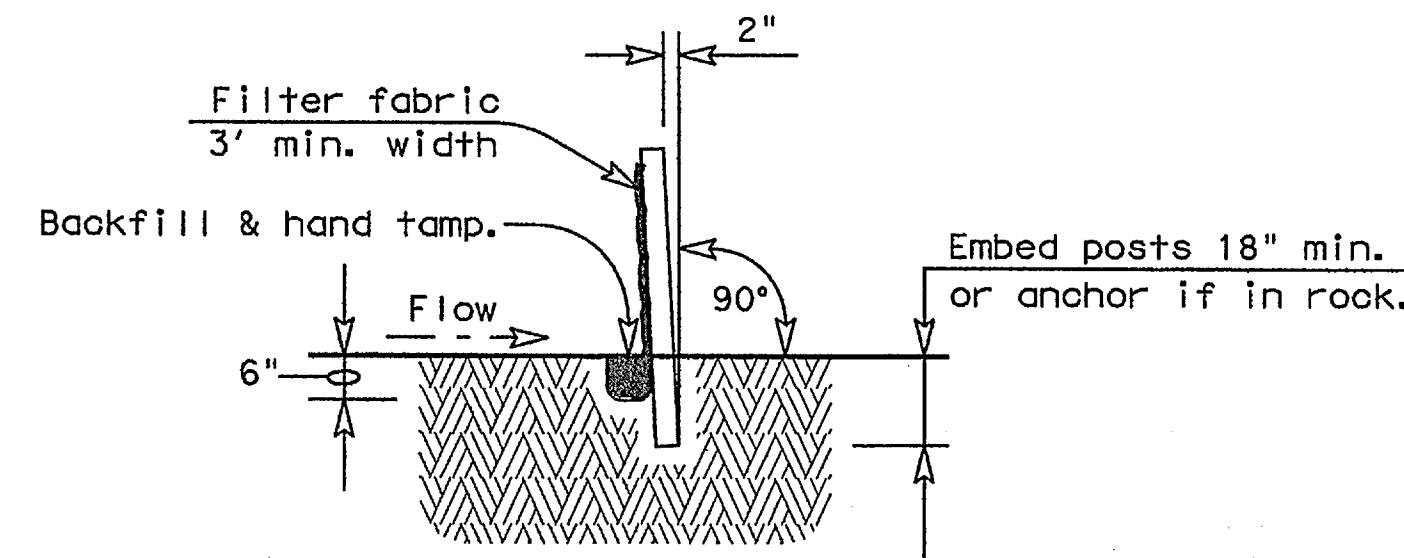
CORWIN ENGINEERING, INC.
200 W. BELMONT, SUITE E
ALLEN, TEXAS 75013 (972)396-1200
TBP FIRM #5951

DEVELOPMENT PLANS FOR
BREEZY HILL
PHASE IX-A
ROCKWALL, TEXAS

EROSION CONTROL PLAN

DRAWN BY	DESIGNED BY	CHECKED BY	SHEET NO.
JOB NUMBER	DATE	SCALE:	16 OF 17
14074	NOVEMBER 2014	1"=100'	

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SECTION A-A

GENERAL NOTES

1. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

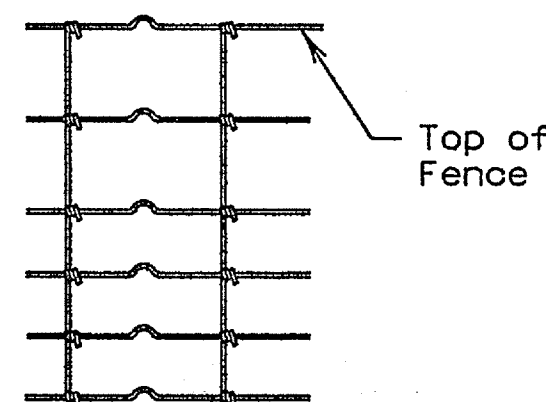
Sediment Control Fence — (SCF)

SEDIMENT CONTROL FENCE USAGE GUIDELINES

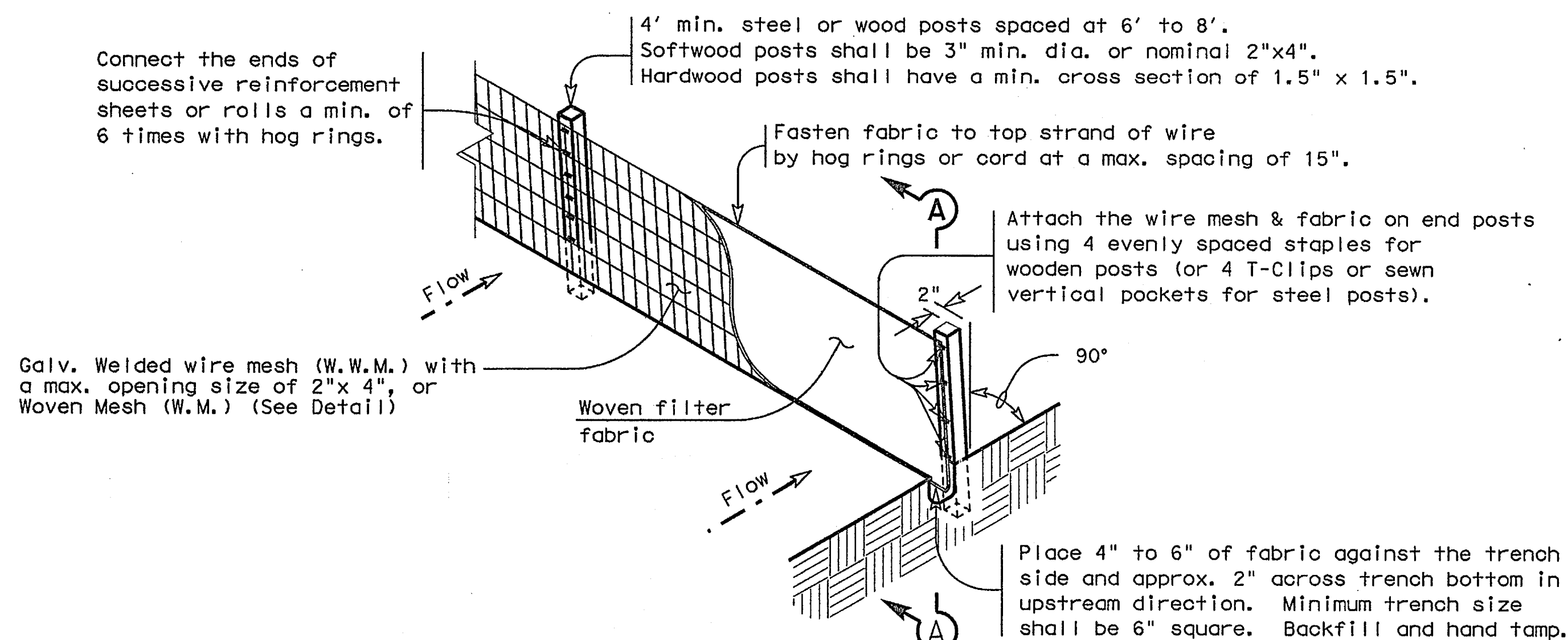
A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a max. flow through rate of 100 GPM/FT². Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

Galv. Hinge joint knot woven mesh (12.5 Ga. Min.) requires a minimum of five horizontal wires spaced at a max. 12 inches apart and all vertical wires spaced at a max. 12 inches apart.

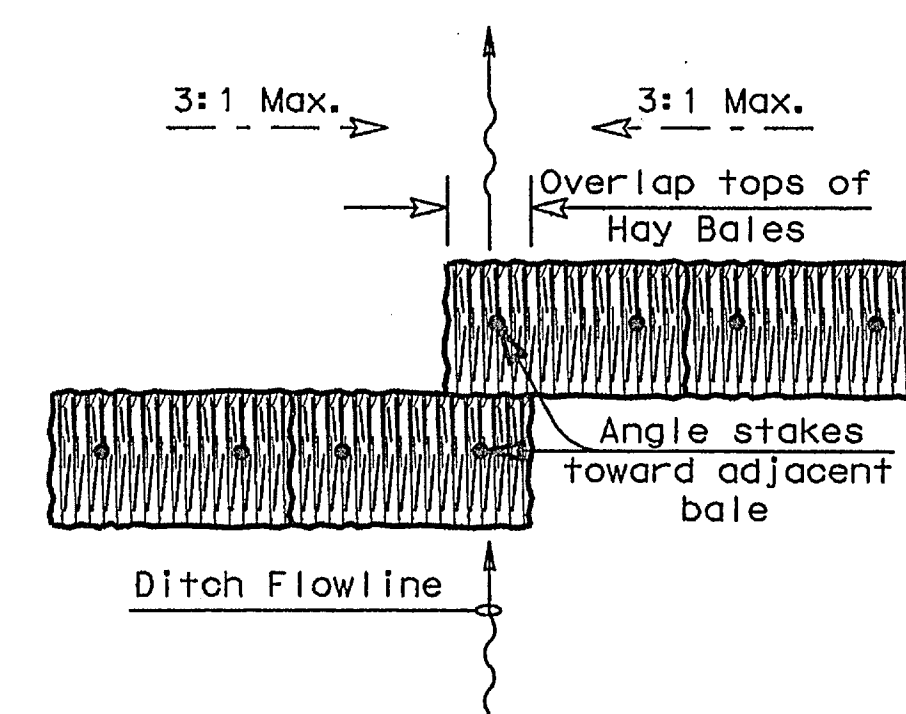


Hinge Joint Knot Woven Mesh (Option)

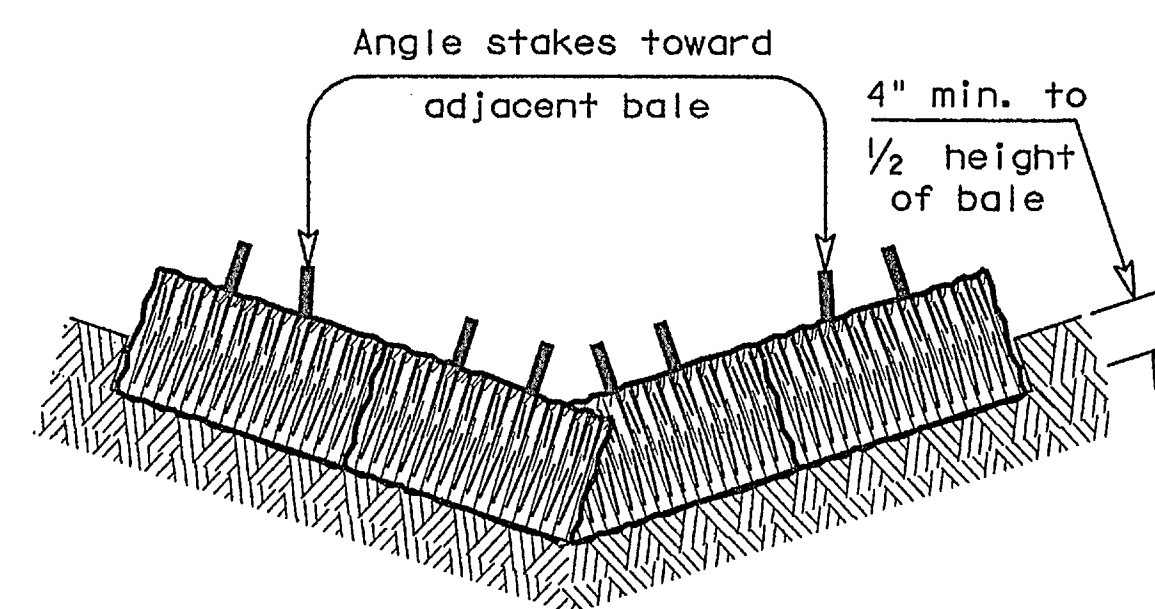


TEMPORARY SEDIMENT CONTROL FENCE

(SCF)



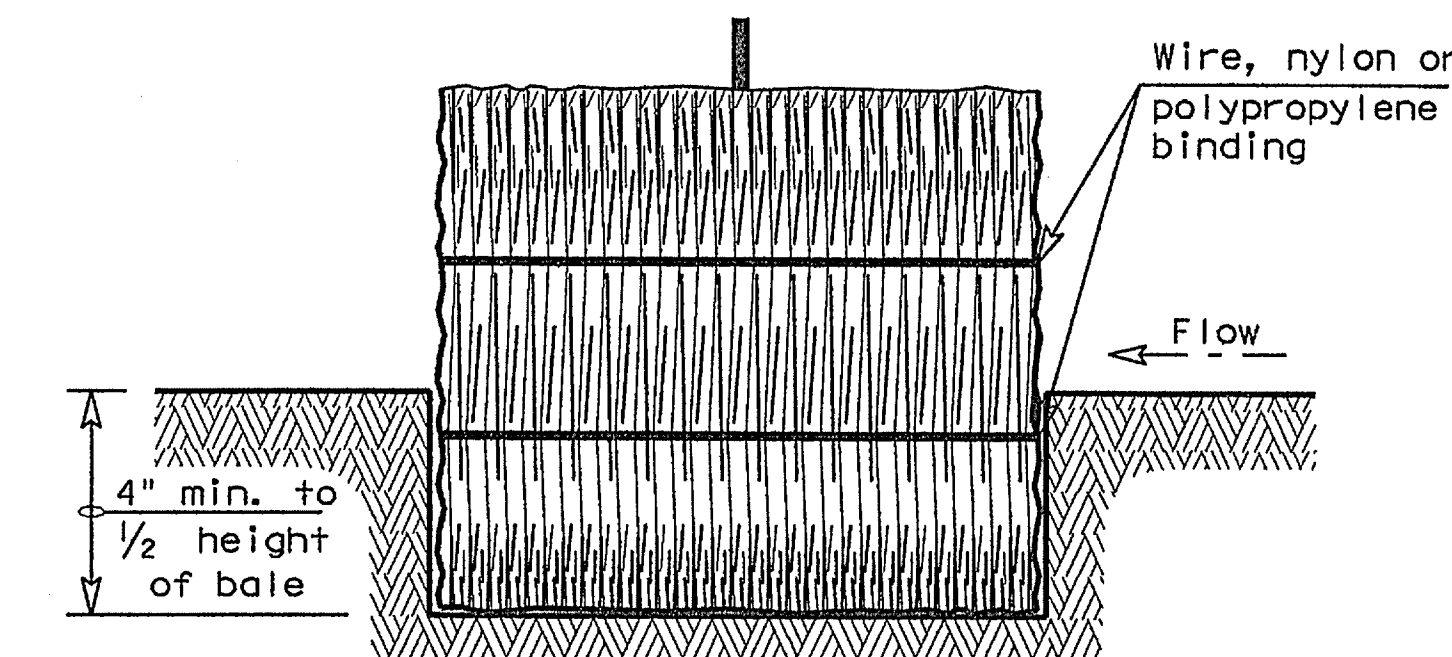
PLAN VIEW



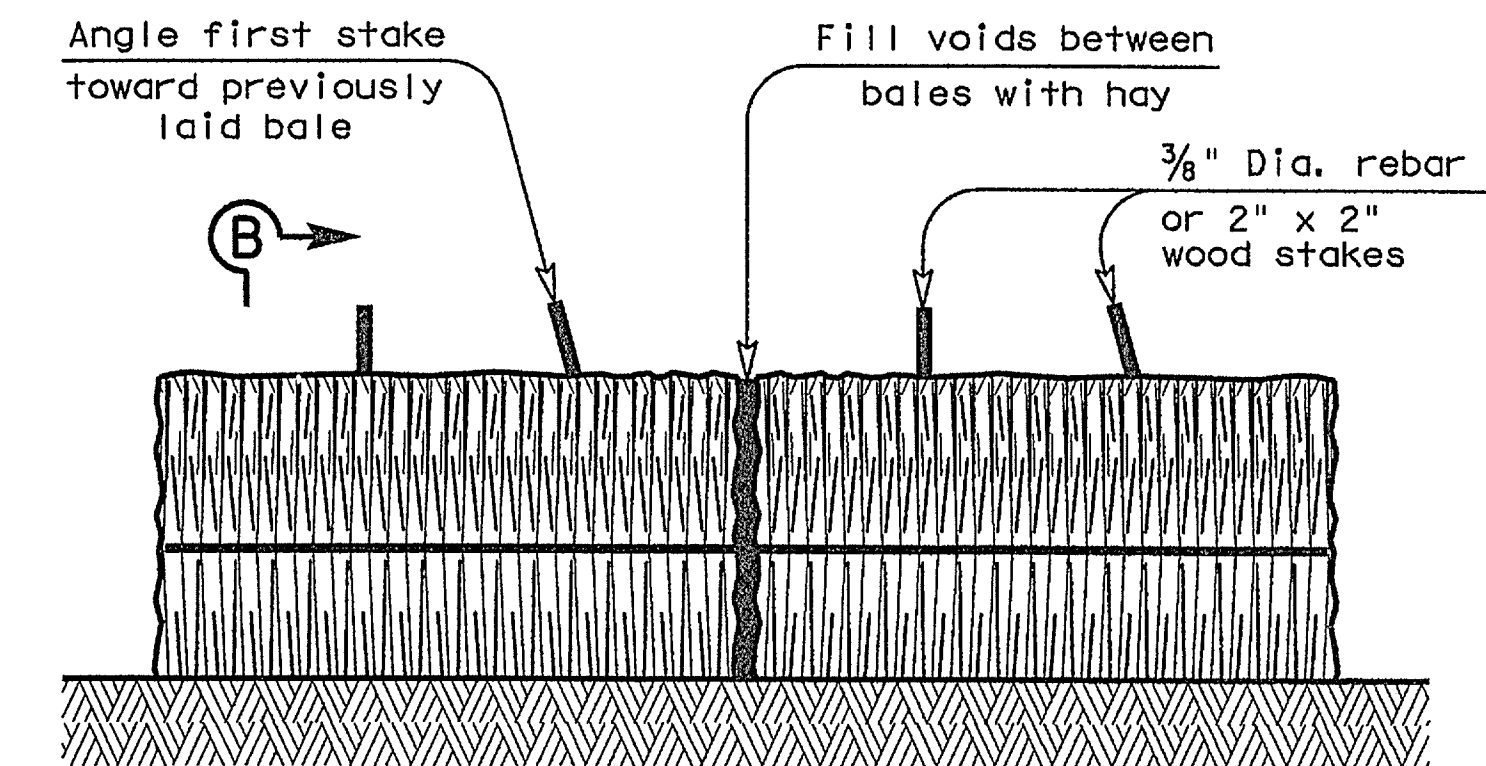
PROFILE VIEW

PLANS SHEET LEGEND

Baled Hay — (BH)



SECTION B-B



BALED HAY FOR EROSION CONTROL

(BH)

GENERAL NOTES

- Hay bales shall be a minimum of 30" in length and weigh a minimum of 50 Lbs.
- Hay bales shall be bound by either wire or nylon or polypropylene string. The bales shall be composed entirely of vegetative matter.
- Hay bales shall be embedded in the soil a minimum of 4" and where possible 1/2 the height of the bale.
- Hay bales shall be placed in a row with ends tightly abutting the adjacent bales. The bales shall be placed with bindings parallel to the ground.
- Hay bales shall be securely anchored in place with 3/8" Dia. rebar or 2" x 2" wood stakes, driven through the bales. The first stake shall be angled towards the previously laid bale to force the bales together.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.

BALED HAY USAGE GUIDELINES

A Baled Hay installation may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A two year storm frequency may be used to calculate the flow rate to be filtered. The installation should be sized to filter a maximum flow thru rate of 5 GPM/FT² of cross sectional area. Baled hay may be used at the following locations:

- Where the runoff approaching the baled hay flows over disturbed soil for less than 100'. If the slope of the disturbed soil exceeds 10%, the length of slope upstream the baled hay should be less than 50'.
- Where the installation will be required for less than 3 months.
- Where the contributing drainage area is less than 1/2 acre.

For Baled Hay installations in small ditches, the additional following considerations apply:

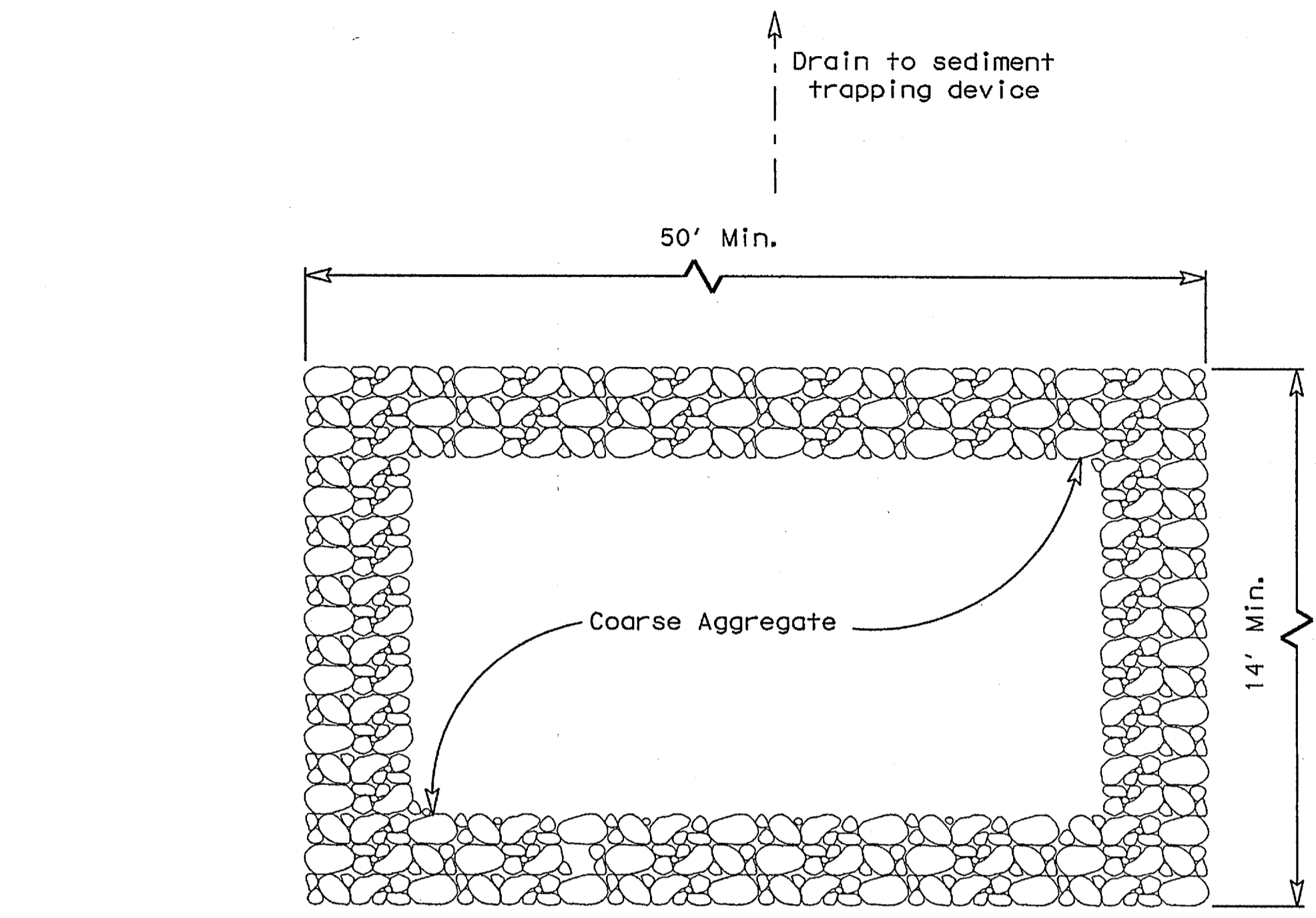
- The ditch sideslopes should be graded as flat as possible to maximize the drainage flowrate thru the hay.
- The ditch should be graded large enough to contain the overtopping drainage when sediment has filled to the top of the baled hay.

Bales should be replaced usually every 2 months or more often during wet weather when loss of structural integrity is accelerated.

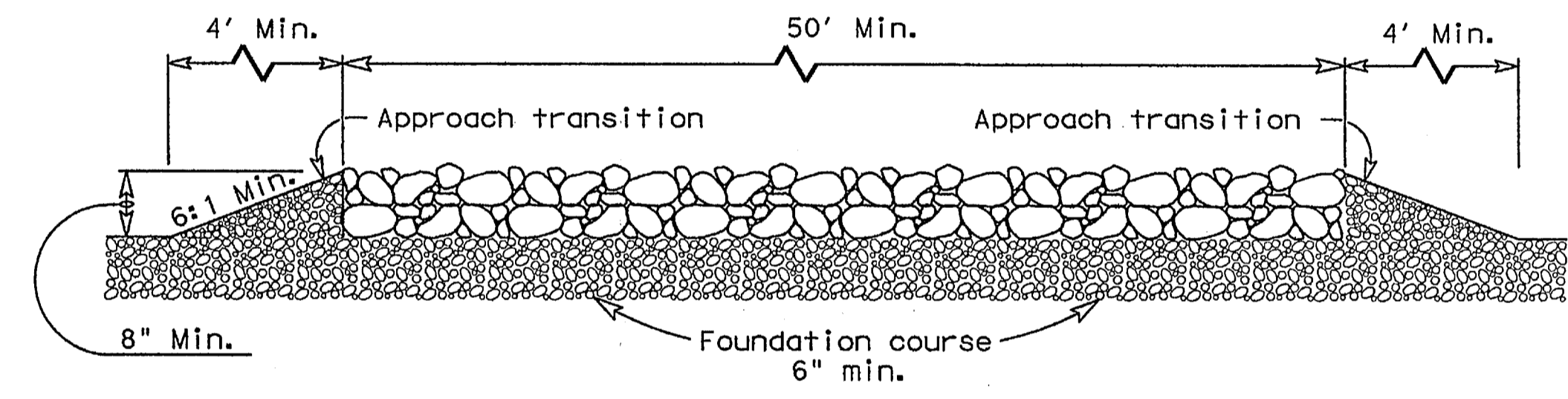
		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & BALED HAY EC(1)-09			
FILE: ec109.dgn	DN: TxDOT	CK: AM	DW: TV
© TxDOT June 1993	CONT SECT	JOB	HIGHWAY
REVISIONS			
DIST	COUNTY	SHEET NO.	

DATE: FILE:

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PLAN

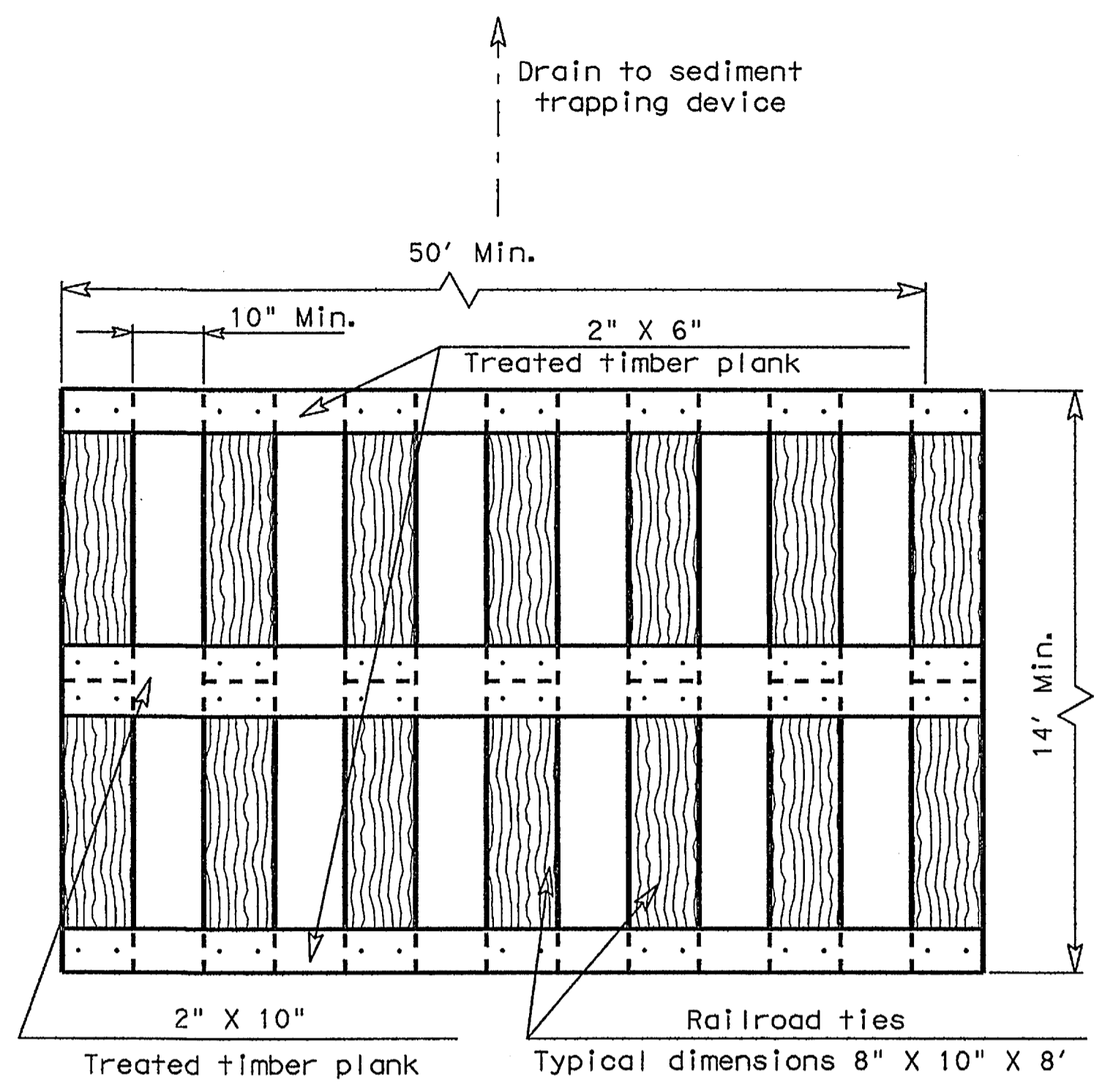


PROFILE

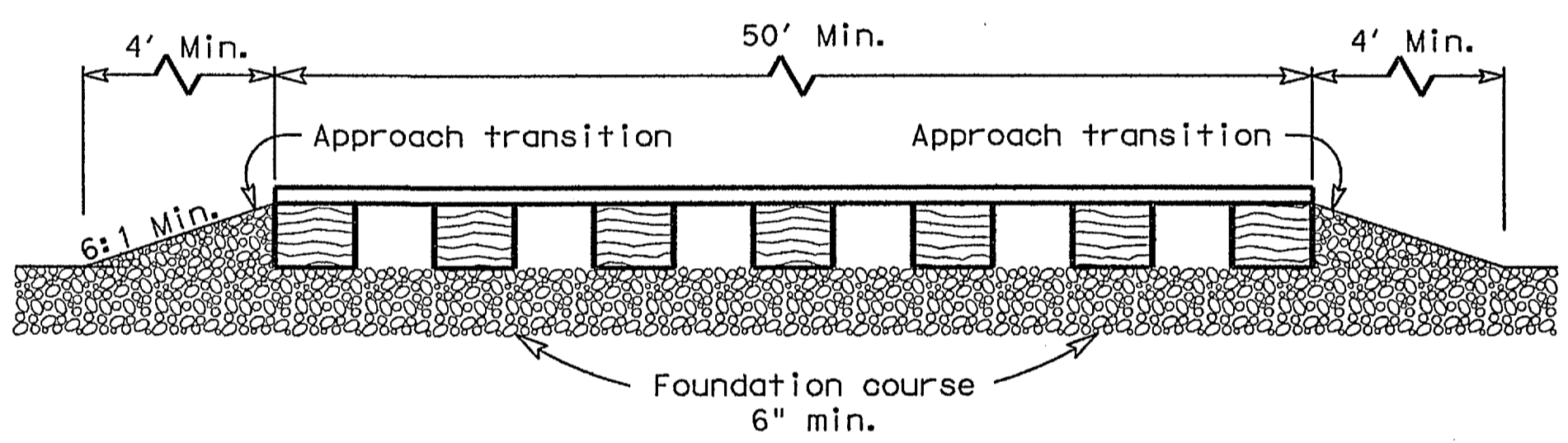
CONSTRUCTION EXIT (TYPE 1)

GENERAL NOTES

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.



PLAN

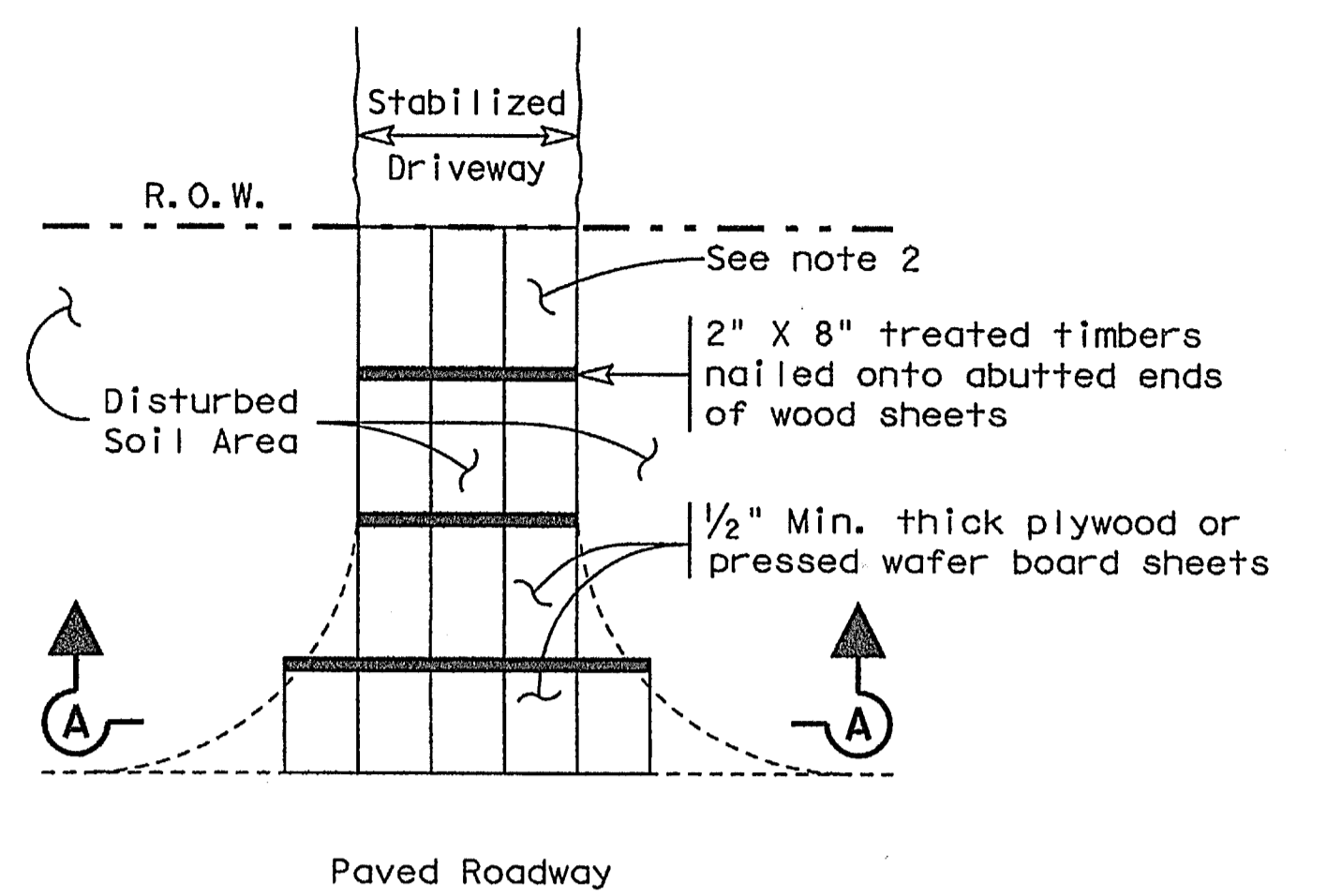


PROFILE

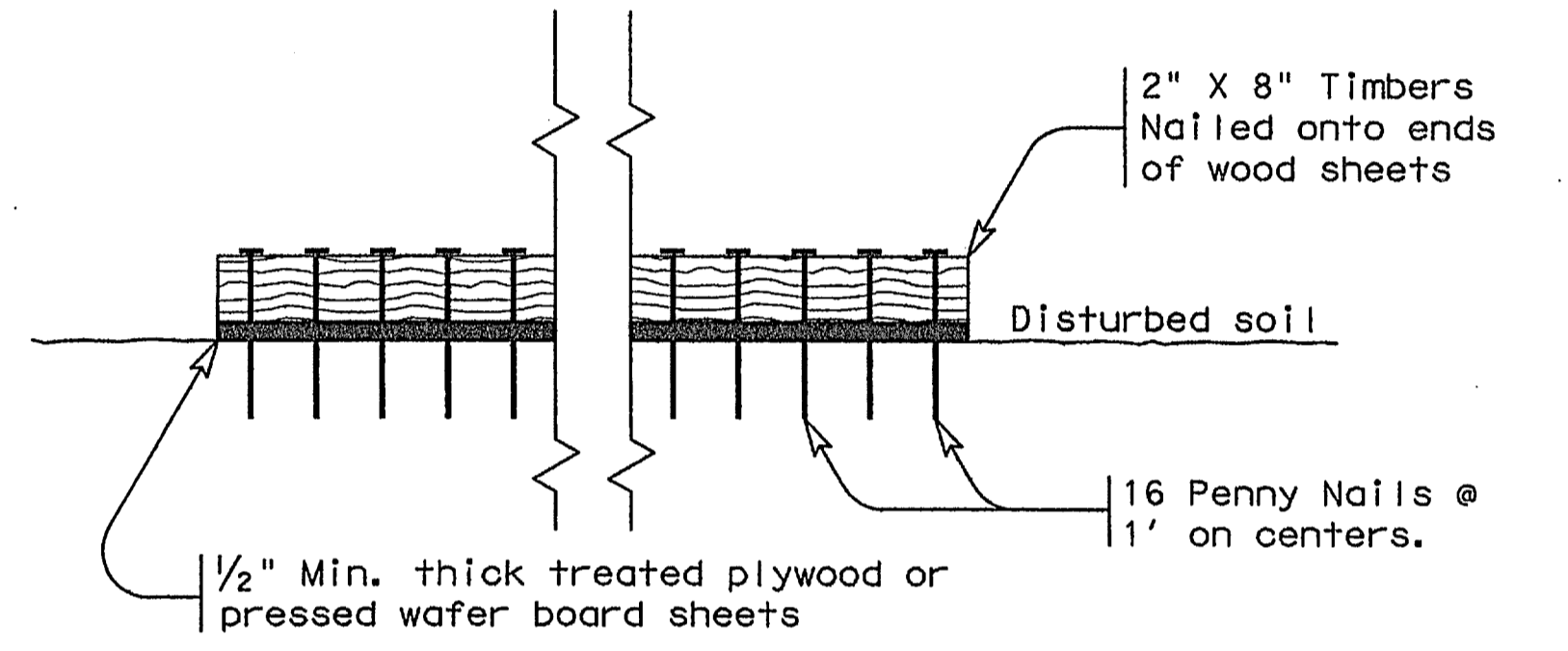
CONSTRUCTION EXIT (TYPE 2)

GENERAL NOTES

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with 1/2" x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.



PLAN



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

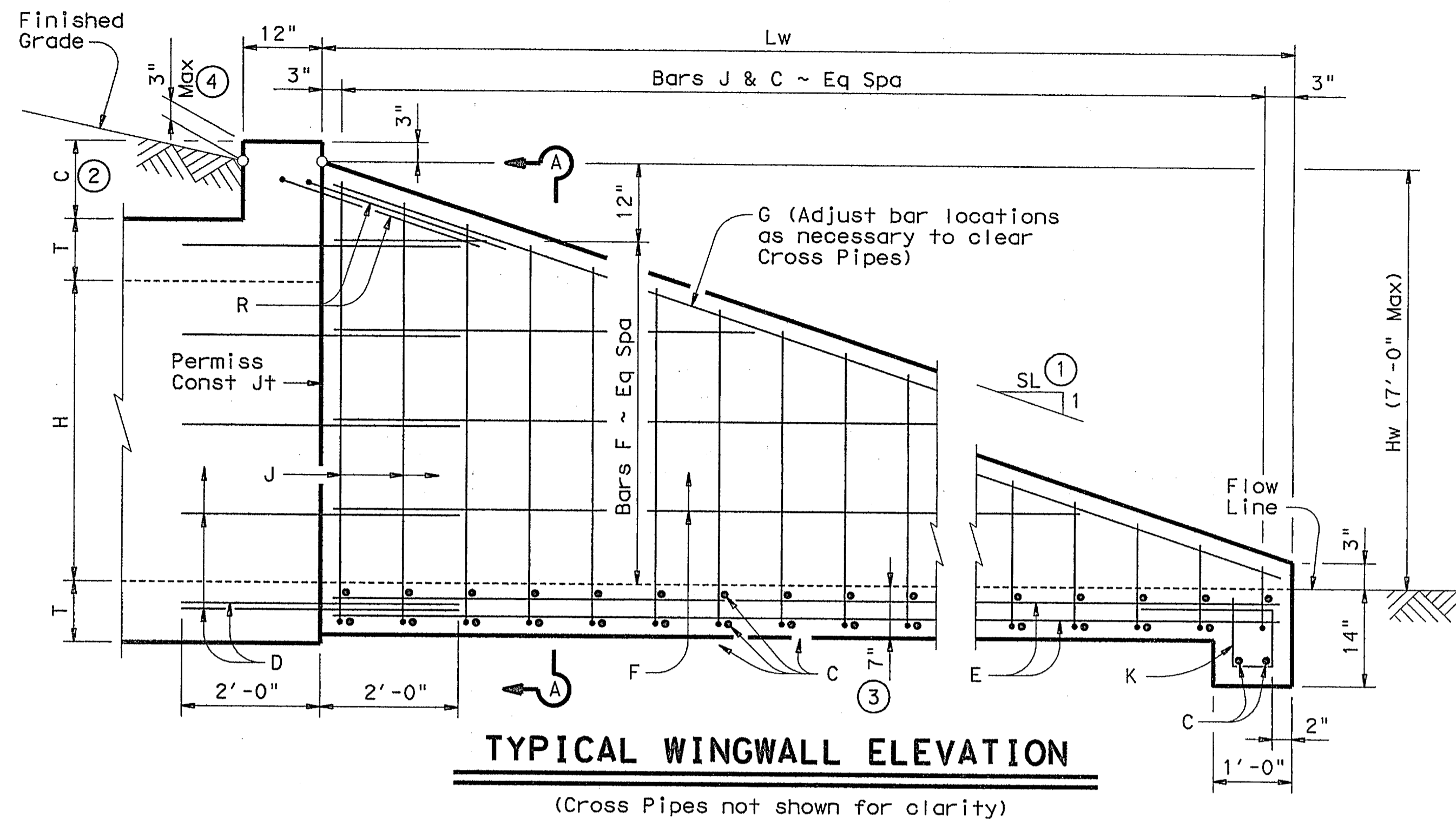
GENERAL NOTES

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES CONSTRUCTION EXITS EC (3) - 93			
FILE#	ec393.dgn	DN: TxDOT	CK: HEJ
© TxDOT	June 1993	CONT	SECT
REVISIONS		JOB	HIGHWAY
		DIST	COUNTY
		SHEET NO.	

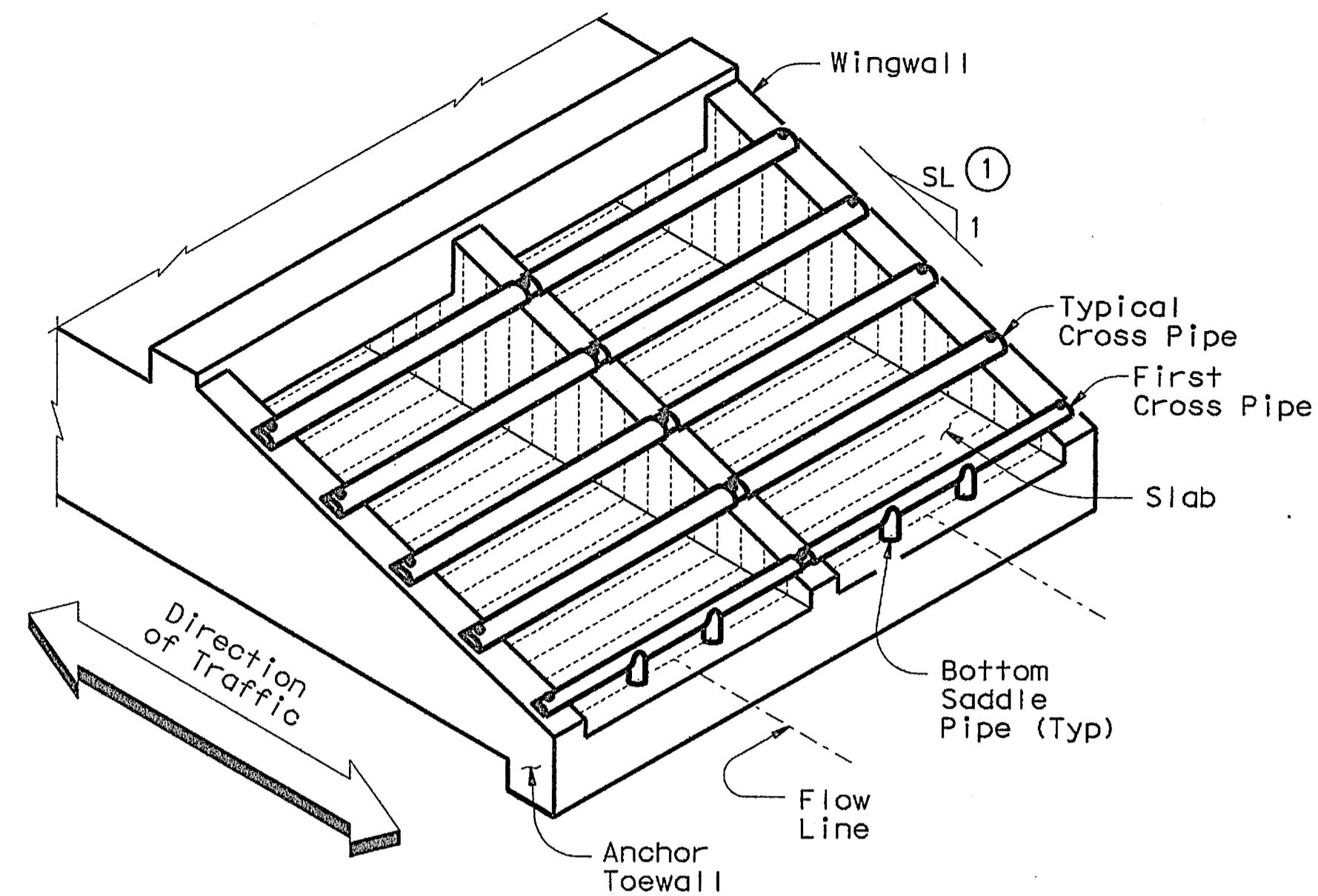
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FILE:

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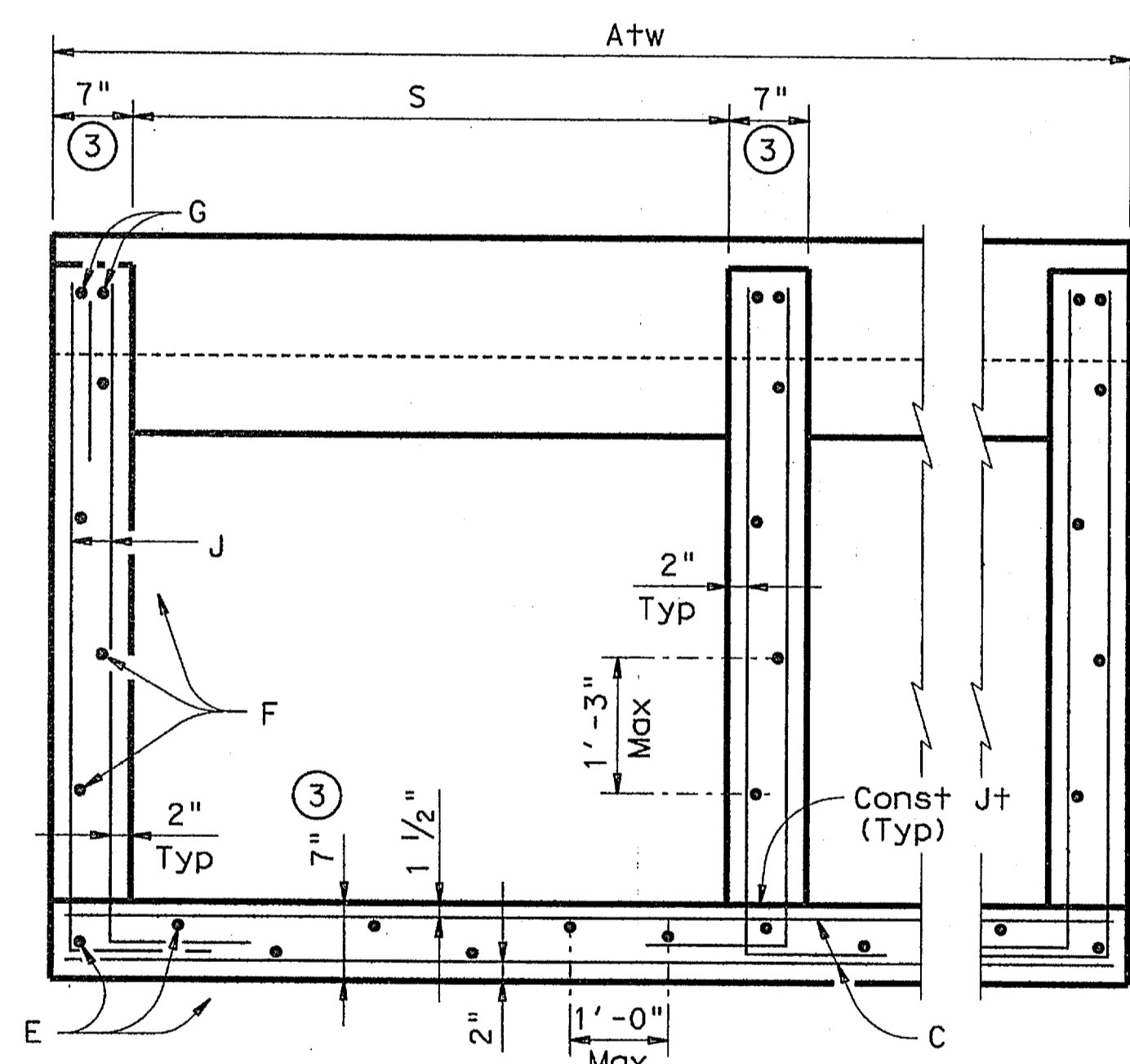
TYPICAL WINGWALL ELEVATION

(Cross Pipes not shown for clarity)



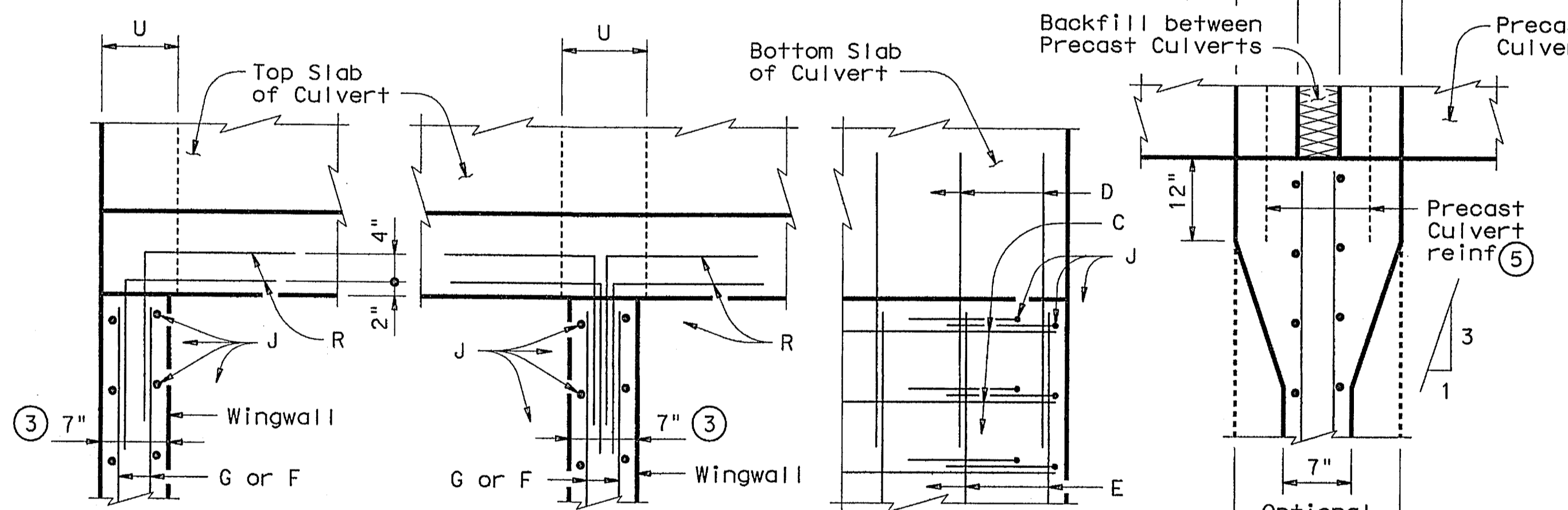
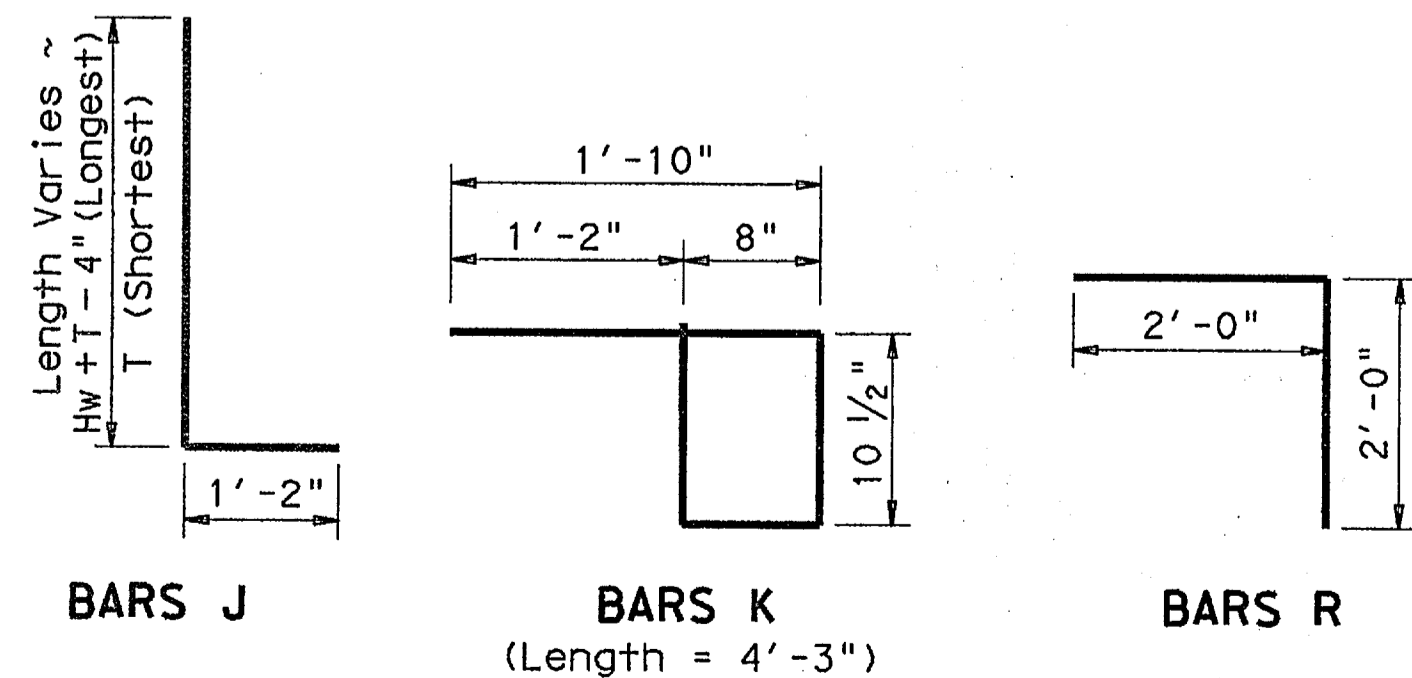
ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing Bolted Anchor Option)



SECTION A-A

(Showing typical Wingwall and Wing Slab reinforcing)
(Pipe Runners not shown for clarity)



PLAN VIEWS OF CORNER DETAILS

TABLE OF REINFORCING BAR SIZES & SPACING		
Bar	Size	Spacing
C	#4	10" Max
D	#4	match F & E
E	#4	1'-0" Max
F	#4	1'-3" Max
G	#6	Shown
J	#4	10" Max
K	#4	1'-0" Max
R	#4	Shown

- ① Slope will be 6:1 or flatter.
- ② 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to ECD standard.
- ③ Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" Minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.
- ④ For vehicle safety, curbs shall project no more than 3" above finished grade. Curb heights shall be reduced, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ⑤ For Culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into Wingwall. Wingwall Bars D and R may be omitted. Otherwise, refer to the "Wingwall Connection Detail" on the SCP-MD standard.

Formulas: (All values are in Feet)
 $Hw = H + T + C - 0.250'$
 $Lw = (Hw - 0.250') (SL)$

For Cast-in-place culverts:
 $Atw = (N) (S) + (N+1) (U)$

For Precast culverts:
 $Atw = (N) (2U+S) + (N-1) (0.500')$

Total Wingwall Area (S.F.)
 $= (0.5) (Hw + 0.250') (Lw) (N+1)$

Total Concrete Volume (C.Y.)
 $= [(Wingwall Area) (0.583') + (Lw) (Atw) (0.583') + (Atw) (1.000') (1.167' - 0.583')] \div (27)$

Total Reinforcing (Lbs)
 $= (1.55) (Lw) (Atw) + (4.43) (Atw) + (K) (Hw) (N+1) (\sqrt{Lw})$

C = Height of Curb above top of Top Slab
Hw = Height of Wingwall
K = Constant Value for use in formulas
Slope SL:1 K
6:1 ~ 10:41
Atw = Anchor Toewall Length
Lw = Length of Wingwall
N = Number of Culvert Barrels
S = Clear Span of each Barrel
SL:1 = Side Slope Ratio (Horizontal : 1 Vertical)

See applicable box culvert standard for H, S, T, and U values.

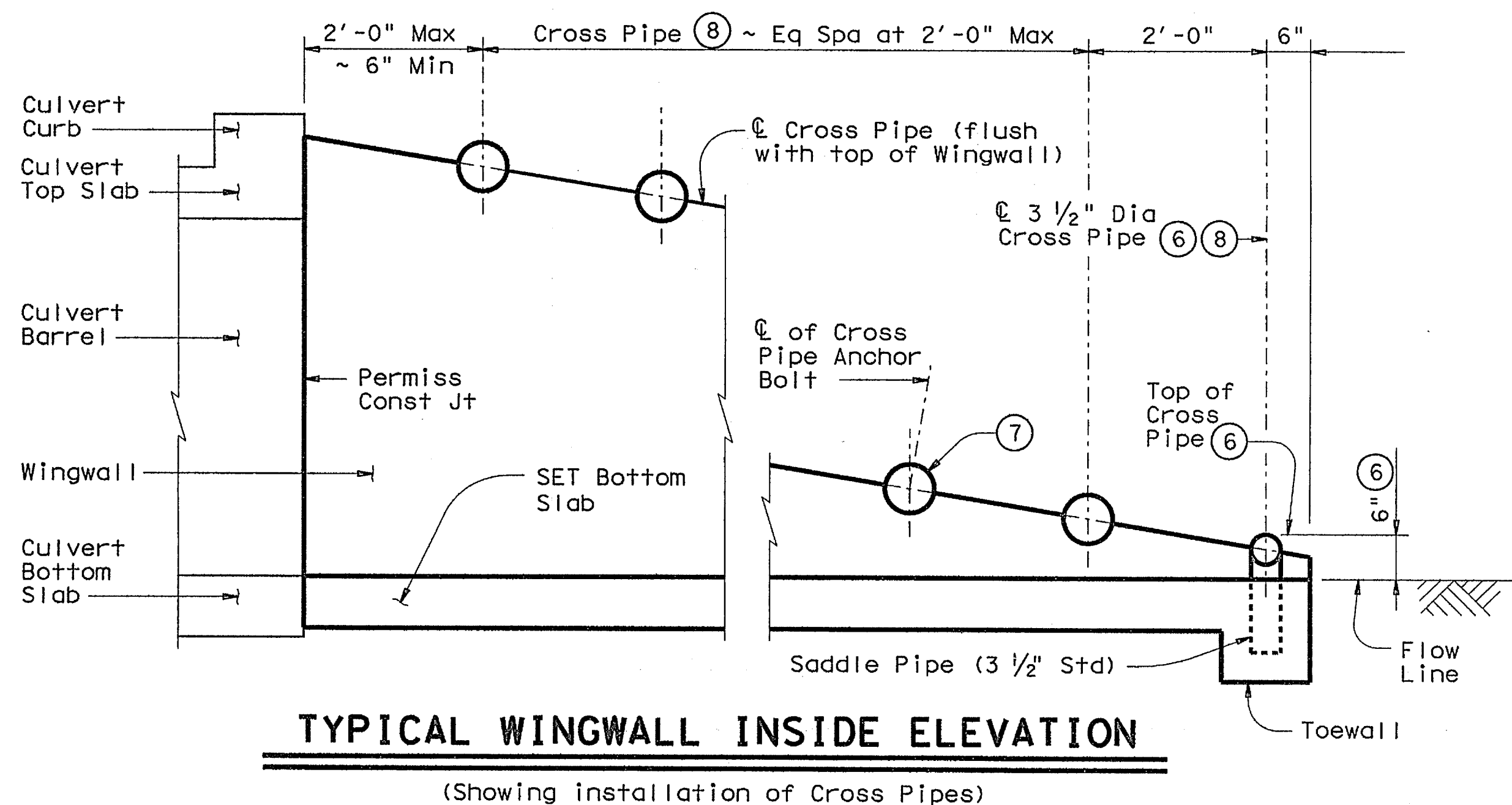
GENERAL NOTES:
Designed according to AASHTO LRFD Specifications.
The Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Cross Pipes.
Cross Pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.
All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.
All reinforcing steel shall be Grade 60. All reinforcing shall be adjusted as necessary to provide a minimum clear cover of 1 1/4".
The quantities for concrete, reinforcing steel, and Cross Pipes resulting from the formulas given herein are for Contractor's information only.
Cross Pipes, Sleeve Pipes, and Saddle Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.
Bolts and nuts shall conform to ASTM A307.
All steel components, except the concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.
See BCS standard sheet for additional dimensions and information.
Alternate design drawings bearing the seal of a professional engineer will be acceptable for precast construction of the Safety End Treatments.

		Bridge Division Standard	
SAFETY END TREATMENT FOR BOX CULVERTS (MAXIMUM Hw = 7'-0") TYPE I ~ PARALLEL DRAINAGE			
SETB-PD			
FILE: setbpdse.dgn	DN: GAF	CK: CAT	DW: JRP
©TxDOT February 2010	CONT	SECT	JOB
REVISIONS			HIGHWAY
	DIST	COUNTY	SHEET NO.

DATE:
FILE:

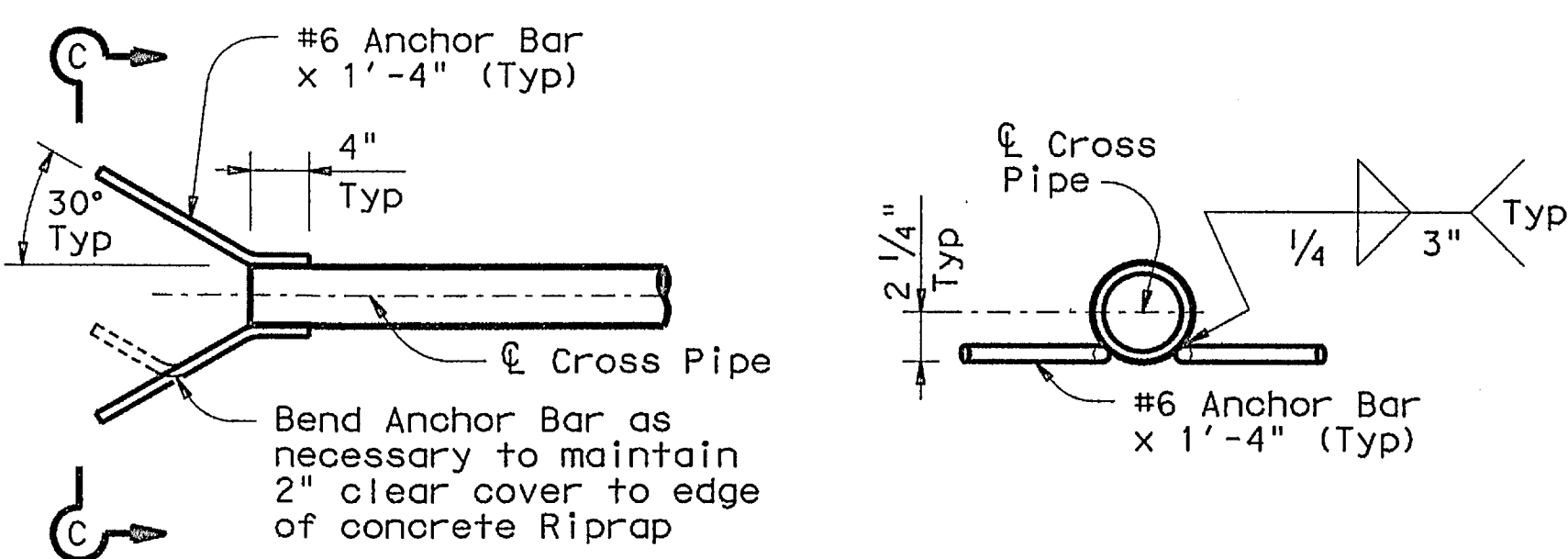
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DATE: FILE:

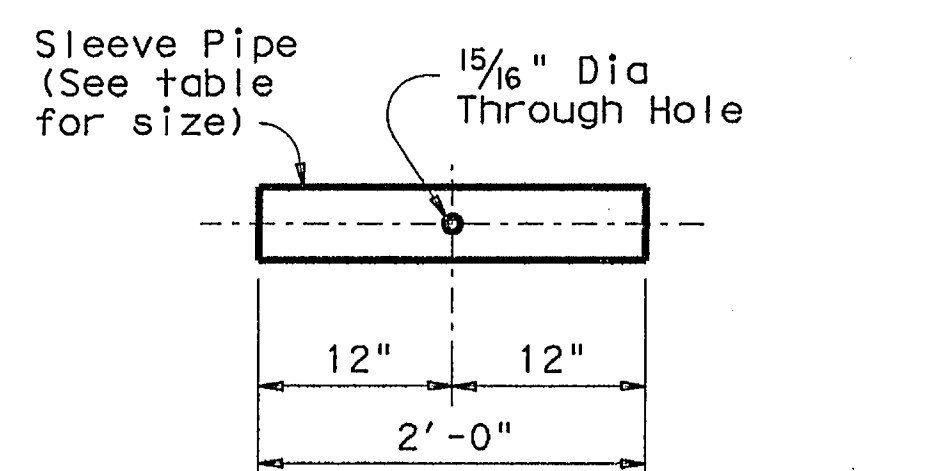


TYPICAL WINGWALL INSIDE ELEVATION

(Showing installation of Cross Pipes)



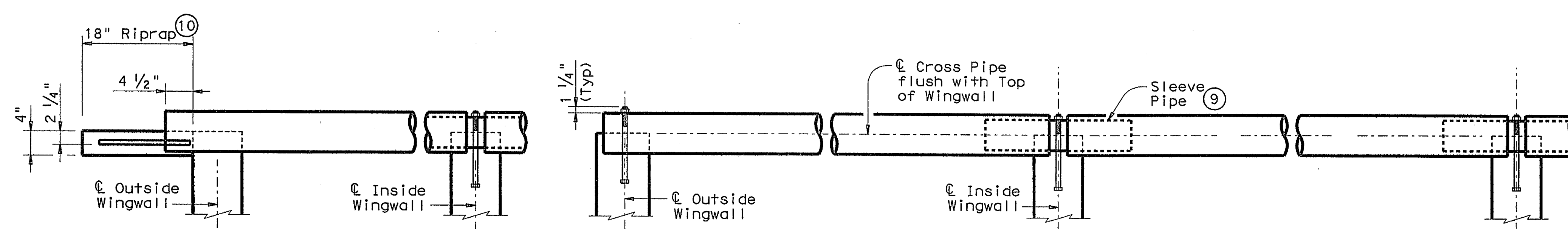
OPTIONAL ANCHOR BAR DETAILS



SLEEVE PIPE DETAILS (9)

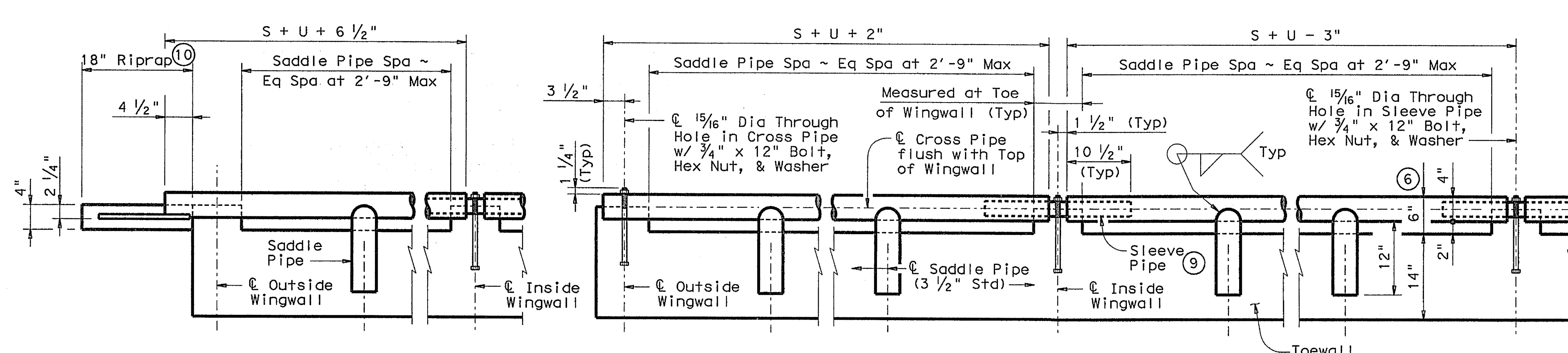
REQUIRED PIPE SIZES (8)			STANDARD PIPE SIZES		
Culvert Span Sizes	Cross Pipe Size	Sleeve Pipe Size (9)	Pipe Size	Pipe O.D.	Pipe I.D.
First Pipe	3 1/2" STD	2 1/2" STD	2 1/2" STD	2.875"	2.469"
30" to 42"	4" STD	3" STD	3" STD	3.500"	3.068"
48" to 72"	5" STD	4" STD	3 1/2" STD	4.000"	3.548"
78" to 120"	6" STD	5" STD	4" STD	4.500"	4.026"
			5" STD	5.563"	5.047"
			6" STD	6.625"	6.065"

- (6) The proper installation of the first Cross Pipe is critical for vehicle safety. The top of the first Cross Pipe must be placed at no more than 6" above the flow line.
- (7) The third Cross Pipe from the bottom of the Culvert shall always be installed using a bolted connection. Care shall be taken to ensure that concrete does not flow into this Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access.
- (8) Cross Pipes and Sleeve Pipes (if required) shall be as shown in the REQUIRED PIPE SIZES table. Saddle Pipes for the 3 1/2" first Cross Pipe shall also be 3 1/2".
- (9) At Contractor's option, the Cross Pipe may be continuous across the Inside Wingwalls. If such option is selected, the Sleeve Pipe shall be omitted and a 15/16" diameter through hole made in the Cross Pipe to accept the anchor bolt at the centerline of each Interior Wingwall.
- (10) Riprap will be required when using the optional Anchor Bar details and shall be included in the Price Bid for Safety End Treatment. Such Riprap shall be concrete Riprap in accordance with Item 432, "Riprap".



SECTION THROUGH INSTALLATION OF TYPICAL FULL CROSS PIPE

(Anchor details and dimensions are similar to those shown below in SECTION THROUGH INSTALLATION OF 3 1/2" FIRST CROSS PIPE detail.)



SECTION THROUGH INSTALLATION OF 3 1/2" FIRST CROSS PIPE

OUTSIDE CULVERT BARREL WITH OPTIONAL ANCHOR BARS & RIPRAP

OUTSIDE CULVERT BARREL WITH BOLTED ANCHOR

INSIDE CULVERT BARREL

CROSS PIPE INSTALLATION DETAILS

SHEET 2 OF 2

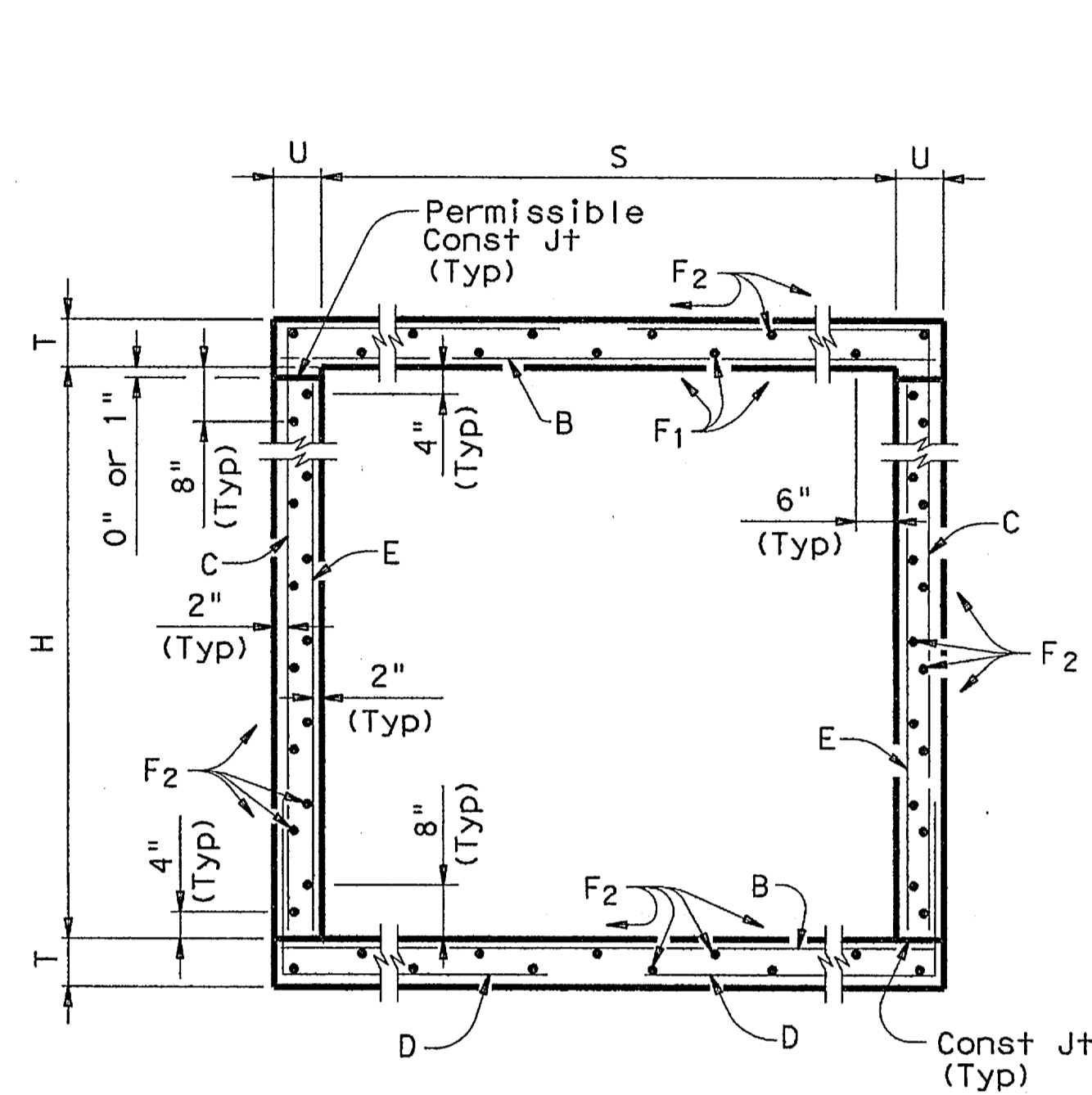
Texas Department of Transportation
SAFETY END TREATMENT
 FOR BOX CULVERTS
 (MAXIMUM Hw = 7'-0")
 TYPE I ~ PARALLEL DRAINAGE

SETB-PD

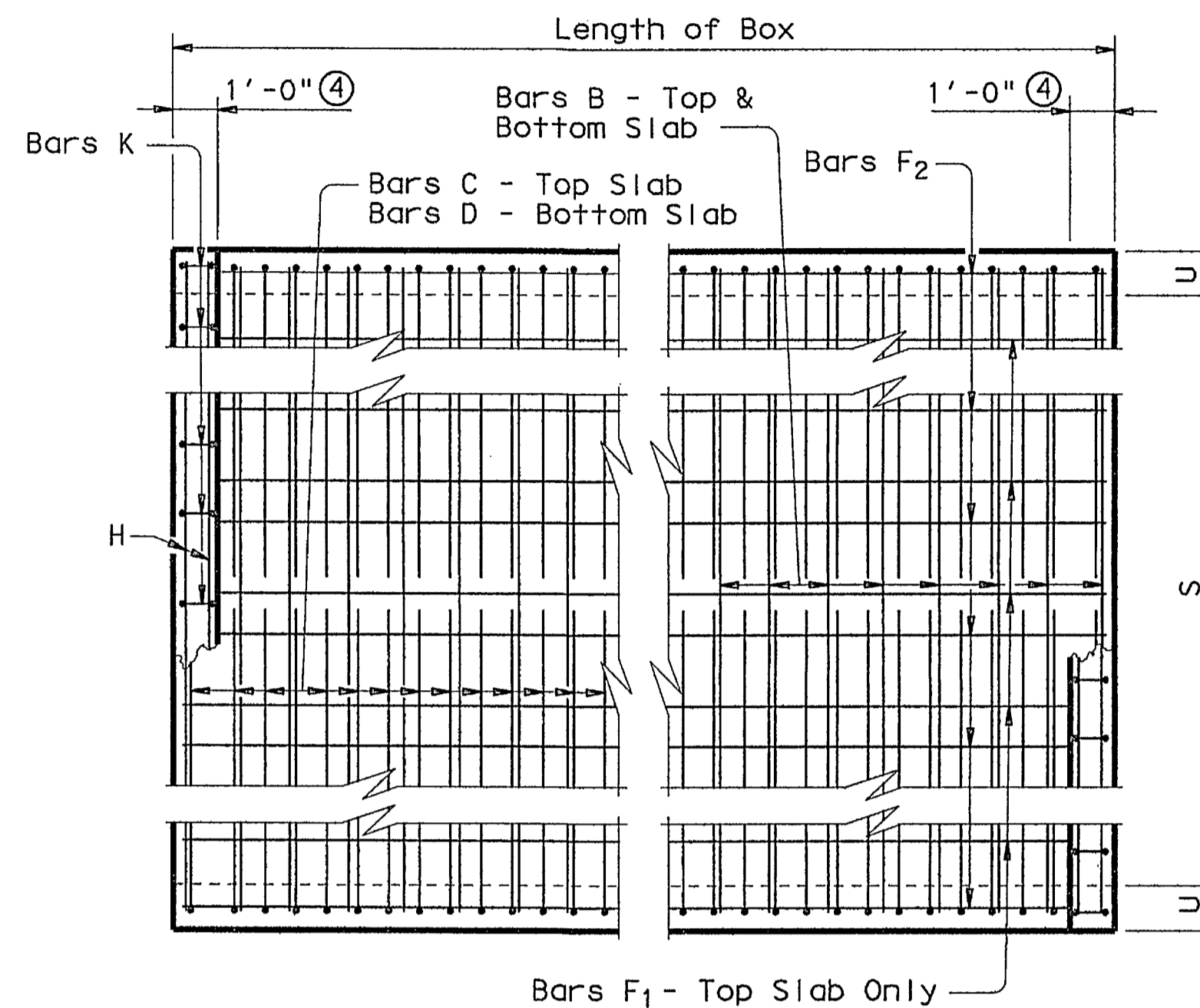
FILE: setbpdse.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO.	

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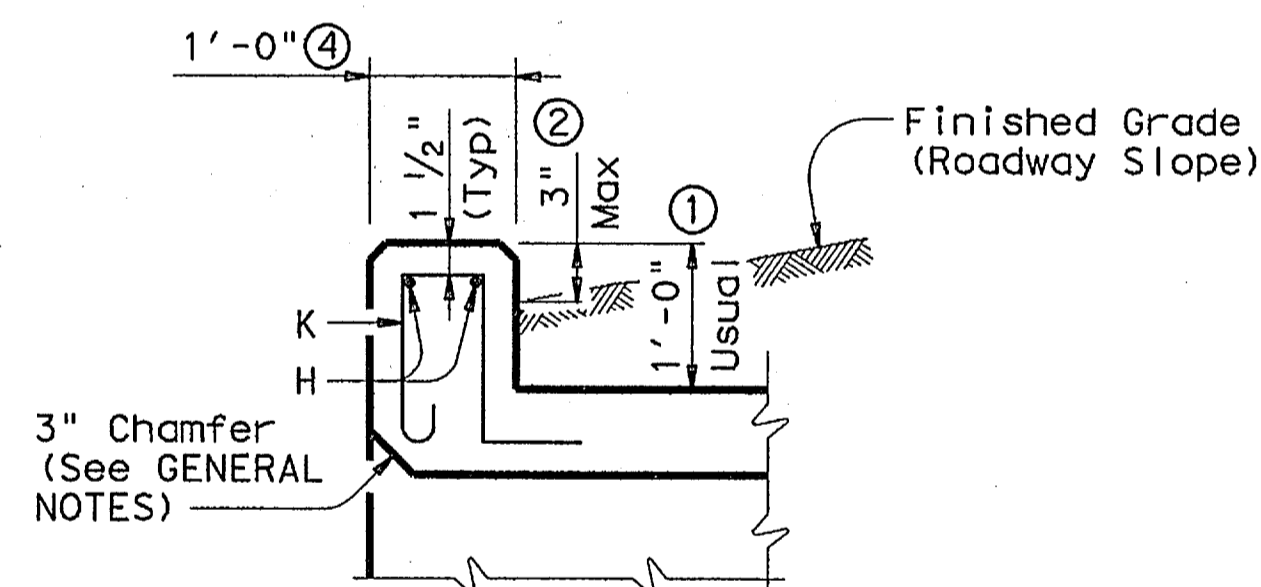
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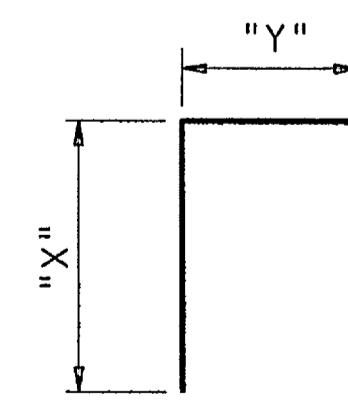
TYPICAL SECTION



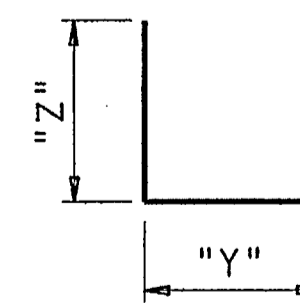
PLAN OF REINF STEEL



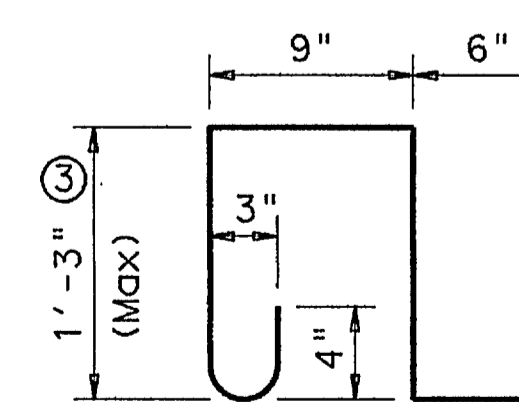
SECTION THRU CURB



BARS C



BARS D



BARS K ~ #4
(Spa = 1'-0" Max)
(Length = 4'-3")

- ① 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
- ② For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, curbs shall project no more than 3" above finished grade.
 - For structures with bridge rail, curbs shall be flush with finished grade.
 Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ③ For curbs less than 1'-0" high, tilt bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, bars K may be omitted.
- ④ 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
 WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
 If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.
 Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).

GENERAL NOTES:

- Designed according to AASHTO LRFD Specifications.
- Designed to the maximum fill height shown.
- All reinforcing steel shall be Grade 60.
- All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.
- Class "C" concrete shall have a minimum compressive strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi.
- The use of permanent forms is not allowed.
- The bottom edge of the top slab shall be chamfered 3" at the entrance.
- Reinforcing bars shall be adjusted to provide a minimum of 1/4" clear cover.
- Construction joints shown at the flow line may be raised a maximum of 6" at the Contractor's option. If this option is used, Bars E may be cut off or raised, and Bars C and D may be reversed.
- See standard SCC-MD for skewed ends, angle sections and lengthening details.

HL93 LOADING

SHEET 1 OF 2



**SINGLE BOX CULVERTS
CAST-IN-PLACE
0' TO 30' FILL**

SCC-5 & 6

FILE: scc56ste.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
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REVISIONS				
10-12: Added WWR	DIST	COUNTY	SHEET NO.	

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DATE: FILE:


SECTION DIMENSIONS				FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																								QUANTITIES														
					Bars B				Bars C				Bars D				Bars E~#4 at 18" Max		Bars F1~#4		Bars F2~#4 at 18" Max		Bars H 4~#4		Bars K		Per foot of Barrel		Curb		Total												
					S	H	T	U	No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	"X"	"Y"	No.	Size	Spa	Length	Weight	"Y"	"Z"	No.	Length	Wt	No.	Length	Wt	No.	Length	Wt	No.	Length	Wt	No.	Length	Wt	Conc (CY)
5'-0"	2'-0"	7"	7"	26'	194	#5	5"	5'-11"	1,197	162	#5	6"	5'-2"	873	2'-5"	2'-9"	162	#5	6"	5'-4"	901	2'-9"	2'-7"	56	2'-0"	75	8	7"	39'-9"	212	22	39'-9"	584	5'-11"	16	14	40	0.353	96.1	0.5	56	14.6	3,898
5'-0"	2'-0"	8"	7"	30'	194	#5	5"	5'-11"	1,197	194	#4	5"	5'-0"	648	2'-6"	2'-6"	194	#4	5"	4'-9"	616	2'-6"	2'-3"	56	2'-0"	75	4	18"	39'-9"	106	22	39'-9"	584	5'-11"	16	14	40	0.391	80.7	0.5	56	16.1	3,282
5'-0"	3'-0"	7"	7"	26'	194	#5	5"	5'-11"	1,197	194	#4	5"	5'-11"	767	3'-5"	2'-6"	194	#4	5"	4'-8"	605	2'-6"	2'-2"	56	3'-0"	112	8	7"	39'-9"	212	26	39'-9"	690	5'-11"	16	14	40	0.396	89.6	0.5	56	16.3	3,639
5'-0"	3'-0"	8"	7"	30'	194	#5	5"	5'-11"	1,197	194	#4	5"	6'-0"	778	3'-6"	2'-6"	194	#4	5"	4'-9"	616	2'-6"	2'-3"	56	3'-0"	112	4	18"	39'-9"	106	26	39'-9"	690	5'-11"	16	14	40	0.434	87.5	0.5	56	17.9	3,555
5'-0"	4'-0"	7"	7"	26'	194	#5	5"	5'-11"	1,197	194	#4	5"	6'-11"	896	4'-5"	2'-6"	194	#4	5"	4'-8"	605	2'-6"	2'-2"	56	4'-0"	150	8	7"	39'-9"	212	26	39'-9"	690	5'-11"	16	14	40	0.439	93.8	0.5	56	18.1	3,806
5'-0"	4'-0"	8"	7"	30'	194	#5	5"	5'-11"	1,197	194	#4	5"	7'-0"	907	4'-6"	2'-6"	194	#4	5"	4'-9"	616	2'-6"	2'-3"	56	4'-0"	150	4	18"	39'-9"	106	26	39'-9"	690	5'-11"	16	14	40	0.477	91.7	0.5	56	19.6	3,722
5'-0"	5'-0"	7"	7"	26'	194	#5	5"	5'-11"	1,197	194	#4	5"	7'-11"	1,026	5'-5"	2'-6"	194	#4	5"	4'-9"	605	2'-6"	2'-3"	56	4'-0"	150	4	18"	39'-9"	106	26	39'-9"	690	5'-11"	16	14	40	0.483	100.6	0.5	56	19.8	4,080
5'-0"	5'-0"	8"	7"	30'	194	#5	5"	5'-11"	1,197	194	#4	5"	8'-0"	1,037	5'-6"	2'-6"	194	#4	5"	4'-9"	616	2'-6"	2'-3"	56	5'-0"	187	8	7"	39'-9"	212	30	39'-9"	797	5'-11"	16	14	40	0.521	98.5	0.5	56	21.3	3,996
6'-0"	3'-0"	7"	7"	20'	194	#5	5"	6'-11"	1,400	162	#5	6"	6'-6"	1,098	3'-5"	3'-1"	162	#5	6"	5'-8"	957	3'-1"	2'-7"	56	3'-0"	112	10	7"	39'-9"	266	29	39'-9"	770	6'-11"	18	16	45	0.439	115.1	0.5	63	18.1	4,666
6'-0"	3'-0"	8"	7"	26'	162	#6	6"	6'-11"	1,683	162	#5	6"	6'-7"	1,112	3'-6"	3'-1"	162	#5	6"	5'-9"	972	3'-1"	2'-8"	56	3'-0"	112	5	18"	39'-9"	133	29	39'-9"	770	6'-11"	18	16	45	0.484	119.6	0.5	63	19.9	4,845
6'-0"	3'-0"	9"	8"	30'	162	#6	6"	7'-1"	1,724	162	#5	6"	6'-8"	1,126	3'-7"	3'-1"	162	#5	6"	5'-10"	986	3'-1"	2'-9"	56	3'-0"	112	5	18"	39'-9"	133	29	39'-9"	770	7'-1"	19	18	51	0.556	121.3	0.5	70	22.7	4,921
6'-0"	4'-0"	7"	7"	20'	194	#5	5"	6'-11"	1,400	194	#4	5"	7'-3"	940	4'-5"	2'-10"	194	#4	5"	5'-0"	648	2'-10"	2'-2"	56	3'-0"	150	10	7"	39'-9"	266	29	39'-9"	770	6'-11"	18	16	45	0.483	104.4	0.5	63	19.8	4,237
6'-0"	4'-0"	8"	7"	26'	194	#6	5"	6'-11"	2,015	162	#5	6"	7'-7"	1,281	4'-6"	3'-1"	162	#5	6"	5'-9"	972	3'-1"	2'-8"	56	4'-0"	150	5	18"	39'-9"	133	29	39'-9"	770	6'-11"	18	16	45	0.527	133.0	0.5	63	21.6	5,384
6'-0"	4'-0"	9"	8"	30'	162	#6	6"	7'-1"	1,724	162	#5	6"	7'-8"	1,295	4'-7"	3'-1"	162	#5	6"	5'-10"	986	3'-1"	2'-9"	56	4'-0"	150	5	18"	39'-9"	133	29	39'-9"	770	7'-1"	19	18	51	0.605	126.5	0.5	70	24.7	5,128
6'-0"	5'-0"	7"	7"	20'	194	#5	5"	6'-11"	1,400	194	#4	5"	8'-3"	1,069	5'-5"	2'-10"	194	#4	5"	5'-0"	648	2'-10"	2'-2"	56	5'-0"	187	10	7"	39'-9"	266	33	39'-9"	876	6'-11"	18	16	45	0.526	111.2	0.5	63	21.5	4,509
6'-0"	5'-0"	8"	7"	26'	194	#6	5"	6'-11"	2,015	162	#5	6"	8'-7"	1,450	5'-6"	3'-1"	162	#5	6"	5'-9"	972	3'-1"	2'-8"	56	5'-0"	187	5	18"	39'-9"	133	33	39'-9"	876	6'-11"	18	16	45	0.570	140.8	0.5	63	23.3	5,696
6'-0"	5'-0"	9"	8"	30'	194	#6	5"	7'-1"	2,064	162	#5	6"	8'-8"	1,464	5'-7"	3'-1"	162	#5	6"	5'-10"	986	3'-1"	2'-9"	56	5'-0"	187	5	18"	39'-9"	133	33	39'-9"	876	7'-1"	19	18	51	0.654	142.8	0.5	70	26.7	5,780
6'-0"	6'-0"	7"	7"	20'	194	#5	5"	6'-11"	1,400	194	#4	5"	9'-3"	1,199	6'-5"	2'-10"	194	#4	5"	5'-0"	648	2'-10"	2'-2"	56	6'-0"	224	10	7"	39'-9"	266	37	39'-9"	982	6'-11"	18	16	45	0.569	118.0	0.5	63	23.3	4,782
6'-0"	6'-0"	8"	7"	26'	194	#6	5"	6'-11"	2,015	162	#5	6"	9'-7"	1,619	6'-6"	3'-1"	162	#5	6"	5'-9"	972	3'-1"	2'-8"	56	6'-0"	224	5	18"	39'-9"	133	37	39'-9"	982	6'-11"	18	16	45	0.613	148.6	0.5	63	25.0	6,008
6'-0"	6'-0"	9"	8"	30'	194	#6	5"	7'-1"	2,064	162	#5	6"	9'-8"	1,633	6'-7"	3'-1"	162	#5	6"	5'-10"	986	3'-1"	2'-9"	56	6'-0"	224	5	18"	39'-9"	133	37	39'-9"	982	7'-1"	19	18	51	0.704	150.6	0.5	70	28.7	6,092

⑤ For each box size, minimum fill height shown shall be used for all culverts with less than 2'-0" of fill.

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
 WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
 If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.
 Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).

HL93 LOADING SHEET 2 OF 2

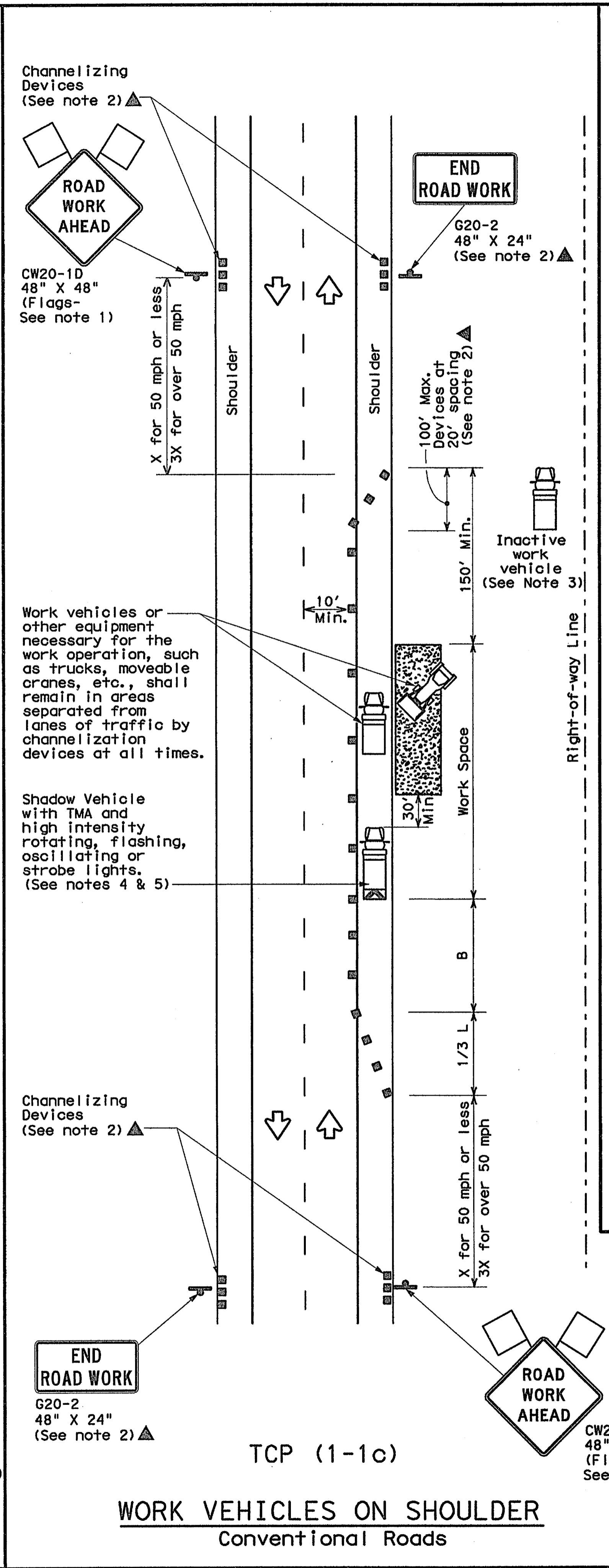
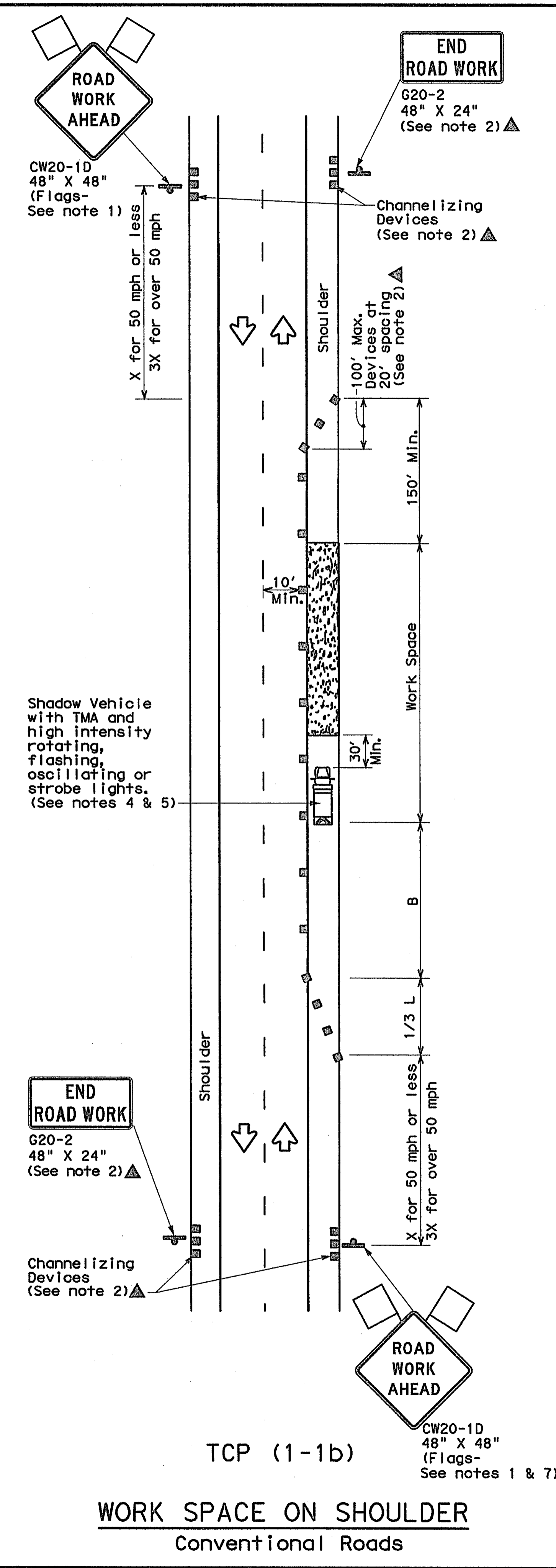
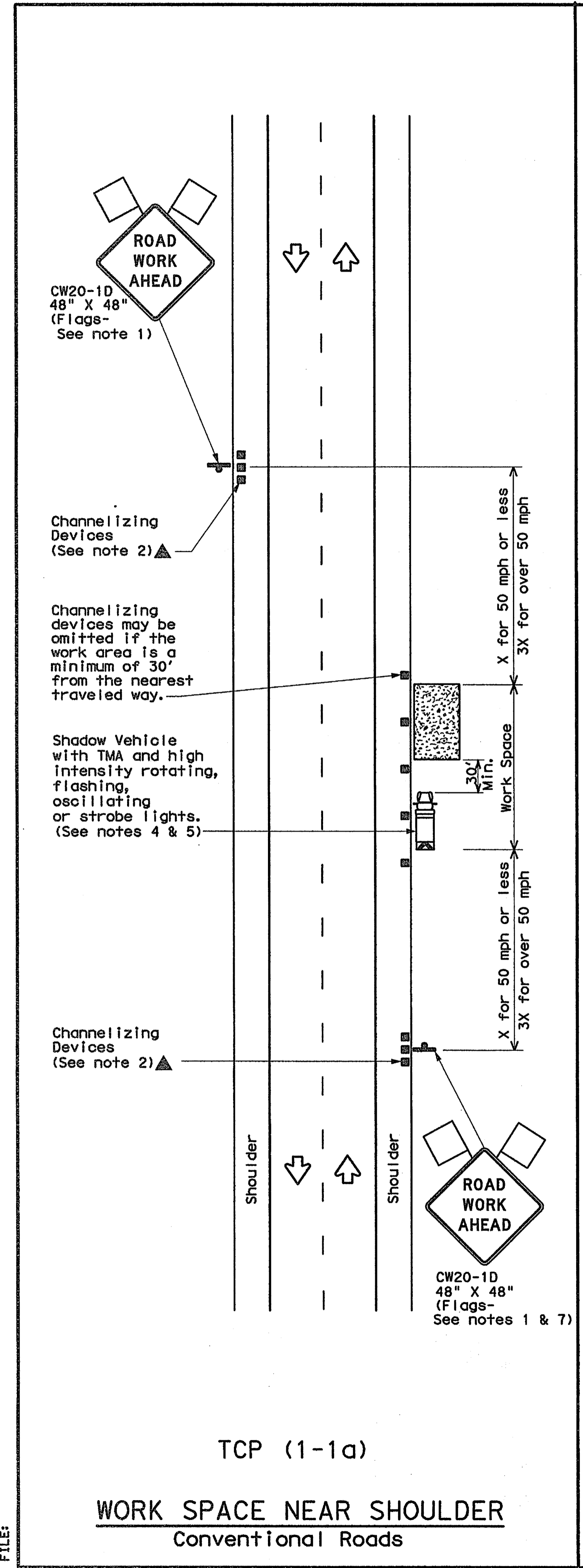

Bridge Division Standard

**SINGLE BOX CULVERTS
CAST-IN-PLACE
0' TO 30' FILL**

SCC-5 & 6

FILE: scc56ste.dgn	DN: GAF	CK: LMW	DW: BWH/TXDOT	CK: GAF
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REVISIONS				
10-12: Added WWR	DIST	COUNTY		SHEET NO.

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LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS / 60	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only
** Taper lengths have been rounded off.
L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

- GENERAL NOTES**
- Flags attached to signs where shown are REQUIRED.
 - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
 - Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
 - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
 - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
 - See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
 - CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
Traffic Operations Division

**TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK**

TCP(1-1)-12

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REVISIONS	CONT	SECT	JOB	HIGHWAY
2-94 2-12				
8-95				
1-97				
4-98				
	DIST	COUNTY	SHEET NO.	

DATE: FILE: