PARTIAL PRELIMINARY DRAINAGE REPORT

TERRADYNE WEST ADDITION

10-16-06

Jim Ubert, PE
Poe & Associates, Inc.

CITY OF WICHITA

POE & ASSOCIATES, INC.
CONSULTING ENGINEERS

POE & ASSOCIATES, INC.
5940 E. Central, Suite 200
Wichita, Kansas 67208

CONSULTING ENGINEERS
(316) 685-4114
FAX: (316) 685-4444

MEMORANDUM

DATE: 10/16/06	RE: Terradyne West – Preliminary Drainage
TO: Mr. Scott Lindebak, P.E. City of Wichita	
FROM: Jim Ubert	

PLEASE ADVISE IMMEDIATELY OF ANY ERRORS OR OMISSIONS YOU BELIEVE TO BE CONTAINED IN THIS MEMORANDUM.

Attached is supporting information as follows:

1. Drainage plan – Brookhaven Estates & USGS "Quadrangle" of area.
2. Lot Grading Plan – Terradyne West
3. HEC-Ras run for 3 –24" pipes through the proposed berm and swale to the pond (in easement)
4. Hydraflow Stormsewer – hydraulic calculations for Brookhaven stormsewer with Terradyne West proposed storm sewer.

SHEET DRAINAGE (LOTS 1-15, BLOCK 3, BROOKHAVEN ESTATES)

The developer wants to construct a berm from Lot 1, Block 1 south to Central Ave. The rear drainage from Lots 1-15, Block 3, Brookhaven Estates that currently sheets flows to the east will collect at about Lots 7 & 8, Block 3.

Three (3) 24" storm sewer pipes (smooth wall) shall be constructed at that location for transmission of runoff through the berm. Having visited the site, overflow from the curb inlets at Lots 7 & 8 will go into the adjacent garages at about the same time it would go between the houses toward the east.

The HEC-Ras run looked at what happens for 12 cfs (100 yr event), 20 cfs, 30 cfs, & 40 cfs (events exceeding the 100 yr) due to the proposed berm. The 100 yr event (12 cfs) had a WS of 1321.58 and 30 cfs had a WS of 1322.07 (providing 2.5 times the 100 yr event for a factor of safety). The HEC-Ras run ignored any proposed area inlet on the east side of the proposed berm. All runoff escaped through the overflow in the easement toward the pond to the east.

STORM SEWER NETWORK (EXISTING BROOKHAVEN ESTATES & PROPOSED TERRADYNE WEST)

Hydraflow Storm Sewers was used to analyze the hydraulic characteristics of the existing Brookhaven Estates and proposed Terradyne West system. Attached is a USGS "quad" sheet of the area and the Brookhaven Estates Drainage Plan dated 2-28-94. We have assumed that the system was built as shown on the Brookhaven Estates Drainage Plan. We will verify during final design. We proposed to put an area inlet sized to handle 12cfs (assuming 50% clogged) below a headwater of 1321.5 at the junction of Lines 2, 3 & 4 (Hydraflow Plan View). The ground elevation near Lots 7 & 8, Block 3, Brookhaven Estates is 1322.0 in the rear yard near the viewout lots (this will be verified during final design). The developer wants to construct a 48" storm sewer (Line 1) privately now from the pond and terminate with

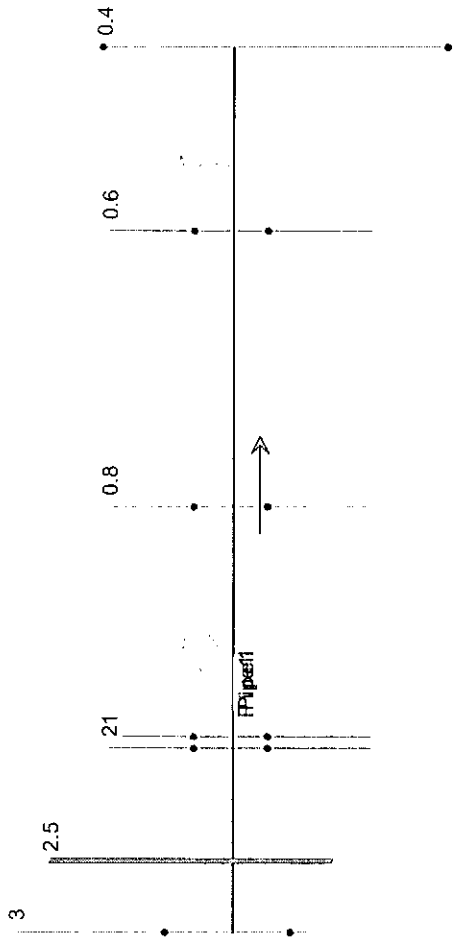
an end section just outside of Lot 1, Block 3. The existing swale that extends from the existing 36" SWS will be redirected to the 48" pipe. The reason for constructing this portion of the storm sewer now is to get it in the ground so that irrigation lines can be installed over it and they can then hydro-seed the golf course.

TERRADYNE WEST

PARTIAL PRELIMINARY DRAINAGE REPORT

10-16-06

Jim Ubert, PE - Poe & Associates, Inc.



HEC-RAS Plan: Plan 01 River: Pipe1 Reach: Pipe1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Pipe1	3	PF 1	12.00	1320.80	1321.58	1321.00	1321.58	0.000138	0.31	38.63	78.71	0.08
Pipe1	3	PF 2	20.00	1320.80	1321.79	1321.07	1321.79	0.000136	0.35	56.77	94.43	0.08
Pipe1	3	PF 3	30.00	1320.80	1322.07	1321.13	1322.07	0.000095	0.35	86.05	120.14	0.07
Pipe1	3	PF 4	40.00	1320.80	1322.38	1321.19	1322.38	0.000052	0.32	130.55	165.35	0.05
Pipe1	2.5		Culvert									
Pipe1	2	PF 1	12.00	1320.00	1321.52		1321.52	0.000014	0.17	74.40	88.44	0.03
Pipe1	2	PF 2	20.00	1320.00	1321.63		1321.63	0.000028	0.25	84.96	95.89	0.04
Pipe1	2	PF 3	30.00	1320.00	1321.75		1321.75	0.000046	0.34	96.56	103.46	0.05
Pipe1	2	PF 4	40.00	1320.00	1321.85		1321.85	0.000062	0.41	107.14	109.90	0.06
Pipe1	1	PF 1	12.00	1320.00	1321.51		1321.52	0.000014	0.17	74.39	88.44	0.03
Pipe1	1	PF 2	20.00	1320.00	1321.63		1321.63	0.000028	0.25	84.94	95.88	0.04
Pipe1	1	PF 3	30.00	1320.00	1321.75		1321.75	0.000046	0.34	96.54	103.44	0.05
Pipe1	1	PF 4	40.00	1320.00	1321.84		1321.85	0.000062	0.41	107.10	109.88	0.06
Pipe1	0.8	PF 1	12.00	1321.20	1321.41	1321.41	1321.50	0.031687	2.42	4.96	27.33	1.00
Pipe1	0.8	PF 2	20.00	1321.20	1321.49	1321.49	1321.61	0.028908	2.78	7.19	30.06	1.00
Pipe1	0.8	PF 3	30.00	1321.20	1321.57	1321.57	1321.72	0.026699	3.08	9.74	32.89	1.00
Pipe1	0.8	PF 4	40.00	1321.20	1321.64	1321.64	1321.81	0.025738	3.32	12.03	35.24	1.00
Pipe1	0.6	PF 1	12.00	1320.00	1321.20		1321.20	0.000041	0.25	49.76	67.96	0.05
Pipe1	0.6	PF 2	20.00	1320.00	1321.40		1321.40	0.000057	0.32	64.61	80.93	0.06
Pipe1	0.6	PF 3	30.00	1320.00	1321.50		1321.50	0.000093	0.44	72.95	87.37	0.07
Pipe1	0.6	PF 4	40.00	1320.00	1321.60		1321.60	0.000123	0.53	81.95	93.82	0.09
Pipe1	0.4	PF 1	12.00	1318.80	1321.20	1318.93	1321.20	0.000000	0.02	625.48	300.00	0.00
Pipe1	0.4	PF 2	20.00	1318.80	1321.40	1318.97	1321.40	0.000000	0.03	685.50	300.00	0.00
Pipe1	0.4	PF 3	30.00	1318.80	1321.50	1319.01	1321.50	0.000000	0.04	715.49	300.00	0.00
Pipe1	0.4	PF 4	40.00	1318.80	1321.60	1319.04	1321.60	0.000000	0.05	745.48	300.00	0.01

Plan: Plan 01 Pipe1 Pipe1 RS: 2.5 Culv Group: Culvert #1 Profile: PF 1

Q Culv Group (cfs)	12.00	Culv Full Len (ft)	
# Barrels	3	Culv Vel US (ft/s)	1.81
Q Barrel (cfs)	4.00	Culv Vel DS (ft/s)	1.47
E.G. US. (ft)	1321.58	Culv Inv El Up (ft)	1320.20
W.S. US. (ft)	1321.58	Culv Inv El Dn (ft)	1319.90
E.G. DS (ft)	1321.52	Culv Frctn Ls (ft)	0.03
W.S. DS (ft)	1321.52	Culv Exit Loss (ft)	0.03
Delta EG (ft)	0.07	Culv Entr Loss (ft)	0.01
Delta WS (ft)	0.07	Q Weir (cfs)	
E.G. IC (ft)	1321.16	Weir Sta Lft (ft)	
E.G. OC (ft)	1321.58	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1321.52	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1321.52	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	0.69	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	0.70	Min El Weir Flow (ft)	1330.01

Plan: Plan 01 Pipe1 Pipe1 RS: 2.5 Culv Group: Culvert #1 Profile: PF 2

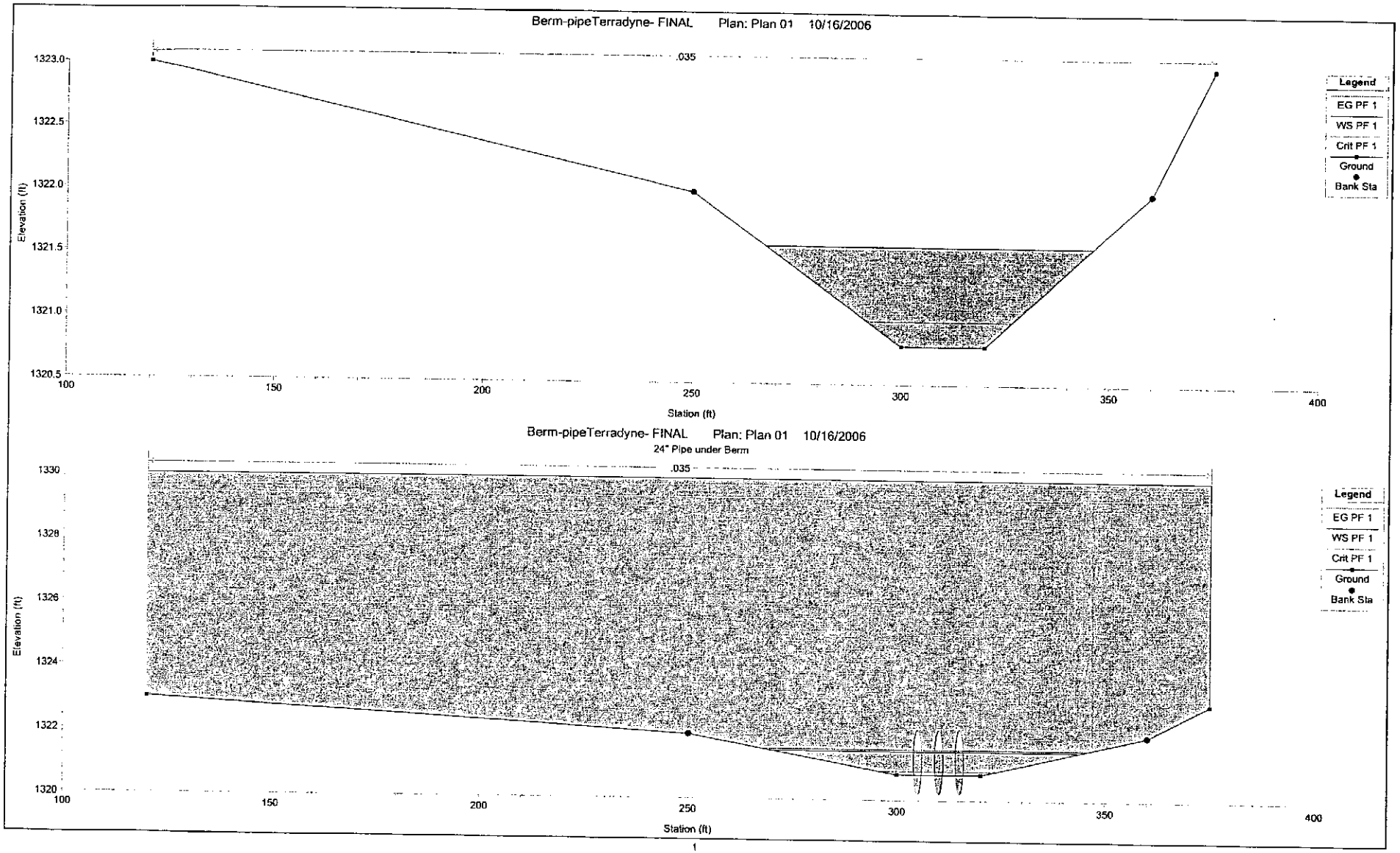
Q Culv Group (cfs)	20.00	Culv Full Len (ft)	
# Barrels	3	Culv Vel US (ft/s)	2.72
Q Barrel (cfs)	6.67	Culv Vel DS (ft/s)	2.31
E.G. US. (ft)	1321.79	Culv Inv El Up (ft)	1320.20
W.S. US. (ft)	1321.79	Culv Inv El Dn (ft)	1319.90
E.G. DS (ft)	1321.63	Culv Frctn Ls (ft)	0.06
W.S. DS (ft)	1321.63	Culv Exit Loss (ft)	0.08
Delta EG (ft)	0.16	Culv Entr Loss (ft)	0.02
Delta WS (ft)	0.16	Q Weir (cfs)	
E.G. IC (ft)	1321.48	Weir Sta Lft (ft)	
E.G. OC (ft)	1321.79	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1321.66	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1321.63	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	0.92	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	0.92	Min El Weir Flow (ft)	1330.01

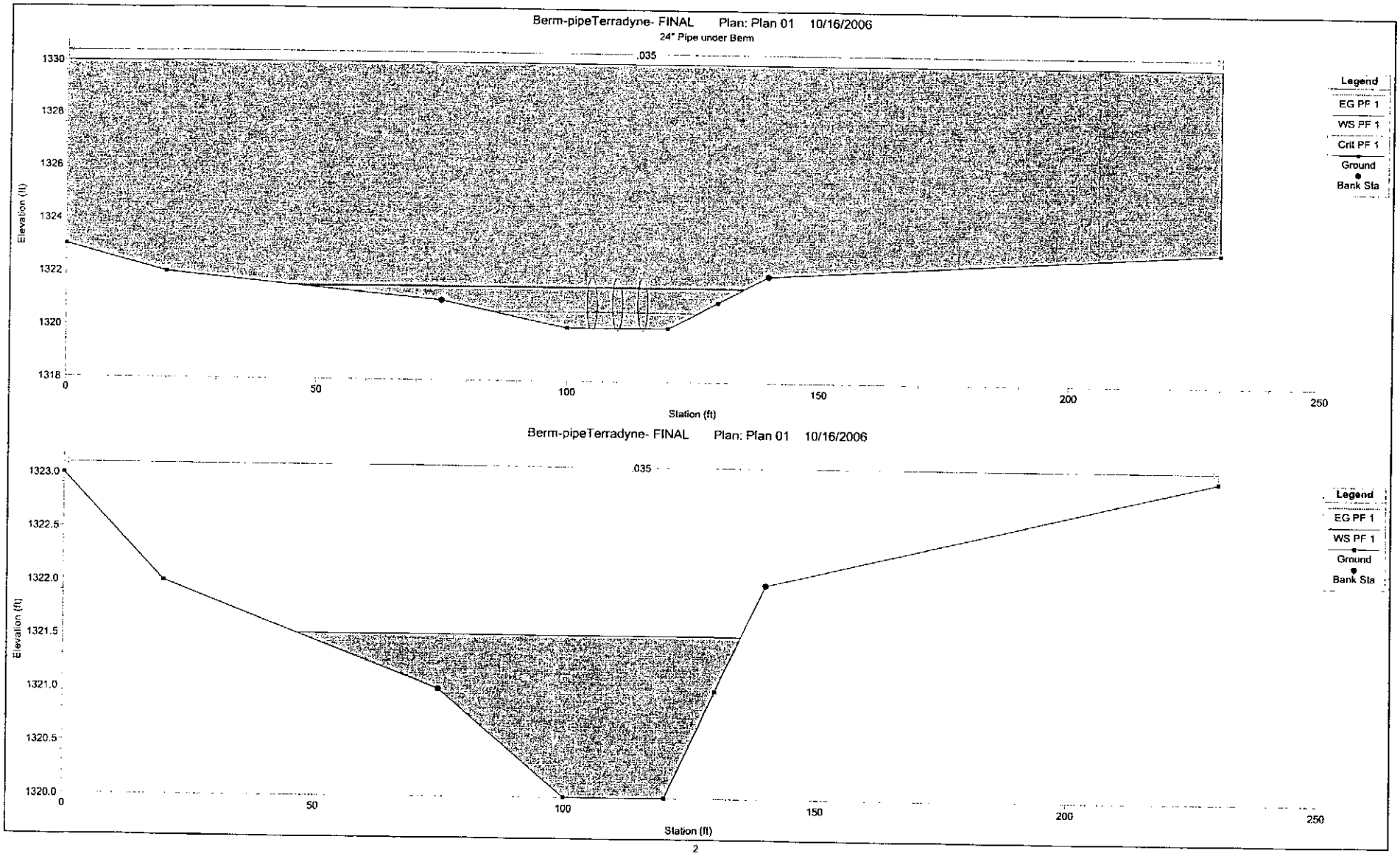
Plan: Plan 01 Pipe1 Pipe1 RS: 2.5 Culv Group: Culvert #1 Profile: PF 3

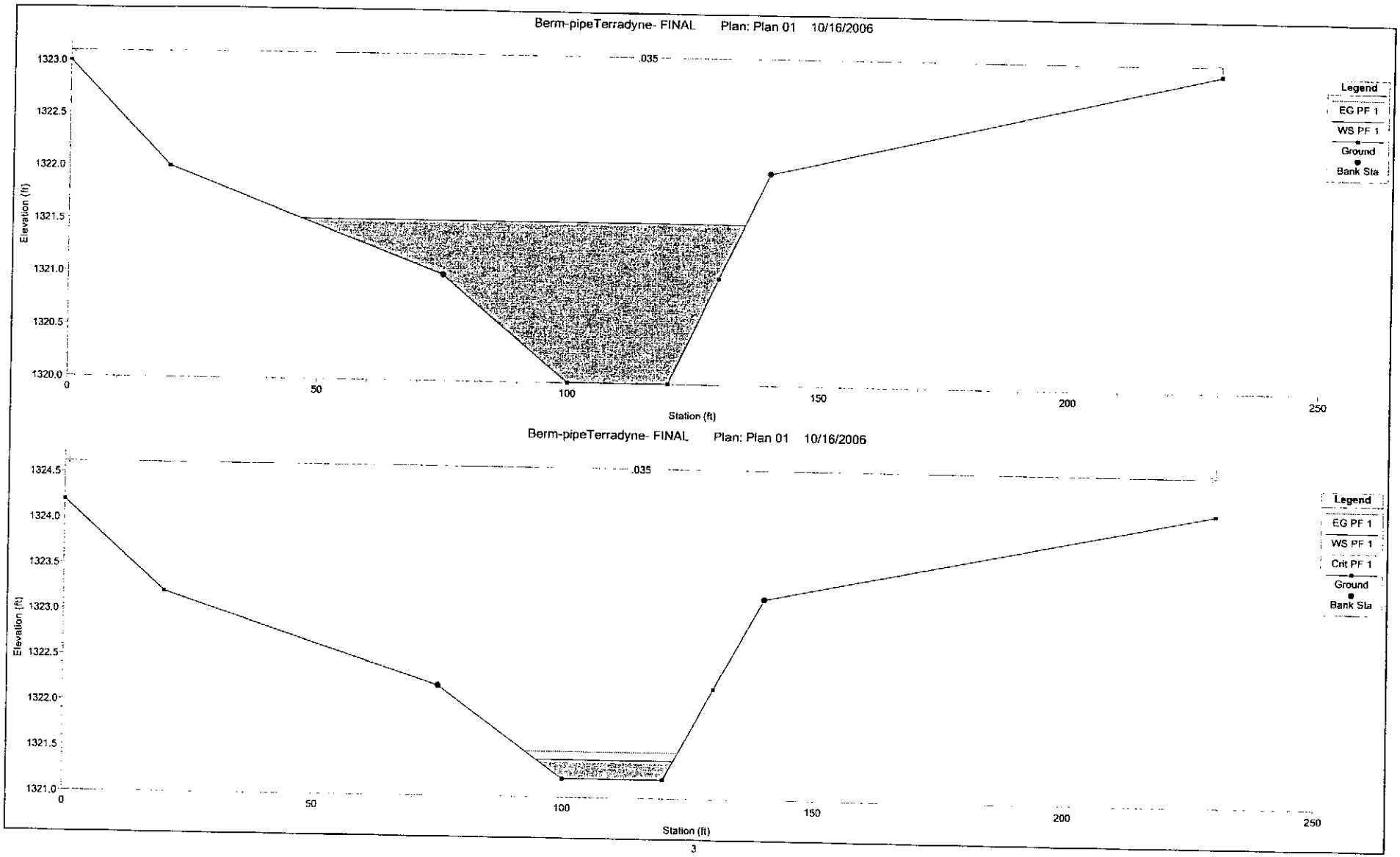
Q Culv Group (cfs)	30.00	Culv Full Len (ft)	
# Barrels	3	Culv Vel US (ft/s)	3.66
Q Barrel (cfs)	10.00	Culv Vel DS (ft/s)	3.30
E.G. US. (ft)	1322.07	Culv Inv El Up (ft)	1320.20
W.S. US. (ft)	1322.07	Culv Inv El Dn (ft)	1319.90
E.G. DS (ft)	1321.75	Culv Frctn Ls (ft)	0.12
W.S. DS (ft)	1321.75	Culv Exit Loss (ft)	0.17
Delta EG (ft)	0.32	Culv Entr Loss (ft)	0.04
Delta WS (ft)	0.32	Q Weir (cfs)	
E.G. IC (ft)	1321.84	Weir Sta Lft (ft)	
E.G. OC (ft)	1322.07	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1321.82	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1321.75	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.17	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.13	Min El Weir Flow (ft)	1330.01

Plan: Plan 01 Pipe1 Pipe1 RS: 2.5 Culv Group: Culvert #1 Profile: PF 4

Q Culv Group (cfs)	40.00	Culv Full Len (ft)	
# Barrels	3	Culv Vel US (ft/s)	4.45
Q Barrel (cfs)	13.33	Culv Vel DS (ft/s)	4.28
E.G. US. (ft)	1322.38	Culv Inv El Up (ft)	1320.20
W.S. US. (ft)	1322.38	Culv Inv El Dn (ft)	1319.90
E.G. DS (ft)	1321.85	Culv Frctn Ls (ft)	0.19
W.S. DS (ft)	1321.85	Culv Exit Loss (ft)	0.28
Delta EG (ft)	0.54	Culv Entr Loss (ft)	0.06
Delta WS (ft)	0.54	Q Weir (cfs)	
E.G. IC (ft)	1322.17	Weir Sta Lft (ft)	
E.G. OC (ft)	1322.38	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1322.01	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1321.85	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.43	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.31	Min El Weir Flow (ft)	1330.01


Berm-pipeTerradyne- FINAL Plan: Plan 01 10/16/2006
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Berm-pipeTerradyne- FINAL Plan: Plan 01 10/16/2006
24" Pipe under Berm
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta


Berm-pipeTerradyne- FINAL Plan: Plan 01 10/16/2006
24" Pipe under Berm
.035
Elevation (ft)
1330
1328
1326
1324
1322
1320
1318
0
50
100
150
200
250
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Berm-pipeTerradyne- FINAL Plan: Plan 01 10/16/2006
.035
Elevation (ft)
1323.0
1322.5
1322.0
1321.5
1321.0
1320.5
1320.0
0
50
100
150
200
250
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta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Elevation (ft)
1323.0
1322.5
1322.0
1321.5
1321.0
1320.5
1320.0
0
50
100
150
200
250
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Berm-pipeTerradyne- FINAL Plan: Plan 01 10/16/2006
.035
Elevation (ft)
1324.5
1324.0
1323.5
1323.0
1322.5
1322.0
1321.5
1321.0
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50
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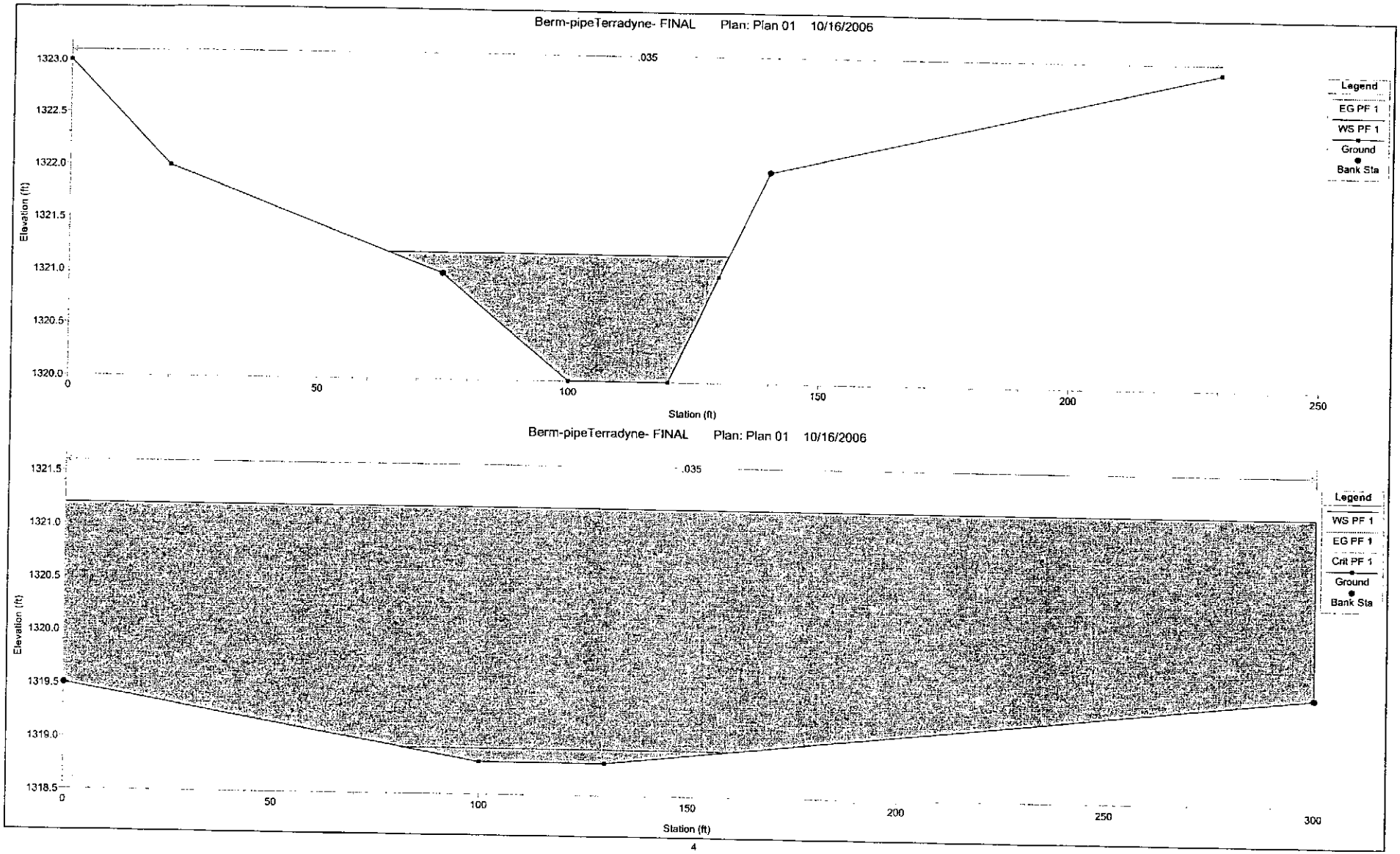
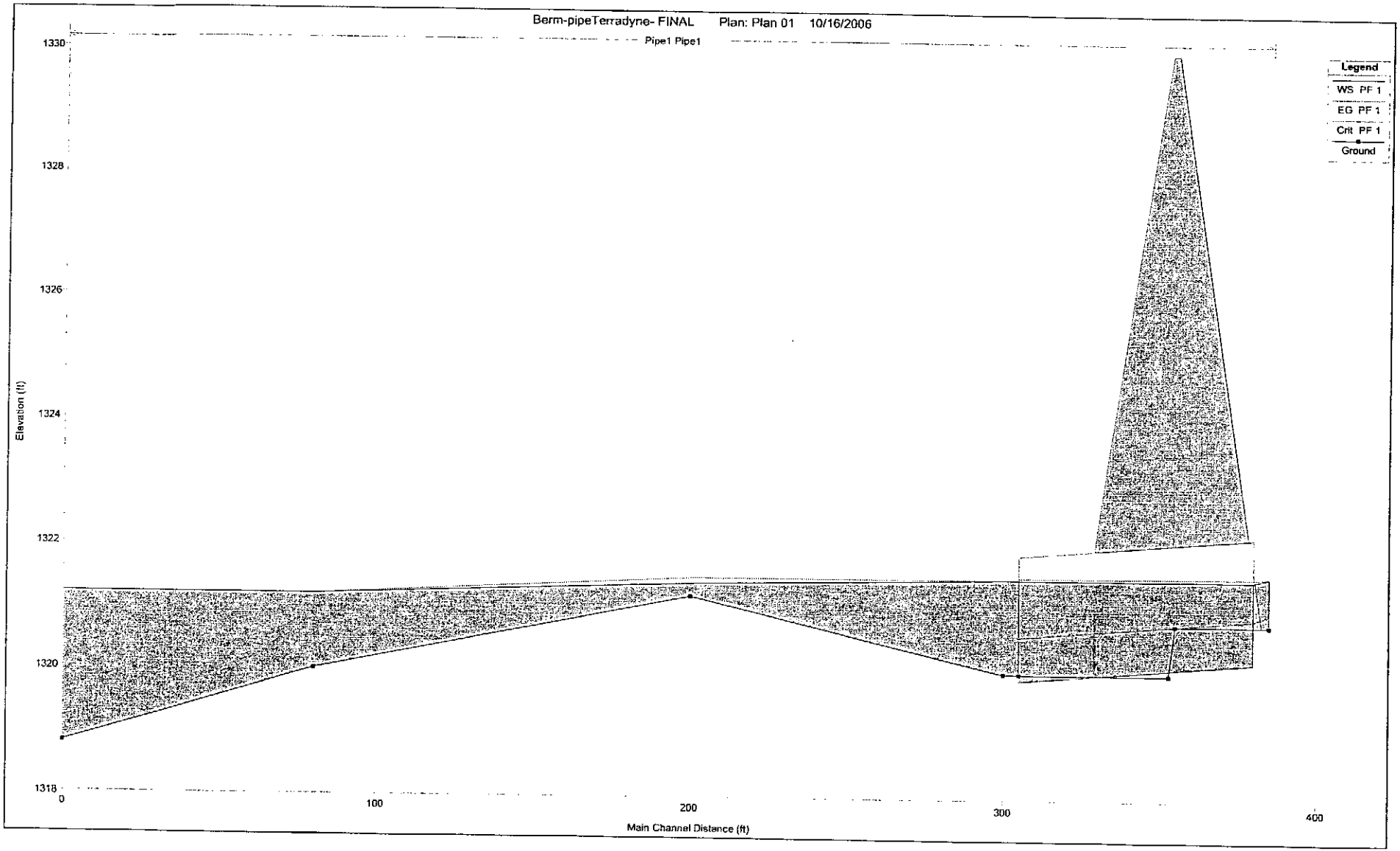
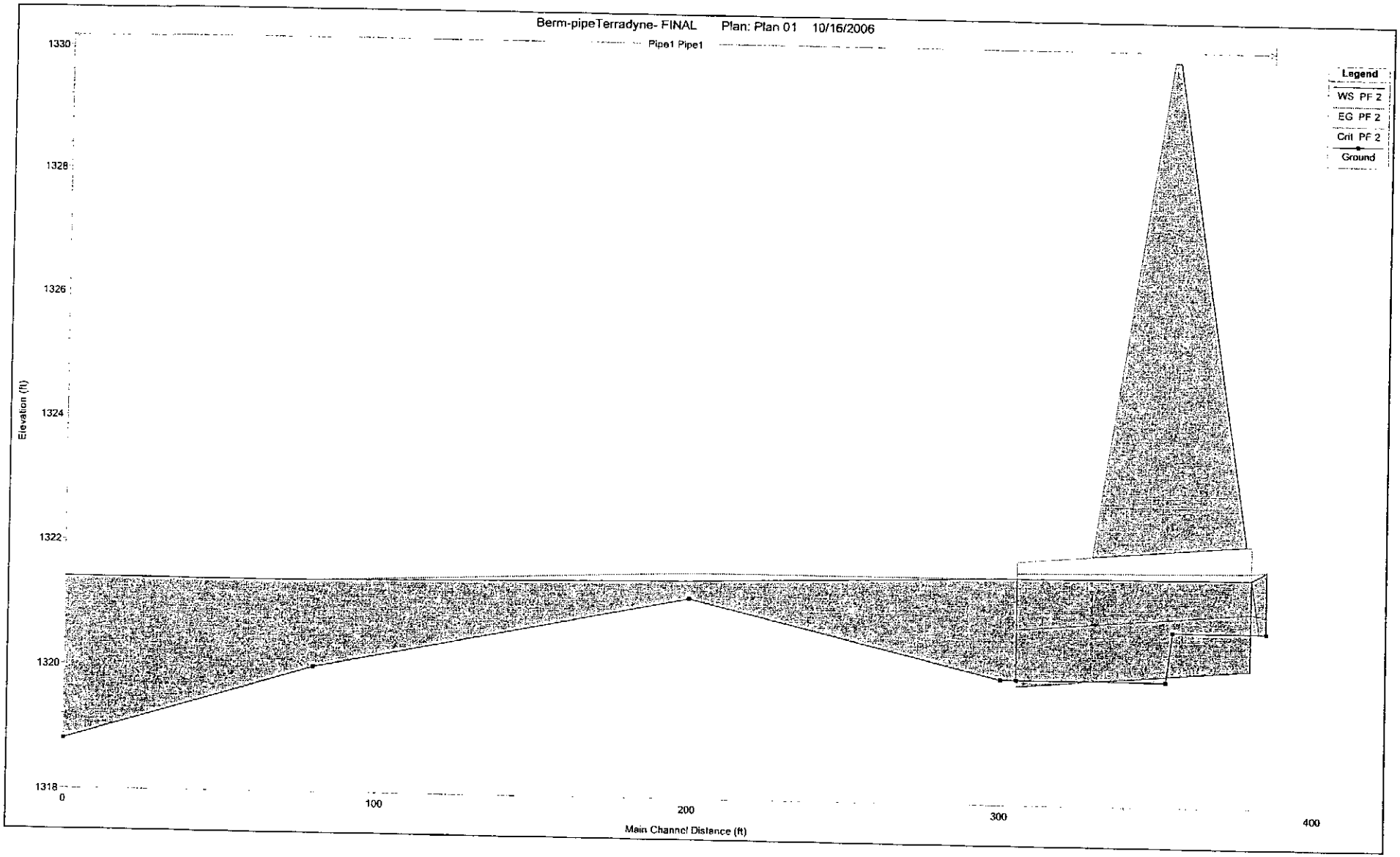
150
200
250
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta


Berm-pipeTerradyne- FINAL Plan: Plan 01 10/16/2006
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Berm-pipeTerradyne- FINAL Plan: Plan 01 10/16/2006
.035
Elevation (ft)
Station (ft)
Legend
WS PF 1
EG PF 1
Crit PF 1
Ground
Bank Sta


Berm-pipeTerradyne- FINAL Plan: Plan 01 10/16/2006
Pipe1 Pipe1
Legend
WS PF 1
EG PF 1
Crit PF 1
Ground
1330
1328
1326
1324
1322
1320
1318
Elevation (ft)
0
100
200
300
400
Main Channel Distance (ft)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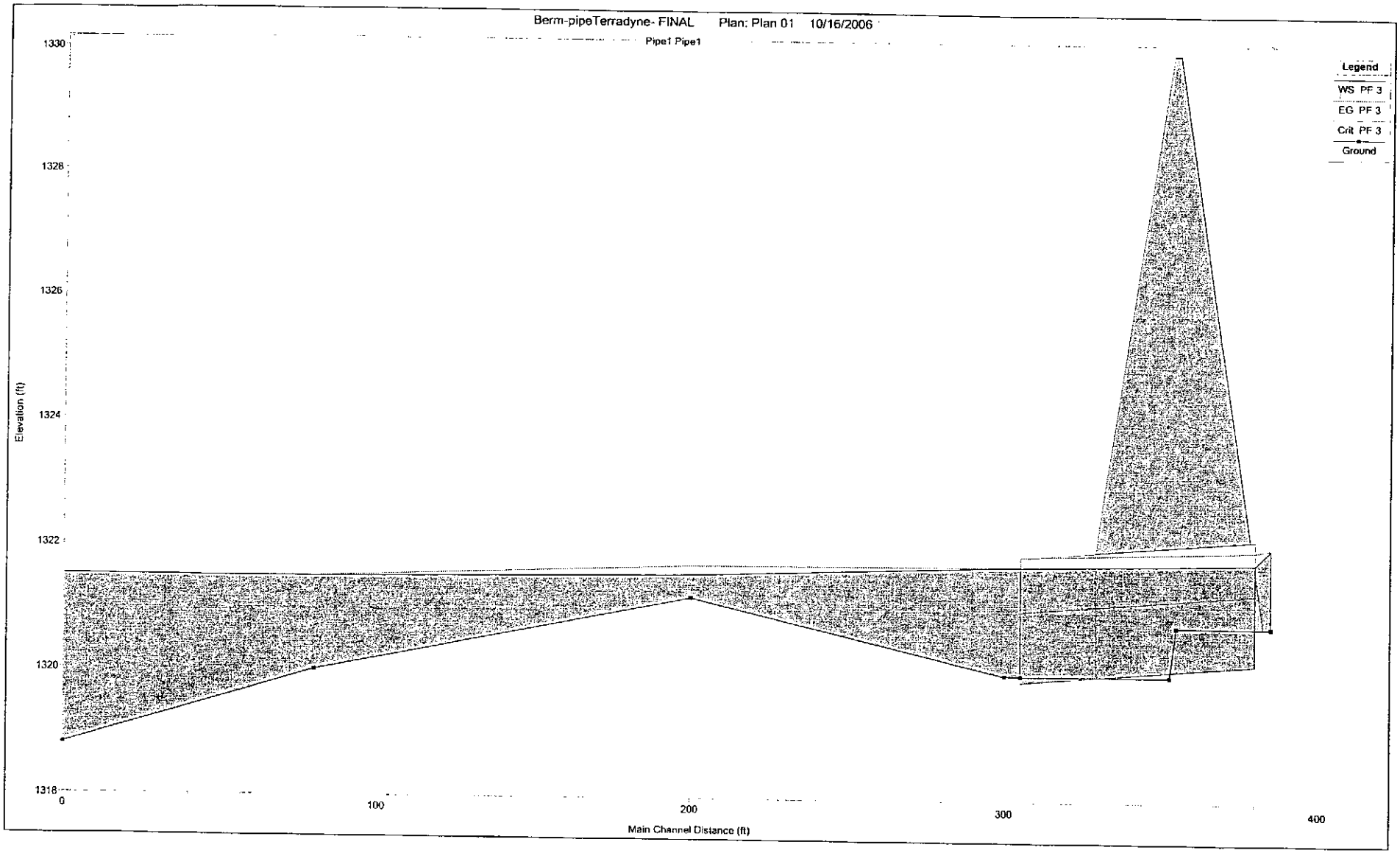
Pipe1 Pipe1
Legend
WS PF 2
EG PF 2
Crit PF 2
Ground
Elevation (ft)
1330
1328
1326
1324
1322
1320
1318
0
100
200
300
400
Main Channel Distance (ft)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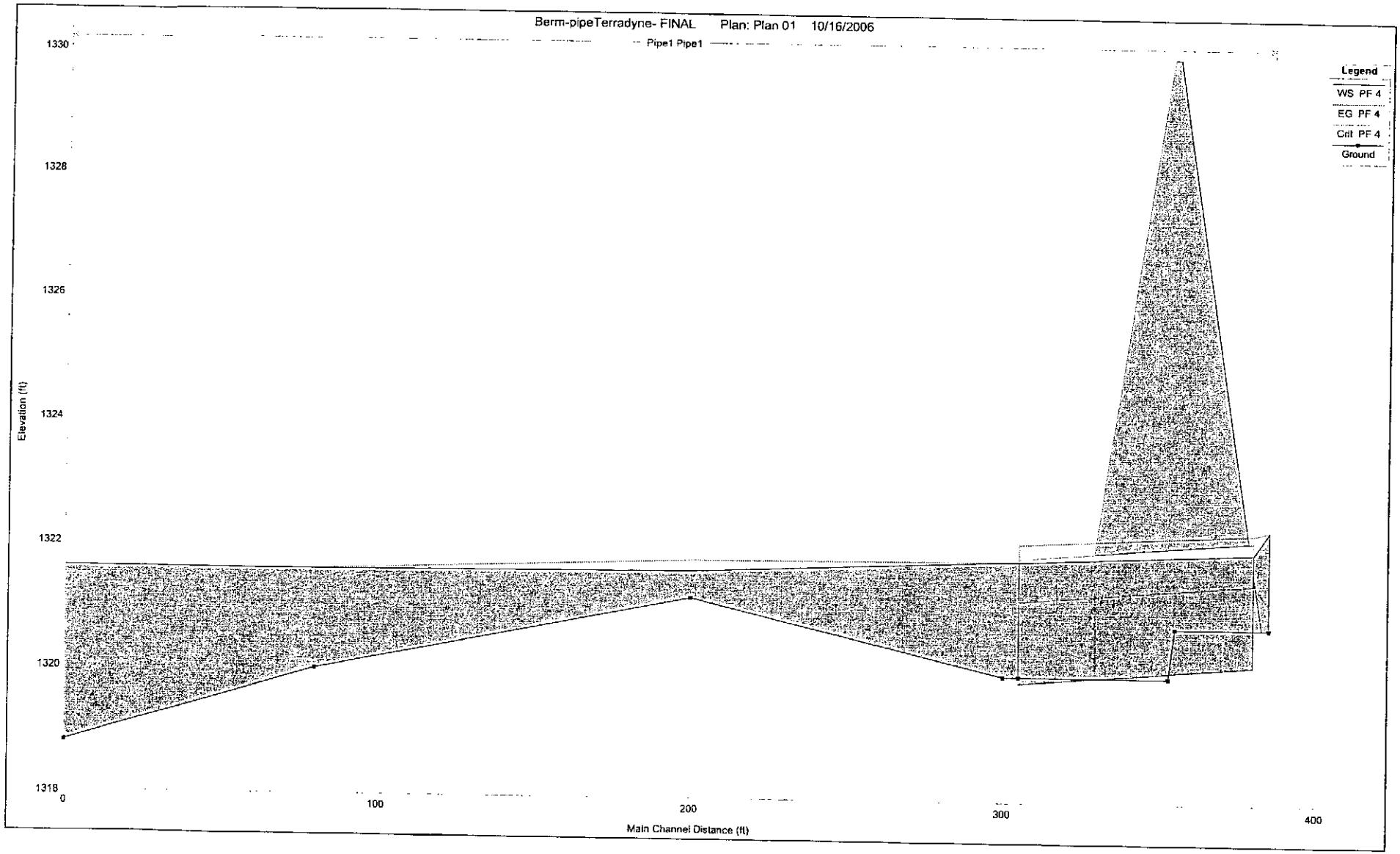
Pipe1 Pipe1
Legend
WS PF 3
EG PF 3
Crit PF 3
Ground
Elevation (ft)
1330
1328
1326
1324
1322
1320
1318
0
100
200
300
400
Main Channel Distance (ft)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Pipe1 Pipe1
Legend
WS PF 4
EG PF 4
Crit PF 4
Ground
Elevation (ft)
1330
1328
1326
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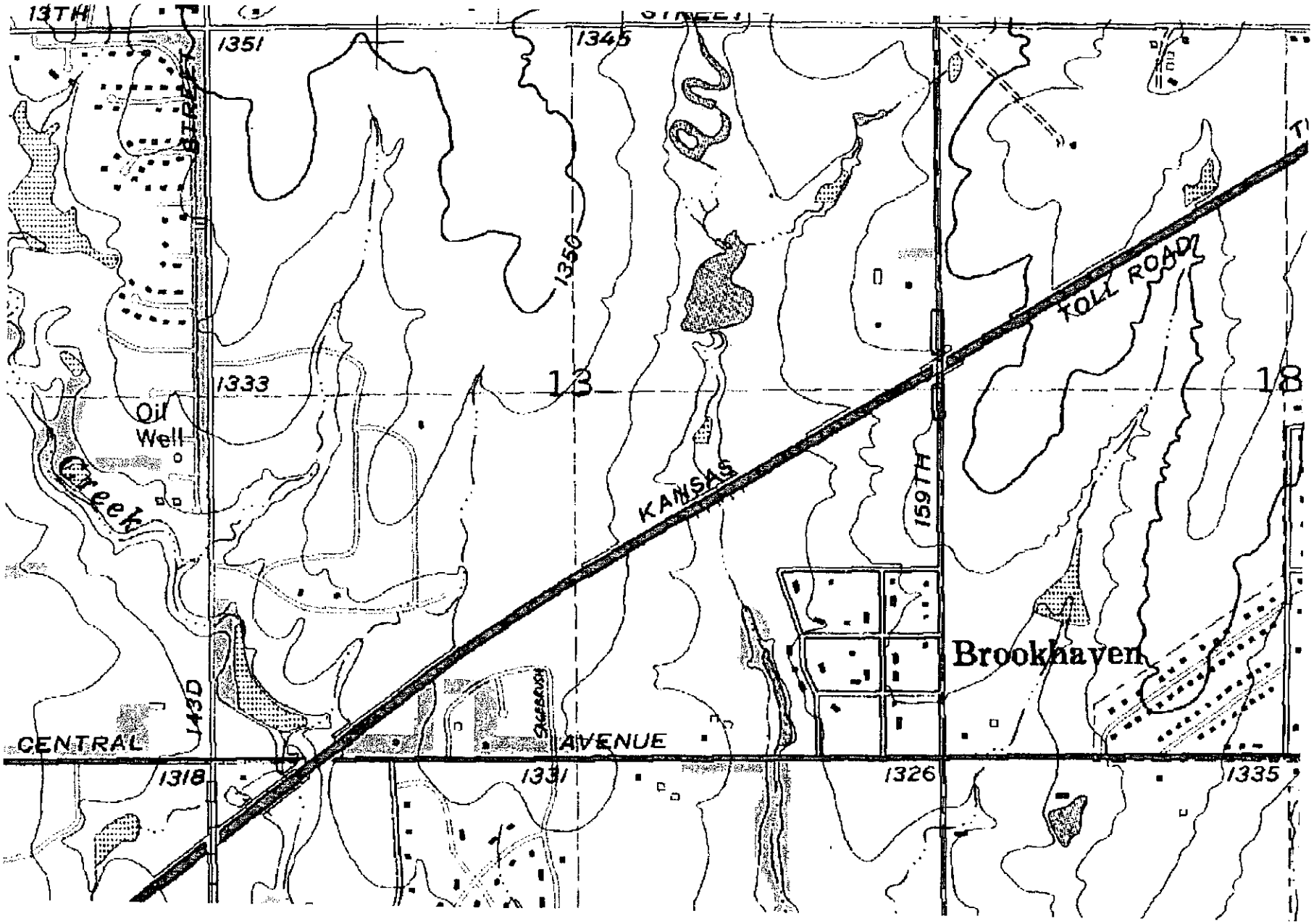
1322
1320
1318
0
100
200
300
400
Main Channel Distance (ft)


13TH
1351
1345
1350
1333
13
18
Oil
Well
Creek
KANSAS
TOLL ROAD
159TH
Brookhaven
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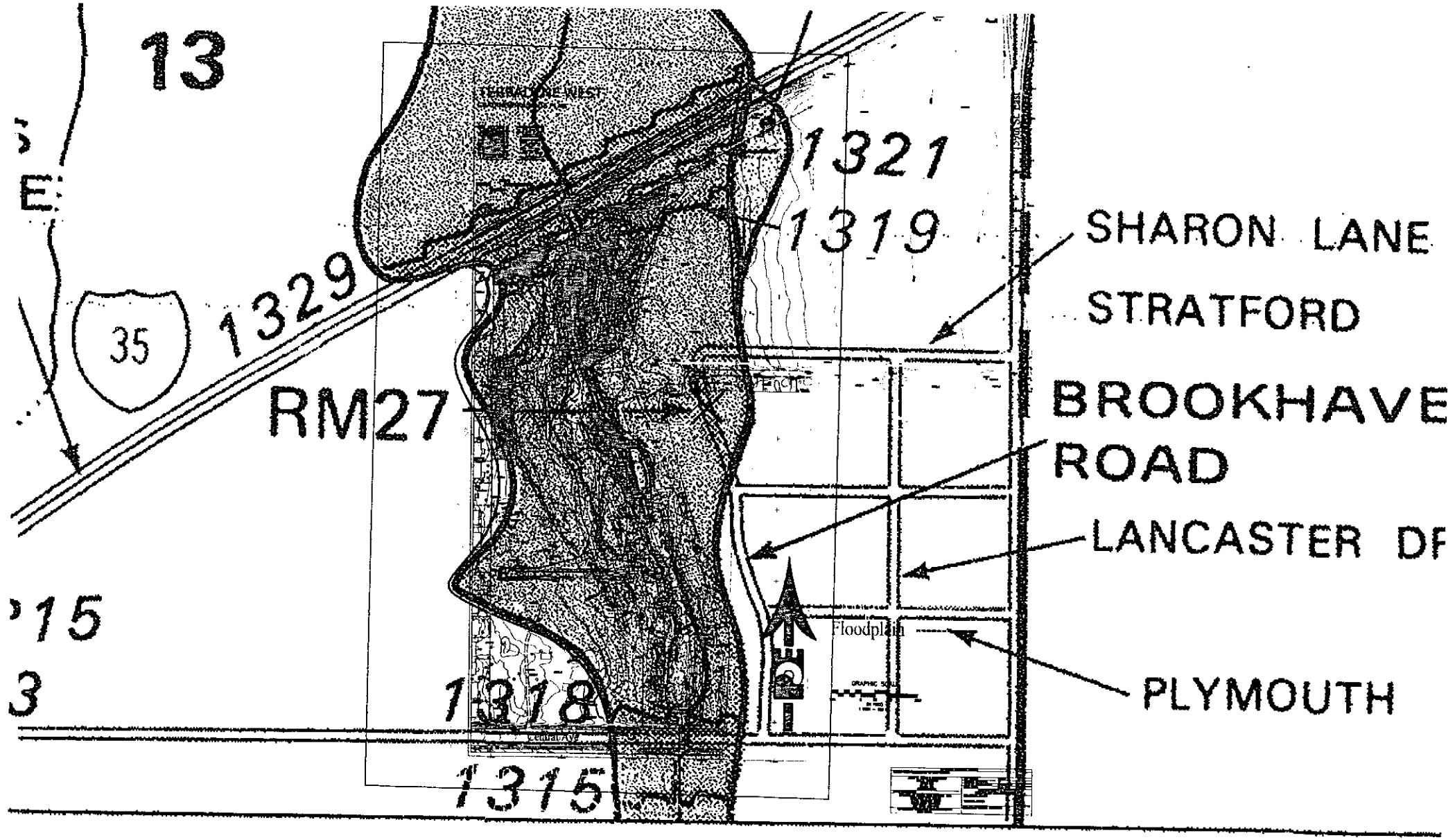
CENTRAL
AVENUE
1318
1331
1326
1335



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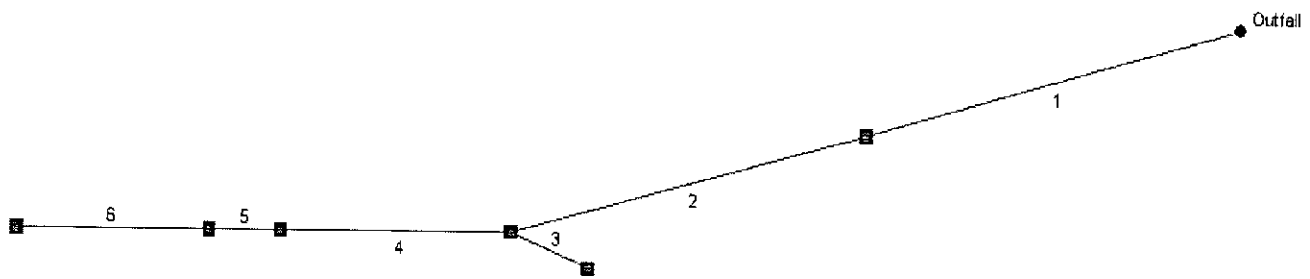
Hydraflow Plan View



Project file: Brookhaven6.stm	IDF file: SedgCo.IDF	No. Lines: 6	10-16-2006

Hydraflow Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1		71.77	48 c	268.0	1307.00	1310.37	1.257	1318.30*	1318.97*	0.25	End
2		72.93	48 c	254.0	1310.87	1314.25	1.331	1319.22*	1319.88*	0.79	1
3		4.33	15 c	58.0	1316.00	1316.58	1.000	1320.66*	1320.93*	0.19	2
4		61.94	36 c	160.0	1316.00	1320.41	2.756	1320.66	1322.92	0.75	2
5		53.01	36 c	49.0	1320.51	1320.66	0.306	1323.67*	1323.98*	0.44	4
6		44.21	24 c	134.0	1320.76	1321.16	0.299	1324.41*	1329.54*	3.08	5

Project File: Brookhaven6.stm	IDF File: SedgCo.IDF	Total No. Lines: 6	Run Date: 10-16-2006

NOTES: c = circular; e = elliptical; b = box; Return period = 100 Yrs.; * Indicates surcharge condition.

Hydraflow Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	depth (ft)	spread (ft)	depth (ft)	spread (ft)	Dep (in)	
1		0.00	0.00	0.00	0.00	Grate	0.0	0.00	4.00	4.00	4.00	Sag	2.00	0.100	0.030	0.000	-0.03	-0.27	0.00	0.00	2.00	Off
2		8.66	0.00	8.66	0.00	Grate	0.0	0.00	2.00	4.00	4.00	Sag	2.00	0.100	0.030	0.000	0.62	16.11	0.65	16.11	2.00	Off
3		4.33	0.00	4.33	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.100	0.030	0.000	0.50	12.05	0.53	12.05	2.00	Off
4		10.25	0.00	10.25	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.100	0.030	0.000	0.78	21.45	0.81	21.45	2.00	Off
5		10.09	0.00	10.09	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.100	0.030	0.000	0.78	21.24	0.80	21.24	2.00	Off
6		44.21	0.00	44.21	0.00	Grate	0.0	0.00	6.00	3.00	3.00	Sag	2.00	0.100	0.030	0.000	1.85	57.13	1.88	57.13	2.00	Off

Project File: Brookhaven6.stm | I-D-F File: SedgCo.IDF | Total number of lines: 6 | Run Date: 10-16-2006

NOTES: Inlet N-Values = 0.016 ; Intensity = 126.77 / (Inlet time + 17.20) ^ 0.81; Return period = 100 Yrs. ; * Indicates Known Q added

Hydraflow Hydraulic Grade Line Computations

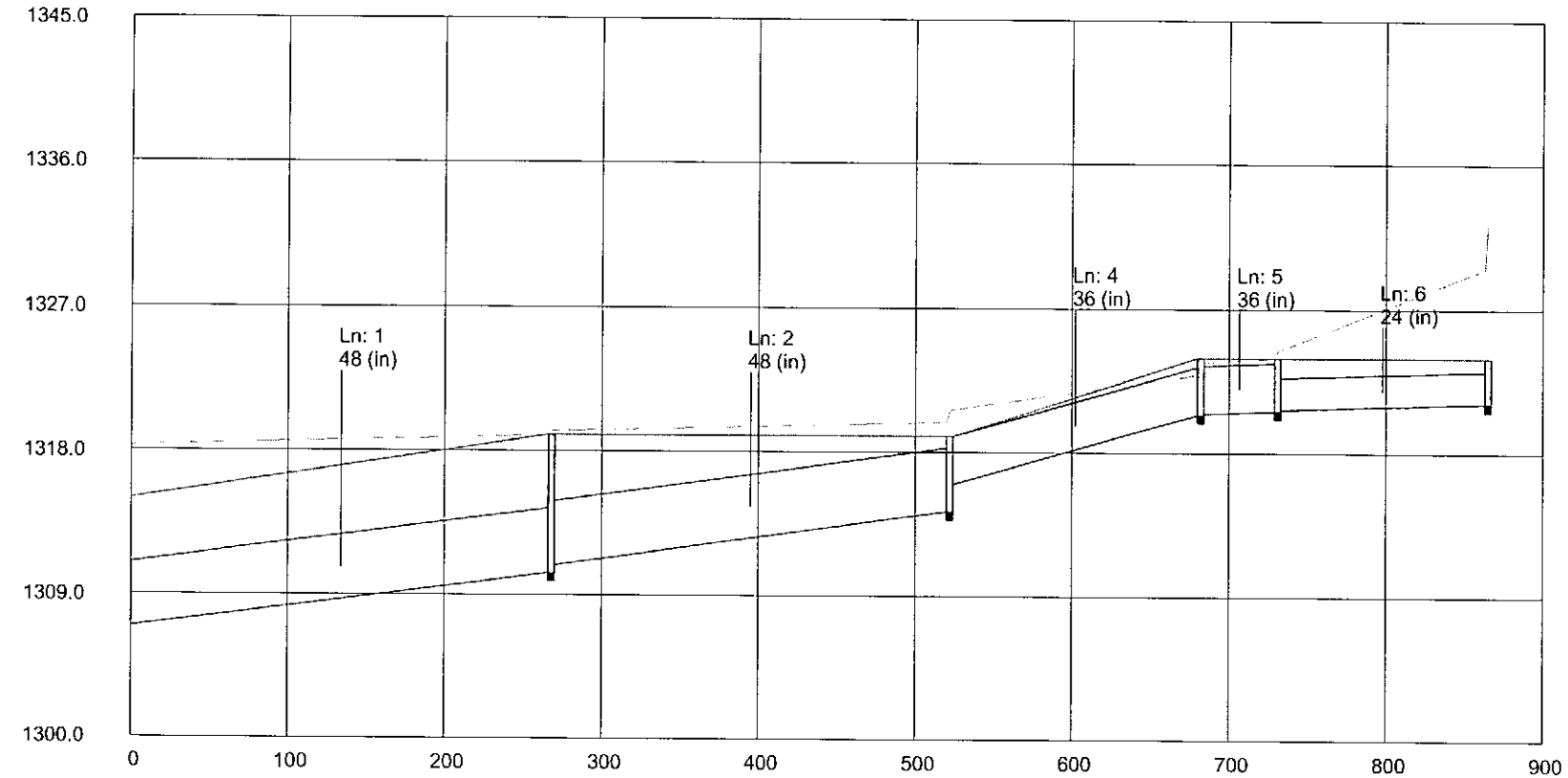
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	48	71.77	1307.00	1318.30	4.00	12.56	5.71	0.51	1318.81	0.250	268	1310.37	1318.97	4.00	12.57	5.71	0.51	1319.48	0.250	0.250	0.669	0.50	0.25
2	48	72.93	1310.87	1319.22	4.00	12.56	5.80	0.52	1319.75	0.258	254	1314.25	1319.88	4.00	12.57	5.80	0.52	1320.40	0.258	0.258	0.655	1.50	0.79
3	15	4.33	1316.00	1320.66	1.25	1.23	3.53	0.19	1320.86	0.450	58.0	1316.58	1320.93	1.25	1.23	3.53	0.19	1321.12	0.450	0.450	0.261	1.00	0.19
4	36	61.94	1316.00	1320.66	3.00	7.07	8.76	1.19	1321.86	0.863	160	1320.41	1322.92	2.51**	6.31	9.81	1.50	1324.42	0.833	0.848	N/A	0.50	0.75
5	36	53.01	1320.51	1323.67	3.00	7.07	7.50	0.87	1324.54	0.632	49.0	1320.66	1323.98	3.00	7.07	7.50	0.87	1324.85	0.632	0.632	0.310	0.50	0.44
6	24	44.21	1320.76	1324.41	2.00	3.14	14.08	3.08	1327.49	3.823	134	1321.16	1329.54	2.00	3.14	14.07	3.08	1332.62	3.822	3.822	5.122	1.00	3.08

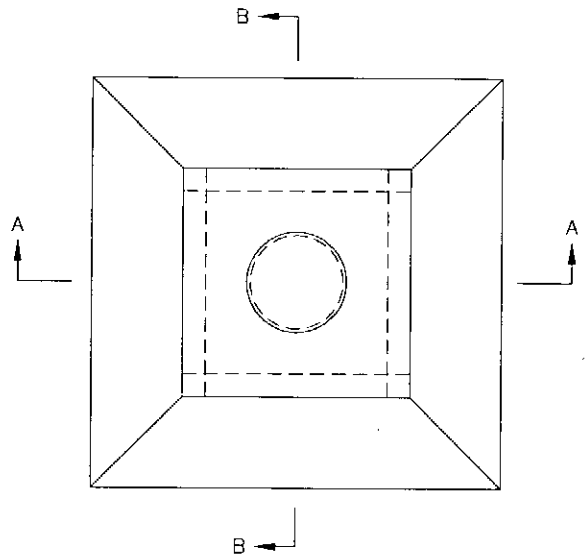
Project File: Brookhaven6.stm | IDF File: SedgCo.IDF | Total number of lines: 6 | Run Date: 10-16-2006

NOTES: Initial tailwater elevation = 1318.3 (ft), * Normal depth assumed., ** Critical depth assumed., i Under inlet control.

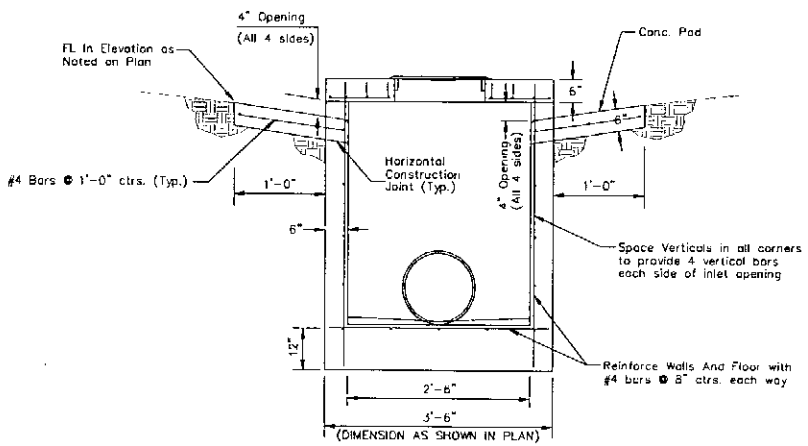
Storm Sewer Profile

Proj. file: Brookhaven6.stm





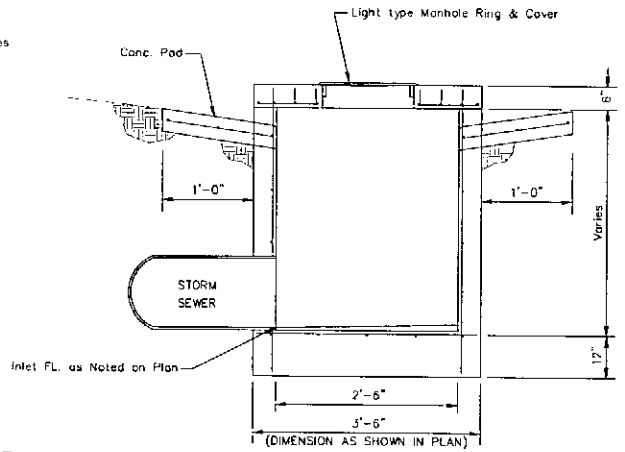
PLAN VIEW



SECTION "A-A"

Provide 3" Radius Curves
at All Inlet Openings

NOT TO SCALE



SECTION "B-B"

FINAL

Designed By: JPD / JMJ
Drawn By: JPD
Proj. Job No.: 170.710
Date: September 2006
Sheet 20 of 19

POE & ASSOCIATES, INC.

MONTANA HILLS 2ND ADDITION
STREET & DRAINAGE IMPROVEMENTS
DROP INLET
CITY OF ANDOVER, KANSAS
JAMES M. THOMPSON, P.E. - CITY ENGINEER