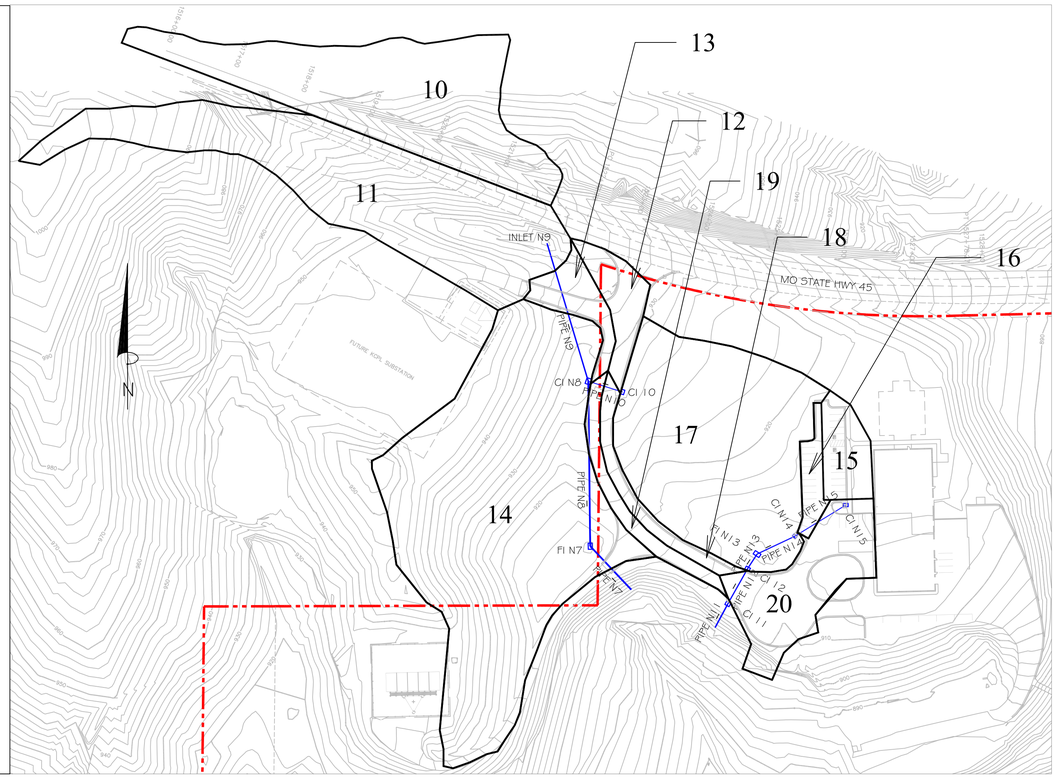
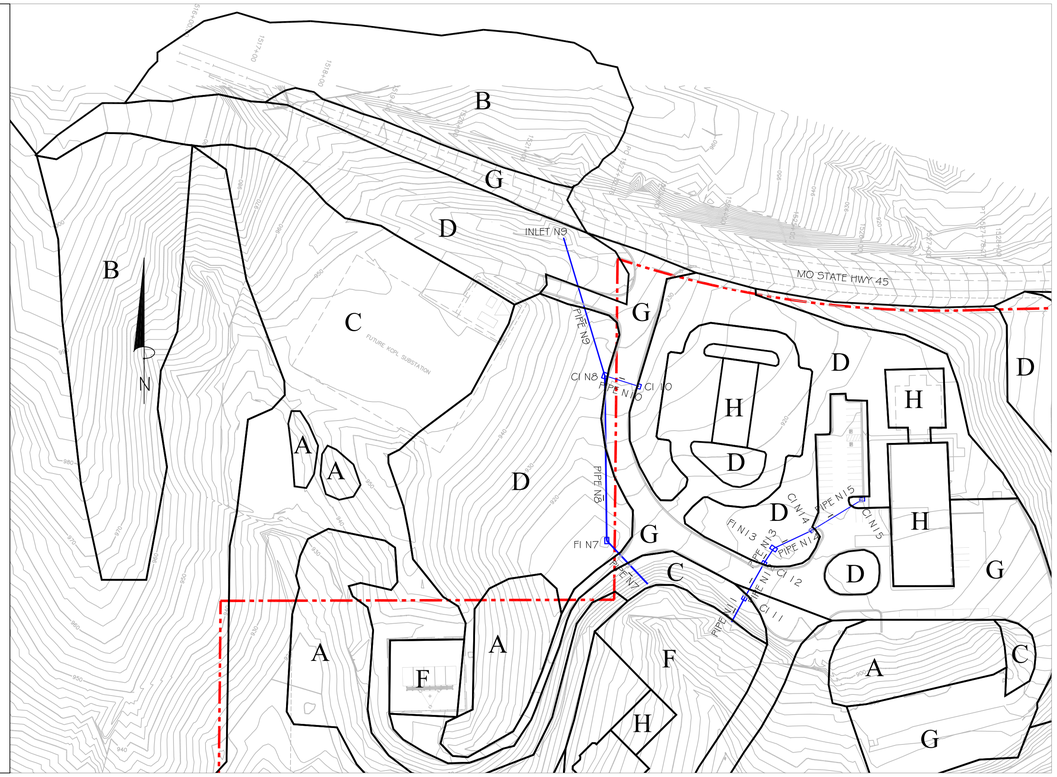
WATERSHED SUB-BASINS



WATERSHED LAND USES



ANALYSIS PARAMETERS

SUB-BASIN	AREA (acres)	HYDROGRAPH PARAMETERS – UNIT – TIME OF CONCENTRATION - TR55 METHODOLOGY – SHEET FLOW: RUNOFF COEF. (n)	SHEET FLOW: 2-YR 24-HR RAINFALL (in)	SHEET FLOW: FLOW LENGTH (ft)	SHEET FLOW: SLOOPE (ft/ft)	SHEET FLOW: TRAVEL TIME (min)	SHALLOW FLOW: K COEFFICIENT (K)	SHALLOW FLOW: FLOW LENGTH (ft)	SHALLOW FLOW: SLOPE (ft/ft)	SHALLOW FLOW: TRAVEL TIME (min)	SHALLOW FLOW: VELOCITY (ft/sec)	CHANNEL FLOW: HYDRAULIC RADIUS (ft)	CHANNEL FLOW: ROUGHNESS COEF. (n)	CHANNEL FLOW: FLOW LENGTH (ft)	CHANNEL FLOW: CHANNEL SLOPE (ft/ft)	CHANNEL FLOW: TRAVEL TIME (min)	CHANNEL FLOW: VELOCITY (ft/sec)	COMPUTED FLOOD: CURVE NUMBER (composite)	TIME OF CONCENTRATION (min.)	TOTAL RAINFALL (in) (SCS TYPE II DISTRIBUTION)	PEAK FLOW (cfs) ROUTED TO OUTLET	RECEIVING INLET
																			100 YR	Q100	
																			50 YR	Q50	
																			25 YR	Q25	
																			10 YR	Q10	
																			2 YR	Q2	
10	1.42	0.13	2.88	100	.04	6.98	.25	395	0.09	8.78	0.75	0.50	0.05	150	0.053	0.58	4.32	74	16.34	9.60	11.22	N9
																				8.40	9.36	
																				7.20	7.52	
																				5.76	5.35	
																				2.88	1.46	
11	1.73	0.24	2.88	100	0.10	7.90	1.5	375	0.08	1.47	4.24	0.55	0.01	555	0.06	0.49	18.85	77	9.87	9.60	17.34	N9
																				8.40	14.61	
																				7.20	11.88	
																				5.76	8.64	
																				2.88	2.59	
12	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	94	5.00	9.60	2.75	N10
																				8.40	2.40	
																				7.20	2.04	
																				5.76	1.62	
																				2.88	0.75	
13	0.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	87	5.00	9.60	2.41	N8
																				8.40	2.08	
																				7.20	1.74	
																				5.76	1.34	
																				2.88	0.53	
14	2.93	0.24	2.88	50	0.04	6.55	.70	157	0.14	1.00	2.62	0.62	.025	124	0.04	0.24	8.67	75	7.78	9.60	30.41	N7
																				8.40	25.46	
																				7.20	20.54	
																				5.76	14.73	
																				2.88	4.09	
15	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	91	5.00	9.60	2.69	N15
																				8.40	2.33	
																				7.20	1.98	
																				5.76	1.55	
																				2.88	0.67	
16	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	5.00	9.60	1.42	N14
																				8.40	1.24	
																				7.20	1.06	
																				5.76	0.85	
																				2.88	0.42	
17	1.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	89	5.00	9.60	21.92	N13
																				8.40	18.97	
																				7.20	16.00	
																				5.76	12.42	
																				2.88	5.18	
18	0.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	5.00	9.60	2.22	N12
																				8.40	1.94	
																				7.20	1.66	
																				5.76	1.33	
																				2.88	0.65	
19	0.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	5.00	9.60	2.26	N11
																				8.40	1.98	
																				7.20	1.69	
																				5.76	1.35	
																				2.88	0.67	
20	0.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	95	5.00	9.60	7.70	FLUME
																				8.40	6.72	
																				7.20	5.74	
																				5.76	4.55	
																				2.88	2.16	

LAND USE CATEGORIES

CATEGORY	CHARACTERISTICS	SCS CURVE NUMBER (CN)	RUNOFF COEFFICIENT (c)
A	DENSE WOODS WITH BRUSH	65	0.30
B	NON-CULTIVATED AGRICULTURAL LAND / PASTURE	74	0.30
C	TURFED, GREENBELTS, UNIMPROVED	75	0.30
D	PARKS, CEMETARIES, LAWNS	77	0.36
E	PERVIOUS PAVEMENT	80	0.45
F	GRAVEL SURFACING	89	0.66
G	NON-PERVIOUS PAVEMENT	98	0.90
H	ROOFS	98	0.90

NOTE:

WATERSHED SUB-BASINS CONTRIBUTING TO THE EXISTING STORM WATER SYSTEM WERE ANALYZED USING EXISTING CONTOURS AND PIPE SIZES BUT ALSO WITH THE ADDITIONAL LAND USES PROJECTED ON THE APPROVED PRELIMINARY SITE PLAN.

VERTICAL VENTURES III
DEVELOPMENT
Existing Storm Sewer System

PARKVILLE, MISSOURI

WATERSHED DETAILS
SUB-BASINS
LAND USES

PROFESSIONAL ENGINEER

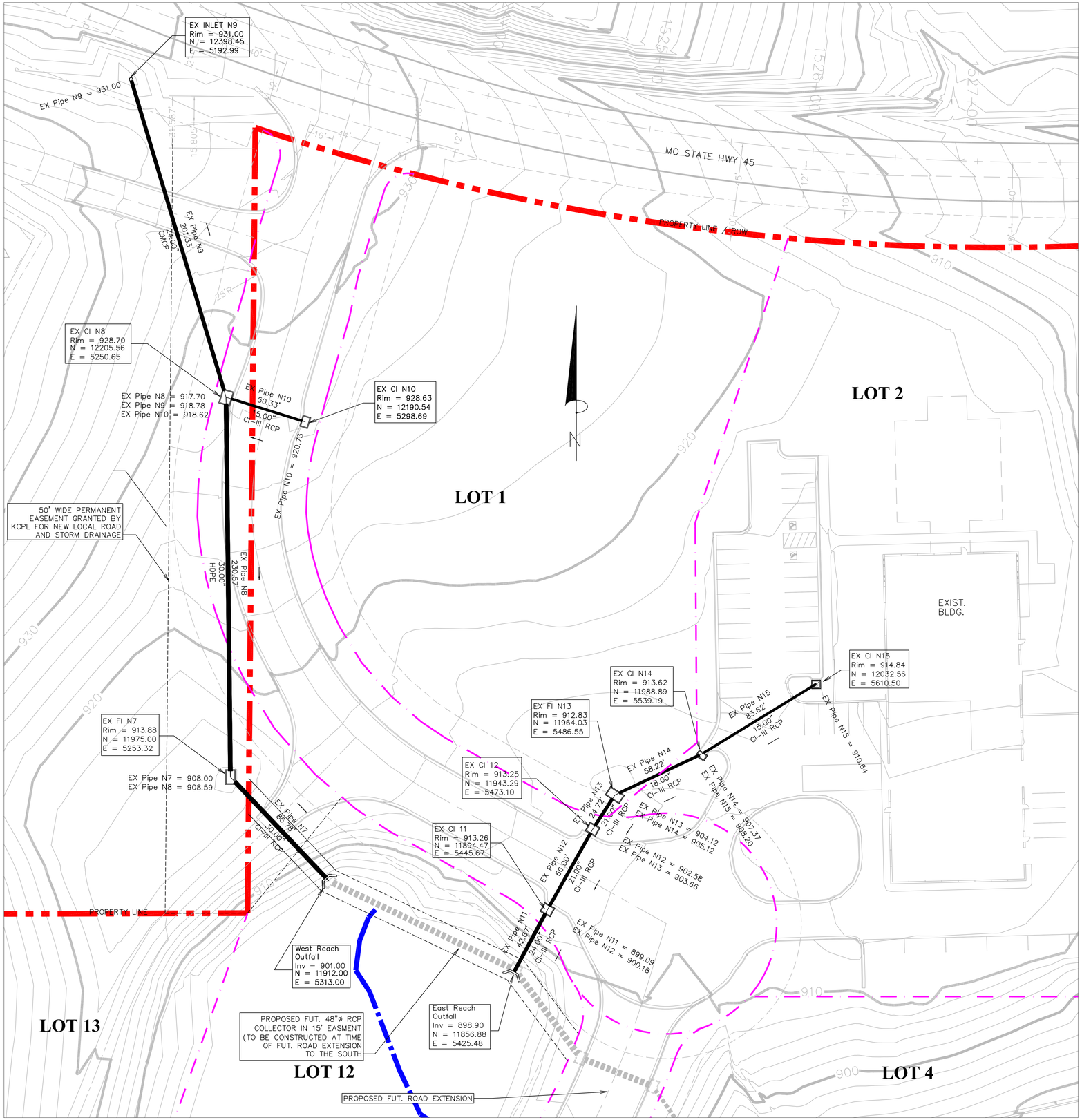
DATE:

TERRADYNE, LTD.
16203 N.W. 45 HIGHWAY
KANSAS CITY, MO 64152
P: (816) 891-8800
F: (816) 891-9889
P.O. BOX 190, WALDRON, MO 64092
FOR U.S. MAIL ONLY:
ENGINEERING + PROPERTY DEVELOPMENT + GENERAL CONSTRUCTION
MISSOURI PROFESSIONAL ENGINEERING CORPORATION LICENSE NO. E-1472-D

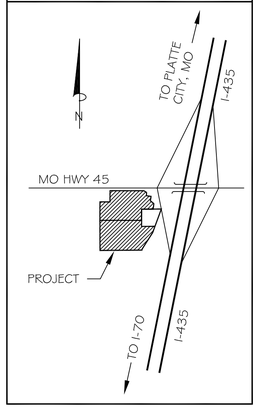
REV.	DATE	DESCRIPTION	BY
	8/18/09	ORIGINAL ISSUE	JMS

PROJECT NO. 09-002

SHEET NO. ST0



PROJECT LOCATION



30 0 30 90

SCALE: 1" = 30'

VERTICAL VENTURES III DEVELOPMENT
Existing Storm Sewer System

PARKVILLE, MISSOURI

NORTH SYSTEM
PLAN VIEWS
WEST REACH
EAST REACH

PROFESSIONAL ENGINEER

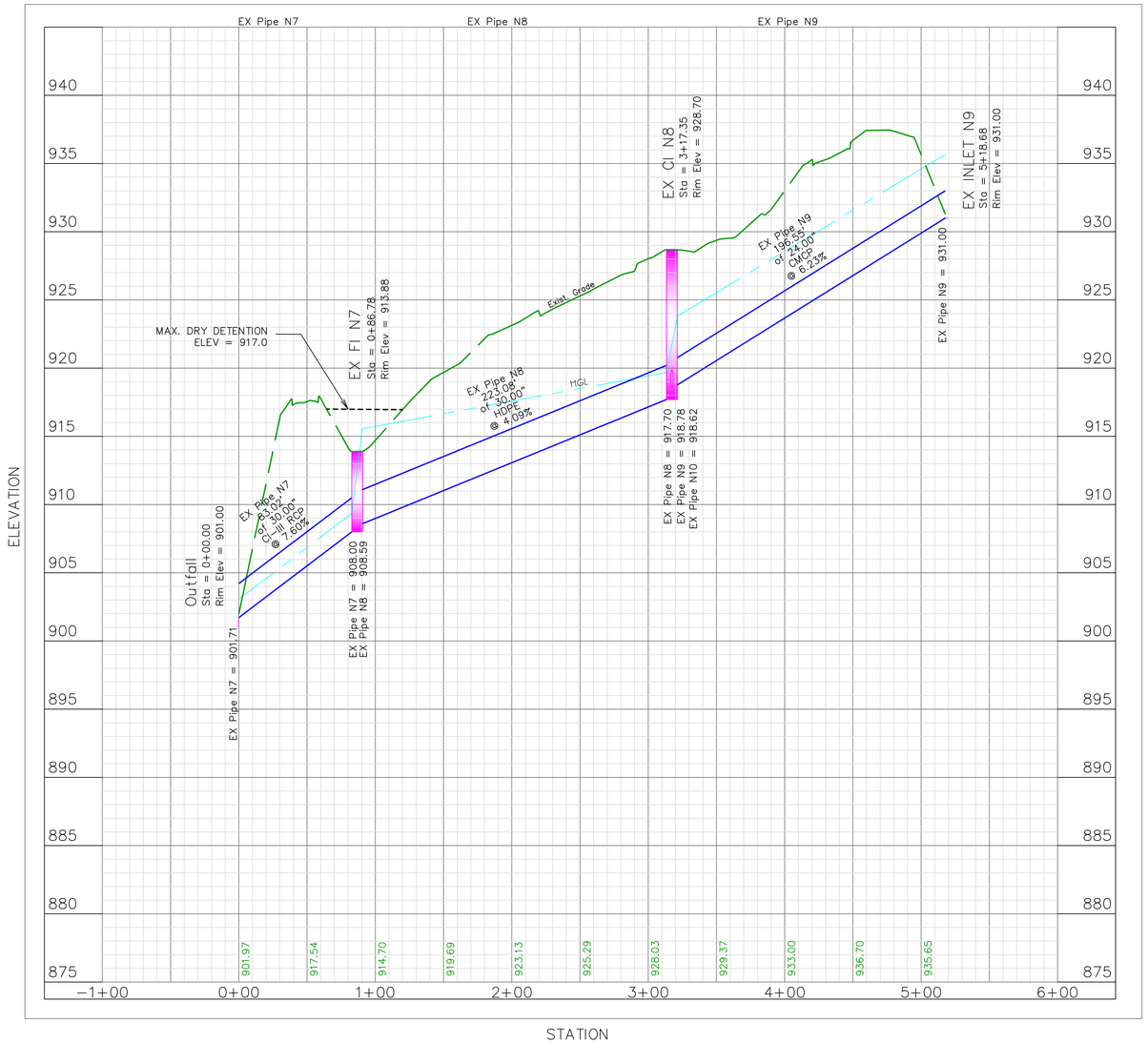
DATE:

TERRADYNE, LTD.
16203 N.W. 45 HIGHWAY
KANSAS CITY, MO 64152
FOR U.S. MAIL ONLY:
P.O. BOX 190, WALDRON, MO 64092
Ph: (816) 891-8800
FX: (816) 891-8899
ENGINEERING + PROPERTY DEVELOPMENT + GENERAL CONSTRUCTION
MISSOURI PROFESSIONAL ENGINEERING CORPORATION LICENSE NO. E-1472-D

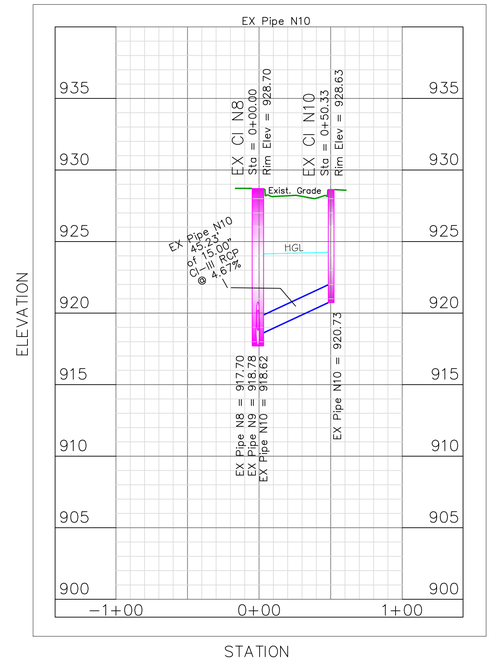
REV.	DATE	DESCRIPTION	BY
	10/31/09	ORIGINAL ISSUE	JWS

PROJECT NO.
09-002

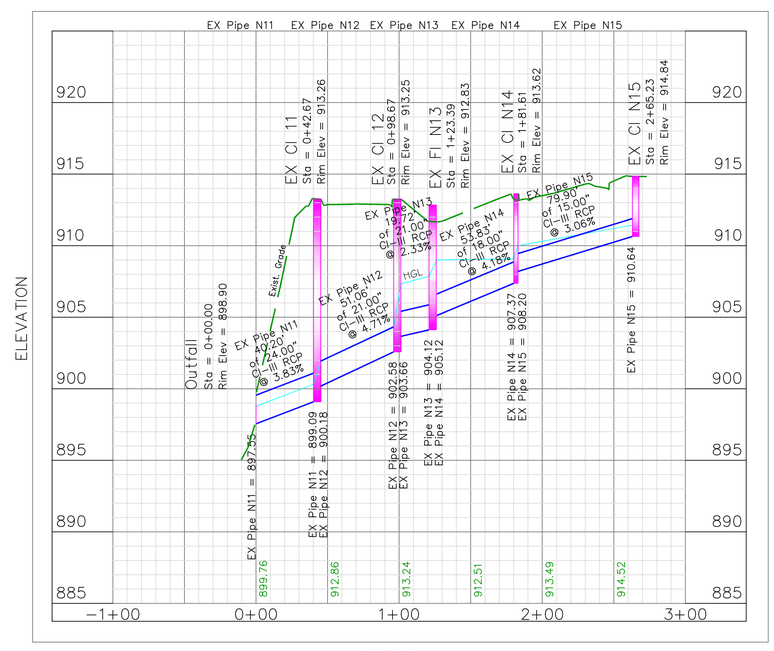
SHEET NO.
ST1



WEST REACH PROFILE - PIPES N7, N8 & N9
(HYDRAULIC GRADE LINE SHOWN (HGL) REPRESENTS 100 YR STORM FLOW)



WEST REACH PROFILE - PIPE N10
(HYDRAULIC GRADE LINE SHOWN (HGL) REPRESENTS 100 YR STORM FLOW)



EAST REACH PROFILE - PIPES N11, N12, N13, N14 & N15
(HYDRAULIC GRADE LINE SHOWN (HGL) REPRESENTS 100 YR STORM FLOW)

SCALES:

HORIZ.	1" = 50'
VERT.	1" – 5'

VERTICAL VENTURES III DEVELOPMENT
Existing Storm Sewer System

PARKVILLE, MISSOURI

NORTH SYSTEM PROFILE VIEWS
WEST REACH
EAST REACH

PROFESSIONAL ENGINEER

DATE:

TERRADYNE, LTD.
16203 N.W. 45 HIGHWAY
KANSAS CITY, MO 64152
FOR U.S. MAIL ONLY:
PH: (816) 891-8800
FX: (816) 891-8899
P.O. BOX 190, WALDRON, MO 64092
ENGINEERING + PROPERTY DEVELOPMENT + GENERAL CONSTRUCTION
MISSOURI PROFESSIONAL ENGINEERING CORPORATION LICENSE NO. E-1472-D

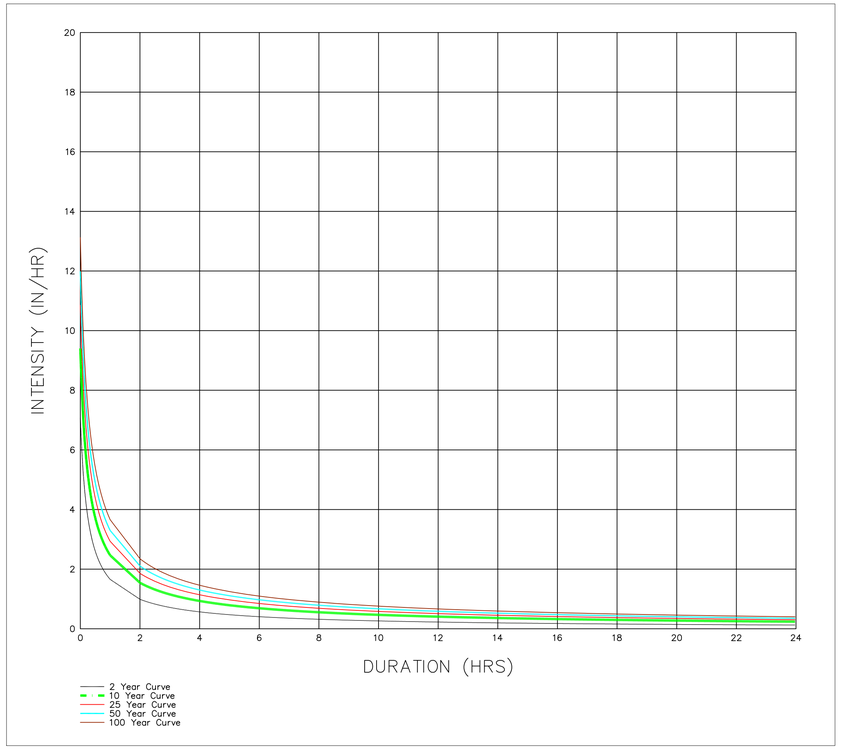
REV.	DATE	DESCRIPTION	BY
	10/31/09	ORIGINAL ISSUE	JWS

PROJECT NO. 09-002

SHEET NO. ST1-1

RAINFALL INTENSITY - DURATION - FREQUENCY CURVES

(FOR PARKVILLE, MISSOURI)



DESIGN & ANALYSIS PARAMETERS

RUNOFF DISCHARGE						GUTTER DISCHARGE					INLET DESIGN					PIPE DESIGN									
STRICTIRE	AREA (AC) A	RUNOFF COEF. c	INLET TIME Tc	RAINFALL INTENSITY I100 / I50 / I10	TOTAL FLOW (cfs) (from Sheet ST3 – Flood hydrographs) Q100 / Q50 / Q10	GUTTER SLOPE (%) Sg	CROSS SLOPE (%) Sx	FLOW BYPASS (cfs) Qby	TOTAL FLOW (cfs) Q100 / Q50 / Q10	FLOW SPREAD (ft) X 100 YR	INLET LENGTH (ft) L	INLET AREA (sf) Ai	INLET CAPACITY (cfs) Ci	80% CAPACITY (cfs) Ci	FLOW BYPASS (cfs) Q100 / Q50 / Q10	PIPE	FROM STRUCTURE	TO STRUCTURE	DESIGN FLOW (cfs) (FROM SHEET ST2) Q100	DIAMETER (in) D	MANNING'S COEF. n	LENGTH (ft) L	SLOPE (%) S	FLOW FULL (cfs) Qf	VELOCITY (fps) V100 100 YR
CI N15	0.20	0.70	5.00	10.32	2.69	SUMP	2.0	0	2.69	2.2'	4.5'	2.25	10.47	8.37	0	N15	CI N15	CI N14	2.69	15	.013	79.90	3.06	11.28	2.19
				9.40	2.33				2.33						0										
				7.35	1.55				1.55						0										
CI N14	0.10	0.90	5.00	10.32	1.42	SUMP	2.0	0	1.42	5.0'	5.0'	2.50	11.63	9.30	0	N14	CI N14	FI N13	4.11	18	.013	53.83	4.18	21.47	2.33
				9.40	1.24				1.24						0										
				7.35	0.85				0.85						0										
FI N13	1.66	0.66	5.00	10.32	21.92	SUMP	2.0	0	21.92	N/A	26.0'	13.00	60.5	48.40	0	N13	FI N13	CI N12	26.03	21	.013	19.72	2.33	24.19	10.82
				9.40	18.97				18.97						0										
				7.35	12.42				12.42						0										
CI N12	0.16	0.90	5.00	10.32	2.22	3.0	2.0	0	2.22	6.5'	6.0'	3.00	13.96	11.17	0	N12	CI N12	CI N11	28.25	21	.013	51.06	4.71	34.34	11.75
				9.40	1.94				1.94						0										
				7.35	1.33				1.33						0										
CI N11	0.16	0.90	5.00	10.32	2.26	3.0	2.0	0	2.26	6.5'	6.0'	3.00	13.96	11.17	0	N11	CI N11	OUTLET	30.51	24	.013	40.20	3.83	44.26	15.19
				9.40	1.98				1.98						0										
				7.35	1.35				1.35						0										
CI N10	0.20	0.70	5.00	10.32	2.75	3.0	2.0	0	2.75	7.2'	6.0'	3.00	13.96	11.17	0	N10	CI N10	CI N8	2.75	15	.013	45.23	4.67	13.95	2.24
				9.40	2.40				2.40						0										
				7.35	1.62				1.62						0										
CI N8	0.19	0.70	5.00	10.32	2.41	3.0	2.0	0	2.41	6.8'	8.0'	4.00	18.61	14.89	0	N8	CI N8	FI N7	33.72	30	.011	223.08	4.09	97.92	6.87
				9.40	2.08				2.08						0										
				7.35	1.34				1.34						0										
FI N7	2.93	0.30	7.78	9.28	30.41	SUMP	4.0	0	30.41	N/A	GRATE	40.00	78.0	62.40	0	N7	FI N7	OUTLET	64.13	30	.013	83.02	7.60	112.85	23.72
				8.45	25.46				25.46						0										
				6.58	14.73				14.73						0										
																N9	IN N9	CI N8	28.56	24	.024	196.55	6.23	30.54	9.09

NOTES:

1. ALL STORM SEWER SYSTEM MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS OF THE AMERICAN PUBLIC WORKS ASSOCIATION – KANSAS CITY CHAPTER (AWPA–KC).
2. PIPE LENGTHS SHOWN IN PLAN VIEW ARE DIMENSIONED IN 2D "PLAN LENGTH"; PIPE LENGTHS SHOWN IN PROFILE LENGTHS OR IN TABLES ARE DIMENSIONED IN 3D "PIPE LENGTH".
3. THE PIPE DESIGN TABLE SHOWN ON THIS SHEET CONSIDERES THE 1% (100 YR) STORM ONLY. SINCE THE SYSTEM ADEQUATELY HANDLES THE 1% STORM, IT WILL OBVIOUSLY HANDLE STORMS OF GREATER FREQUENCY.
4. THE SCS TR–55 METHODOLOGY WAS CHOSEN AS THE PREFERRED STORM MODELING METHOD SINCE IT BETTER TAKES INTO ACCOUNT THE SIGNIFICANTLY VARIED TOPOGRAPHY IN TERMS OF GRADES AND LAND USES. THE HYDROGRAPH FLOWS OBTAINED BY THIS METHODOLOGY WERE ALSO USED FOR STREET GUTTER AND INLET ANALYSIS SINCE THEY WERE FOUND TO SLIGHTLY EXCEED SIMILAR FLOWS DETERMINED FROM THE RATIONAL METHODOLOGY, THEREBY PRODUCING THE MORE CONSERVATIVE DESIGN
5. ALL CALCULATIONS ARE BASED UPON ACTUAL AS–BUILT CONDIDTIONS TO THE EXTENT THAT THEY ARE KNOWN.

VERTICAL VENTURES III
DEVELOPMENT
Existing Storm Sewer System

PARKVILLE, MISSOURI

NORTH SYSTEM
RAINFALL IDF CURVES
&
DESIGN PARAMETERS

PROFESSIONAL ENGINEER

DATE:

TERRADYNE, LTD.
12625 N.W. 45 HIGHWAY
KANSAS CITY, MO 64152
FOR U.S. MAIL ONLY:
P.O. BOX 190, WALDRON, MO 64092
PH: (816) 891-4860
FAX: (816) 891-8595
ENGINEERING + PROPERTY DEVELOPMENT + GENERAL CONSTRUCTION
MISSOURI PROFESSIONAL ENGINEERING CORPORATION LICENSE NO. E–1472–D

REV.	DATE	DESCRIPTION	BY
	10/31/09	ORIGINAL ISSUE	JWS

PROJECT NO.
09-002

SHEET NO.
ST1-2