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LETTER OF TRANSMITTAL

TO: Flood Control District of Maricopa County
2801 West Durango Street
Phoenix AZ 85009

ATTENTION: Mr. John Stock, R.L.S.

DATE: 21 September 2000

RE: Floodplain Delineation for Durango ADMP
FCD No. 99-41

Transmitted herewith are the following items:

- ❑ Plans
- ✘ Reports
- ❑ Details
- ❑ Specifications
- ❑ Estimate
- ❑ Calculations
- ❑ Prints
- ❑ Change Order
- ❑ Other
- ❑ Copy of Letter
- ❑ Shop Drawings

Copies	Date	I.D. Number	Description
1	8-18-00	FCD 99-41	3-ring binder, Buckeye Feeder Canal, Survey Report, with disk
1	8-18-00	FCD 99-41	3-ring binder, Southern Pacific Railroad, Survey report

FLOOD CONTROL DISTRICT
RECEIVED
SEP 21 '00
CH & GM
PIO
ADMIN
REG
ENG
CONTRACTS
ROUTING

These are transmitted as checked below:

- ✘ For Approval
- ❑ For Your Use
- ❑ As Requested
- ❑ Returned
- ✘ For Review and Comment
- ❑ For Information Only
- ❑ For Use as Guideline Only
- ❑ Other

- ❑ Approve
- ❑ Disapprove
- ❑ Approve with Comments

REMARKS: John,

Here are the Survey Reports you requested, sealed by Larry Maldonado. Project Engineering Consultants are our survey sub-consultant on this project. The contents of these two reports will be included in their entirety in the Floodplain Delineation Study Technical Data Notebook.

copy: 9935 letter file
Brian Fry, Dibble & Associates
Greg Jones, FCDMC
Larry Maldonado, PEC

Sincerely,
DIBBLE & ASSOCIATES

Frank Edward Brown

Frank Edward Brown, P.E. Project Engineer

J:\9935\WP\FCDMC_trn-FP.wpd

PROJECT ENGINEERING
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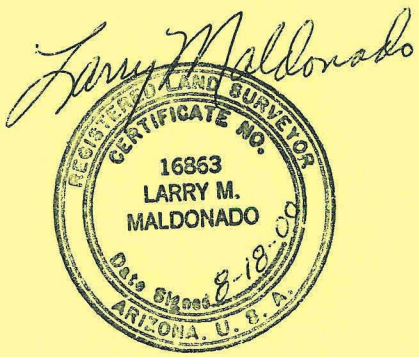
Durango ADMP
Southern Pacific Railroad
35th Avenue to 69th Avenue
FCD 99-41

Survey Report



2320 W. Peoria Avenue, Suite C-122, Phoenix, Arizona 85029 (602) 906-1901 FAX (602) 906-3080

NOTE: The disk containing the survey files is found

in the

Buckeye Feeder Canal survey notebook.

Survey Control

NAD 27 SPC
NGVD 29 Elevations - 3rd Order

Note: Prime BM for this project is Brass Cap in Handhole @ intersection of 67th Avenue and Buckeye Road, Elevation = 1029.060

Point No.	NAD 27 Horizontal Coordinates	NGVD 29 Elevation	Section Data	Description
1	886677.396 412649.781	1029.060	NE Corner, Section 13, T1N, R1E	Brass Cap in Handhole @ intersection of 67th Avenue and Buckeye Road
2	889317.330 412721.254	1038.739		Set ½" Rebar
3	889265.994 414376.450	1039.107		Set ½" Rebar
4	889101.415 415250.013	1037.181		Brass Cap flush in center of 63rd Avenue +/-2400' north of Buckeye Road, +/-200' south of railroad tracks
5	889253.981 416557.583	1041.748		Set ½" Rebar
6	889219.328 417853.920	1047.947		Chiseled "x" in Sidewalk
7	889219.874 419171.315	1046.977		Set ½" Rebar
8	889181.195 420605.191	1050.073		Set ½" Rebar
9	888746.986 420539.373	1046.289		Brass Cap flush @ intersection of 55th Avenue and Buchanon Street
10	889166.029 421751.578	1052.294		Set ½" Rebar
11	889177.897 423194.413	1054.638		Set ½" Rebar

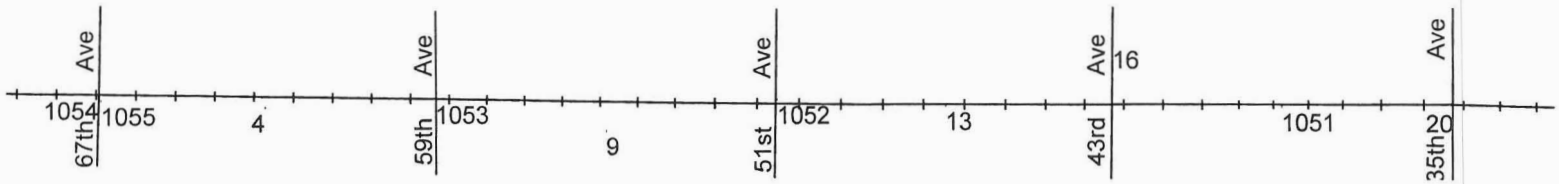
Point No.	NAD 27 Horizontal Coordinates	NGVD 29 Elevation	Section Data	Description
12	889167.356 424609.731	1049.671		Set ½" Rebar
13	889141.493 425873.014	1051.152		Railroad Spike in Concrete in corner of irrigation structure +/-½ mile south of Van Buren Street, +/-½ mile east of 43rd Avenue, +/-13.1' south of railroad tracks, +/ 30' east of irrigation channel
14	889168.180 427223.442	1052.246		Set ½" Rebar
15	889184.615 428517.334	1052.411		Set ½" Rebar
16	890085.422 428491.238	1052.110		Brass Cap in Handhole (0.43' below rim) @ intersection of 43rd Avenue and Jefferson Street
18	889174.937 431111.478	1054.270		Set ½" Rebar
19	889179.009 432463.253	1056.376		Set ½" Rebar
20	889121.763 433773.025	1061.652		Brass Cap flush @ 35th Avenue and Harrison Street
31	889285.118 433728.585	1061.566		Set ½" Rebar
50	889282.516 412679.071	1038.151		Set ½" Rebar
51	889177.554 415272.307	1039.220		Set ½" Rebar
53	889319.815 413887.772	1036.379		Set ½" Rebar
90	881441.906 412550.224	1014.007	NE Corner, Section 24, T1N, R1E	Brass Cap in Handhole (0.52' below rim) @ intersection of 67th Avenue and Lower Buckeye Road

Point No.	NAD 27 Horizontal Coordinates	NGVD 29 Elevation	Section Data	Description
91	881321.670 417886.926	1027.150	NE Corner, Section 19, T1N, R2E	1½" Iron Pipe in Handhole (0.56' below rim) @ intersection of 59th Avenue and Lower Buckeye Road
92	881301.595 417866.687	1027.698		Brass Cap flush w/concrete in corner of irrigation structure @ southwest corner of 59th Avenue and Lower Buckeye Road; stamped "U.S. Geological Survey B.M. Elevation Above Sea Level 1028.89"
93	886512.072 433722.812	1051.054	NE Corner, Section 15, T1N, R2E	Brass Cap in Handhole @ intersection of 35th Avenue and Buckeye Road
94	894432.833 433780.970	1069.404	E¼ Corner, Section 34, T2N, R2E	Brass Cap in Handhole @ intersection of 35th Avenue and Roosevelt Street
95	894435.907 423203.969	1066.983	E¼ Corner, Section 32, T2N, R2E	Brass Cap flush w/pavement @ intersection of 51st Avenue and Roosevelt Street
1051	889129.105 431119.624	1053.423		Set Brass Cap flush w/concrete +/-2640' west of 35th Avenue, +/-500' north of Lincoln Street, +/-35' south of mainline Southern Pacific railroad tracks, +/-1.3' northwest of chainlink fence at NW corner of Praxair Industrial Property; stamped "ERM"
1052	889229.869 423221.571	1051.786		Set Brass Cap flush w/concrete +/-½ mile south of Van Buren Street, +/-3.0' east of headwall on westside of 51st Avenue, +/-42.6' north of north rail of railroad tracks; stamped "ERM"
1053	889225.850 417872.681	1047.089		Set Brass Cap flush w/concrete +/-½ mile south of Van Buren Street, +/-9.2' west of curb on westside of 59th Avenue, +/-12.4' north of north rail of railroad tracks, +/-2.0' east of a wooden barricade post; stamped "ERM"
1054	889289.846 412697.563	1038.760		Brass Cap in Pothole in center of southbound lane of 67th Avenue, +/-½ mile north of Buckeye Road, +/-5.0' south of south rail of railroad tracks, +/-12.3' northeast of power pole on west side of 67th Avenue
1055	889199.973 412735.681	1037.801		Fd. 2" Aluminum Cap flush w/concrete +/-½ mile north of Buckeye Road, +/-2.0' east of sidewalk on eastside of 67th Avenue, +/-42.3' south of south rail of railroad tracks, +/-31.4' south of power pole on eastside of 67th Avenue; stamped "RLS #21780"

ERM Data

Durango ADMP
35th Avenue to 67th Avenue
Elevation Reference Monument Diagram

Project Engineering Consultants, Ltd.
March 17, 2000



Southern Pacific Railroad

NAD 27 SPC
NGVD 29 Elevations - 3rd Order

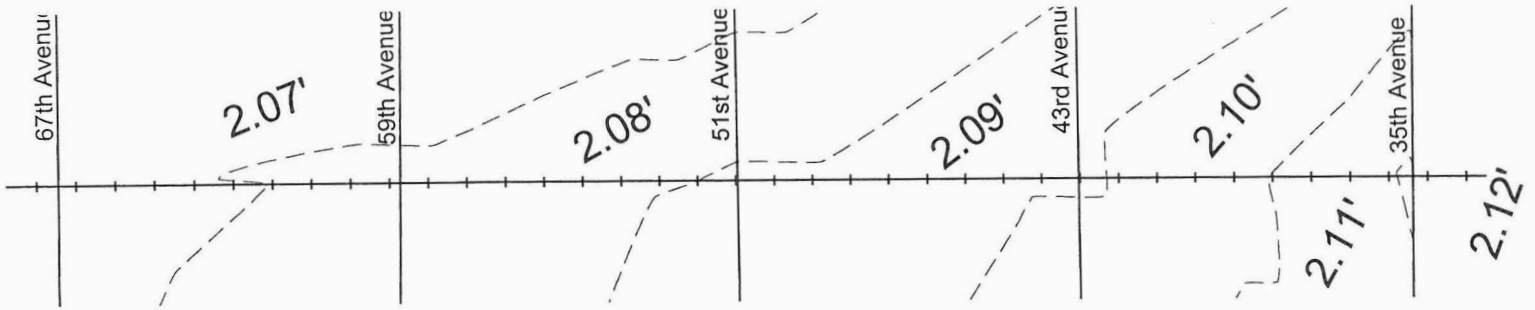
Note: Prime BM for this project is Brass Cap in Handhole @ intersection of 67th Avenue and Buckeye Road, Elevation = 1029.060

Point No.	NAD 27 Horizontal Coordinates	NGVD 29 Elevation	Section Data	Description
4	889101.415 415250.013	1037.181		Brass Cap flush in center of 63rd Avenue +/-2400' north of Buckeye Road, +/-200' south of railroad tracks
9	888746.986 420539.373	1046.289		Brass Cap flush @ intersection of 55th Avenue and Buchanon Street
13	889141.493 425873.014	1051.152		Railroad Spike in Concrete in corner of irrigation structure +/-½ mile south of Van Buren Street, +/-½ mile east of 43rd Avenue, +/-13.1' south of railroad tracks, +/-30' east of irrigation channel
16	890085.422 428491.238	1052.11		Brass Cap in Handhole (0.43' below rim) @ intersection of 43rd Avenue and Jefferson Street
20	889121.763 433773.025	1061.652		Brass Cap flush @ 35th Avenue and Harrison Street
1051	889129.105 431119.624	1053.423		Set Brass Cap flush w/concrete +/-2640' west of 35th Avenue, +/-500' north of Lincoln Street, +/-35' south of mainline Southern Pacific railroad tracks, +/-1.3' northwest of chainlink fence at NW corner of Praxair Industrial Property; stamped "ERM"
1052	889229.869 423221.571	1051.786		Set Brass Cap flush w/concrete +/-½ mile south of Van Buren Street, +/-3.0' east of headwall on westside of 51st Avenue, +/-42.6' north of north rail of railroad tracks; stamped "ERM"
1053	889225.850 417872.681	1047.089		Set Brass Cap flush w/concrete +/-½ mile south of Van Buren Street, +/-9.2' west of curb on westside of 59th Avenue, +/-12.4' north of north rail of railroad tracks, +/-2.0' east of a wooden barricade post; stamped "ERM"
1054	889289.846 412697.563	1038.76	E¼ Corner, Section 12, T1N, R1E	Brass Cap in Pothole in center of southbound lane of 67th Avenue, +/-½ mile north of Buckeye Road, +/-5.0' south of south rail of railroad tracks, +/-12.3' northeast of power pole on west side of 67th Avenue

Point No.	NAD 27 Horizontal Coordinates	NGVD 29 Elevation	Section Data	Description
1055	889199.973 412735.681	1037.801		Fd. 2" Aluminum Cap flush w/concrete +/-½ mile north of Buckeye Road, +/-2.0' east of sidewalk on eastside of 67th Avenue, +/-42.3' south of south rail of railroad tracks, +/-31.4' south of power pole on eastside of 67th Avenue; stamped "RLS #21780"

Durango ADMP
35th Avenue to 67th Avenue
NGVD 29 to NAVD 88 Datum

March 17, 2000



Southern Pacific Railroad

Survey Notes

Project Engineering Consultants
Survey Data Collector Code List

ABT	Abutment
BC	Brass Cap
BLD	Building
BM	Bench Mark
BS	Back Site
BTM	Bottom
BW	Back of Walkway
CB	Catch Basin
CIT	Citrus Tree
CL	Center Line
CLD	Concrete Lined Ditch
CMP	Corrugated Metal Pipe
COL	Column
CP	Control Point
CPS	Cotton Picker Spindle
CRN	Crown of Road
CTV	Cable TV
DEL	Delineator
DG	Down Guy Wire
DR	Dirt Road
DW	DriveWay
EB	Electric Box
EC	Edge of Concrete
EM	Electric Meter
EP	Edge of Pavement
FC	Face of Curb
FH	Fire Hydrant
FL	Flow Line
FNC	Fence
FS	Fore Sight
G	Gutter
GAS	Gas Line or Valve
GB	Grade Brake
GRL	Guard Rail
GRT	Grate
HH	Hand Hole
HW	Head Wall
HWM	High Water Mark
ICV	Irrigation Control Valve
INV	Invert
IP	Iron Pipe
IRR	Irrigation Structure
LIP	Lip of Curb
LOW	Low Spot
LP	Light Pole
MES	Mesquite Tree
MH	Man Hole (Sewer, Storm, Tel, Elect)
NAIL	Nail (60-d)
NG	Natural Ground
P	Pavement
PALM	Palm Tree
PC	Point of Curvature
PIER	Pier
PIL	Pillar
PIPE	Pipe
PK	PK Nail
POC	Point on Curve
POL	Point on Line
POST	Post
PP	Power Pole
PT	Point of Tangency
PV	Palo Verde Tree
RB	Rebar
RR	Rail Road
SAG	Saguaro Cactus
SCP	Scupper
SD	Storm Drain (Inlet or Man Hole)
SGN	Sign
SM	Survey Monument
SPW	Spill Way
SS	Side Shot
SW	Side Walk
TB	Top of Bank
TC	Top of Curb (at Back)
TCW	Top of Curb Wing (at Back)
TEL	Telephone Riser, Junction Box
TOE	Toe of Slope
TOP	Top of Slope, Object
TREE	Tree
TRN	Transformer
TRV	Traverse
TSP	Traffic Signal Pole
VG	Valley Gutter
VLT	Vault
WALL	Wall (Masonry, Brick, Concrete)
WELL	Well (Water or Dry)
WM	Water Meter
WNG	Wing Wall
WV	Water Valve

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1215, 889219.09267, 417853.86772,   1047.89663,CONTROL POINT 6
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CURVE FORMULAS

$T = R \tan \frac{1}{2} I$

$T = \frac{50 \tan \frac{1}{2} I}{\text{Sin. } \frac{1}{2} D}$

$\text{Sin. } \frac{1}{2}D = \frac{50}{R}$

$\text{Sin. } \frac{1}{2}D = \frac{50 \tan \frac{1}{2}I}{T}$

$R = T \cot. \frac{1}{2}I$

$R = \frac{50}{\text{Sin. } \frac{1}{2}D}$

$E = R \text{ ex. sec } \frac{1}{2} I$

$E = T \tan \frac{1}{4} I$

$\text{Chord def.} = \frac{\text{chord}^2}{R}$

$\text{No. chords} = \frac{I}{D}$

Tan. def. = ½ chord def.

The square of any distance, divided by twice the radius, will equal the distance from tangent to curve, very nearly.

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft.) and divide given deflection by the product.

Rule 2. Multiply given deflection by 57.3, and divide the product by the given distance.

To find deflection for a given angle and distance. Multiply the angle by .01745, and the product by the distance.

GENERAL DATA

Right Angle Triangles. Square the altitude, divide by twice the base. Add quotient to base for hypotenuse.

Given Base 100, Alt. $10.10^2 \div 200 = .5$. $100 + .5 = 100.5$ hyp.

Given Hyp. 100, Alt. $25.25^2 \div 200 = 3.125$. $100 - 3.125 = 96.875$ = Base.

Error in first example, .002; in last, .045.

To find Tons of Rail in one mile of track: multiply weight per yard by 11, and divide by 7.

Leveling. The correction for curvature and refraction, in feet and decimals of feet is equal to $0.574\ d^2$, where d is the distance in miles. The correction for curvature alone is closely, $\frac{2}{3}d^2$. The combined correction is negative.

Probable Error. If d_1, d_2, d_3, etc. are the discrepancies of various results from the mean, and if Σd^2 = the sum of the squares of these differences and n = the number of observations, then the probable error of the mean = $\pm 0.6745 \sqrt{\frac{\Sigma d^2}{n(n-1)}}$

MINUTES IN DECIMALS OF A DEGREE

1'	.0167	11'	.1833	21'	.3500	31'	.5167	41'	.6833	51'	.8500
2	.0333	12	.2000	22	.3667	32	.5333	42	.7000	52	.8667
3	.0500	13	.2167	23	.3833	33	.5500	43	.7167	53	.8833
4	.0667	14	.2333	24	.4000	34	.5667	44	.7333	54	.9000
5	.0833	15	.2500	25	.4167	35	.5833	45	.7500	55	.9167
6	.1000	16	.2667	26	.4333	36	.6000	46	.7667	56	.9333
7	.1167	17	.2833	27	.4500	37	.6167	47	.7833	57	.9500
8	.1333	18	.3000	28	.4667	38	.6333	48	.8000	58	.9667
9	.1500	19	.3167	29	.4833	39	.6500	49	.8167	59	.9833
10	.1667	20	.3333	30	.5000	40	.6667	50	.8333	60	1.0000

INCHES IN DECIMALS OF A FOOT

1/16	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	7/8
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729

1	2	3	4	5	6	7	8	9	10	11
.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

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Durango AOMP

Job # 99080

Levels 67th Av. & Buckeye

To 55th Av. Pg# 1-3

55th Av To 43rd Pg# 3-5

43rd To 35th Pg# 5-6

Loop Back 35th to 43rd Pg# 6-8

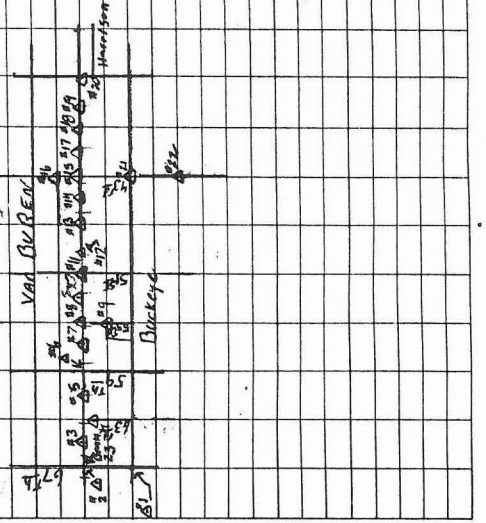
Profil 67th Av Pg 14-15 & 25

Profil Tracks & 59th 15-19

GPS "A" Pg# 21-22

GPS "B" Pg# 23-24

Profile 25-32



PT		+	−	ELVE	Adj. ELVE
1				1029.06	1029.060
		4.885			
	1		4.125	1029.820	
		5.716			
	2		4.524	1031.013	
		5.347			
	3		3.353	1033.007	
		5.310			
	4		4.524	1033.794	
		8.162			
	5		3.416	1038.539	
		4.677			
2	6		4.485	1038.732	1038.739
		1.101			
	7		4.354	1035.479	
		4.842			
	8		4.310	1036.010	
		5.057			
	9		4.724	1036.343	
		5.867			
3	10		3.117	1039.092	1039.107
		4.658			
	11		3.994	1039.757	
		4.629			

Fd BC in HH @ 67th Av. & Buckeye 0.54 To Rim ELVE = 1029.06

* NOTE "Dirt Road acesse on N side of Tracks from 67th Av. entire Power station Then acesse off of Buckeye on 63rd Av. Dirt Road on S. side Tracks"

Set Rebar on N.E. side of R.R. cresing @ 67th Av. ± 18' N. of Tracks & 6.7' E of EP of 67th Av.

Set Rebar inBetwen R.R. Tracks ± 1400' E. of 67th Av ± 75' S. of S.W. Cor. of Power station wall @ 64th Dr & Jackson

PT	A	+	−	ELVE	ADJ. ELVE
	12		6.213	1038.172	
		5.413			
	13		5.177	1038.408	
		4.262			
4	14		5.511	1037.159	1037.181
		5.486			
	15		4.243	1038.402	
		5.017			
	16		4.811	1038.608	
		6.196			
5	17		3.082	1041.722	1044.748
		4.254			
	18		4.153	1041.822	
		6.208			
	19		5.346	1042.684	
		10.116			
6	20		4.885	1047.915	1047.947
		2.647			
	21		6.686	1043.876	
		4.230			
	22		4.206	1043.9	
		6.009			
	23		4.060	1045.849	
		5.217			

FD. BCF in Center of Culdisack on 63rd Av ± 200' S. of Tracks

Set Rebar ± 1300' E. of 63rd Av. ± 1300' W. of 59th Av in Between R.R. Tracks 7.7' N. of S. Tracks 10.9 S. of N. Tracks

Chiseled "⊠" 7' W. of EP of 59th Av & 6.2' S. of R.R. Tracks in BSW

PT	A	+	-	ELVE	Adj ELVE
7	24		4.126	1046.940	1046.977
		3.806			
	25		4.531	1046.215	
		5.476			
	26		3.685	1048.006	
		4.818			
	27		4.941	1047.883	
		4.800			
8	28		2.651	1050.032	1050.073
		2.162			
	29		5.411	1046.793	
		4.649			
9	30		5.186	1046.246	1046.289
		End Day			
		5.051			
	31		1.956	1049.341	
		3.932			
	32		5.205	1048.068	
		5.451			
	33		4.964	1048.555	
		5.140			
10	34		3.565	1050.130	1050.178
		4.799			
	35		4.655	1050.275	
		5.672			

Set Rebar ± 1300 E. of 59th Av inBetwen N. & S. RR. Tracks 9.2' N of S. Track 5.7' S of N Track

Set Rebar inBetween 5.2 Tracks of 3 5.2' S of N. Track of 2. 5.1' N of S. Track of 2 ± 80' N E.P. of 55th Av 21' To N.E. of E. Track switch

Found BCF @ 55th Av & Buchanan St.

Set Rebar inBetween Tracks South 2 of 3 5' from S. Tracks & 4.9' from N. Tracks ± 40' N.E. from APx. 6th LP from PT #8 (This Page) LP is also 4th from end Pole

PT	STA	+	−	ELVE	Adj ELVE
	36		4.819	1051.128	
		5.943			
	37		5.008	1052.003	
		6.652			
11	38		4.129	1054.586	1054.638
		2.852			
	39		8.802	1048.636	
		5.491			
	40		4.726	1049.401	
		5.292			
	41		5.929	1048.764	
		4.892			
12	42		4.041	1049.615	1049.671
		5.399			
	43		4.574	1050.440	
		4.169			
	44		3.146	1051.463	
		5.476			
13	45		5.848	1051.090	1051.152
		5.449			
	46		5.337	1051.203	
		4.744			
	47		4.677	1051.271	
		4.820			

Set Rebar in median on ℄ 51st Av. ± 17 N. of R.R. Tracks

Set Rebar 9.2' N. of Tracks ± 35' S.E. of S.E. corner of P. For 4th Industrial Building Going E. from 51st Av

Found Rail Road Spick Set in Concret Irg. Structer ± 1900' N. of end of 47th 13.1' S of Track's ± 30' E. of Irg. Channel

PT	A	+	-	ELVE	Adj. ELVE
14	48		3.909	1052.181	
		4.585			
	49		3.152	1053.614	
		4.099			
	50		3.659	1054.055	
		4.812			
	51		6.602	1052.264	
		4.840			
15	52		4.762	1052.342	1052.412
		5.291			
	53		6.135	1051.498	
		5.456			
	54		4.739	1052.215	
		5.22			
16	55		5.400	1052.034	1052.110
		5.739			
	56		5.561	1052.216	
		4.624			
	57		5.270	1051.570	
		5.044			
15 End Day	58		4.279	1052.335	1052.412
		6.059			
	59		5.478	1052.916	
		4.286			

Set Rebar 6.8' N. of S. Track of Z & 18.6'S. of N. Track of Z ± 30 S. SE. of RR. Switch ± 1400 W. of 43rd Av

Set Rebar 21.7' N of Tracks & ±36' E of E.P. on 43rd Av.

Found Bolt @ 43rd & Jefferson 0.76' To Rim

See this Pg. for Dec. (ELVE 1052.342)

PT	A	+	−	ELVE	Adj ELVE
	60		5.573	1051.629	
		5.452			
17	61		4.731	1052.349	1052.431
		4.709			
	62		2.410	1054.648	
		3.219			
	63		2.678	1055.189	
		3.105			
18	64		4.110	1054.185	1054.270
		5.382			
	65		3.390	1056.177	
		3.722			
	66		3.180	1056.720	
		3.976			
19	67		4.406	1056.290	1056.379
		2.825			
	68		3.609	1055.425	
		4.331			
	69		4.284	1055.473	
		8.291			
	70		1.378	1062.386	
		4.517			
20	71		5.343	1061.560	1061.652
LOOP BACK		5.299			

Set Rebar inbetween RR. Tracks 8.5' N. of S. Track 20.1' S. of N. Track ± 1327' E. of PT 15 Pg # 5

Set Rebar inbetween R.R. Tracks 8.9' N. of S. Tracks & 20' S. of N. Tracks ± 1/2 mile inbetween 43rd & 35th Av.

Set Rebar 11.2' N of South R.R. Tracks ± 1356 E. of PT # 18 See This Pg for Dck. ± 1300 W. of 35th Av

Fd IBCF @ Harrison & 35th Av in N. Bound Travel Lane

PT	BS	+	−	ELEV	ADJ. ELEV
	72		6.200	1060.659	
		0.505			
	73		5.647	1055.516	
		3.865			
	74		5.464	1053.918	
		4.563			
	75		5.358	1053.123	
		4.744			
	76		5.206	1052.661	
		4.981			
	77		5.432	1052.210	
		4.224			
	78		5.655	1050.779	
		4.560			
	79		5.328	1050.010	
		5.000			
	80		4.193	1050.817	
		4.420			
	81		4.983	1050.254	
		4.413			
	82		5.890	1047.777	
		4.846			
	83		5.757	1047.866	
		4.999			

PT	A	+	−	ELVE	ADJ. ELVE
	84		5.845	1047.021	
		5.629			
	85		5.735	1046.915	
		4.505			
	86		4.579	1046.841	
		5.064			
	87		5.353	1046.552	
		4.915			
21	88		5.681	1045.787	1045.905
		4.921			
	89		6.467	1044.241	
		4.734			
	90		5.938	1043.037	
		3.746			
	91		5.346	1041.437	
		4.592			
	92		5.945	1040.084	
		4.171			
	93		5.399	1038.856	
		4.668			
22	94		5.275	1038.25	1038.375
Cont level back	TP95 = 1				
		4.544			
	1		6.047	1036.747	
		4.973			

Found BC HH @ Buckeye & 43rd Av. 0.6' To Rim

Found BCF ±140' N. of Rid canal @ ℄ 43rd Av & driveway for "SHURTAPE TECHNOLOGIES, INC." (1835 43rd Av) ELVE = 1038.97

PT	STA	+	-	ELVE	Adj Elve
	2		6.064	1035.656	
		4.435			
	3		5.883	1034.209	
		4.790			
	4		5.346	1033.653	
		4.918			
	5		4.556	1034.014	
		4.257			
	6		5.386	1032.885	
		5.616			
23	7		3.899	1034.602	1034.736
		2.619			
	8		4.504	1032.718	
		4.674			
	9		4.329	1033.062	
		4.143			
	10		4.247	1032.958	
		4.626			
	11		4.876	1032.707	
		5.605			
	12		6.394	1031.918	
		5.445			
24	13		4.848	1032.514	1032.66
		4.493			

Chiseld "□" in center of overflow structure N.S. Irg. Ditch ± 30' N. of RID Channel ± ½ mile in Between 45th & 51st

Found BC Flush @ 51ST & MOHAVE ELVE = 1032.66

PT	S	+	-	ELVE	Adj. ELVE
	1		5.355	1031.652	
		5.818			
	2		4.871	1032.600	
		4.468			
	3		4.764	1032.303	
		4.566			
	4		4.427	1032.442	
		4.420			
	5		4.397	1032.464	
		4.843			
25	6		3.586	1033.721	1033.869
		4.601			
	7		4.645	1033.757	
		3.780			
	8		5.236	1032.301	
		5.093			
	9		4.958	1032.436	
		4.892			
	10		4.552	1032.776	
		4.534			
26	11		1.278	1036.033	1036.180
		0.068			
	12		5.833	1030.267	
		4.572			

Chiseled "□" on Head wall of irragation ditch N.to S. on N. edge of RID canal ± ½ mile in Between 5th Av. & 6th Av.

FD BC in NW Abutment going over RID Canal ± ½ mile South of Buckeye & 5th Av ELVE = 1037.19

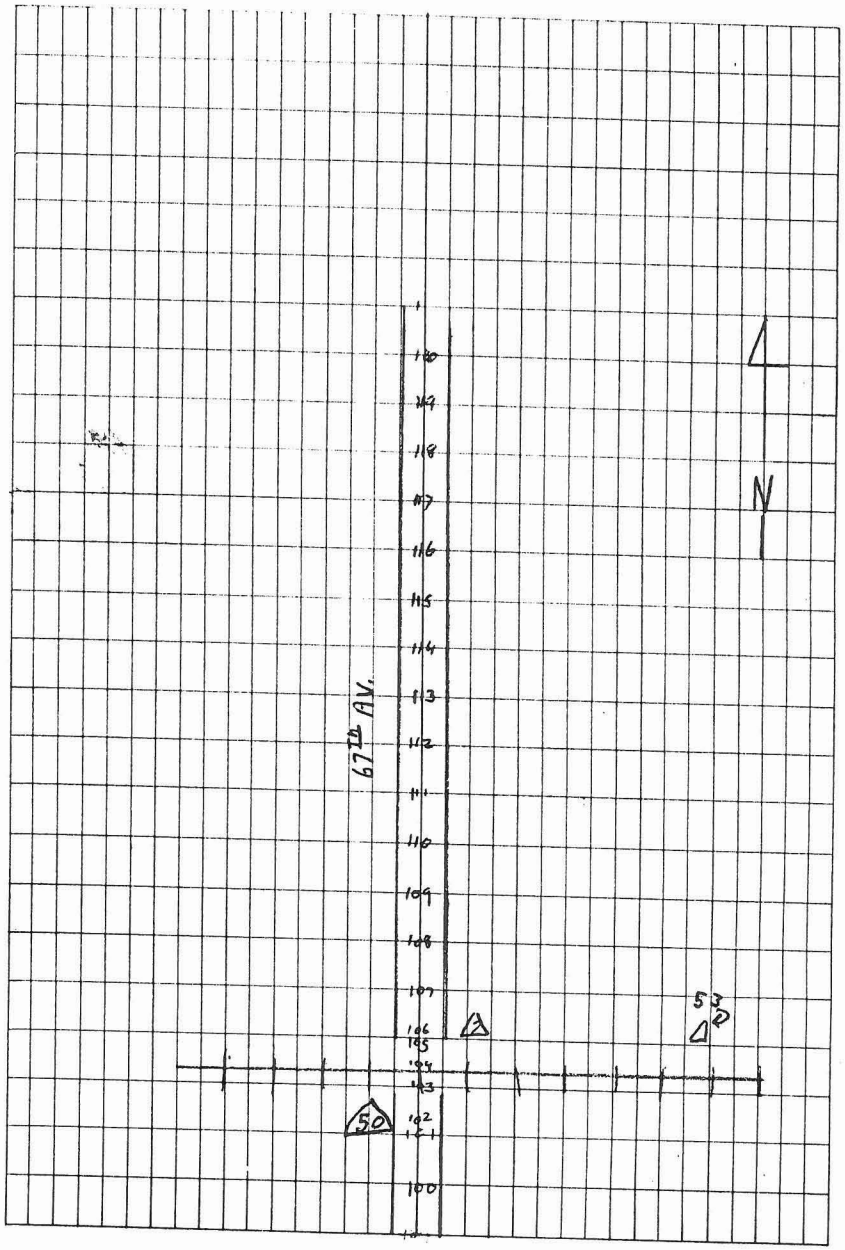
PT		+	-	ELVE	Adj. ELVE
	13		5.330	1029.509	
		5.746			
	14		5.064	1030.191	
		0.271			
	1		5.471	1030.833	
		4.525			
	2		5.342	1030.016	
		4.947			
	3		4.900	1030.064	
		4.083			
	4		3.929	1030.218	
		5.067			
	5		4.383	1030.901	
		4.621			
	6		4.505	1031.018	
		5.106			
	7		5.091	1031.033	
		5.249			
	8		4.846	1031.437	
		4.861			
27	9		5.954	1030.344	1030.490
		5.852			
	10		4.626	1031.570	
		5.126			

*Note Last ELVE Restarted on PT 26 Pg# 10 ELEV = 1037.19
Field ELVE = 1036.033

Chiseled "□" in center of Irrigation STRUCTER on N. side of North access Road on E. side of Road Begenig of 3rd Corner coming from 59th Av(E.) ± 2000 S. of Buckeye ± 70' N. of Rid Channel ± 120' N.NW. of Pump STation

PT		+	−	ELVE	Adj ELVE	
	11		5.451	1031.245		
		4.113				
	12		4.962	1030.396		
		4.840				
	13		4.923	1030.313		
		4.377				
	14		4.331	1030.358		
		4.824				
	15		5.411	1029.771		
		5.148				
	16		4.126	1030.793		
		4.102				
1	17		5.983	1028.912		See Pg#1 for dec. ELVE = 1029.06 Field ELVE = 1028.912
	Set Beeter B.M.					
2				~~1038.732~~	1038.739	See Pg# 1 for Dec.
		4.836				
28			5.178	~~1038.390~~	1038.397	Found chiseled "□" on N.NW cor. of sidewalk ±50' S. of Tracks on E. side of 67th AV.
11				~~1054.586~~	1054.637	See Pg# 4 for Dec.
		4.926				
29	1		5.407	~~1054.105~~		Chisled "□" on TC E. side of 51st AV ±10' N. of Tracks
18				~~1054.165~~	1054.270	See Pg# 6 for Dec.
		4.896				
30			4.316	~~1054.765~~		Chiseld "□" in NW. cor of irrigation structer ±40' S. of PT#18 Pg# 6

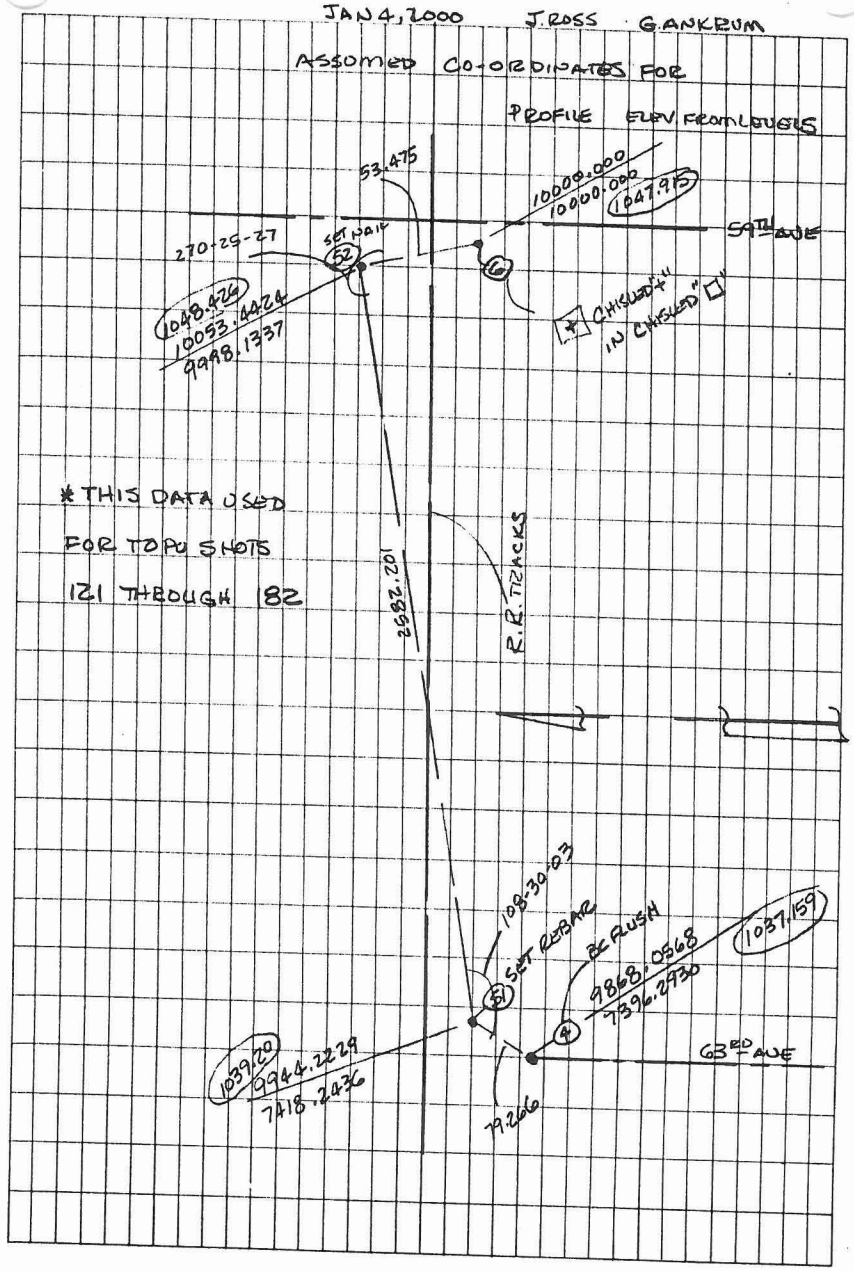
PT	.ode	HR	Dec		
TP 2		5.39			
B.S. @ 3		4.87			
50	Set Rebar	4.45			
TP 2		5.39			
B.S. @ 50		4.45			
100	P	4.87			
1	P				
2	P				
3	R.R.				
4	R.R.				
5	P				
6	P				
7	P				
8	P				
9	P				
110	P				
11	P				
12	P				
13	P				
14	P				
15	P				
16	P				
17	P				
118	P	4.87			



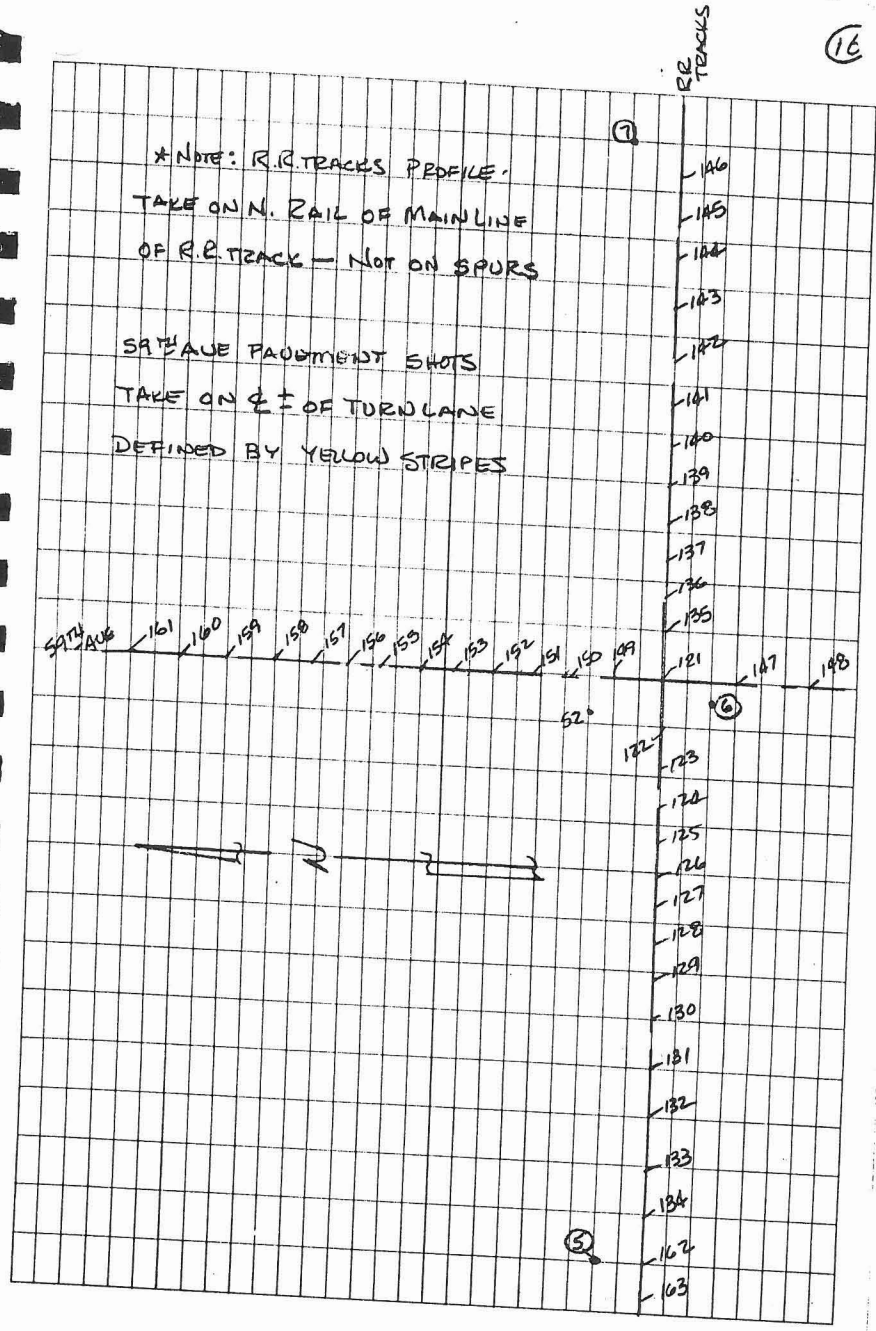
PT	side	HR	Dec		
119	P	4.87			
120	P	4.87			

JAN 4, 2000 J. ROSS G. ANKRUM

ASSUMED CO-ORDINATES FOR PROFILE ELEV FROM LOUGEE'S



⊼@ 52	.0				
BS@ 51	5.20				
121	8.74	R.R			
122		"			
123		"			
124		"			
125		"			
126		"			
127	8.74	R.R			
128		"			
129		"			
130		"			
131		"			
132		"			
133	8.74	R.R			
134		"			
135		"			
136		"			
137		"			
138	8.74	RR			
139		"			
140		"			
141		"			
142		"			
143	8.74	RR			

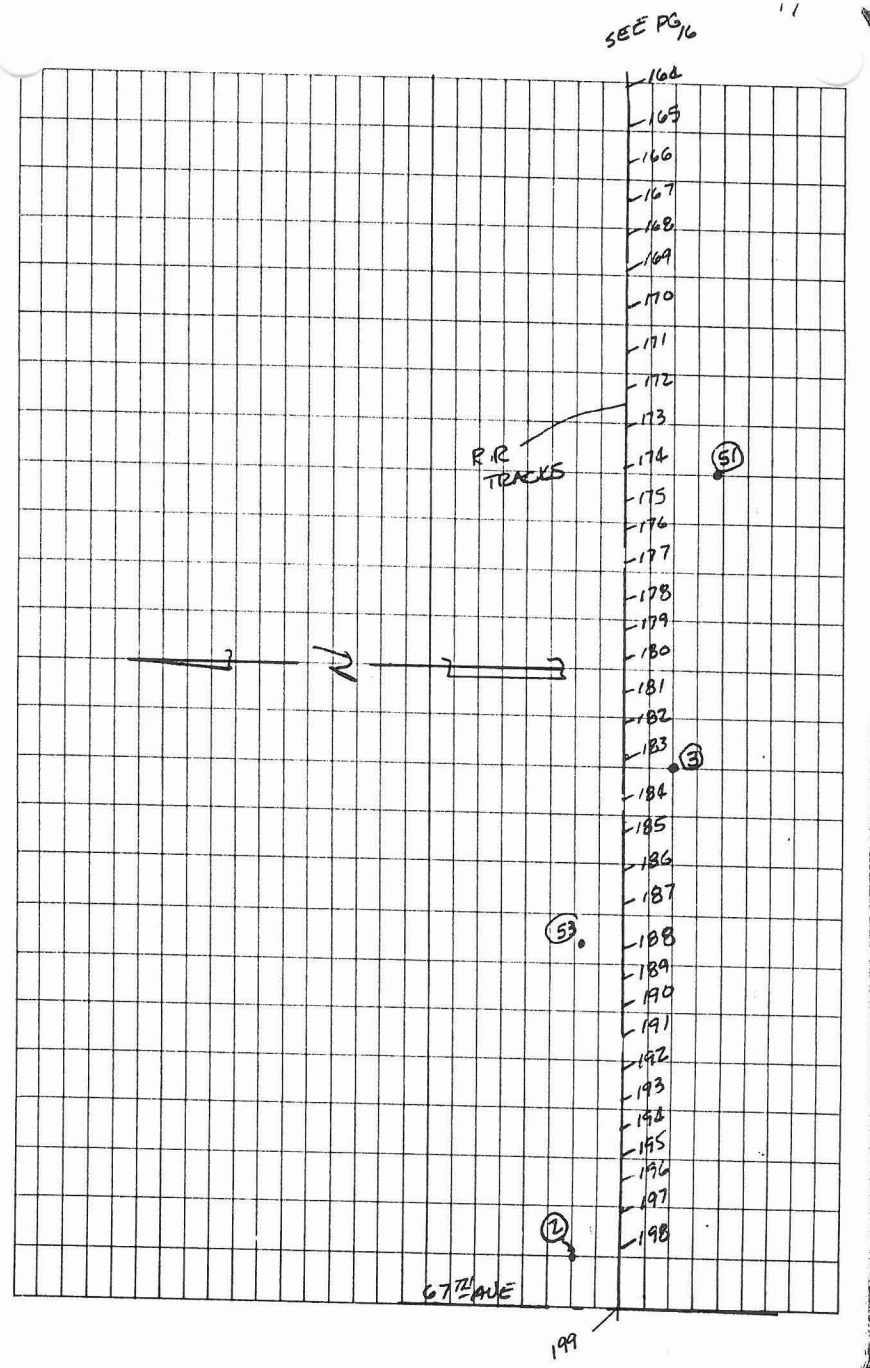


*NOTE: R.R. TRACKS PROFILE.
TAKE ON N. RAIL OF MAIN LINE
OF R.R. TRACK — NOT ON SPURS

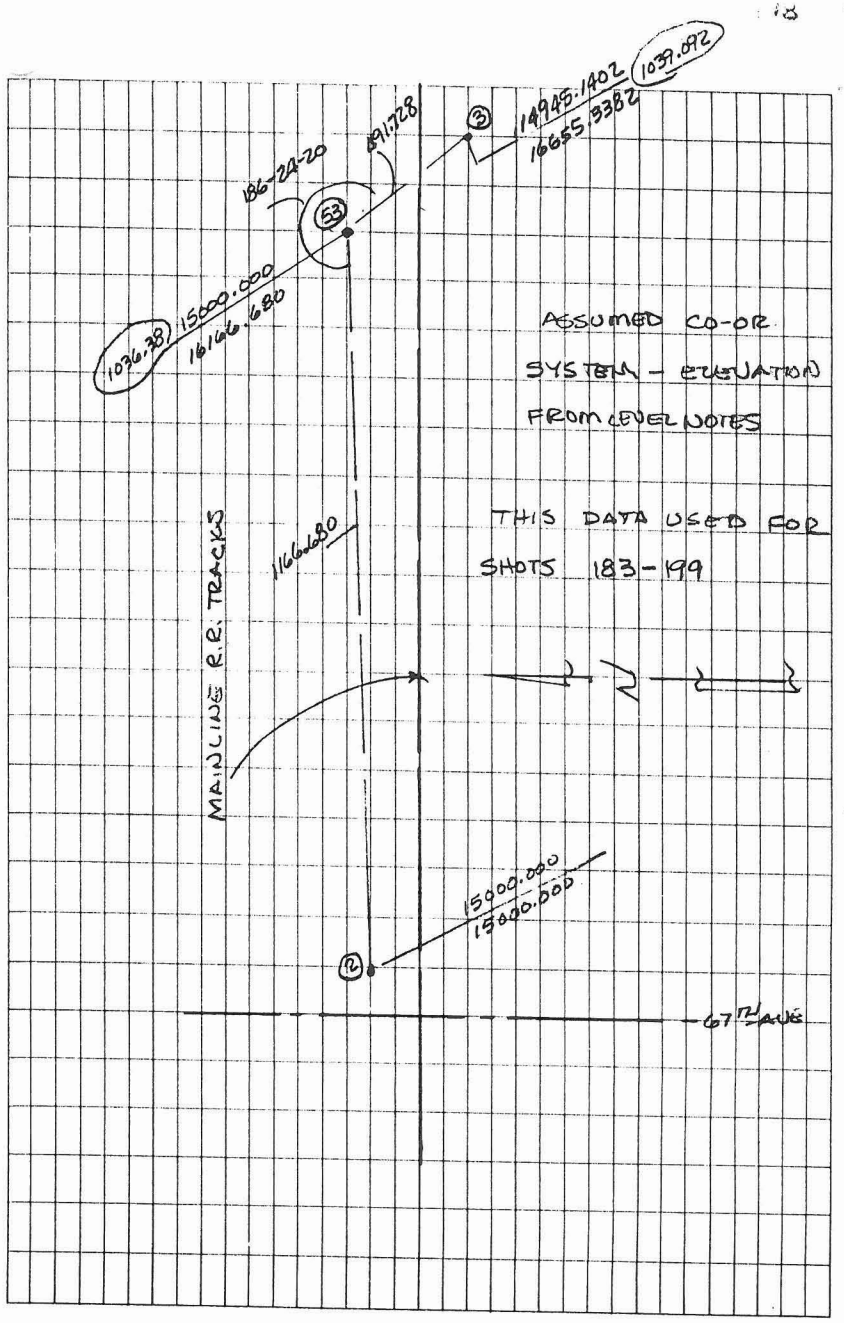
59TH AVE PAVEMENT SHOTS
TAKE ON ℄ ± OF TURN LANE
DEFINED BY YELLOW STRIPES

SEE PG 17

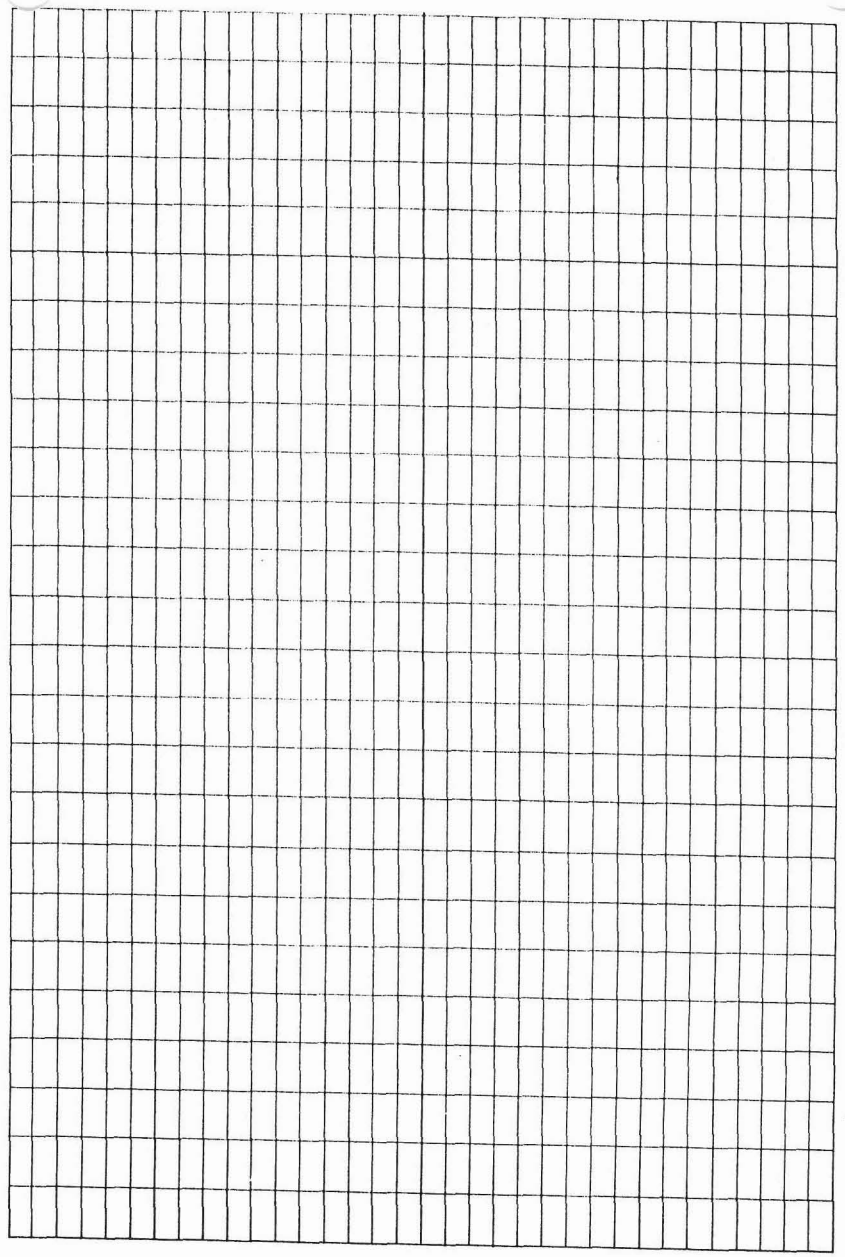
144	.74	RR			
145		R.R			
146		R.R			
147		P			
148	8.74	P			
149		"			
150		"			
151		"			
152	8.74	P			
153		"			
154		"			
155		"			
156		"			
157	8.74	P			
158		"			
159		"			
160		"			
161	8.74	P			
TR@ 51	5.44				
BS@52	9.30				
162	8.74	R.R			
163		"			
164		"			
165	8.74	R.R			



Sta	Elev	Desc			
166	8.74	R.R			
167		"			
168		"			
169		"			
170		"			
171	8.74	R.R			
172		"			
173		"			
174		"	FOR		
175		"	SKETCH		
176	8.74	R.R	SEE		
177		"			
178		"			
179		"	PG		
180		"	17		
181		"			
182	8.74	R.R			
TP@53	5.60				
BS@2	9.47				
183	8.74	R.R			
184		"			
185		"			
186		"			
187	8.74	R.R			



Sta	Elev	Desc			
188	.74	R.R			
189		"			
190		"	For Sketch		
191		"			
192		"	See	PG 17	
193	8.74	R.R			
194		"			
195		"			
196		"			
197		"			
198		"			
199	8.74	R.R			



GPS OBSERVATIONS

Unit	PT	HR	Epochs	Time on	Time off
#B	GPS1	2.417			
#A (MAIN)	53	1.829			
Rover	2	2.181	120	11:10	11:20
	60		12	11:32	11:33
	61			11:45	11:46
	62				

Dec

GPS1 Set Rebar NEXT TO Back of Sidewalk 7' from EP of 35TH AV. ± 75' N. of R.R. TRACKS

PT 53 See Pg# 18 for Pic

PT 2 See Pg# 19 for Pic

Found 1304 HH @ Lower Buckeye & 67TH AV 0.52' To Surface

Found 2" Pipe with nail in center @ Lower Buckeye & 59TH AV. 0.56' To Surface

Found BCF @ Rosavelt & 51ST AV

UNIT	PT	HR	EPOCHS	Time on	Time of
B	GPS1	2.084			
A (MAIN)	53	1.771			
Rover	2	2.181	120	7:44	7:54
	1		12	8:05	8:06
	90			8:13	8:14
	91			8:22	8:23
	92			8:24	8:25
Rover	93	2.181	12	8:49	8:50
	19		120	9:01	9:11
	93		12	9:22	9:23
	20		120	9:39	9:49
	94	2.181	12	9:59	9:50
	95			10:18	10:19
	3			10:34	10:35
	4			10:44	10:45
Rover	5	2.181	12	10:53	10:54

SCT REAR NEAR TO BSW 7' FROM W. EP OF 35TH AV. ±75' N. OF R.R. TRACKS

See Pg# 18 for Pic. of PT 53

See Pg# 2 for Pic. of PT 2

Found BCHH @ Lower Buckeye & 67TH AV 0.52' to Rim

Found Na.1 in 1½" Pipe in HH @ Lower Buckeye & 59TH AV 0.56' To Rim

Found BCF in Concret irragation Structer on S.W. Corner of Lower Buckeye & 59TH AV Stamped "U.S. Geological survey B.M. Elavation above sea level 1028.89"

Found BCHH @ Buckeye & 35TH AV 0.8' To Rim

*Note "Battery died on Rover with Receiver Later in session"

See Pg# 6 For Dec.

See This Pg for Dec.

See Pg# 6 for Dec *Battiry Dead again 10 minute session on This PT

Found BCHH @ Roosevelt & 35TH AV. *(HH Lid marked water)

Found BCF @ Roosevelt & 51ST AV.

See Pg# 1 for Dec.

See Pg# 2 for Dec.

See Pg# 2 for Dec.

Unit	PT	HR	Epochs	Time on	Time of
Rover	6	2.181	12	10:59	11:00
	7			11:05	11:06
	9			11:14	11:15
	8			11:17	11:18
	10			11:25	11:26
	11			11:32	11:33
	12			11:45	11:46
	13	2.181	12	11:52	11:53
	14			12:02	12:03
	15			12:09	12:10
	16			12:13	12:14
	17			12:24	12:15
	18		12	12:31	12:32
Rover	50	2.181	120	12:49	12:59
		End Session			

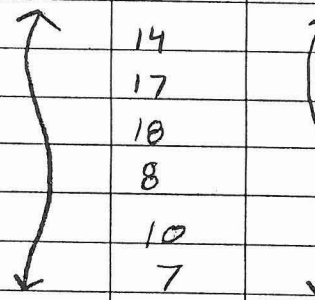
See Pg# 2 for Dec.
3
3
3
3
4
4
4
5
5
5
6
See Pg# 6 for Dec.
See Pg# 14 for Pic

Session 13

Unit		HR	Epochs	Time on	Time off
# 3	GPS1	1.934		7:02	1:30
# 2	53	2.101		7:24	1:14
Rover	2	2.034	120	7:35	7:45
	1		12	7:50	7:51
	90			7:59	8:00
	91			8:07	8:08
	92			8:09	8:10
	93		12	8:23	8:24
Rover	19	2.034	120	8:42	8:52
	19		120	9:06	9:16
	20		12	9:21	9:22
	94			9:30	9:31
	95			9:40	9:41
	3			9:53	9:54
	4			10:02	10:03
Rover	51	2.034	12	10:05	10:06
	5			10:10	10:10
	6			10:14	10:15
	9			10:20	10:21
	11			10:36	10:37
	12		12	10:46	10:47
Rover	13	2.034	120	10:56	11:06
	13	2.034	120	11:07	11:17
	13	2.034	120	11:19	11:29
	15		12	11:42	11:43

See Pg # 21 for Dec
See Pg # 21 for Dec
See Pg # 21 for Dec
See Pg # 21 for Dec
* Battery Read 10 minute This PT See Pg # 6 for Dec
* Unit Reset 10 minute This PT See Pg # 6 for Dec
See Pg # 6 for Dec
See Pg # 21 for Dec
See Pg # 21 for Dec
See Pg # 1 for Dec
See Pg # 2 for Dec
See Pg # 17 for Pic
See Pg # 2 for Dec
See Pg # 2 for Dec
See Pg # 3 for Dec
See Pg # 4 for Dec
See Pg # 4 for Dec
* Rover Reset 10 minute This PT See Pg # 4 for Dec
* Rover Reset 10 minute This PT See Pg # 4 for Dec
* Rover Reset 10 minute This PT See Pg # 4 for Dec
See Pg # 5 for Dec

Unit	T	HR	Ephocs	Time on	Time off
Rover	16	2.034	12	11:48	11:49
	14			11:53	11:54
	17			12:04	12:05
	18			12:13	12:14
	8			12:32	12:34
	10			12:38	12:39
	7		12	12:48	12:49
Rover	50	2.034	120	12:58	1:08
	End Session Rover off 1:08				



See Pg #5 for Dec

See Pg #5 for Dec

See Pg #6 for Dec

See Pg #6 for Dec

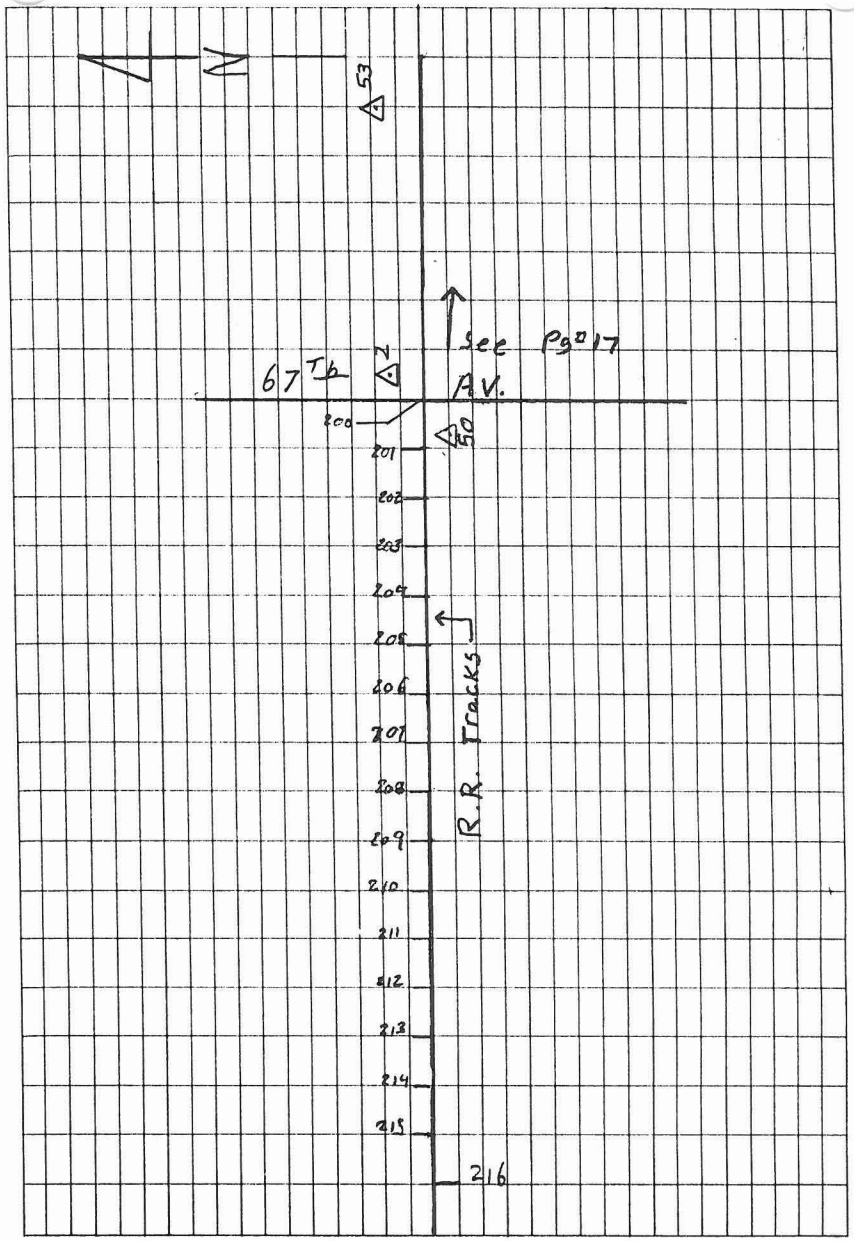
See Pg #3 for Dec

See Pg #3 for Dec

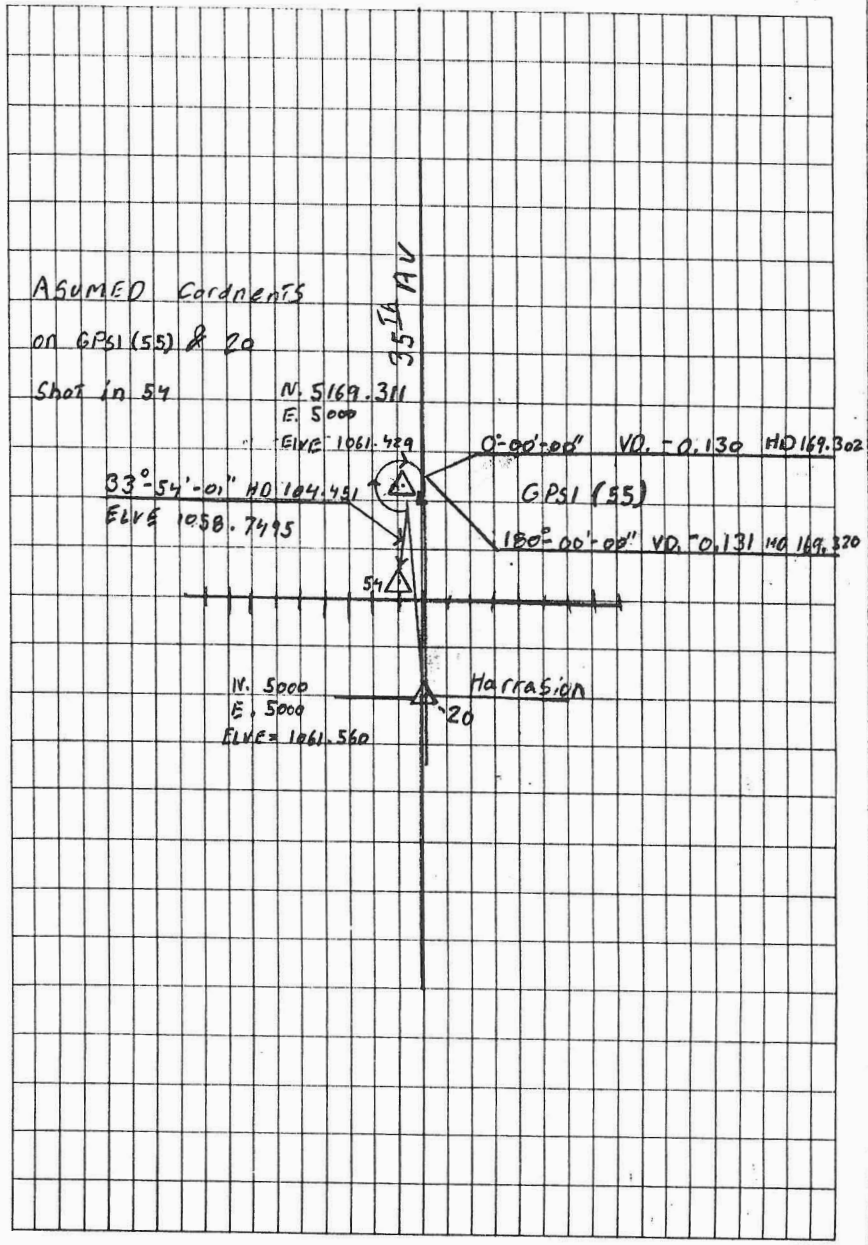
See Pg #3 for Dec

See Pg #14 for Pic

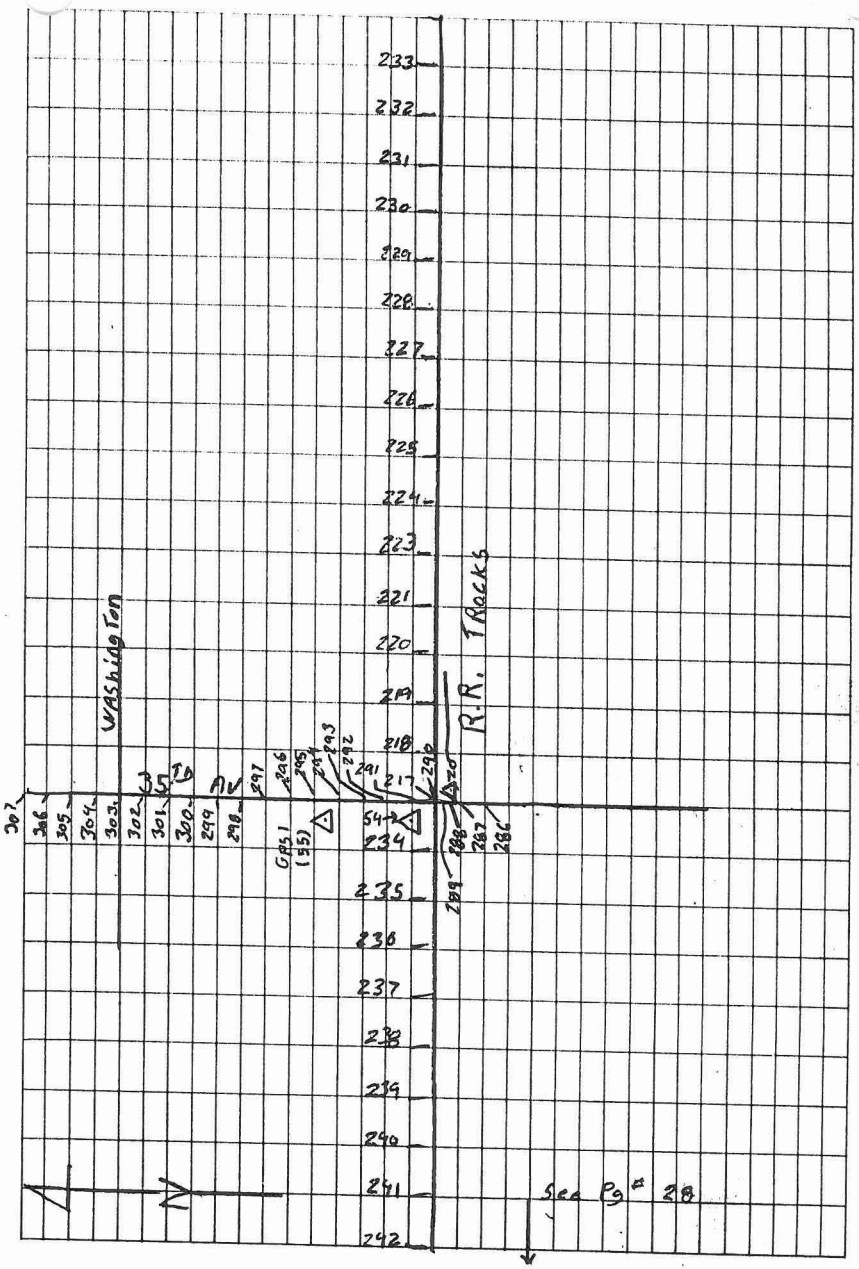
PT	Grade	HR	Rec.		
TC 2		5.01			
B.S. 50		4.47			
200	RR	4.86			
1	"	2.25	* This PT HR. Shall Be 0.25		
2	"	4.86			
3	"	"			
4	"	"			
205	R.R	4.86			
6	"	"			
7	"	"			
8	"	"			
9	"	"			
210	R.R.	4.86			
11		"			
12		"			
13		"			
14		"			
215	R.R.	4.86			
216	R.R.	4.86			



PT	Code	HR	Dec
*TP (GPS1) 55		5.07	
B.S. @ 20		4.86	
54	Set Rebar	4.86	Set Rebar ± 15 N. of Tracks & ± 35' W. of 35th AV
TP 54		4.99	
B.S. @ GPS1 (55)		4.70	
Z17	R.R	4.86	℄ 35th AV
18	"	"	
19	"	"	
Z20	R.R	4.86	
Z1	"		
Z2	"		
Z3	"		
Z4	"		
Z25	RR	4.86	
Z6	"	"	
Z7	"	"	
Z8	"	"	
Z9	"	"	
Z30	RR	4.86	
31	"	"	
32	"	"	
33	R.R	4.86	
Z34	R.R.	4.86	

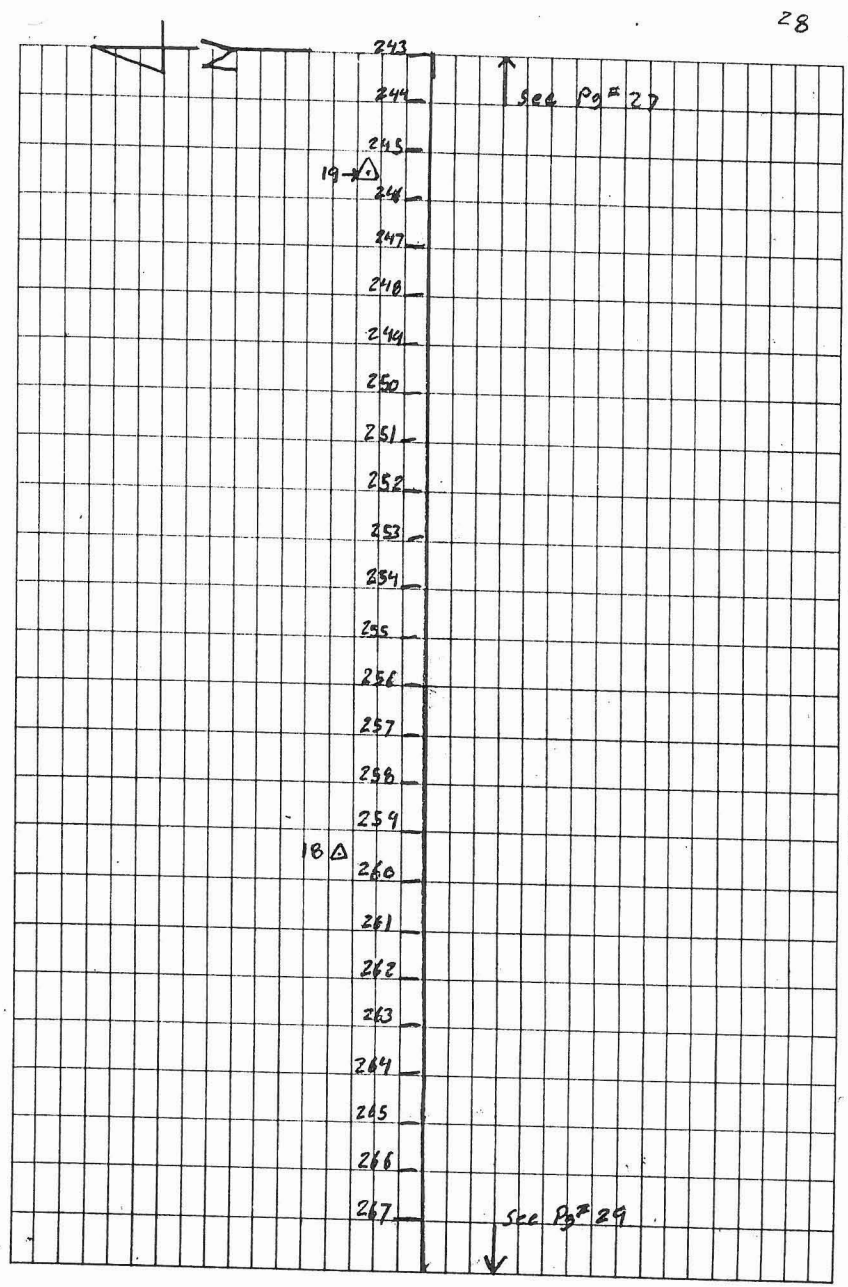


PT		HR	Dec		
235	R.R.	4.86			
36	"	"			
37	"	"			
38	"	"			
39	"	"			
240	R.R.	4.86			
41	"	"			
42	"	"			
43	"	"			
44	"	"			
245	R.R.	4.86			
246	RR	4.86.			
19	Rebar	4.86			
		END SETUP			
TP 19		4.95			
BS@54		4.52			
247	R.R.	4.86			
48	"	"			
49	"	"			
250	RR	"			
51	"	"			
52	"	"			
53	"	"			
54	"	"			
255	R.R.	"			

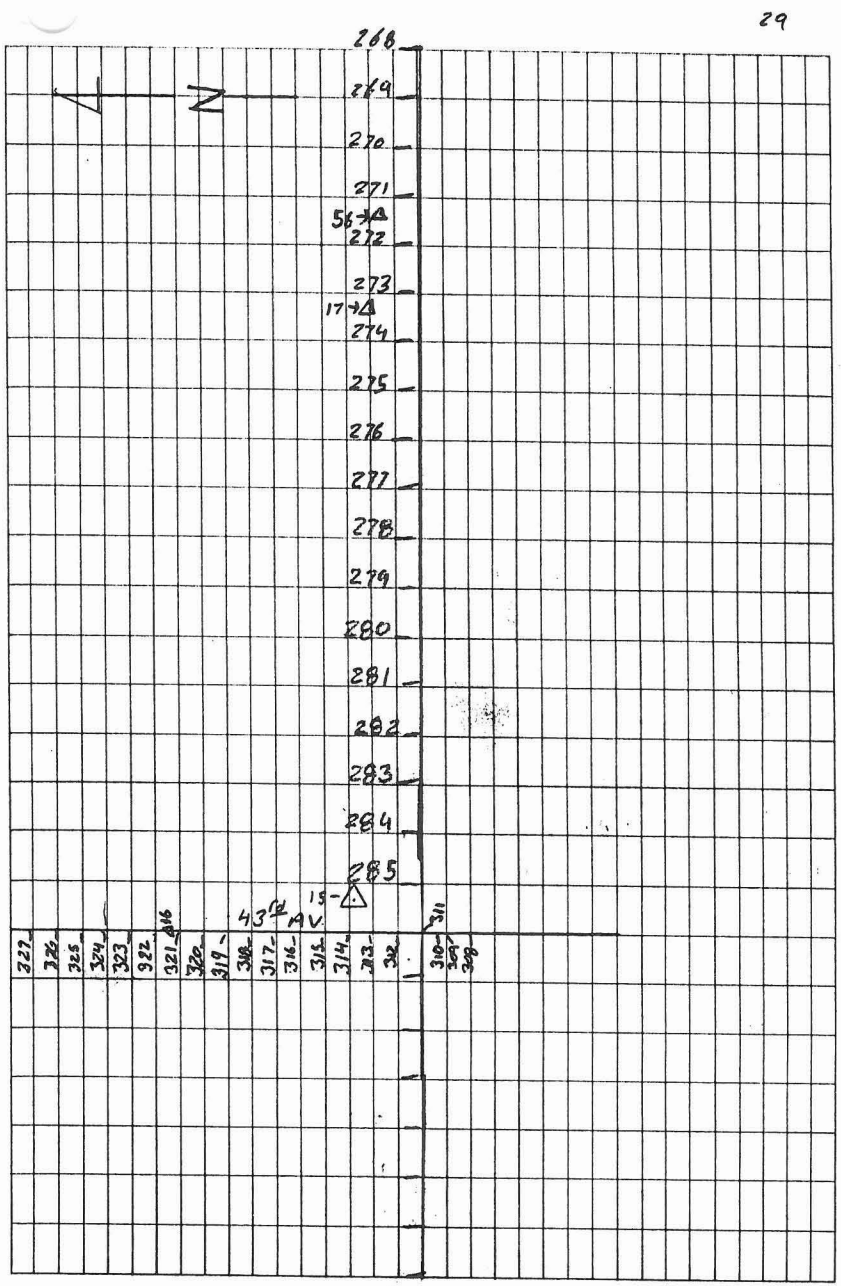


.0644

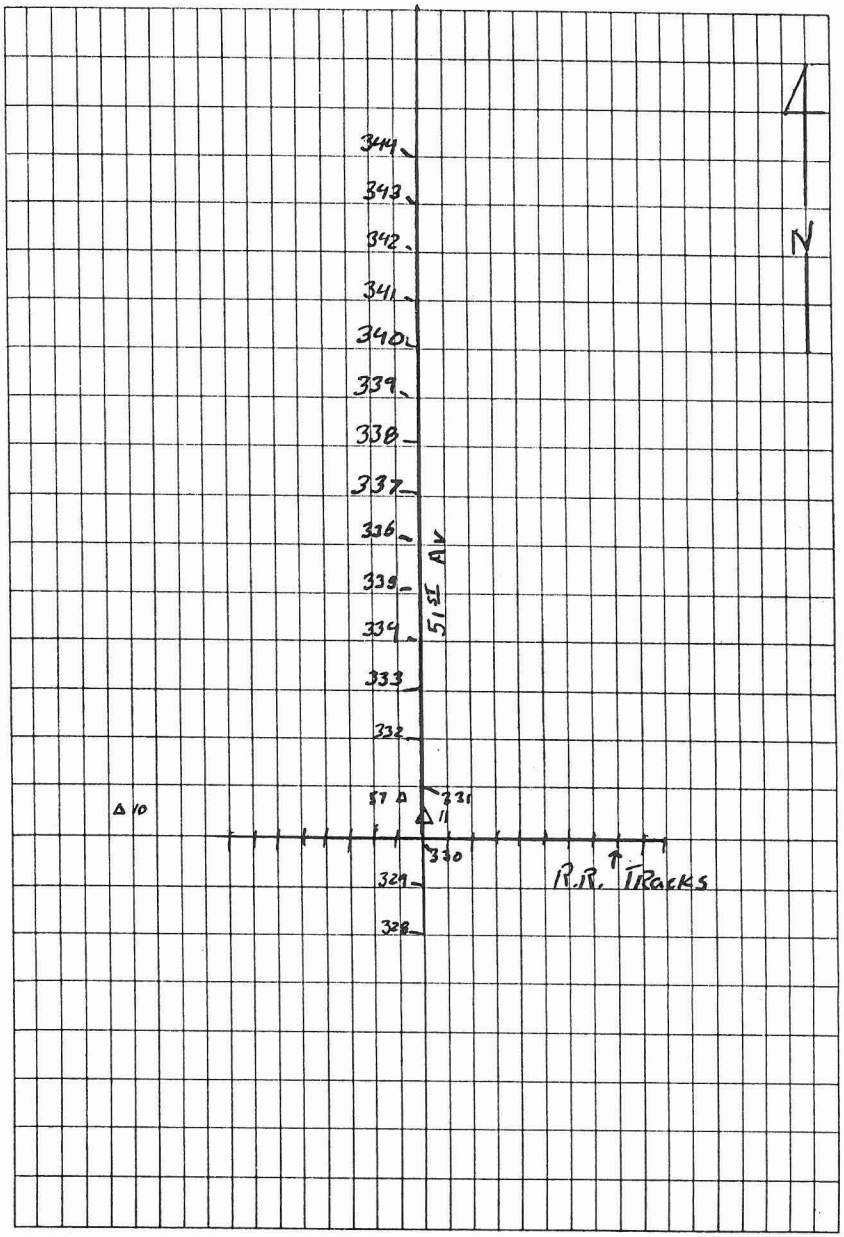
PT	Code	HR	Dec
256	RR	4.86	
57	"	"	
58	"	"	
59	"	"	
260	RR	4.86	
18	Rebar	4.86	
Δ@18		5.04	B.S. Check gave -0.556 ERorr
B.S.@19		5.03	unknown why
261	RR	4.86	
262	"	"	
263	"	"	
264	"	"	
265	RR	4.86	
266	"	"	
67	"	"	
68	"	"	
69	"	"	
270	RR	4.86	
71	"	"	
72	"	"	
73	R.R.	4.86	
17	Rebar	4.86	
56	SetNail	4.86	SetNail 100' E of PT 17
	END SetUP		



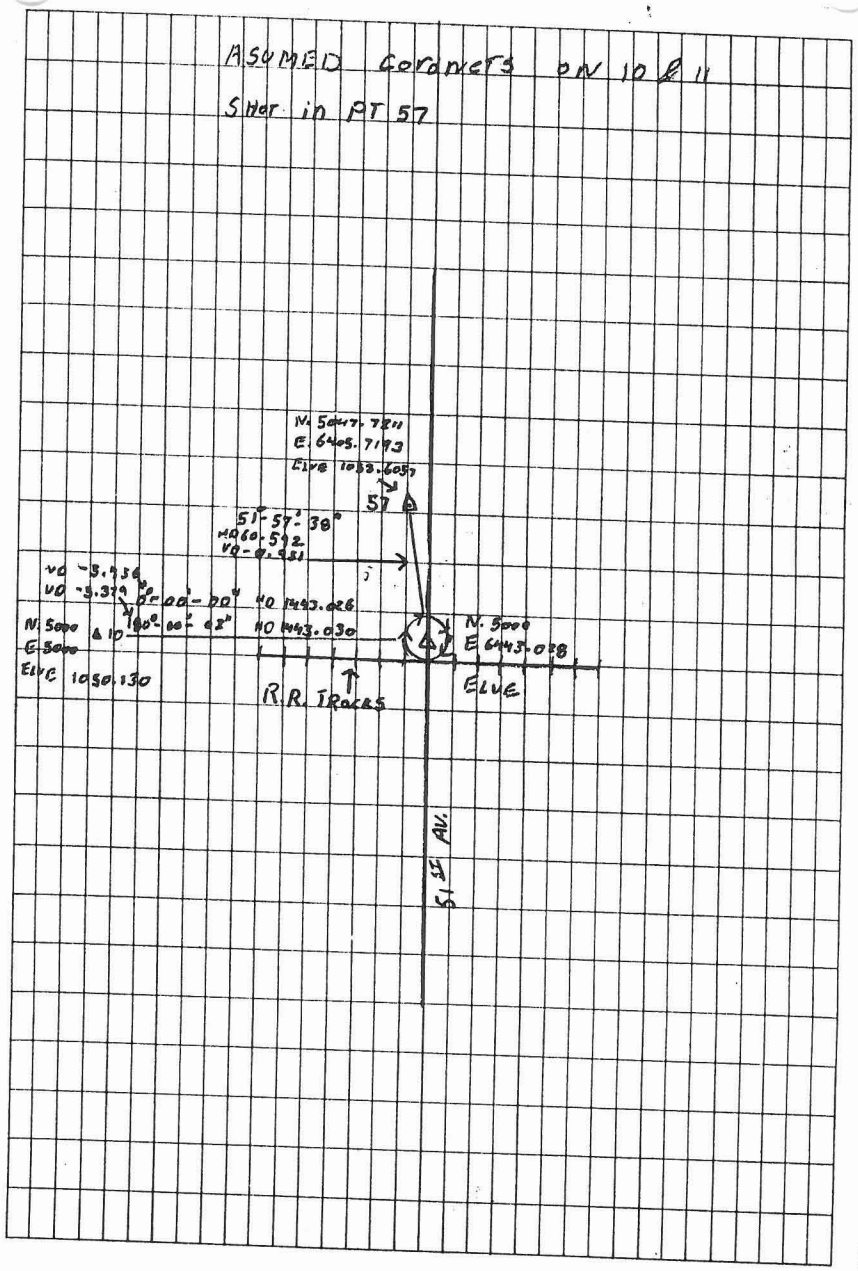
PT	Code	HR	Dec		
TP17		5.03			
B.S. 56		4.80			
274	RR	4.86			
275	RR	4.86			
76	"	"			
77	"	"			
78	"	"			
79	"	"			
280	RR	4.86			
81	"	"			
82	"	"			
83	"	"			
84	"	"			
285	RR	4.86			
15	ReBar				
	END SETUP				
TP GPS1 (55)		4.92			
BS @ 54		5.10			
286	P	4.86			
287	P	4.86			
288	P	4.86	℄ Harrasion & 35th		
289	P	4.86			
290	P	4.86	℄ RR Tracks		
291	P	4.86			
292	P	4.86			



PT	Code	HR	Dec
293	P	4.86	
94	"	"	
295	P	4.86	
96	"	"	
97	"	"	
98	"	"	
99	"	"	
300	P	4.86	
1	"	"	
2	"	"	
3	"	"	℄ Washington & 35th
4	"	"	
305	P	4.86	
6	"	"	
307	P	4.86	
	END	SETUP	
TP 15		4.74	
B.S. @ 17		4.92	
308	P	8.39	
309	P	"	
310	P	"	
311	"	4.86	℄ RR
312	"	"	
313	"	N	
317	"	4.86	*

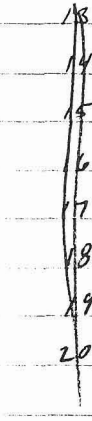


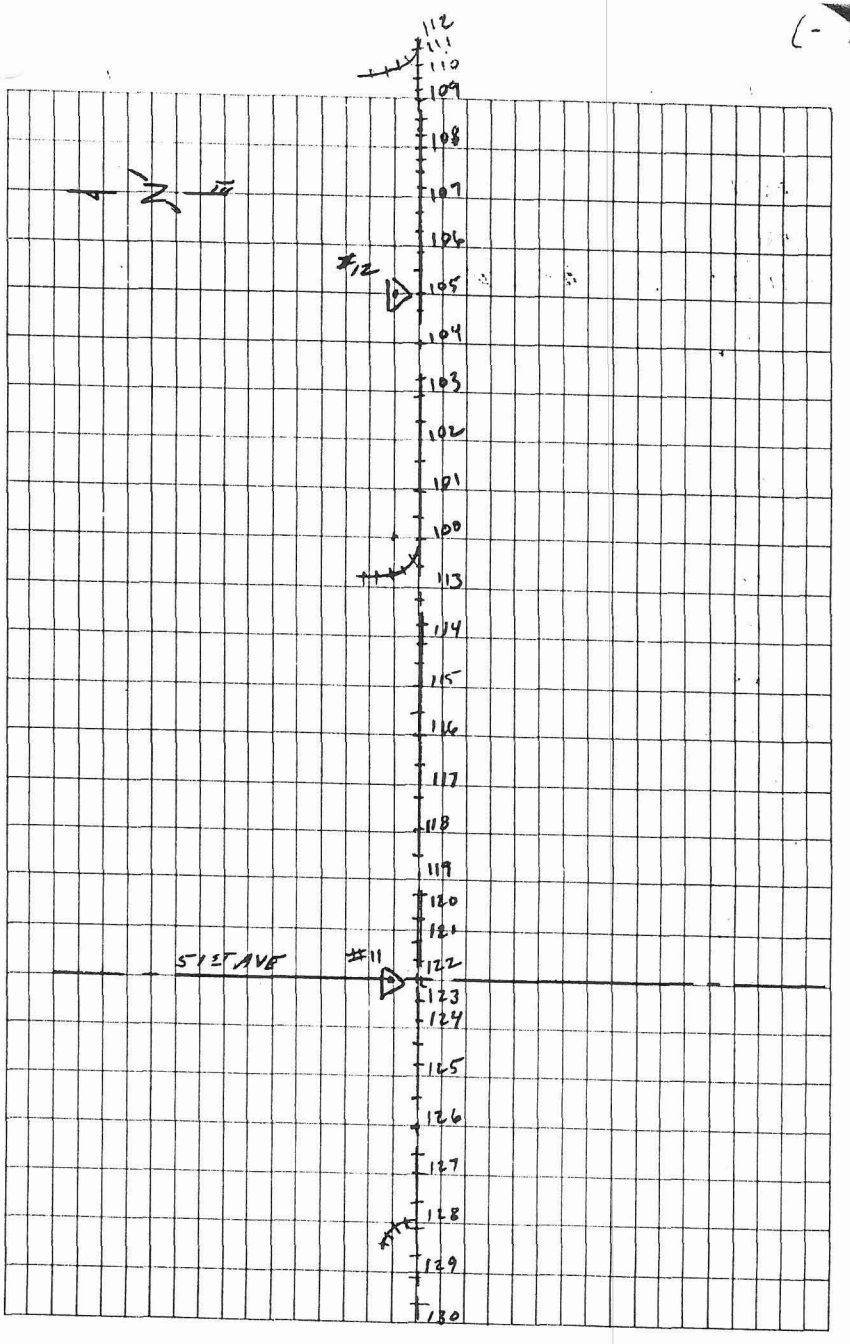
PT	c	HR	Dec		
315	P	4.86			
316	"	"			
317	"	"			
318	"	"			
319	"	"			
320	P	4.86			
321	P	4.86	℄ Jefferson		
16	BCMH	4.86			
322	P	"			
323	"	"			
329	P	"	℄ Washington		
325	"	"			
326	"	"			
327	P	4.86			
	END SETUP				
Tℓ11		4.83			
BSℓ10		3.90			
57	Setnail	4.86			
	END SETUP				
Tℓ57		4.87			
BSℓ11		4.72			
328	P	4.86			
329	"	"			
330	P	4.86	℄ RR		
331	P	4.86			



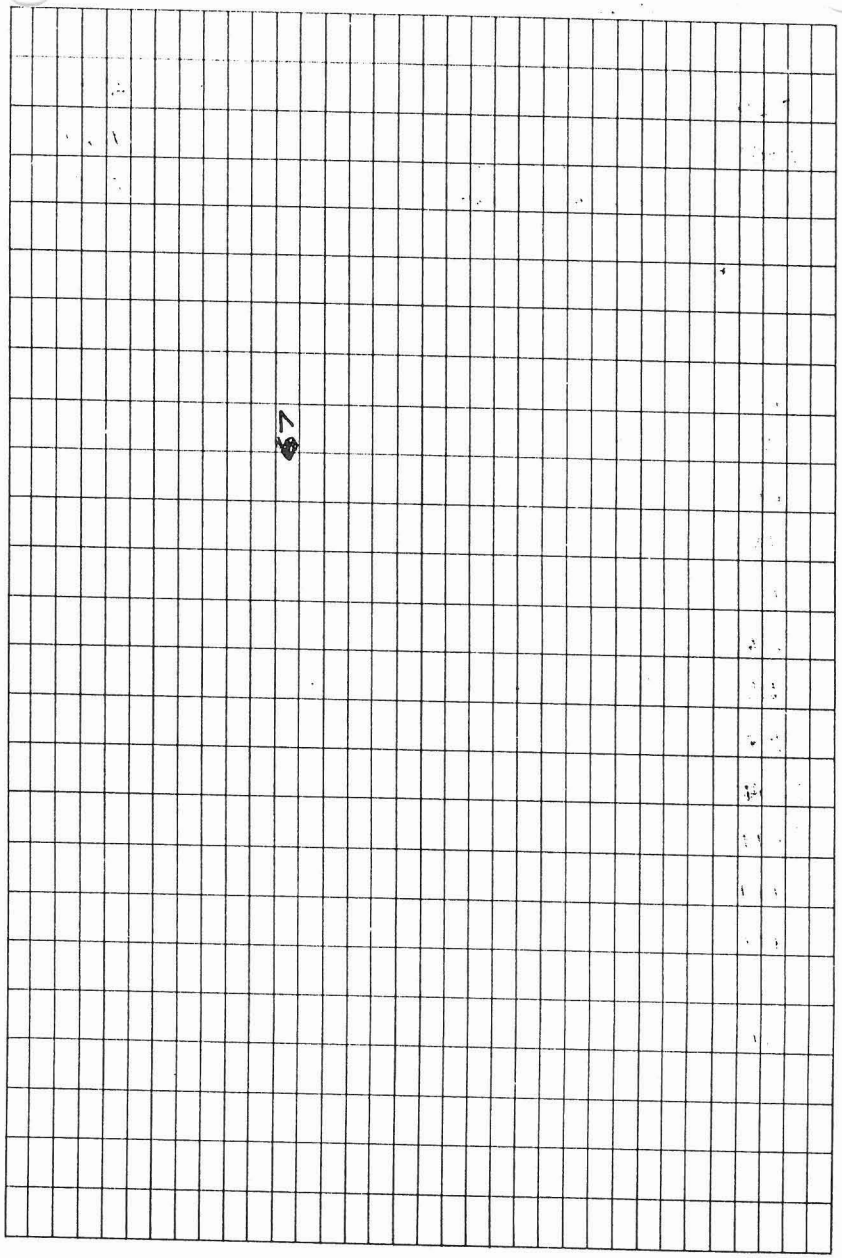
PT	Code	HR	Dec		
332	P	4.86			
333	"	"			
334	"	"			
335	P	4.86			
336	"	"			
337	"	"			
338	P	4.86	& W. Jefferson		
339	"				
340	P	4.86			
341	"	"			
342	"	"			
343	P	4.86			
344	P	4.86			
	END SETUP				

STA	ESC.				HI
T@12					5.51
BS@11					4.61
FS@1100	N. RAIL ROAD				4.87
1101	"				
1102	"				
1103	"				
1104	"				
1105	"				
1106	"				
1107	"				
1108	"				
1109	"				
1110	"				
1111	"				
1112	"				

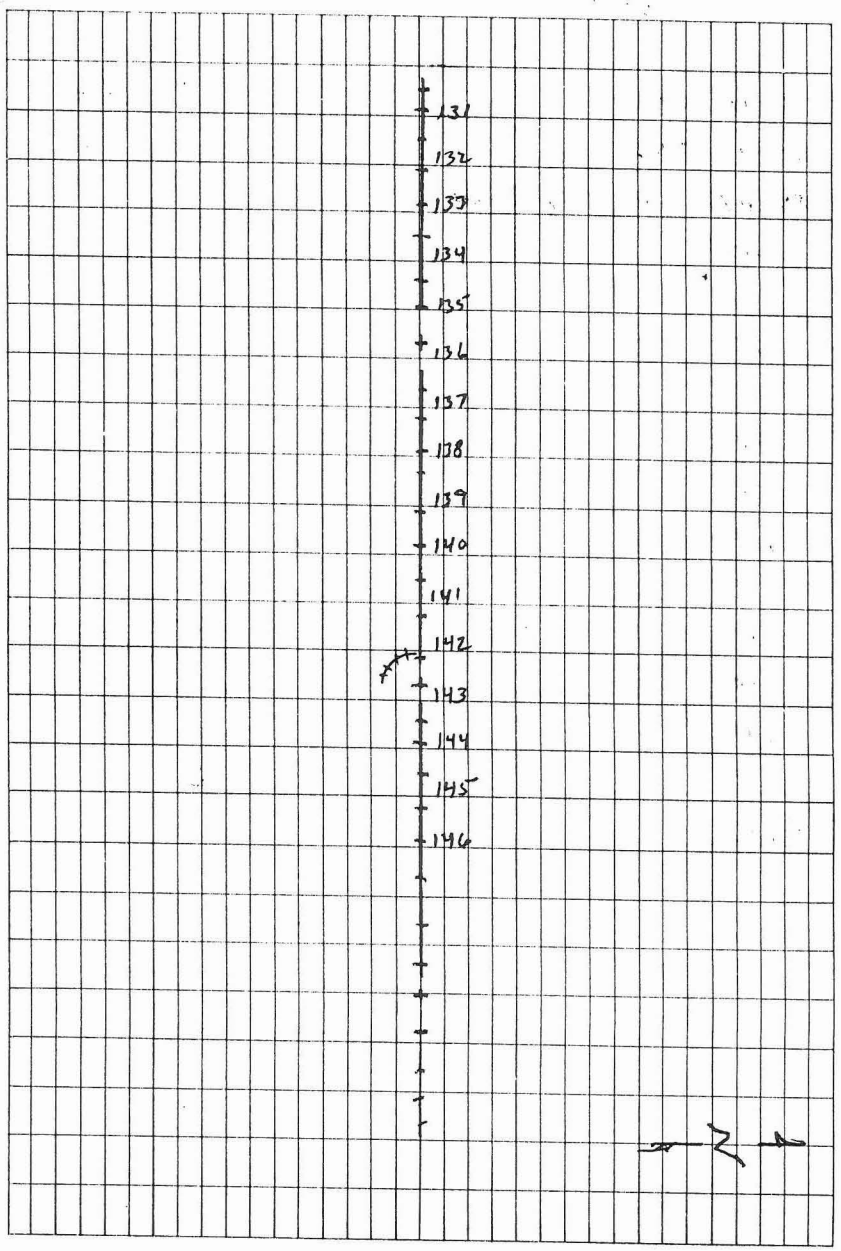




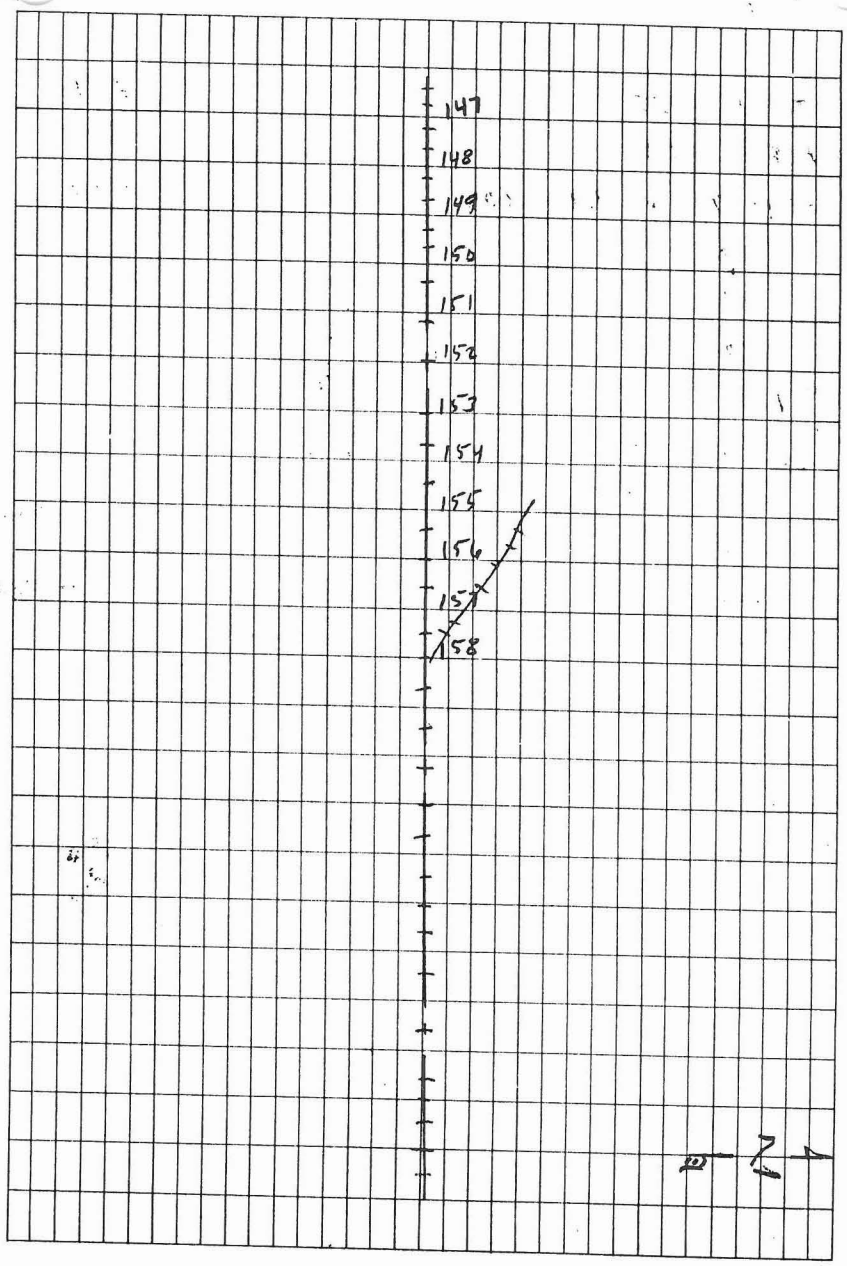
STA					HI
TP@11					5.32
BS@12					4.61
1113	N. RAIL ROAD				4.87
1114	"				
1115	"				
1116	"				
1117	"				
1118	"				
1119	"				
1120	"				
1121	"				
1122	"				
1123	℄ 51ST AVE & N. RAIL ROAD				
1124	N. RAIL ROAD				
1125	"				
1126	"				
1127	"				
1128	"				
1129	"				
1130	"				



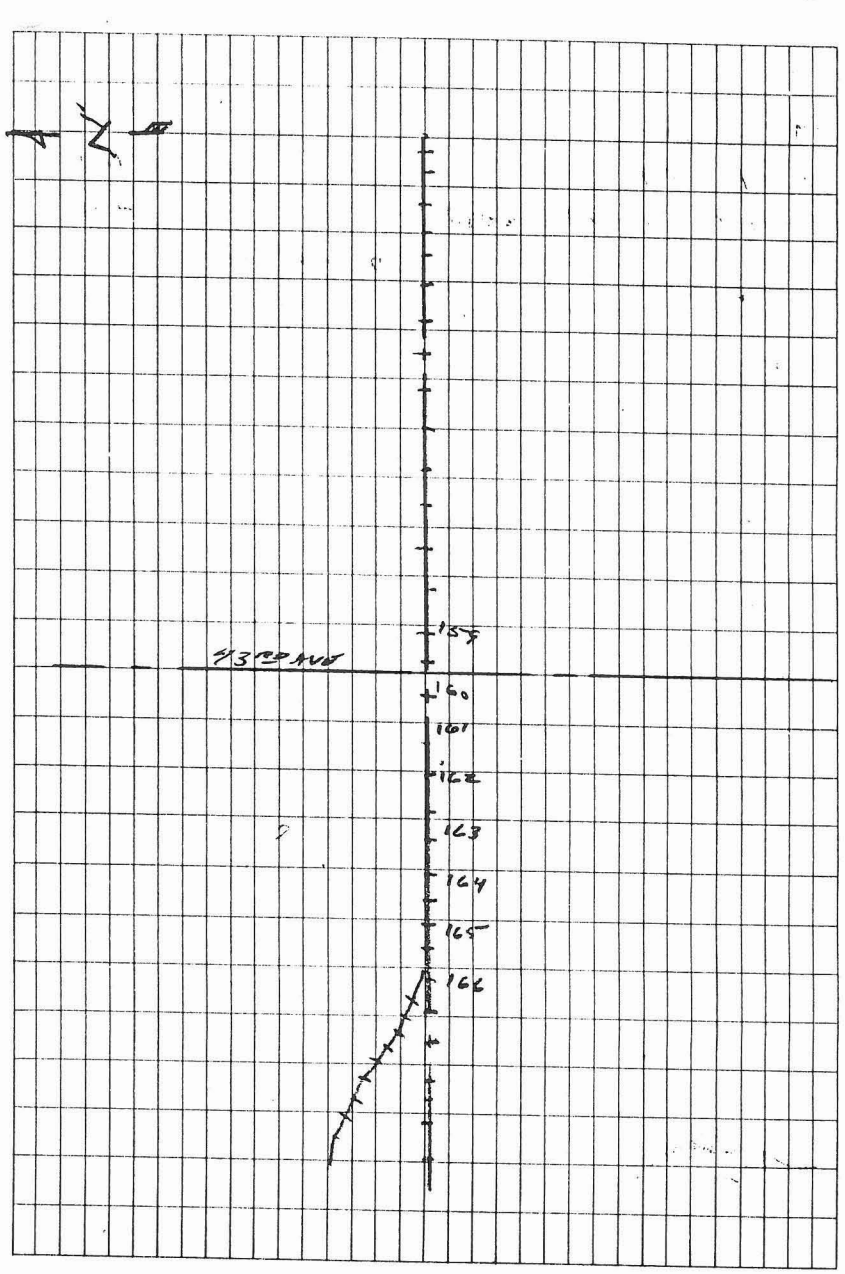
STA	DESC				HI
BS@13 = 51					4.20
BS@12 = 50					4.61
~~FS 129~~	~~N. RAIL ROAD~~				4.87
~~130~~	~~"~~				"
1131	N. RAIL ROAD				
1132	"				"
1133	"				"
1134	"				"
1135	"				"
1136	"				"
1137	"				"
1138	"				"
1139	"				"
1140	"				"
1141	"				"
1142	"				"
1143	"				"
1144	"				"
1145	"				"
1146	"				"



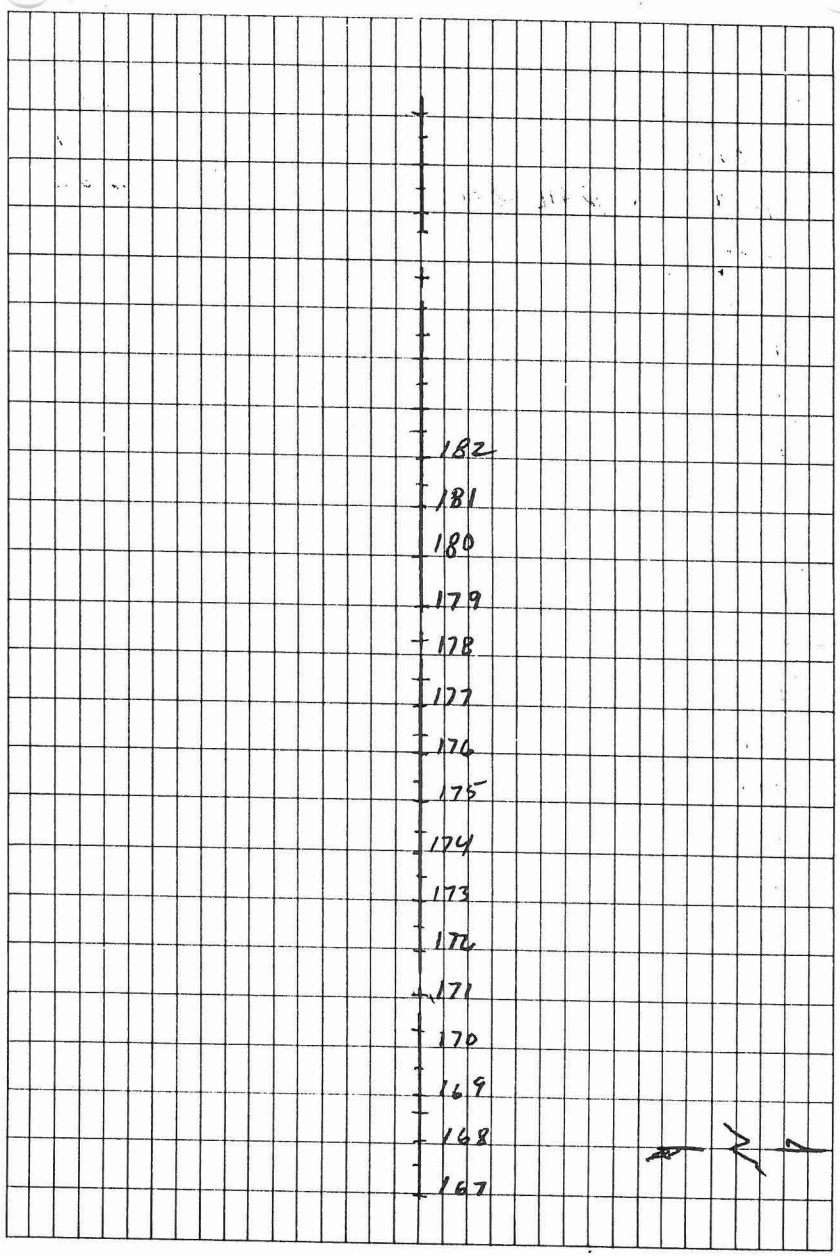
STA.	SC				HI.
TP@14	= 53				5.18
BS@13	= 52				4.61
FS@1147	N. RAIL ROAD				4.87
1148	"				"
1149	"				"
1150	"				"
1151	"				"
1152	"				"
1153	"				"
1154	"				"
1155	"				"
1156	"				"
1157	"				"
1158	"				"
1159					
1160					



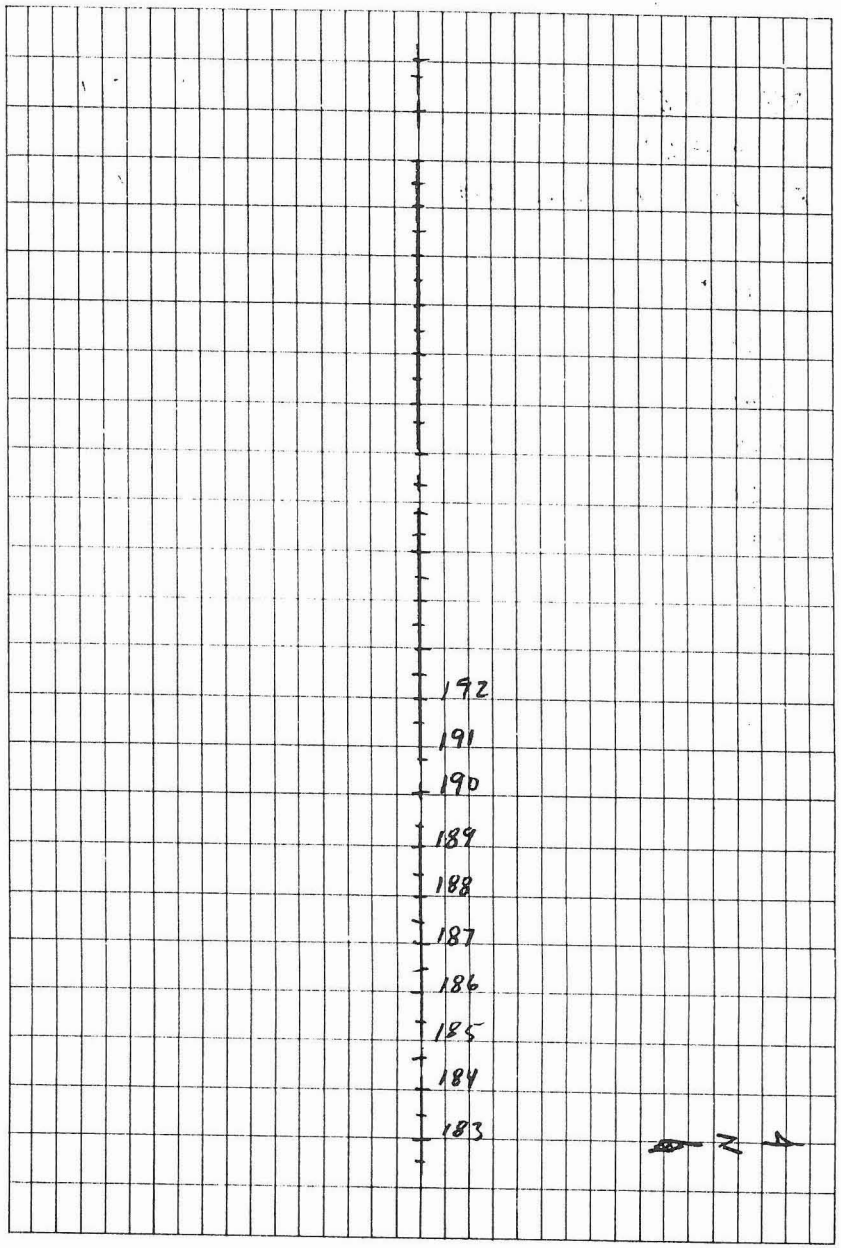
STA					H 1
TP @ 15 = 55					4.71
BS @ 14 = 54					4.61
FS 1159	N. RAIL ROAD				4.86
1160	N. RAIL ROAD @ ℄ 43rd AVE				"
1161	N. RAIL ROAD				"
1162	"				"
1163	"				"
1164	"				"
1165	"				"
1166	"				"
~~167~~					



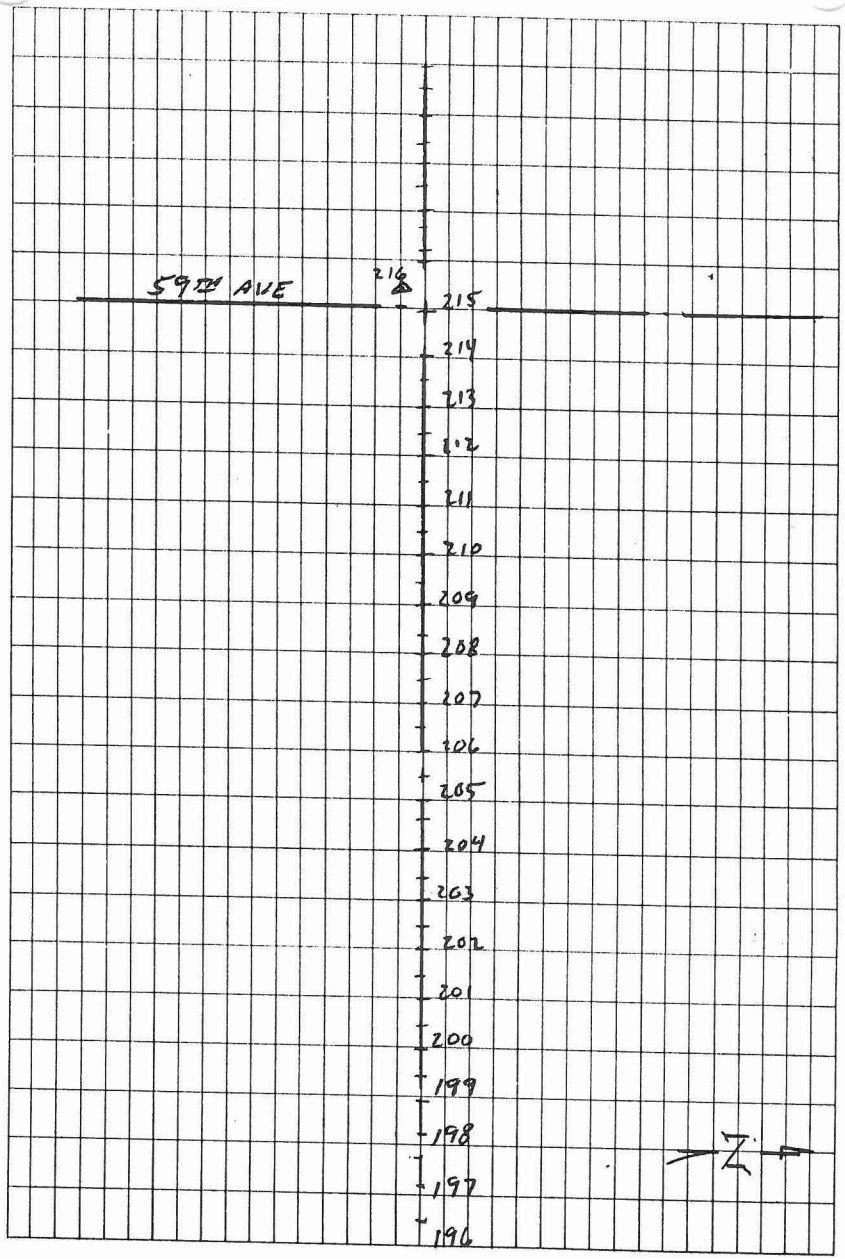
STA	BC.				HI
T@10 = 56					4.88
BS@11 = 57					4.70
FS 1167	N. RAIL ROAD			4.87	4.87
+.17 1168	"		ADD →	+ .17	4.70
1169	"				4.87
1170	"				"
1171	"				"
1172	"				"
1173	"				"
1174	"				"
1175	"				"
1176	"				"
1177	"				"
1178	"				"
1179	"				"
1180	"				"
1181	"				"
1182	"				



STA.	EGL				HI
TP@8 = 58					5.03
BS@10 = 59					4.87
FS1183	N. RAIL ROAD				4.87
1184	"				"
1185	"				"
1186	"				"
1187	"				"
1188	"				"
1189	"				"
1190	"				"
1191	"				"
1192	"				"
1193					
1194					
1195					



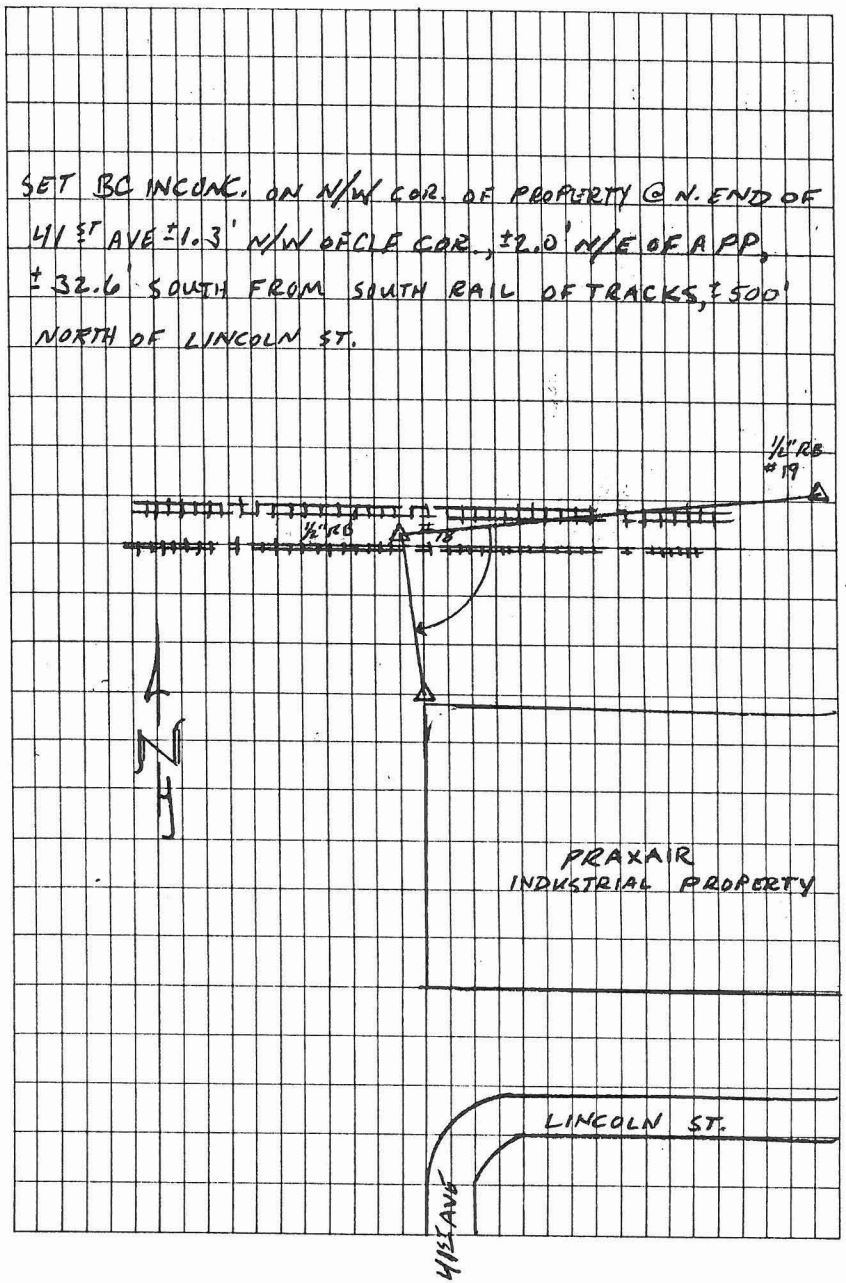
TP@7 = 60			5.11
BS@8 = 61			4.72
FS@196	N. RAIL ROAD		4.87
1197	"		"
1198	"		"
1199	"		"
1200	"		"
1201	"		"
1202	"		"
1203	"		"
1204	"		"
1205	"		"
1206	"		"
1207	"		"
1208	"		"
1209	"		"
1210	"		"
1211	"		"
1212	"		"
1213	"		"
1214	"		"
1215	N. RAIL ROAD @ ℄ 59TH AVE.		"
1216	CUT CROSS @ B/W #6		"



STA	PT NO	+	-	ELEV	ADJ. ELEV.
POB	18			~~100.00~~	1054.270
		5.677			
TPI	1051		6.524	~~99.153~~	1053.423

STA	H I	HD	Remark's
BS@18			½" RB
BS@19	00-00-00	2672.155	"
FS@1051	80-05-41	46.550	SETBC/CONC
FS REV	260-05-41		

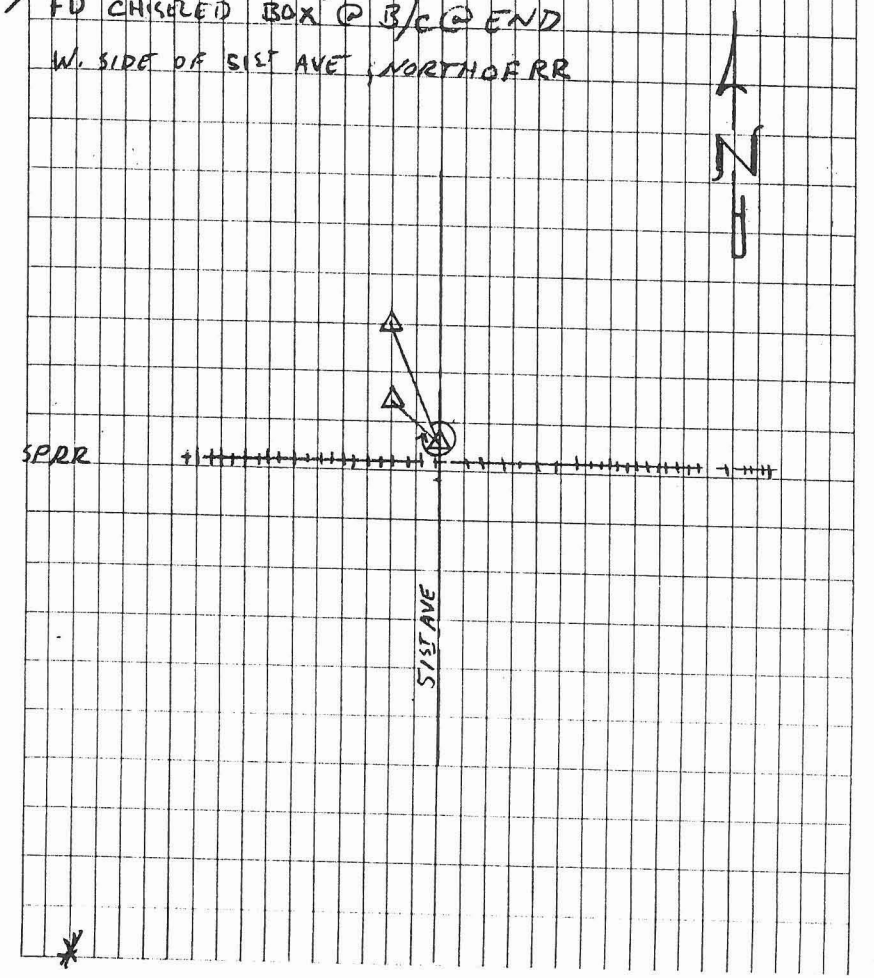
SET BC INCONC. ON N/W COR. OF PROPERTY @ N. END OF 4/1 ST AVE ±1.3' N/W OF CLF COR., ±2.0' N/E OF A PP, ±32.6' SOUTH FROM SOUTH RAIL OF TRACKS, ±500' NORTH OF LINCOLN ST.



STA	PT No	+	−	ELEV.	ADJ ELEV.
POB	11			1054.638	
POB		3.724			
SS1	29	3.724	4.213	1054.149	
TP2	1052		6.576	1051.786	

STA	HI	HD	Remarks
A@11			½" Rebar
BS@S7	0-0-0	60.640	FD NAIL
FS 1052	330-35-20	58.640	BC/CONC.
	150-35-20		

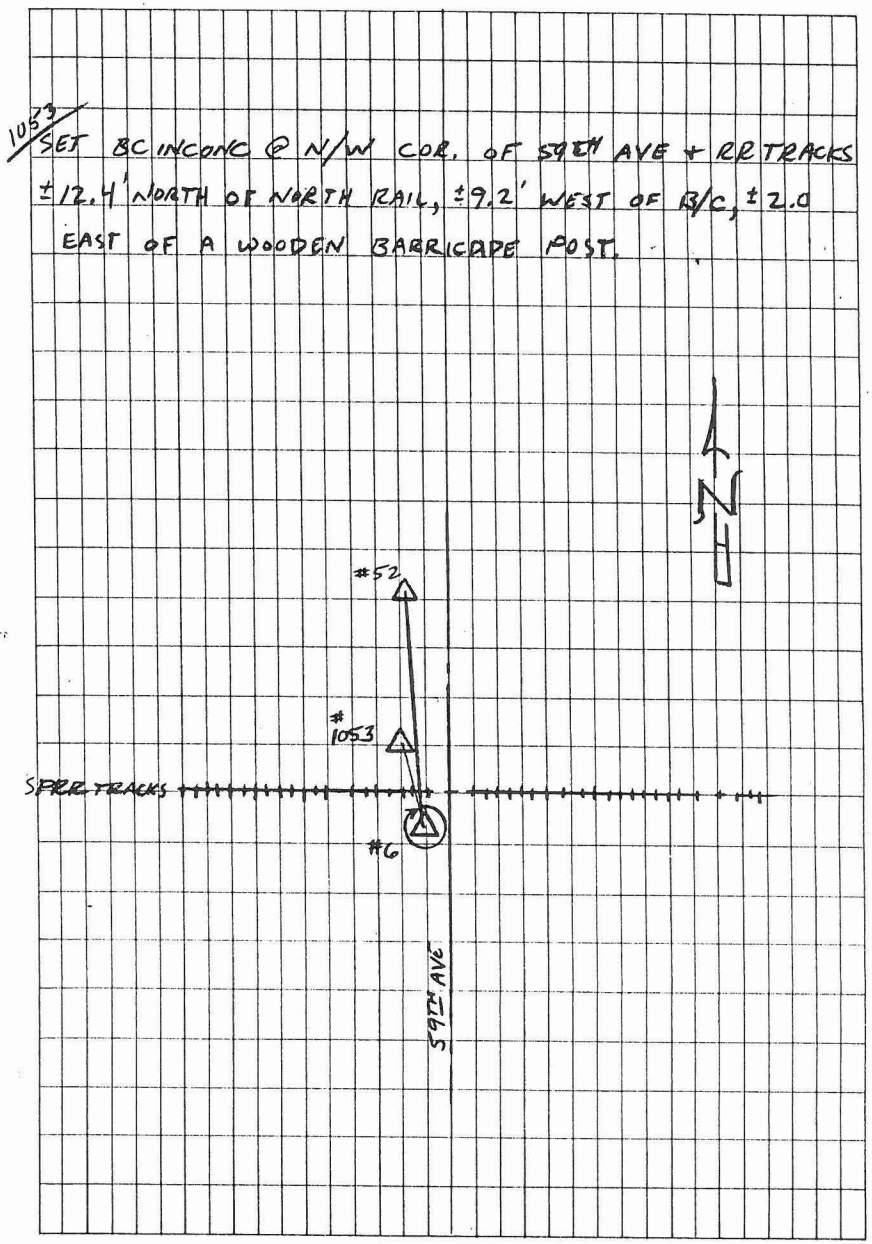
11
1052
FD ½" RB @ S1ST + RR IN MEDIAN (BENT)
SET BC IN CONC. @ N/W COR. OF S1ST AVE + RR TRACKS
±3.0' EAST OF HEADWALL, ±42.6' NORTH OF NORTH RAIL OF TRACKS, ±58.6' FROM #11 (½" RB IN MEDIAN ON NORTH SIDE OF RR TRACKS).
29
FD CHISELED "BOX" @ B/C @ END W. SIDE OF S1ST AVE, NORTH OF RR



STA	PT NO	+	−	ELEV.	ADJ. ELEV.
POB	6			~~1047.915~~	1047.947
		5.634			
TP1	1053		6.491	1047.057	1047.089

STA	H.I.	H.D.	Remarks
T@6			CHISLED "X" ON B/C
BS@52		53.43	FD NAIL
FS@1053	340-23-05	19.862	SET BC/CONC.
FS REV	160-23-05		

1053 SET BC IN CONC @ N/W COR. OF 59TH AVE + RR TRACKS ±12.4' NORTH OF NORTH RAIL, ±9.2' WEST OF B/C, ±2.0 EAST OF A WOODEN BARRICADE POST.



STA	PT NO	+	−	ELEV.	ADJ. ELEV.
POB				1038.390	1038.397
		4.958			
SS 1	50		5.172	~~1038.776~~	
SS 2	1054		4.595	~~1038.753~~	1038.760
SS 3	2		5.554	~~1037.799~~	1037.801
TP 4	1055				

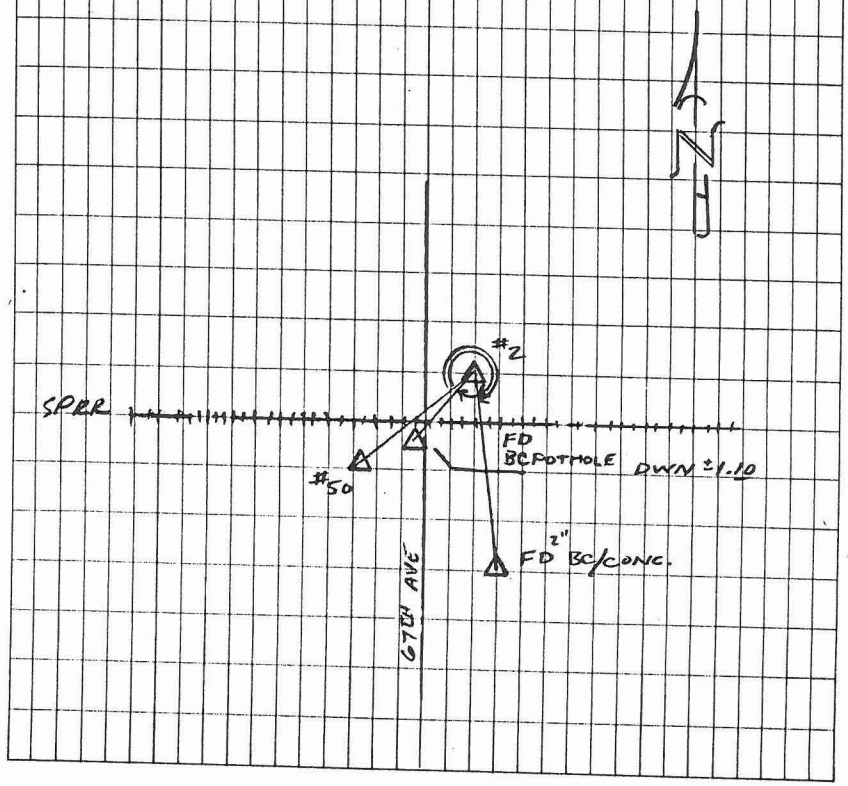
STA	H.I.	HD	Remarks
I @ 2			
BS @ 50	0-0-0	54.750	½" RB
FS @ 1054	350-17-39	36.286	FD BCPH
FS REV	170-17-40		
# 1055	302-31-29	118.240	FD BC/CONC.
FS REV	122-31-30		

FD CHISLED BOX @ BC @ END

FD ½" RB @ S/W COR.

P54 FD BC POTHOLE IN SOUTH BOUND LANE 67TH AVE ±5.0' SOUTH OF SOUTH RAIL, ±12.3' N/E OF PP ON WEST SIDE 67TH AVE

1055 FD 2" ALCAP IN CONC (BY OTHERS) RLS # 21780, ±42.3' SOUTH OF SOUTH RAIL OF TRACK, ± 31.4' SOUTH OF PP ON EAST SIDE OF 67TH AVE ± 2.0' FROM B/W



Basis of Project Control

Basis of Control

For

Durango ADMP
35th Avenue to 67th Avenue
FCD 99-41

Data Collection

Data from the Maryvale ADMS Project was the basis for the supplemental surveying that was performed by PEC. The Maryvale ADMS Project was based on NAD27 State Plane Coordinates and NGVD29 vertical datum.

Horizontal Control

Horizontal control was performed using Kinematic GPS. The GPS network was tied into existing control from the Maryvale ADMS using a least squares best fit:

Pt#	Latitude	Longitude	
91	**33 25 20.93724**	**112 11 08.84924**	**I.P. in Handhole – 59th Ave & Lower Buckeye Rd.**
93	**33 26 12.65982**	**112 08 02.13143**	**BC in Handhole – 35th Ave & Buckeye Rd.**
94	**33 27 31.03255**	**112 08 01.64035**	**BC in Handhole – 35th Ave & Roosevelt St.**

Vertical Control

Vertical control was based on control originally provided by Kaminski-Hubbard for the Maryvale ADMS project. The primary ERM used by PEC for this portion of the project was the brass cap in the handhole at the intersection of 67th Avenue and Buckeye Road (Elevation = 1029.06'). This bench mark was checked against another existing ERM, a brass cap flush with the pavement at the intersection of 51st Avenue and Mohave Street (Elevation = 1032.66'). The bench loop between these 2 caps fell within 3rd Order tolerance.