N00158.AR.000050
NAS WILLOW GROVE
5090.3a

HALLIBURTON NUS, NAS WILLOW GROVE
WILLOW GROVE, PA

SURVEY REPORT

FOR

WELLS, BORINGS AND TEST PITS

November 8, 1991

Prepared By:

Boucher & James, Inc.
Consulting Engineers
P.O. Box 904
Doylestown, PA 18901

GENERAL

All horizontal and vertical data shown are based upon a field survey conducted by Boucher & James, Inc. during October 1991.

HORIZONTAL SURVEY

United States Coast and Geotetic Survey monuments "Willow" and "Prospectville, Tower of Chimes, 1942" were used to establish Pennsylvania State plan coordinates (South zone, 1927 datum) of the wells, borings and test pits.

VERTICAL SURVEY

United States Coast and Geodetic survey monument "Pitcairn A" elevation 368.949 (NGVD of 1929) was used to establish elevations of the wells, borings and test pits.

I. PRIVET ROAD SITE

1. Monitoring Wells

Number	North/East Coordinates	ELEVATIONS Top Steel Casing	Notch in Top PVC Pipe	Ground
PRW-2B	329,482.429 2,727,618.000	303.86	303.67	302.3
PRW-4B	329,291.517 2,727,872.950	313.60	313.27	311.2
PRW-5	329,125.668 2,727,752.520	313.11	312.61	311.1
PRW-6	329,745.770 2,727,500.870	298.61	298.07	295.8
PRW-6B	329,757.560 2,727,520.070	298.28	297.85	296.5
PRW-7	329,586.280 2,727,282.340	298.75	298.30	296.3
PRW-7B	329,580.283 2,727,274.400	297.71	297.2	296.2

	ELEV.	
PRW-5B	311.4	SURF.
	313.24	T. PIPE
	313.03	T. PVC

WRW-1B - NOT SURVEYED

2. **Soil Borings**

Number	North/East Coordinates	Ground Elevation
B-3	329,346.8 2,727,566.3	303.4
B-4	329,304.8 2,727,623.6	305.0
B-5	329,264.4 2,727,660.5	306.6
B-6	329,207.6 2,727,717.7	309.8
B-7	329,441.1 2,727,636.8	302.4
B-8	329,407.9 2,727,678.8	303.5
B-9	329,371.3 2,727,725.1	304.6
B-10	329,340.6 2,727,765.5	306.2
B-11	329,502.5 2,727,691.3	303.9
B-12	329,464.8 2,727,716.4	303.2
B-13	329,433.3 2,727,786.3	303.9
B-14	329,398.4 2,727,830.4	306.3
B-15	329,553,.5 2,727,742.7	303.6
B-16	329,524.3 2,727,798.6	303.9
B-17	329,493.0 2,727,841.3	304.9
B-18	329,459.8 2,727,885.3	306.8

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
Timothy D. Hydrusko
LAND SURVEYOR

II. NINTH STREET LAND FILL

1. Monitoring Wells

Number	North/East Coordinates	ELEVATIONS Top Steel Casing	Notch in Top PVC Pipe	Ground
9SLW1-C	324,559.583 2,725,280.180	347.77	347.49	346.2
9SLW5	324,430.342 2,725,486.030	363.21	362.90	359.9

2. Monitoring Wells (Artesian)

Number	North/East Coordinates	ELEVATIONS Top Steel Casing	Base of Pressure Gaugee	Ground
9SLW3-C	325,145.401 2,724,942.440	315.95	315.00	313.0
9SLW4-C	324,698.201 2,724,562.900	325.59	324.85	323.0

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Timothy D. Hydrusko
LAND SURVEYOR
31410-E

3. Test Pits

Number	North/East Coordinates	Ground Elevation	North/East Coordinates	Ground Elevation
		ELEVATIONS		
TP1	324,185.3 2,724,751.7	342.4	324,283.5 2,724,733.2	335.8
TP2	324,690.4 2,724,973.9	338.4	324,596.8 2,725,016.4	339.8
TP3	324,900.0 2,725,031.4	327.3	324,804.5 2,724,926.7	323.4
TP4	324,625.2 2,725,212.1	342.8	324,698.5 2,725,148.6	341.6

III. FIRE TRAINING AREA

1. Monitoring Wells

Number	North/East Coordinates	Top of Steel Casing	Notch in Top PVC Pipe	Ground
		ELEVATIONS		
FTAW-1B	323,546.952 2,726,902.890	364.94	364.56	363.4
FTAW-5	323,339.261 2,726,560.520	361.25	360.84	358.9
FTAW-6	323,473.792 2,727,088.800	363.85	363.30	360.8
FTAW-6B	323,472.860 2,727,100.420	362.23	362.00	360.7
FTAW-7	323,275.301 2,726,860.780	361.94	361.65	359.7
FTAW-7B	323,265.957 2,726,853.900	362.03	361.12	359.6

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LAND SURVEYOR
31410-E

2. SOIL BORINGS

Number	North/East Coordinates	Ground Elevation
FTAB-5	323,749.3 2,726,812.7	365.8
FTAB-6	323,746.1 2,726,887.3	365.8
FTAB-7	323,740.0 2,726,964.4	364.9
FTAB-8	323,700.9 2,726,797.4	365.1
FTAB-9	323,696.0 2,726,872.2	365.0
FTAB-10	323,673.2 2,726,941.1	364.5
FTAB-11	323,642.5 2,726,886.9	363.9
FTAB-12	323,671.9 2,727,045.1	364.4
FTAB-13	323,641.5 2,726,993.6	363.8
FTAB-14	323,580.1 2,727,079.5	362.4
FTAB-15	323,517.5 2,727,070.0	362.4
FTAB-16	323,582.9 2,726,964.2	363.8

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
Timothy D. Hydrusko
LAND SURVEYOR
31410-E

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 6-34
Ed. Feb. 1941

DESCRIPTION OF BENCH MARK

Designation of bench mark J 188 State Pennsylvania County Bucks
Nearest town Neshaminy County Bucks
Distance and direction from nearest town 0.8 mile north of, along U. S. Highway No. 611
Detailed description of location

0.8 mile north along U. S. Highway No. 611 from the post office at Neshaminy, on the south edge of a cultivated field, at a large billboard, 41 feet east of the center line of the highway, 35 feet southeast of a cast iron power line pole No. 1/05, 2.5 feet south of the center of the billboard, and 1 foot west of a standard reference post. A standard disk, set in the top of a concrete post.

Not Recovered 1952 U.S.G.S. Report

LINE 118

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 6-34
Ed. Feb. 1941

DESCRIPTION OF BENCH MARK

Designation of bench mark K 188 State Pennsylvania County Montgomery
Nearest town Norristown County Montgomery
Distance and direction from nearest town 12.6 miles east of, along the Pennsylvania Railroad
Detailed description of location

12.6 miles east along the Pennsylvania Railroad from the crossing of an electric railroad at Norristown, 0.1 mile west of a water tank and watering station, 94.8 feet east of the northeast corner of a small storage building, 54 feet south of the south rail of the south track, 1.4 feet north of an east-west pasture fence, 2½ feet east of a telephone pole, and 1 foot west of a standard reference post. A standard disk, set in the top of a concrete post.

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 6-34
Ed. Feb. 1941

DESCRIPTION OF BENCH MARK

Designation of bench mark G 188 State Pennsylvania County Montgomery
Nearest town Horsham County Montgomery
Distance and direction from nearest town 0.8 mile south of, along U. S. Highway No. 611
Detailed description of location

0.8 mile south along U. S. Highway No. 611 from the post office at Horsham, in the southeast quarter of the intersection of the highway and a black top road leading northeast, across the highway from a Unity-Frankford Store, 38 feet east of the center line of the highway, 50 feet southeast of the center line of the black top road, 2.4 feet south of a highway signpost, and 1.3 feet north of a standard reference post. A standard disk, set in the top of a concrete post.

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 6-34
Ed. Feb. 1941

DESCRIPTION OF BENCH MARK

Designation of bench mark F 188 State Pennsylvania County Montgomery
Nearest town Horsham County Montgomery
Distance and direction from nearest town At Horsham
Detailed description of location

At Horsham, at Horsham Friends Meeting House, in the northeast corner of the cemetery, 31 feet west of the center line of U. S. Highway No. 611, 2.5 feet south of the iron fence, and 1.7 west of the concrete wall. A standard disk, set in the top of a concrete post, and level with the surface of the ground.

LEVELING AT WILLOW GROVE N.A.S.
FORMERLY PITCAIRN FIELD

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 6-34
Ed. Feb. 1941

DESCRIPTION OF BENCH MARK

Designation of bench mark PITCAIRN A State Pennsylvania County Montgomery
Nearest town Horsham County Montgomery
Distance and direction from nearest town 1.1 miles north of, along U. S. Highway No. 611
Detailed description of location

1.1 miles north along U. S. Highway No. 611 from the post office at Horsham, at the Pitcairn Airport, under the east edge of the water tower, half way between the northeast corner and the southeast corner, 54 feet west of the center line of the highway, and 1 foot east of a standard reference post. A standard disk, set in the top of a concrete post.

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 6-34
Ed. Feb. 1941

DESCRIPTION OF BENCH MARK

Designation of bench mark E 188 State Pennsylvania County Montgomery
Nearest town Neshaminy County Bucks
Distance and direction from nearest town 1.3 miles south of, along U. S. Highway No. 611
Detailed description of location

1.3 miles south along U. S. Highway No. 611 from the post office at Neshaminy, at an intersection of the highway and a black top road leading southwest, in the northeast corner of Pitcairn field, 42 feet west of the center line of the highway, 42 feet southeast of the center line of the black top road, and 1 foot east of a standard reference post. A standard disk, set in the top of a concrete post.

END OF LEVELING AT WILLOW GROVE

LINE 114
(Continued)

BENCH MARK	ADJUSTED ELEVATION (Meters)	(Feet)
D 184	68.256	223.937
E 184	57.766	189.521
F 184	49.805	163.402
G 184	68.120	223.490
H 184	71.744	235.380

LINE 115
(Second-order)

The field work (L-9676) was done in June 1942 by parties supervised by K. B. Jeffers and G. C. Mast.

These elevations are based on a supplementary adjustment of 1943 and should be considered TENTATIVE at this time since additional leveling may require a readjustment.

BENCH MARK	ADJUSTED ELEVATION (Meters)	(Feet)
K 184	60.074	197.093
L 184	DESTROYED	
M 184	71.110	233.300
N 184	99.304	325.800
P 184	145.088	476.010
Q 184	143.111	469.523
R 184	117.108	384.212
T 184	73.871	242.358
U 184	105.964	347.650

LINE 116
(Second-order)

The field work (L-9673) was done in June 1942 by a party supervised by G. C. Mast.

These elevations are based on a supplementary adjustment of 1943 and should be considered TENTATIVE at this time since additional leveling may require a readjustment.

BENCH MARK	ADJUSTED ELEVATION (Meters)	(Feet)
T 189 (PDH)	71.376	234.173
S 189	66.265	217.404

LINE 116
(Continued)

BENCH MARK	ADJUSTED ELEVATION (Meters)	(Feet)
R 189	68.916	226.102
Q 189	64.192	210.603
P 189	56.082	183.996
N 189	52.569	172.470

LINE 117
(Second-order)

The field work (L-9673) was done in June 1942 by a party supervised by G. C. Mast.

These elevations are based on a supplementary adjustment of 1943 and should be considered TENTATIVE at this time since additional leveling may require a readjustment.

BENCH MARK	ADJUSTED ELEVATION (Meters)	(Feet)
V 188	45.502	149.284
U 188	54.896	180.105
T 188	47.806	156.844
S 188	88.973	291.906
R 188	86.028	282.244
Q 188	108.925	357.365
P 188	92.864	304.671
N 188	106.535	349.524
M 188	108.026	354.415
ZIMMERMAN RM 2	129.720	425.590
ZIMMERMAN RM 1	129.284	424.159
ZIMMERMAN	NO ELEV. AVAILABLE	
ZIMMERMAN AZI.	77.619	254.655
L 188 (PHD)	70.270	230.544
K 188	123.276	404.448
J 188	99.593	326.748

LINE 118
(Second-order)

The field work (L-9673) was done in June 1942 by a party supervised by G. C. Mast.

These elevations are based on a supplementary adjustment of 1943 and should be considered TENTATIVE at this time since additional leveling may require a readjustment.

BENCH MARK	ADJUSTED ELEVATION (Meters)	(Feet)
H 188	67.824	222.519
G 188	81.092	266.049
F 188	83.645	274.425

LEVELING AT WILLOW GROVE N.A.S.
FORMERLY PITCAIRN FIELD

PITCAIRN A	112.456	368.949
E 188	93.588	307.047

END OF LEVELING AT WILLOW GROVE

D 188	71.472	234.488
C 188	77.326	253.694
B 188	87.733	287.837
A 188	99.394	326.095
Z 187	80.958	265.610
Y 187	109.693	359.884
X 187	102.714	336.988
W 187	127.372	417.886

LINE 119
(Second-order)

The field work (L-9673) was done in June 1942 by a party supervised by G. C. Mast.

These elevations are based on a supplementary adjustment of 1943 and should be considered TENTATIVE at this time since additional leveling may require a readjustment.

BENCH MARK	ADJUSTED ELEVATION (Meters)	(Feet)
V 187	104.664	343.385
U 187	93.287	306.099
T 187	84.638	277.683
S 187	83.278	273.221
R 187	77.741	255.055
Q 187	79.385	260.449
P 187	87.277	286.341
N 187	91.690	300.820
M 187	103.884	340.826
L 187 RESET (1946)		352.963

LINE 120
(Third-order)

The field work (L-12142) was done in August 1946 by a party supervised by E. L. Jones.

This elevation is based on a supplementary adjustment of 1947.

BENCH MARK	ADJUSTED ELEVATION (Meters)	(Feet)
D 197	91.986	301.791
D 197 RESET (1949)		301.298

[redacted] DE[redacted]ENT [redacted]MMER[redacted]
[redacted]ST [redacted]ODE[redacted] [redacted]RVE[redacted]
WASHINGTON D.C.

[redacted] H[redacted]ZO[redacted]L [redacted]TR[redacted]DA[redacted] [redacted] 400[redacted]TATI[redacted]5 [redacted]

by the
Coast and Geodetic Survey
NORTH AMERICAN 1927 DATUM

LATITUDE 40°00' TO 40°30'
LONGITUDE 75°00' TO 75°30'
DIAGRAM NK 18-11 NEWARK

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
FORM 526
REV. OCT., 1932

DESCRIPTION OF TRIANGULATION STATION

Prospectville,

NAME OF STATION: Tower of Chimes
STATE: Pennsylvania COUNTY: Montgomery
YEAR: 1942 LOCALITY: Prospectville
CHIEF OF PARTY: G.W.L.

Surface-station mark, Note.*
Underground station mark, Note.*
Reference mark, Note.*
Reference mark, Note.*
Azimuth mark, Note.*
Witness mark, Note.*
Height of light above station mark meters.
Height of telescope above station mark meters.†

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND			
OBJECT	DISTANCE	DIRECTION ° ' "	AZIMUTH ° ' "
This is an intersection station.			

Detailed description:

The station is the Tower of Chimes in the White Marsh Memorial Park in the town of Prospectville. The tower is of white sandstone, 175 feet high and has a star at the peak of the tower.

The point observed upon was the star at the peak of the tower.

Form 526
(11-6-35)

U.S. DEPARTMENT OF COMMERCE - COAST AND GEODETIC SURVEY

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: PROSPECTVILLE, TOWER OF CHIMES
ESTABLISHED BY G.W.L. YEAR: 1942 STATE: Penna.
RECOVERED BY * I.Y.F. YEAR: 1959 COUNTY: Montgomery

Detailed statement as to the fitness of the original description, including marks found, stampings, changes made, and other pertinent facts:

Station recovered in good condition. The published description is adequate and complete.

By I.Y.F.

* Name of chief of party should be inserted here. The officer who actually visited the station should sign his name at the end of the recovery note.
Note.—One of these forms must be used for every station recovered.

Comm-DC 34134

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PROSPECTVILLE TOWER OF CHIMES YEAR: 1942,1959

STATE: Pennsylvania LOCALITY: Doylestown, Pa., to Sussex, N.J.

Third -ORDER Triangulation SOURCE: G-5248 G-12125 FIELD SKETCH: Pa. 59

GRID DATA	COORDINATES (Feet)	PLANE AZIMUTH (IOR Δα) ANGLE	MARK
STATE: Pa. ZONE: S CODE: 3702	x 2,715,166.41 y 332,181.51	+ 1 39 42	
STATE: ZONE: CODE:	x y		

GEODETIC DATA	POSITION	SECONDS IN METERS	ELEVATION
	LATITUDE: 40° 13' 00".299 NORTH LONGITUDE: 75 11 19.793 WEST		METERS FEET

TO STATION	GEODETIC AZIMUTH (From south)	DISTANCE (Meters)
	THIRD-ORDER	
CHRISTY	(153°18'57".5)	5,638.22
DOYLESTOWN	(185 19 04.6)	11,962.39
BUCKINGHAM	(228 33 09.8)	16,682.19
WILLOW AZIMUTH MARK	(293 19 07.7)	3,696.32
WILLOW	(295 16 06.1)	3,967.21

FORM 381 (7-23-36)

USCOMM-DC 27548

[redacted] BLI[redacted] ND [redacted]) BY [redacted]
U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY
WASHINGTON D.C.

HORIZONTAL CONTROL DATA

by the
Coast and Geodetic Survey
NORTH AMERICAN 1927 DATUM

QUAD 400752 STATION 1001
PA
LATITUDE 40°00' TO 40°30'
LONGITUDE 75°00' TO 75°30'
DIAGRAM NK 18-11 NEWARK

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 555
Rev. Aug 1948

DESCRIPTION OF ~~TRIANGULATION~~ TRAVERSE STATION

NAME OF STATION: WILLOW STATE: Penna. COUNTY: Bucks

CHIEF OF PARTY: I.Y.F. YEAR: 1959 Described by: L.F.B.

NOTE.* HEIGHT OF TELESCOPE ABOVE STATION MARK METERS.† HEIGHT OF LIGHT ABOVE STATION MARK METERS.

Surface-station mark, Underground-station mark — DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

OBJECT	BEARING	DISTANCE feet	DISTANCE meters	DIRECTION °	'	"
Prospectville, Tower of Chimes, 1942				00	00	00.0
Azimuth Mark		985		24	43	43.9
RM No. 1		50.10	15.272	211	20	35
RM No. 2		35.95	10.958	297	22	22

Detailed descriptions

Station is located about 1.7 miles N of the intersection of Route 611 and 463 in Horsham, at the Willow Grove Naval Air Station; about 300 ft. SW of the control tower, 50.6 ft. W of the SE corner of concrete parking apron and 6.1 ft. SW of the SW edge of the apron. Station surface and underground marks are standard traverse station disk stamped WILLOW 1959. Station surface mark is set in the top of an irregular mass of concrete, flush with the ground.

Reference mark No. 1 is SE of the station, 10.6 ft. SW of the SE corner of the concrete apron. A standard reference mark disk stamped WILLOW NO. 1 1959 set in the top of an irregular mass of concrete, flush with the ground.

Reference mark No. 2 is SW of the station and 42.0 ft. SW of the SW edge of the concrete apron. A standard reference mark disk stamped WILLOW NO. 2 1959 set in the top of an irregular mass of concrete, flush with the ground.

The Azimuth mark is NW of the station, 35.5 ft. SW of the SW edge of the concrete apron and 114 ft. NW of the prolongation of the NW edge of a taxi strip. A standard reference mark disk stamped WILLOW 1959 AZ MK set in the top of an irregular mass of concrete, flush with the ground.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: WILLOW YEAR: 1959

STATE: Pennsylvania LOCALITY: Willow Grove and Johnsville N.A.D.C.

Third -ORDER Triangulation & Traverse SOURCE: G-12125 FIELD SKETCH:

GRID DATA	COORDINATES (Feet)	PLANE AZIMUTH θ (or dα) ANGLE	MARK
STATE: Pa. ZONE: S CODE: 3702	x 2,727,092.56 y 326,969.41	138°20'08" + 1 41 20	AZIMUTH MARK
STATE: ZONE: CODE:	x y		

GEODETIC DATA	POSITION	SECONDS IN METERS	ELEVATION
	LATITUDE: 40° 12' 05".367 NORTH; LONGITUDE: 75 08 48.105 WEST		METERS FEET

TO STATION	GEODETIC AZIMUTH (From south)	DISTANCE (Meters)
	THIRD-ORDER	
PROSPECTVILLE TOWER OF CHIMES	115°17'44".0	3,907.21
WILLOW AZIMUTH MARK	140 01 28	300.60
TACAN WILLOW GROVE NAVAL AIR STATION	359 18 53.5	737.01

*Geodimeter length, 300.59

FORM 551 (7-23-56)

10-22-91 WILLOW GROVE AIR STATION

BENCH RUN

STA	+	HI	−	ELEV.	DESC.
	5.900	374.849		368.949	USC&G DISC. PITCAIRN A
TP 1			7.255	367.594	
	2.820	370.414			
TP 2			3.850	366.564	
	1.230	367.794			
TP 3			9.070	358.724	
	0.280	359.004			
TP 4			10.345	348.659	
	6.500	355.159			
TP 5			7.025	348.134	
	4.875	353.009			
TP 6			4.870	348.139	
	2.770	350.909			
TP 7			6.850	344.059	
	2.935	346.994			
TP 8			11.500	335.494	
	0.305	335.799			
TP 9			9.145	326.654	
	0.315	326.969			
TP 10			4.490	322.479	
	16.350	338.829			
TP 11			0.465	338.364	
	9.395	347.759			

D. CATTARIN
M. BAKER

JOB # 91-10-929

FIELD BOOK BE-31

TEMP 55°

SUNNY, CLEAR

INSTR. WILD NAK-1

SERIAL No. 494181

BAROMETER 30.0

2

D. CATTARIN
M. BAKER

JOB # ~~87-10-291~~ 91-10-929

10-22-91 WILLOW GROVE AIR STATION

STA	+	HI 347.759	−	ELEV.	DESC
TP 12			3.865	343.894	TBM
	6.005	349.899			
TP 13			1.710	348.189	
	8.790	356.979			
TP 14			1.685	355.294	
	7.780	363.074			
TP 15			0.835	362.239	TBM
	11.105	373.344			
TP 16			5.880	367.464	
	0.310	367.774			
TP 17			15.825	351.949	
	2.235	354.184			
TP 18			7.115	347.069	TBM
	6.915	353.984			
TP 19			2.035	351.949	
	15.815	367.764			
TP 20			0.300	367.464	
	6.475	373.939			
TP 21			11.690	362.249	
	0.860	363.109			
TP 22			7.805	355.304	
	1.700	357.004			
TP 23			8.805	348.199	
	1.770	349.969			

10-22-91 WILLOW GROVE AIR STATION

STA	+	349.969 HI	−	ELEV.	DESC.
TP 24			6.055	343.914	
	4.255	348.169			
TP 25			9.775	338.394	TP 11
	0.280	338.674			
TP 26			16.170	322.504	
	5.135	327.639			
TP 27			0.970	326.669	
	9.220	335.889			
TP 28			0.380	335.509	
	11.800	347.309			
TP 29			3.240	344.069	
	7.730	351.799			
TP 30			3.660	348.139	
	4.740	352.879			
TP 31			4.750	348.129	
	7.245	355.374			
TP 32			6.720	348.654	
	10.935	359.589			
TP 33			0.870	358.719	
	9.910	368.629			
TP 34			2.075	366.554	
	4.070	370.624			
TP 35			3.045	367.579	
	7.615	375.194			
BM			6.250	368.944	

D. CATTARIN
M. BAKER

91-10-929
TID # ~~87-10-291~~

D. CATARIN
M. BAKER

91-10-929
JOB # ~~87-10-891~~

10-22-91 WILLOW GROVE AIR STATION

STA	+	HI	−	ELEV.	DESC.	
Bm	0.58	320.05		319.47	TOP YELLOW	F. HYD OPPOSITE MINI MART SEE PG 60 TP #9
TP 1			9.57	310.48	TOP CURB	
	4.25	314.73				
			5.21	309.52	—	
			6.07	308.66	T. H.W. (TP 11 S.B.)	
			6.08	308.65	" " "	
TP 2			6.08	308.65	TOP H.W. @	
	6.01	314.66				
TP 3			4.19	310.47		
	9.74	320.21				
Bm			0.75	319.46	T. F. HYD	

STA	+	HI	−	ELEV.	DESC.	
Bm	0.14	319.61		319.47	TOP YELLOW	F. HYD. OPPOSITE MINI MART
TP 1	4.42	315.93	8.10	311.~~51~~ 52	PK 11	
TP 2	4.37	314.02	6.28	309.~~65~~ 66	PK 12	
TP 3	7.86	316.47	5.41	308.~~61~~ 63	TOP H.W.	
TP 4	8.32	319.82	4.97	311.~~50~~ 52		
Bm			0.38	319.~~44~~ 47	TOP YELLOW	F. HYD. OPPOSITE MINI MART

5

10-23-91 WILLOW GROVE AIR STATION

TEMP 65°

SUNNY CLEAR

INSTR. LEITZ SET 3

SERIAL NO# 83480

BAROMETER 30.04

D. CATTARIN
M. BAKER

JOB # ~~87-10-291~~ 91-10-929

HORIZ CONTROL CHECK

INST. STA	BS	FS
13	2	CHIMES TOWER

D 1. 304° 08' 28"

R 2. 124° 08' 28"

INSTR. STA	BS	FS
15	2	CHIMES TOWER

1 D 276° 27' 17"

2 R 96° 27' 17"

∡ @ WILLOW BS @ CHIMES TOWER

STA	HORIZ ∡	HORIZ DIST
IP 13	1D. 247° 53' 26"	3278.02'
	2R 67° 53' 29"	
IP 15	1D. 277° 40' 11"	3196.78'
	2R. 97° 40' 13"	
IP 17	1D. 302° 50' 24"	2080.76'
	2R. 122° 50' 28"	

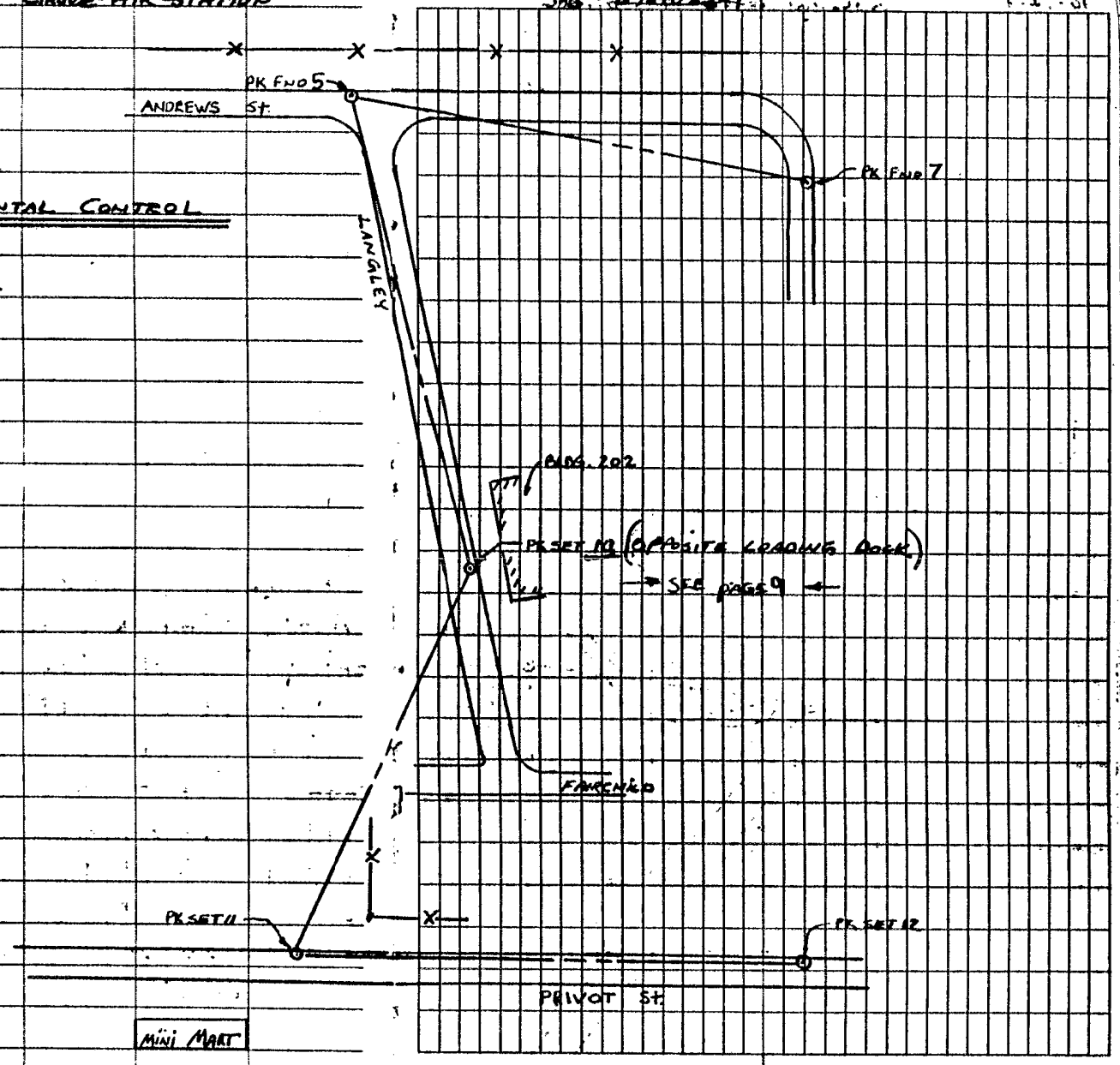
6

10-24-91 WILLOW GROVE AIR STATION

O. CATTARIN
M. BAKER

JOB # 91-10-929

HORIZONTAL CONTROL



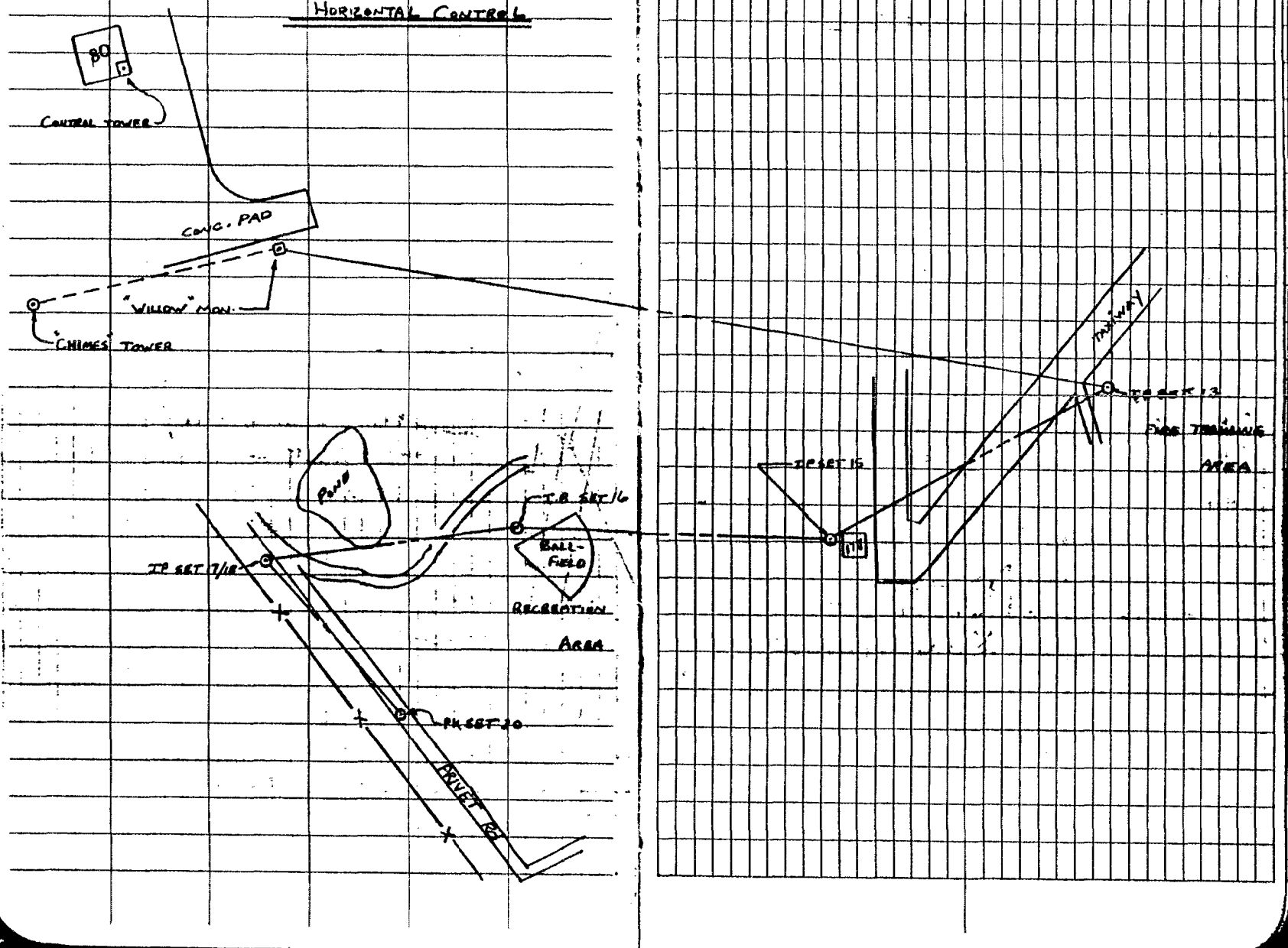
9

10-24-91 WILLOW GROVE NAS STATION

D. CATTARIN
M. BAKER

JOB # 91-10-929

HORIZONTAL CONTROL



8

10-24-91 WILLOW GROVE AIR STATION

WELL ELEVATIONS

STA	+	HI	−	ELEV.	DESC.
Bm	6.29	315.95		309.66	PK 12
PRW-4B			4.8	311.2	GND
"			2.35	313.60	T. PIPE
"			2.68	313.27	T. PVC
PRW-5B			4.6	311.4	GND.
"			2.71	313.24	T. PIPE
"			2.92	313.03	T. PVC
PRW-5			4.9	311.1	GND
"			2.84	313.11	T. PIPE
"			3.34	312.61	T. PVC
Bm			6.29	309.66	PK 12

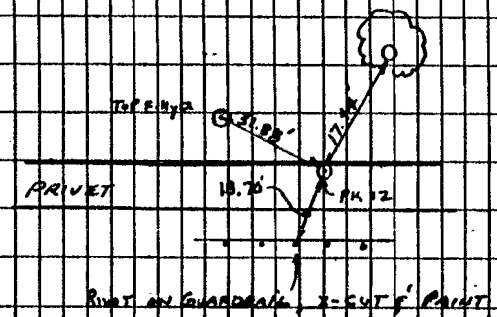
ELEVATIONS: TOP PIPE WITH CAP OFF

TOP OF PVC PIPE AT "NOTCH"

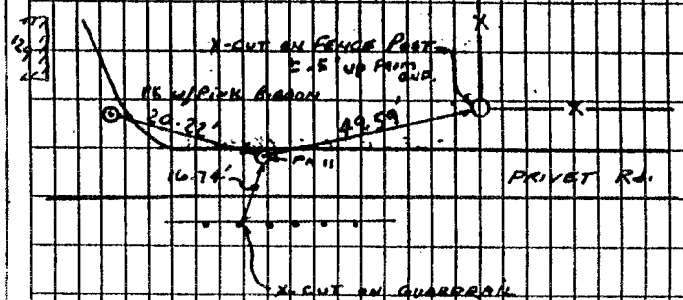
D. CATTARIN
M. BAKER
JOB # 91-10-929

CONTROL REFERENCES

PG 4



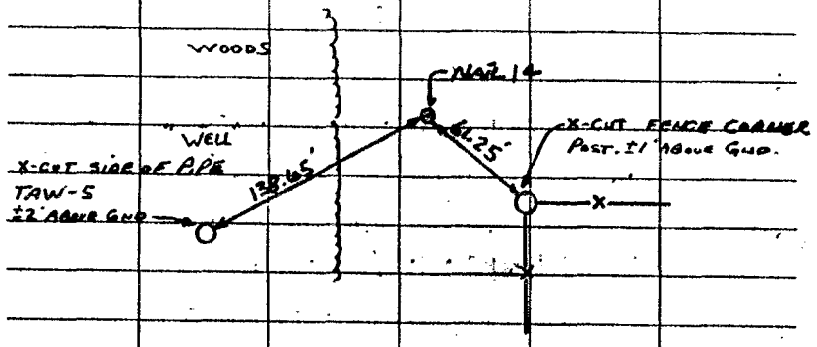
PK 12



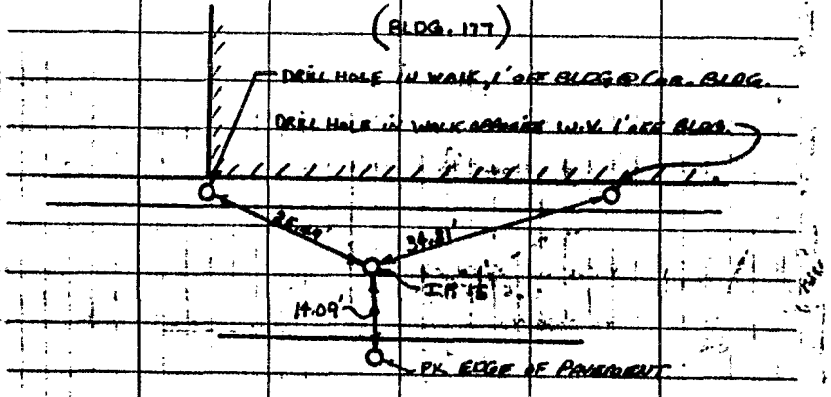
PK 11

10-24-91 WILLOW GROVE AIR STATION

CONTROL REFERENCES



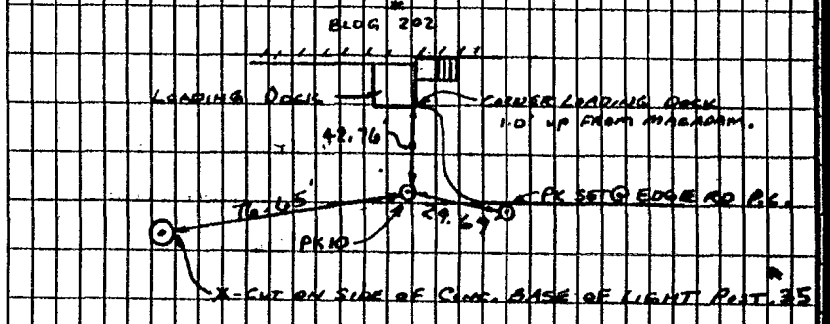
NAIL 14



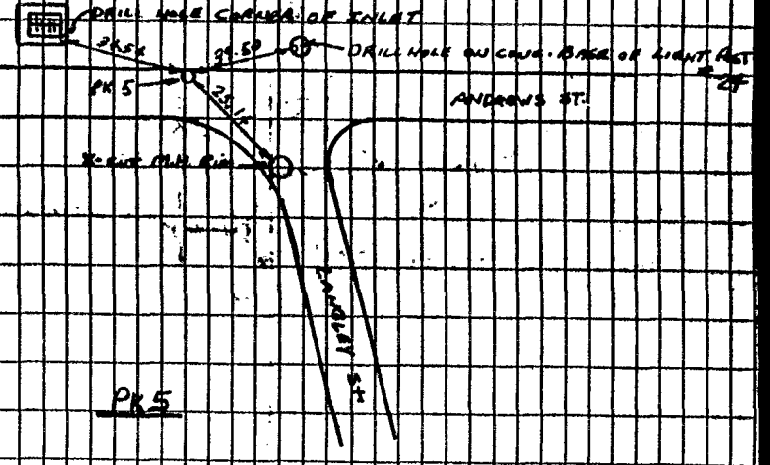
IP 15

D. CATTARIN
M. BAKER

JOB # 91-10-929
(B1-10-291)



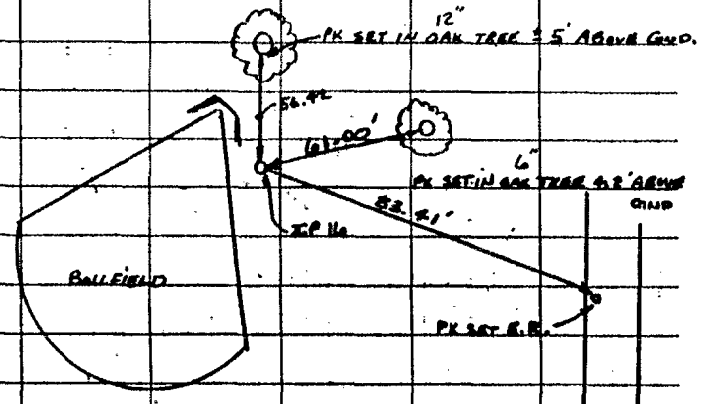
PK 10



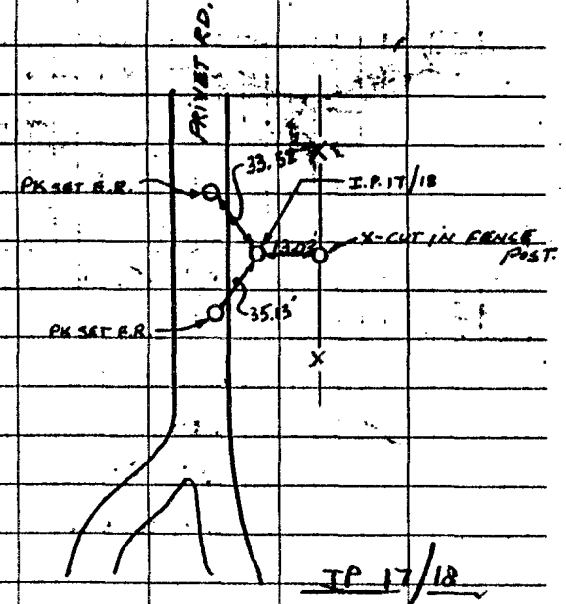
PK 5

10

10-24-91 WILLOW GROVE AIR STATION



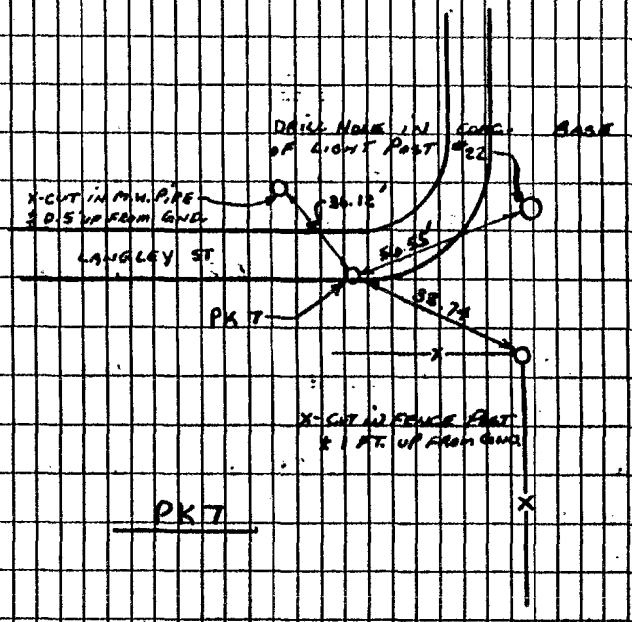
IP 16



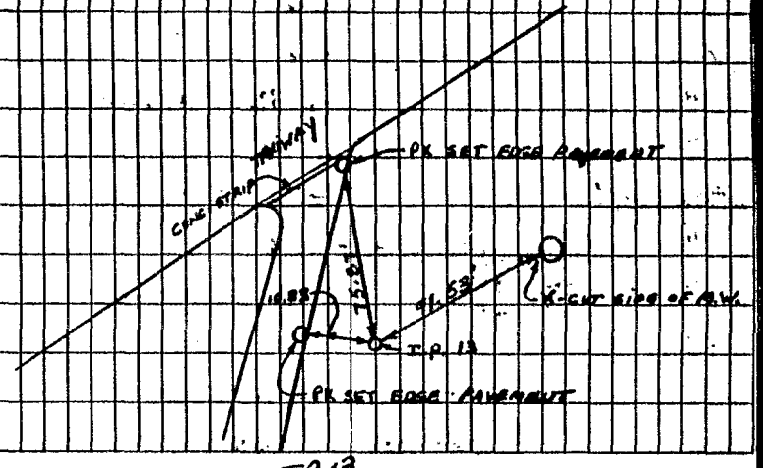
IP 17/18

D. CATTARIN
M. BAKER

JOB # ~~97-10-29~~ 91-10-929



PK 7



IP 13

11

9-24-91 WILLOW GROVE AIR STATION

D. CATTARIN
M. BAKER

Job # ~~91-10-291~~ 91-10-929

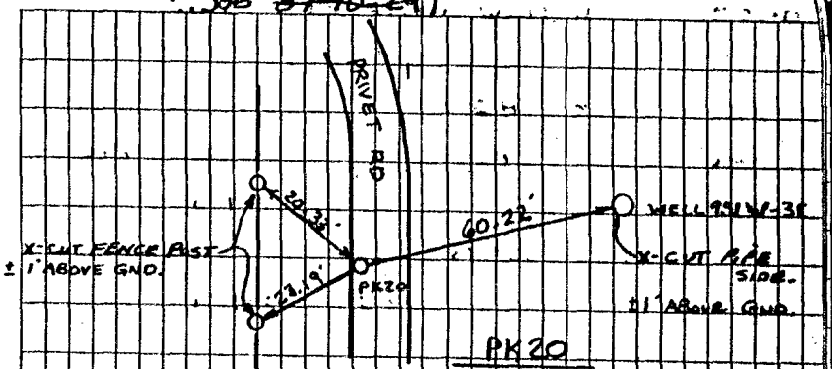
BENCH RUN

STA	+	HI	−	ELEV.	DESC
Bm	2.02	311.67		309.65	PK 12
TP1	15.02	311.48	15.21	296.46	PK "A"
Bm			1.84	309.64	PK 12

WELL ELEVATIONS

STA	+	HI	−	ELEV.	DESC
Bm	4.61	301.07		296.46	PK "A"
PRW-6B			4.6	[illegible]	GND
"			2.79	[illegible]	T.PIPE
"			3.22	[illegible]	T PVC
PRW-6			5.3	[illegible]	GND
"			2.46	[illegible]	T.PIPE
"			3.00	[illegible]	T.PVC
PRW-7			4.8	[illegible]	GND
"			2.32	[illegible]	T.PIPE
"			2.77	[illegible]	T.PVC
PRW-7B			4.9	[illegible]	GND
"			3.36	[illegible]	T.PIPE
"			3.87	[illegible]	T.PVC.
Bm			4.61	296.46	PK "A"

ELEVATIONS: TOP PIPE WITH CAP OFF
TOP PVC AT "NOTCH"



PK 20

CONTROL REFERENCES — PK 20

61)

87-10-291
NAVEL BASE
DAMES + MOORE

STA	+	Hi	-	ELEV.	
TP 11			9.09	308.64	
	3.37	312.01			
TP 12			10.85	301.16	
	1.71	302.87			
TP 13			10.20	292.67	
	2.43	295.10			
TP 14			7.36	287.74	
	0.47	288.21			
TP 15			8.26	279.95	
	2.03	281.98			
TP 16			7.55	274.43	
	7.42	281.85			
			4.47	277.38	
TP 15			1.90	279.95	279.95
	8.38	288.33			
" 14			0.59	287.74	287.74
	8.06	295.80			
" 13			3.14	292.66	292.67
	9.30	301.96			
" 12			0.81	301.15	301.16
	11.04	312.19			
" 11			3.57	308.62	308.64
	9.27	317.89			

9-14-87

REMARKS

T. CULVERT. PRIVOT + Johnson

WATER. VALVE JOHNSON ST.

CORNER CONC PAD MC GUIRE AV. + EGLINAW.

YELLOW F.H. LANGLEY ST. OPP. ENG. T&R. SHOP.

TOP CONC. CULVERT HEADWALL LANGLEY ST. CHIZEL-MARK HEADWALL
OPP GATE ①

PK. "B" LANGLEY ST. + ANDREWS ST.

PK "C" LANGLEY ST.
HEADWALL (CHIZEL-MARK)

YELLOW F.H

CONC PAD. MC GUIRE AV

WATER VALVE

T. CULVERT. PRIVOT RD + JOHNSON. CHIZEL MARK

62

87-10-291
NAVEL BASE
DAMES + MOORE

STA	+	Hi	-	ELEV.		
		317.89				
TP 10			3.85	314.04	314.05	
	15.27	329.31				
" 9			9.84	319.47	319.47	
" 8			2.83	326.48	326.49	
	13.00	339.48				
" 7			4.87	334.61	334.60	
	6.56	341.17				
" 6			3.79	337.38	337.38	
	9.87	347.25				
" 5			1.21	346.04	346.05	
	6.30	352.34				
" 4			4.00	348.34	348.34	
	6.18	354.52				
" 3			3.62	350.90	350.91	
	9.30	360.20				
" 2			0.37	359.83	359.85	
	6.97	366.80				
" 1			0.59	366.21	366.23	
	7.08	373.291				
N.G.V.D. B.M.			4.36	368.93	368.95	

9-14-87

RAM.

MARK opp. DUMPSTER

F.H. opp. MINI MART

MARK ON RD.

T. FH opp. CONSTRU.

MARK ON RD.

WOOD ELEC. POST.

MARK ON RD

MARK ON RD

M.H.

TOP.
RED + SILVER F.H.

B.M. CHECK CONC MON (PITCAIRN)

63)

NAVEL BASE
DAMES + MOORE

GUN ON PK "B" SITED PK "C"
TURN TO DM-7 * RIGHT
SINGLE = 108° 20' 13" R DIST. = 279.23'
DOUBLE = 216° 40' 32" R DIST. = 279.22'

GUN ON PK "B" SITED PK "C"
TURN TO DM-6 * RIGHT
SINGLE 341° 43' 25 R DIST. = 218.08'
DOUBLE 683° 26' 47" DIST. = 218.08'

GUN ON PK "B" SITED "PK" D
TURN TO DM-5 * RIGHT
SINGLE 7° 44' 49" R DISTANCE = 240.45'
DOUBLE 15° 29' 44" R DISTANCE = 240.44'

GUN ON PK "B" SITED PK "D"
TURN TO DM-8 * RIGHT
SINGLE 4° 52' 12" R DIST 242.15'
DOUBLE 9° 44' 23" R DIST. 242.15'

GUN ON PK "B" SITED PK "D"
TURN TO DM-4 * RIGHT
SINGLE 1° 32' 47" R DIST. 426.93'
DOUBLE 3° 05' 29" R DIST 426.89'

9-15-87

13

WELL LOCATION

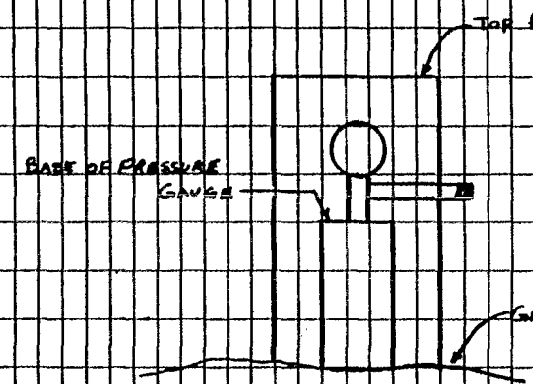
D. CATTARIN
M. BAKER

Job# 87-10-291

10-25-91 WILLOW GROVE AIR STATION

WELL ELEVATIONS

STA	+	HI	−	ELEV.	DESC.
Bm	0.79	347.86		347.07	TP 18 "PK"
95LW-1C			1.7	[illegible]	GND
"			0.09	[illegible]	T.PIPE
"			0.37	347.49	T PVC
TP 1	1.20	341.95	7.11	340.75	
TP 2	2.03	328.02	15.96	325.99	
TP 3	5.14	328.01	5.15	322.87	
TP 4	3.03	327.42	3.62	324.39	TP 17/18
TP 5	0.35	320.08	7.69	319.73	
TP 6	6.69	316.86	9.91	310.17	
95LW-3C			3.9	313.0	GND
"			0.91	315.95	T.PIPE
"			1.86	[illegible]	BASE
TP 7	10.95	326.71	1.10	315.76	
95LW-4C			3.7	[illegible]	GND
"			1.12	[illegible]	T.PIPE
"			1.86	[illegible]	BASE
TP 8	5.05	330.79	0.97	325.74	
TP 9	15.15	344.80	1.14	329.65	
TP 10	11.63	356.05	0.38	344.42	
Bm			4.08	351.97	TP 17 "PK"
					(EL = 351.95)



ELEVATIONS AT WELLS 95LW-3C, 95LW-4C

10-25-91 WILLOW GROVE AIR STATION

WELL ELEVATIONS

STA	+	HI	−	ELEV.	DESC.
Bm	12.36	364.31		351.95	TP17 "PK"
95LW-5			4.4	359.9	GND
"			1.10	363.21	T.PIPE
"			1.41	362.90	T. PVC
Bm			12.36	351.95	TP17 "PK"

D. CATTARIN
M. BAKER

11-[redacted] WILLOW GROVE AIR STATION [redacted] 87[redacted]91 [redacted] BUCK[redacted]K 3[redacted]

LOCATION WELL 2B

STA	+	HI	−	ELEV.	DESC. Pg 4 TP 2
BM	1.75	311.40		309.65	PK 12
PRW-2B			9.1	302.30	GND.
"			7.54	303.86	T.P.PB
"			7.73	303.67	T. PVC AT "NOTCH"
BM			1.75	309.65	PK 12

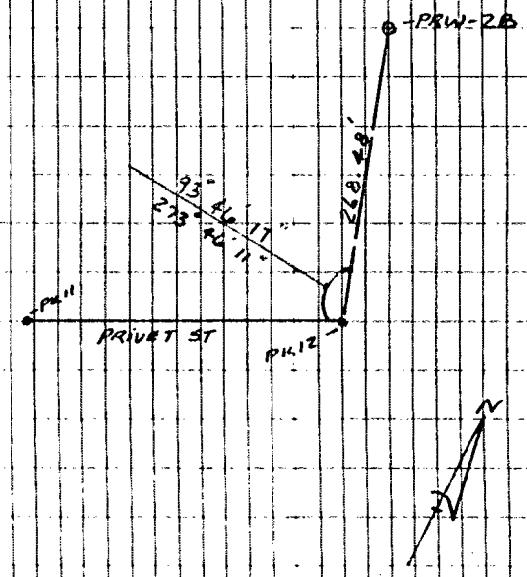
TEMP 42°

CLOUDY, DRIZZLE, INTERMITTENT RAIN

BAR 29.86

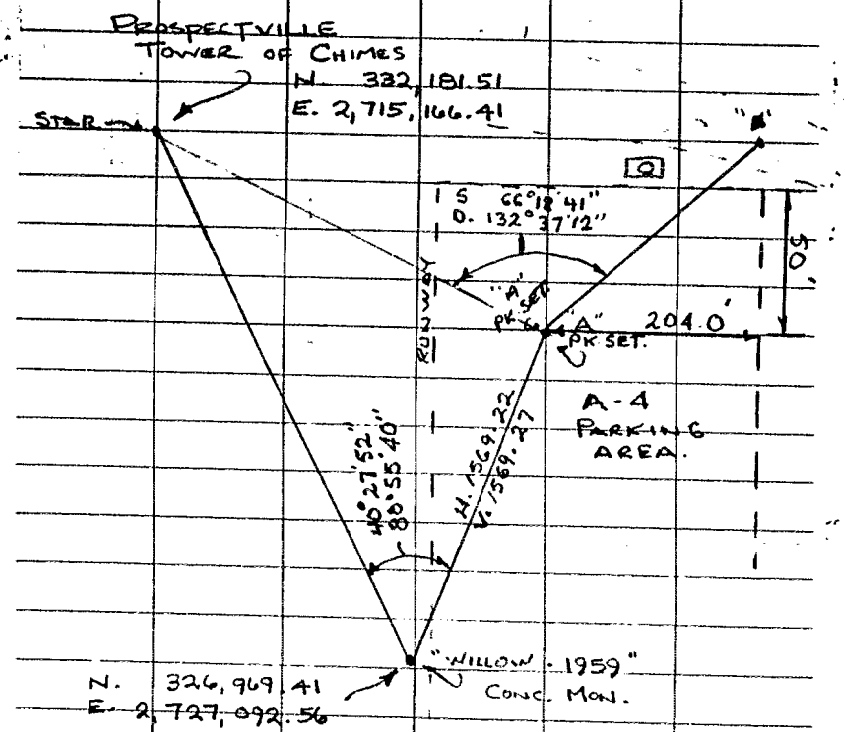
LEVEL WILD NAK-1 # 474181

EDM LEITZ SET 3 # 83480



WILLOW GROVE NAVEL BASE
DAMES + MOORE
TRAVERSE

SEE PG 57 FOR
REVISED TRAVERSE.
ON A COULD NOT SEE
WILLOW DO TO PLANE



FIELD BOOK MC 7

8-31-87

Temp. 72° PPM +5

VERT CONTR	REVERSE VERT.
90°25'13"	269°34'40

WILLOW TO PT "A"

SLOPE DISTANCE	HORZ DIST.
1569.27	1569.22
1569.27	1569.23
1569.27 R.V.	1569.22
1569.27 R.V.	

SINGLE: 40°27'52"
DOUBLE: 80°55'40"

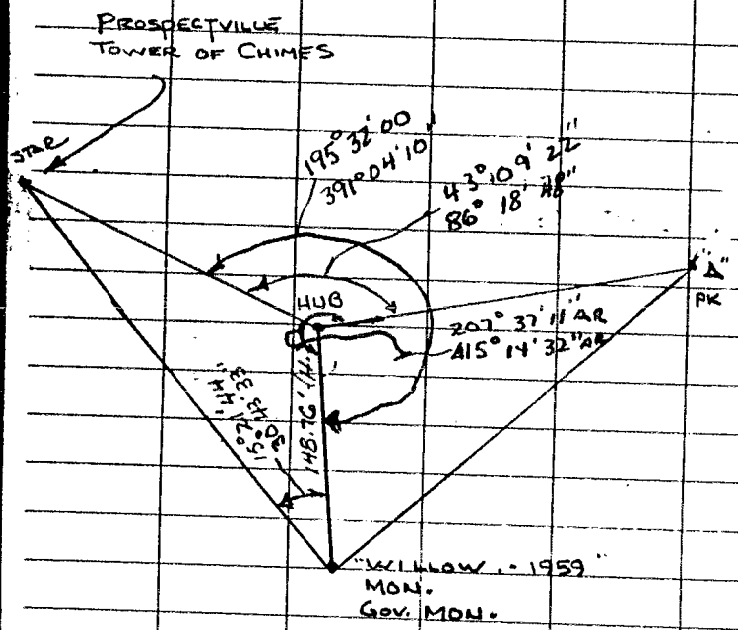
PT "A" TO "B"

VERT CONTROLL	REVERSE VERT
91°06'08	268°53'47'

SLOPE	HORZ
2548.51	2548.04
2548.51	2548.04
2548.51	2548.04

57)

NAVEL BASE
WILLOW GROVE
DAMES + MOORE
TRAVERSE



8-31-87

	DISTANCE
WILLOW TO HUB	148.76
HUB TO "A"	

VERT CON.	REVERSE V.
90° 21' 03	269° 38' 57

SLOPE	HORZ.
1435.92	1435.89
1435.92	1435.90
1435.92	1435.89

HORZ ANGLE: 207° 37' 11" AR

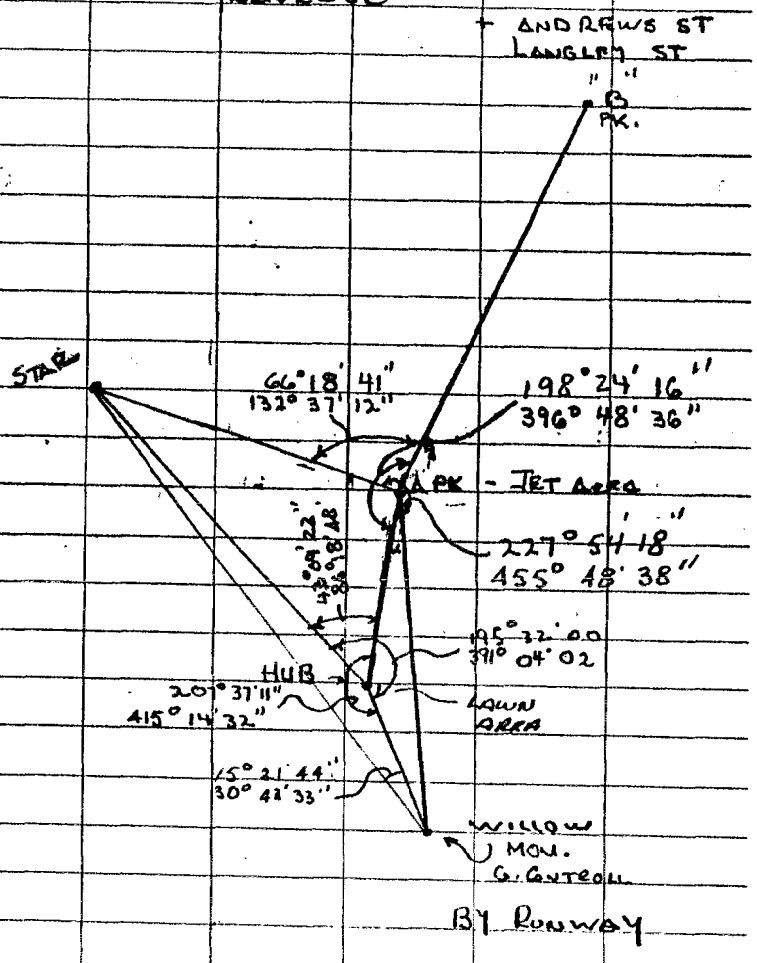
DOUBLE: 415° 14' 32" AR

360
55 14 32
415 14 32

BB
G.V.

58)

NAVEL BASE
WILLOW GROVE
DAMES + MOORE
TRAVERSE



8-31-87

WILLOW TO A

S 207° 37' 11" AR } GUN ON
D 415° 14 32 AR } HUB

S STAR TO WILLOW

S 195° 32' 00" AR } GUN ON
D 391° 04' 10" AR } HUB

STAR TO "A"

S. 43° 09' 22" AR } GUN ON
D. 86° 18' 48" AR } HUB

STAR TO HUB

S. 15° 21' 44" AR } GUN ON
D. 30° 43' 33" AR } WILLOW

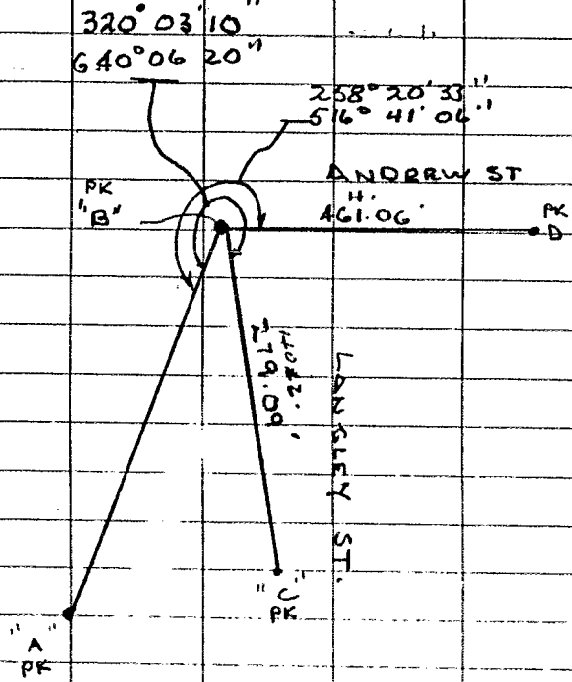
HUB

"A" TO "B" SET ON "A" SITED HUB THEN TO "B"

S. 198° 24' 17 AR } GUN ON
D 396° 48' 32" AR } "A"

STAR TO HUB } GUN
227° 54' 18" AR } ON
455° 48' 38" AR } A

NAVEL AIR BASE
DAMES + MOORE
TRAVERSE



8-31-87

"A" TO C
S 320° 03' 10" ∠R } GUN ON "B"
D 640° 06' 20 ∠R

SLOPE 279.11 HORZ 279.11
279.11 279.09

A TO D } GUN ON "B"
S. 258° 20' 33" AR.
D. 516° 41' 06" AR.

SLOPE. 461.11 HORZ. 461.06
461.08 461.06
461.09 461.06

87-10-291

NAVEL BASE

DAMES + MOORE

BENCH LEVEL RUN

9-14-87

STA	BS	HI	FS	ELEV.	REMARKS
N.G.V.D. B.M.	4.10	373.05		368.95	B.M. PITCAIRN "A" CONC. MON. UNDER TOWER
TP 1			6.82	366.23	TOP. RED + SILVER F.H.
	0.54	366.77			
TP 2			6.92	359.85	M.H. AT CURVE OF RD. END OF RUNWAY STORM SEWER
	0.75	360.60			
TP 3			9.69	35091	MARK ON RD.
	3.64	354.55			
TP 4			6.21	348.34	MARK ON RD
	3.37	351.71			
TP 5			5.66	346.05	WOOD ELEC. POST OPP. BLDG. HOME OF V.P. GC
	1.32	347.37			
TP 6			9.99	337.38	MARK ON RD
	3.69	341.07			
TP 7			6.47	334 60	TOP YELLOW F.H. BY NEW CONSTRUCTION
	4 67	339.27			
TP 8			12.79	326.48	MARK ON RD.
	0 83	327.31			
TP 9			7 84	319.47	TOP YELLOW F.H. OPP. MINI MART
	2 13	321.60			
TP 10			7 55	314.05	MARK IN RD OPP. DUMPSTER
	3 68	317 73			
TP 11			9.09	308.64	TOP CONC. HEADWALL CULVERT AT PIVOT RD + JOHNSON ST.

12

D. CATTACIN
M. BAKER

10-25-91 WILLOW GROVE AIR STATION

BENCH RUN

STA	+	HI	−	ELEV	Desc "PK"
Bm	6.00	349.89		343.89	TP 12 pg 2.
TP 1			0.32	349.57	
	10.41	359.98			
TP 2			0.81	359.17	
	5.64	364.81			
TP 3			5.17	359.64	NAIL 14
	5.08	364.72			
TP 4			5.08	359.64	
	4.92	364.56			
TP 5			4.08	360.48	
	6.13	366.61			
TP 6			3.30	363.31	
	6.03	369.34			
TP 7			4.38	364.96	TP 13
	3.37	368.33			
TP 8			6.75	361.58	
	3.32	364.90			
TP 9			5.72	359.18	
	0.57	359.75			
TP 10			10.15	349.60	
	0.67	350.27			
Bm			6.35	343.92	TP 12 "PK"

50° TEMP

FOG

BAROMETER 29.95

D CATTARIN
M. BAKER

WELL ELEVATIONS

13 STA	+	HI	−	ELEV.	DESC.
10-25-91	6.00	349.89		343.89	TP 12
TP1	10.41	359.98	0.32	349.57	
TP2	5.64	364.81	0.81	359.17	
TP3	5.08	364.72	5.17	359.64	
FTAW-7			5.0	359.7	GND
"			2.78	361.94	T. PIPE
"			3.07	361.65	T. PVC
FTAW-7B			5.1	359.6	GND
"			2.69	362.03	T. PIPE
"			3.60	361.12	T. PVC
TP4	4.92	364.56	5.08	359.64	
FTAW-5			5.7	358.7	GND
"			3.31	361.25	T. PIPE
"			3.72	360.84	T. PVC
TP5	6.13	366.61	4.08	360.48	
FTAW-1B			3.2	363.[illegible]	GND
"			1.67	[illegible]	T. PIPE
"			2.05	[illegible]	T. PVC
TP 6	6.03	369.34	3.30	363.31	
TP 7	3.37	368.33	4.38	364.96	
FTAW-6			7.5	[illegible]	GND
"			4.48	[illegible]	T. PIPE
"			5.03	[illegible]	T. PVC
FTAW-6B			7.6	[illegible]	GND
"			6.10	[illegible]	T. PIPE
"			6.33	[illegible]	T. PVC

D. CATTARIN
M. BAKER

10-25-91

WILLOW GROVE AIR STATION

WELL ELEVATIONS CONT'D.

STA	+	HI (368.33)	−	ELEV	DESC.
TP 8			6.75	361.58	
	3.32	364.90			
TP 9			5.72	359.18	
	0.57	359.75			
TP 10			10.15	349.60	
	0.67	350.27			
BM			6.35	343.92	TP 12

15

D. CATTARIN
M. BAKER

Job# ~~87-10-291~~ 91-10-929

10-25-91 WILLOW GROVE AIR STATION

STA	+	HI	−	ELEV.	DESC
BM	0.79	347.86		347.07	TP 18 "PK"
TP 1			7.11	340.75	IP 16
	1.20	341.95			
TP 2			15.96	325.99	
	2.03	328.02			
TP 3			5.15	322.87	
	5.14	328.01			
TP 4			3.62	324.39	IP 17/18
	3.03	327.42			
TP 5			7.69	319.73	
	0.35	320.08			
TP 6			9.91	310.17	
	6.69	316.86			
TP 7			1.10	315.76	
	10.95	326.71			
TP 8			0.97	325.74	
	5.05	330.79			
TP 9			1.14	329.65	
	15.15	344.80			
TP 10			0.38	344.42	
	11.63	356.05			
BM			4.08	351.97	TP 17 "PK"
					(EL=351.95)

NAVEL BASE
DAMES + MOORE

9-15-87

GUN ON PK "B" SITED PK "D"
TURN TO DM-3 & RIGHT
SINGLE = 352° 46' 40" DIST = 463.33'
DOUBLE = 705° 33' 20" DIST. = 463.32'

GUN ON PK "C" SITED PK "B"
TURN TO DM-10 & RIGHT
SINGLE 201° 47' 32" DIST 226.79'
DOUBLE 403° 35' 55" DIST. 226.79'

GUN ON PK "C" SITED PK "B"
TURN TO DM-9 & RIGHT
SINGLE 200° 7' 48" DIST 239.26'
DOUBLE 400° 35' 40" DIST 239.25'

GUN ON PK "D" SITED PK "B"
TURN TO DM-1 & RIGHT
SINGLE 205° 40' 11" DIST. 217.86'
DOUBLE 411° 20' 20" DIST. 217.85'

GUN ON PK "D" SITED PK "B"
TURN TO DM-2 & RIGHT
SINGLE 207° 33' 18" DIST. 210.42'
DOUBLE 415° 06' 34" DIST. 210.39'

13

WELL LOCATION

65)

NAVEL BASE
DAMES + MOORE

GUN ON PK "D" SITED PK "B"
TURN TO DM - 13 & RIGHT
SINGLE 188° 05' 28" DIST. 310.12'
DOUBLE 276° 10' 54" DIST. 310.11'

GUN ON PK "D" SITED PK B"
TURN TO DM-12 & RIGHT
SINGLE 51° 28' 16" DIST. 527.34'
DOUBLE 102° 56' 34" DIST. 527.33'

GUN ON PK "B" SITED PK "C"
TURN TO DM-11 & RIGHT
SINGLE 183° 53' 44' DIST. 248.88'
DOUBLE 367° 47' 28" DIST. 248.88'

9-15-87

13

WELL LOCATION

66)

DAMES + MOORE
NAVEL BASE

GUN ON PK- "D" SITED PK "B"
TURN TO B-4 & RIGHT
SINGLE 188° 22' 01" DIST. 106.56'
DOUBLE 376° 44' 01" DIST. 106.56

GUN ON PK "D" SITED PK "B"
TURN TO B-3 & RIGHT
SINGLE 237° 27' 36" DIST. 90.66'
DOUBLE 474° 55' 16" DIST. 90.65

GUN ON PK "D" SITED PK "B"
TURN TO B-1 & RIGHT
SINGLE 1° 52' 23" DIST 365.91'
DOUBLE 3° 44' 42" DIST 365.91'

GUN ON PK B SITED PK 'C'
TURN TO B-2 & RIGHT
SINGLE 352° 09' 04" DIST. 377.72'
DOUBLE 704° 18' 07" DIST. 377.71'

9-15-87

NO PIPE

(4)

BORING LOCATIONS

NO PIPE

PVC PIPE.

PVC. PIPE

SDR2 V02-08S(3)	Serial #: 04-Jun-00 10:24		
	Angle: Degrees	Dist : US Feet	Press : inch Hg
	Temp : Fahrenheit	Coord : N-E-H	H.ang : Right
JOB	Job ID WILLOW		
NOTE	DC MB		
NOTE	87-10-291		
SCALE	S.F. 1.00000000		
NOTE	Sea level crn:N		
NOTE	C and R crn : N		
NOTE	Atmos crn : N		
INSTRUMENT			
POS KI 0001	N 332181.510	E 2715166.41	H
	Desc CHIMES		
POS KI 0002	N 326969.410	E 2727092.56	H
	Desc WILLOW		
POS KI 0003	N 328380.610	E 2726406.44	H
	Desc		
POS KI 0004	N 327062.960	E 2726976.91	H
	Desc		
POS KI 0005	N 330918.810	E 2726184.15	H
	Desc		
POS KI 0006	N 332180.660	E 2715169.59	H
	Desc		
POS KI 0007	N 331051.010	E 2726625.85	H
	Desc		
STN TV 0005	N 330918.810	E 2726184.15	H
	HI	Desc PK	
ATMOS	Press 30.00	Temp 45.0	
OBS F1 0005-0007	Dist 461.150	V.ang 89 21'58"	H.ang 359 59'59"
	Desc PK		
OBS F1 0005-0010	Dist 1135.240	V.ang 89 20'09"	H.ang 65 20'14"
	Desc PK		
OBS F2 0005-0010	Dist 1135.230	V.ang 270 39'40"	H.ang 245 20'12"
	Desc PK		
OBS F2 0005-0007	Dist 461.160	V.ang 270 37'43"	H.ang 180 00'04"
	Desc PK		
SET TV 0005	Count 002		
OBS MC 0005-0007	Dist 461.155	V.ang 89 22'07"	H.ang 73 20'16"
	Desc PK		
OBS MC 0005-0010	Dist 1135.235	V.ang 89 20'14"	H.ang 138 40'27"
	Desc PK		
POS TV 0010	N 330066.343	E 2726933.74	H
	Desc PK		
BKB TV 0005-0007	Azm 73 20'16"	H.ang 0 00'04"	
STN TV 0010	N 330066.343	E 2726933.74	H
	HI	Desc PK	
OBS F1 0010-0005	Dist 1135.230	V.ang 90 42'07"	H.ang 359 59'59"
	Desc PK		
OBS F1 0010-1000	Dist 593.590	V.ang 89 23'45"	H.ang 186 18'05"
	Desc PRW-7B		

OBS F1 0010-1001	Dist 593.330 Desc PRW-7	V.ang 89 17'41"	H.ang 185 20'26"
OBS F1 0010-0011	Dist 1261.170 Desc PK	V.ang 88 49'27"	H.ang 190 15'06"
OBS F2 0010-0011	Dist 1261.170 Desc PK	V.ang 271 10'25"	H.ang 10 15'04"
OBS F2 0010-1001	Dist 593.340 Desc PRW-7	V.ang 270 42'14"	H.ang 5 20'16"
OBS F2 0010-1000	Dist 593.590 Desc PRW-7B	V.ang 270 36'06"	H.ang 6 17'55"
OBS F2 0010-0005	Dist 1135.240 Desc PK	V.ang 269 17'46"	H.ang 179 59'56"
SET TV 0010	Count 004		
OBS MC 0010-0005	Dist 1135.235 Desc PK	V.ang 90 42'11"	H.ang 318 40'27"
OBS MC 0010-1000	Dist 593.590 Desc PRW-7B	V.ang 89 23'49"	H.ang 144 58'30"
OBS MC 0010-1001	Dist 593.335 Desc PRW-7	V.ang 89 17'44"	H.ang 144 00'51"
OBS MC 0010-0011	Dist 1261.170 Desc PK	V.ang 88 49'31"	H.ang 148 55'35"
STN TV 0010	N 330066.347 HI	E 2726933.73 Desc PK	H
POS TV 1000	N 329580.283 Desc PRW-7B	E 2727274.40	H
POS TV 1001	N 329586.280 Desc PRW-7	E 2727282.34	H
POS TV 0011	N 328986.377 Desc PK	E 2727584.54	H
STN TV 0011	N 328986.377 HI	E 2727584.54 Desc PK	H
OBS F1 0011-0010	Dist 1261.150 Desc PK	V.ang 91 05'45"	H.ang 359 59'59"
OBS F1 0011-0012	Dist 401.160 Desc PK	V.ang 90 08'06"	H.ang 67 32'19"
OBS F1 0011-1002	Dist 419.860 Desc PRW-4B	V.ang 90 22'01"	H.ang 74 27'40"
OBS F1 0011-1003	Dist 229.170 Desc PRW-5B	V.ang 90 46'46"	H.ang 80 35'46"
OBS F1 0011-1004	Dist 218.240 Desc PRW-5	V.ang 90 51'12"	H.ang 81 24'26"
OBS F2 0011-1004	Dist 218.240 Desc PRW-5	V.ang 269 08'57"	H.ang 261 24'33"
OBS F2 0011-1003	Dist 229.150 Desc PRW-5B	V.ang 269 13'12"	H.ang 260 35'50"
OBS F2 0011-1002	Dist 419.900 Desc PRW-4B	V.ang 269 37'51"	H.ang 254 27'31"
OBS F2 0011-0012	Dist 401.180 Desc PK	V.ang 269 51'55"	H.ang 247 32'15"
OBS F2 0011-0010	Dist 1261.110	V.ang 268 54'21"	H.ang 180 00'01"

	Desc PK		
SET TV 0011	Count 005		
OBS MC 0011-0010	Dist 1261.130	V.ang 91 05'42"	H.ang 328 55'35"
	Desc PK		
OBS MC 0011-0012	Dist 401.170	V.ang 90 08'05"	H.ang 36 27'52"
	Desc PK		
OBS MC 0011-1002	Dist 419.880	V.ang 90 22'05"	H.ang 43 23'10"
	Desc PRW-4B		
OBS MC 0011-1003	Dist 229.160	V.ang 90 46'47"	H.ang 49 31'23"
	Desc PRW-5B		
OBS MC 0011-1004	Dist 218.240	V.ang 90 51'07"	H.ang 50 20'04"
	Desc PRW-5		
STN TV 0011	N 328986.379	E 2727584.54	H
	HI	Desc PK	
POS TV 0012	N 329309.010	E 2727822.96	H
	Desc PK		
POS TV 1002	N 329291.517	E 2727872.95	H
	Desc PRW-4B		
POS TV 1003	N 329135.123	E 2727758.83	H
	Desc PRW-5B		
POS TV 1004	N 329125.668	E 2727752.52	H
	Desc PRW-5		
BKB TV 0011-0010	Azm 328 55'35"	H.ang 0 00'01"	
INSTRUMENT	MANUAL	EDM	Serial #: 000000
	Theo	Serial #: 000000	Mount : Scope
	V. angle : Zenith	EDM o/s :	
STN TV 0002	N 326969.410	E 2727092.56	H
	HI	Desc MN	
STN TV 0002	N 326969.410	E 2727092.56	H
	HI	Desc MNW	
ATMOS	Press 30.00	Temp 65.0	
OBS F1 0002-0001	Dist	V.ang	H.ang 0 00'00"
	Desc CH		
INSTRUMENT			
INSTRUMENT	MANUAL	EDM	Serial #: 000000
	Theo	Serial #: 000000	Mount : Scope
	V. angle : Zenith	EDM o/s :	
OBS F1 0002-0001	Dist 13015.339	V.ang	H.ang 0 00'00"
	Desc CH		
INSTRUMENT			
INSTRUMENT	MANUAL	EDM	Serial #: 000000
	Theo	Serial #: 000000	Mount : Scope
	V. angle : Zenith	EDM o/s :	
OBS F1 0002-0001	Dist 13015.339	V.ang	H.ang 0 00'00"
	Desc CH		
INSTRUMENT			
INSTRUMENT	MANUAL	EDM	Serial #: 000000
	Theo	Serial #: 000000	Mount : Scope
	V. angle : Zenith	EDM o/s :	
OBS F1 0002-0001	Dist 13015.339	V.ang 90 00'00"	H.ang 0 00'00"

	Desc		
OBS F1 0002-0013	Dist 3278.020	V.ang 90 00'00"	H.ang 247 53'26"
	Desc IP		
OBS F1 0002-0015	Dist 3196.780	V.ang 90 00'00"	H.ang 277 40'11"
	Desc IP		
OBS F1 0002-0017	Dist 2080.760	V.ang 90 00'00"	H.ang 302 50'24"
	Desc IP		
OBS F2 0002-0017	Dist 2080.760	V.ang 270 00'00"	H.ang 122 50'28"
	Desc IP		
OBS F2 0002-0015	Dist 3196.780	V.ang 270 00'00"	H.ang 97 40'13"
	Desc IP		
OBS F2 0002-0013	Dist 3278.020	V.ang 270 00'00"	H.ang 67 53'29"
	Desc IP		
OBS F2 0002-0001	Dist 13015.339	V.ang 270 00'00"	H.ang 180 00'00"
	Desc		
SET TV 0002	Count 004		
OBS MC 0002-0001	Dist 13015.339	V.ang 90 00'00"	H.ang 293 36'25"
	Desc		
OBS MC 0002-0013	Dist 3278.020	V.ang 90 00'00"	H.ang 181 29'52"
	Desc IP		
OBS MC 0002-0015	Dist 3196.780	V.ang 90 00'00"	H.ang 211 16'37"
	Desc IP		
OBS MC 0002-0017	Dist 2080.760	V.ang 90 00'00"	H.ang 236 26'51"
	Desc IP		
POS TV 0013	N 323692.510	E 2727006.87	H
	Desc IP		
POS TV 0015	N 324237.222	E 2725432.87	H
	Desc IP		
POS TV 0017	N 325819.369	E 2725358.49	H
	Desc IP		
BKB TV 0002-0001	Azm 293 36'25"	H.ang 0 00'00"	
INSTRUMENT			
STN TV 0013	N 323692.510	E 2727006.87	H
	HI	Desc IP	
ATMOS	Press 30.00	Temp 70.0	
OBS F1 0013-0002	Dist 3278.140	V.ang 90 33'11"	H.ang 0 00'00"
	Desc MNW		
OBS F1 0013-0014	Dist 485.700	V.ang 90 33'20"	H.ang 218 01'22"
	Desc NL		
OBS F2 0013-0014	Dist 485.690	V.ang 269 26'47"	H.ang 38 01'19"
	Desc NL		
OBS F2 0013-0002	Dist 3278.140	V.ang 269 26'42"	H.ang 179 59'54"
	Desc MNW		
SET TV 0013	Count 002		
OBS MC 0013-0002	Dist 3278.140	V.ang 90 33'15"	H.ang 1 29'52"
	Desc MNW		
OBS MC 0013-0014	Dist 485.695	V.ang 90 33'16"	H.ang 219 31'16"
	Desc NL		
STN TV 0013	N 323692.527	E 2727006.87	H
	HI	Desc IP	

POS TV 0014	N 323317.883	E 2726697.81	H
	Desc NL		
BKB TV 0013-0002	Azm 1 29'52"	H.ang 359 59'54"	
STN TV 0015	N 324237.222	E 2725432.87	H
	HI	Desc IP	
OBS F1 0015-0002	Dist 3196.910	V.ang 90 35'08"	H.ang 0 00'00"
	Desc MNW		
OBS F1 0015-0016	Dist 663.960	V.ang 92 07'07"	H.ang 308 35'47"
	Desc IP		
OBS F2 0015-0016	Dist 663.960	V.ang 267 53'05"	H.ang 128 35'47"
	Desc IP		
OBS F1 0015-0002	Dist 3196.910	V.ang 90 35'07"	H.ang 359 59'59"
	Desc MNW		
OBS F1 0015-0016	Dist 664.000	V.ang 92 10'46"	H.ang 308 35'47"
	Desc IP		
OBS F2 0015-0016	Dist 663.970	V.ang 267 49'14"	H.ang 128 35'49"
	Desc IP		
OBS F2 0015-0002	Dist 3196.910	V.ang 269 24'52"	H.ang 179 59'55"
	Desc MNW		
SET TV 0015	Count 002		
OBS MC 0015-0002	Dist 3196.910	V.ang 90 35'08"	H.ang 31 16'37"
	Desc MNW		
OBS MC 0015-0016	Dist 663.985	V.ang 92 10'46"	H.ang 339 52'28"
	Desc IP		
POS TV 0016	N 324860.213	E 2725204.57	H
	Desc IP		
BKB TV 0015-0002	Azm 31 16'37"	H.ang 359 59'55"	
STN TV 0016	N 324860.213	E 2725204.57	H
	HI	Desc IP	
ATMOS	Press 30.00	Temp 72.0	
OBS F1 0016-0015	Dist 664.050	V.ang 87 43'58"	H.ang 0 00'00"
	Desc IP		
OBS F1 0016-0018	Dist 971.540	V.ang 90 55'10"	H.ang 209 14'42"
	Desc IP		
OBS F2 0016-0018	Dist 971.540	V.ang 269 04'57"	H.ang 29 14'49"
	Desc IP		
OBS F2 0016-0015	Dist 664.050	V.ang 272 17'43"	H.ang 180 00'08"
	Desc IP		
SET TV 0016	Count 002		
OBS MC 0016-0015	Dist 664.050	V.ang 87 43'07"	H.ang 159 52'28"
	Desc IP		
OBS MC 0016-0018	Dist 971.540	V.ang 90 55'06"	H.ang 9 07'09"
	Desc IP		
STN TV 0016	N 324860.222	E 2725204.57	H
	HI	Desc IP	
POS TV 0018	N 325819.359	E 2725358.53	H
	Desc IP		
STN TV 0018	N 325819.359	E 2725358.53	H
	HI	Desc IP	
OBS F1 0018-0016	Dist 971.570	V.ang 88 55'07"	H.ang 359 59'59"

	Desc IP		
OBS F1 0018-0020	Dist 811.310	V.ang 90 46'25"	H.ang 26 40'29"
	Desc PK		
OBS F2 0018-0020	Dist 811.350	V.ang 269 13'40"	H.ang 206 40'14"
	Desc PK		
OBS F2 0018-0016	Dist 971.560	V.ang 271 04'57"	H.ang 179 59'47"
	Desc IP		
SET TV 0018	Count 002		
OBS MC 0018-0016	Dist 971.565	V.ang 88 55'05"	H.ang 189 07'09"
	Desc IP		
OBS MC 0018-0020	Dist 811.330	V.ang 90 46'23"	H.ang 215 47'38"
	Desc PK		
STN TV 0018	N 325819.348	E 2725358.53	H
	HI	Desc IP	
POS TV 0020	N 325161.315	E 2724884.05	H
	Desc PK		
BKB TV 0018-0016	Azm 189 07'09"	H.ang 359 59'47"	
OBS F1 0018-0016	Dist 971.550	V.ang 88 55'15"	H.ang 359 59'59"
	Desc IP		
OBS F1 0018-0019	Dist 2080.770	V.ang 89 44'34"	H.ang 227 19'40"
	Desc MNW		
OBS F2 0018-0019	Dist 2080.760	V.ang 270 15'46"	H.ang 47 19'43"
	Desc MNW		
STN TP 0012	N 329309.010	E 2727822.96	H 309.650
	HI 4.980	Desc PK	
ATMOS	Press 30.00	Temp 50.0	
STN TV 0012	N 329309.010	E 2727822.96	H 309.650
	HI 4.860	Desc PK	
ATMOS	Press 30.00	Temp 62.0	
TARGET	HT 3.400		
OBS F1 0012-0011	Dist 401.150	V.ang 89 56'49"	H.ang 0 00'01"
	Desc PK		
TARGET	HT		
OBS F1 0012-1005	Dist 542.920	V.ang 91 40'13"	H.ang 107 07'45"
	Desc PRW-6		
OBS F1 0012-1006	Dist 541.330	V.ang 91 03'29"	H.ang 109 30'26"
	Desc PRW-6B		
OBS F2 0012-1006	Dist 541.330	V.ang 268 56'38"	H.ang 289 30'19"
	Desc PRW-6B		
OBS F2 0012-1005	Dist 542.900	V.ang 268 20'05"	H.ang 287 07'43"
	Desc PRW-6		
TARGET	HT 3.400		
OBS F2 0012-0011	Dist 401.150	V.ang 270 03'28"	H.ang 180 00'01"
	Desc PK		
SET TV 0012	Count 003		
OBS MC 0012-0011	Dist 401.154	V.ang 89 44'10"	H.ang 216 27'52"
	Desc PK		
OBS MC 0012-1005	Dist 542.790	V.ang 91 09'18"	H.ang 323 35'35"
	Desc PRW-6		
OBS MC 0012-1006	Dist 541.262	V.ang 90 32'34"	H.ang 325 58'13"

	Desc PRW-6B		
POS TV 1005	N 329745.770	E 2727500.87	H 298.709
	Desc PRW-6		
POS TV 1006	N 329757.560	E 2727520.07	H 304.523
	Desc PRW-6B		
BKB TV 0012-0011	Azm 216 27'52"	H.ang 0 00'01"	
TARGET	HT 1.000		
POS TP 1007	N 329207.622	E 2727717.68	H 309.757
	Desc PRB-6		
POS TP 1008	N 329264.444	E 2727660.50	H 306.632
	Desc PRB-5		
TARGET	HT 25.300		
POS TP 1009	N 329304.805	E 2727623.55	H 304.982
	Desc PRB-4		
TARGET	HT 20.500		
POS TP 1010	N 329441.092	E 2727636.81	H 302.360
	Desc PRB-7		
POS TP 1011	N 329407.907	E 2727678.83	H 303.479
	Desc PRB-8		
POS TP 1012	N 329371.281	E 2727725.11	H 304.603
	Desc PRB-9		
TARGET	HT 6.150		
POS TP 1013	N 329340.584	E 2727765.49	H 306.176
	Desc PRB-10		
POS TP 1014	N 329398.396	E 2727830.42	H 306.321
	Desc PRB-14		
POS TP 1015	N 329459.801	E 2727885.34	H 306.799
	Desc PRB-18		
TARGET	HT 15.650		
POS TP 1016	N 329493.024	E 2727841.25	H 304.932
	Desc PRB-17		
TARGET	HT 6.150		
POS TP 1017	N 329433.269	E 2727786.34	H 303.925
	Desc PRB-13		
POS TP 1018	N 329464.822	E 2727716.41	H 303.233
	Desc PRB-12		
POS TP 1019	N 329524.288	E 2727798.64	H 303.910
	Desc PRB-16		
POS TP 1020	N 329553.457	E 2727742.67	H 303.618
	Desc PRB-15		
POS TP 1021	N 329502.477	E 2727691.26	H 303.398
	Desc PRB-11		
STN TP 0011	N 328986.379	E 2727564.54	H 311.510
	HI 4.950	Desc PK	
ATMOS	Press 30.00	Temp 67.0	
BKB TP 0011-0012	Azm 36 27'52"	H.ang 0 00'00"	
OBS F1 0011-0012	Dist 401.150	V.ang 90 05'39"	H.ang 0 00'00"
	Desc PK		
TARGET	HT 20.500		
POS TP 1022	N 329346.805	E 2727566.34	H 303.365

	Desc PRB-3		
STN TV 0014	N 323317.883	E 2726697.81	H
	HI 5.140	Desc NL	
ATMOS	Press 30.00	Temp 65.0	
TARGET	HT		
OBS F1 0014-0013	Dist 485.670	V.ang 89 17'12"	H.ang 359 59'59"
	Desc IP		
OBS F1 0014-1023	Dist 307.460	V.ang 89 56'16"	H.ang 2 19'06"
	Desc FTAW-1B		
OBS F1 0014-1024	Dist 138.980	V.ang 91 22'55"	H.ang 239 19'44"
	Desc FTAW-5		
OBS F1 0014-1025	Dist 164.510	V.ang 90 54'06"	H.ang 68 52'41"
	Desc FTAW-7B		
OBS F1 0014-1026	Dist 168.460	V.ang 90 54'30"	H.ang 65 07'22"
	Desc FTAW-7		
OBS F1 0014-1027	Dist 431.420	V.ang 90 18'55"	H.ang 29 25'36"
	Desc FTAW-6B		
OBS F1 0014-1028	Dist 420.940	V.ang 89 18'57"	H.ang 28 44'30"
	Desc FTAW-6		
OBS F2 0014-1028	Dist 420.970	V.ang 270 41'03"	H.ang 208 44'17"
	Desc FTAW-6		
OBS F2 0014-1027	Dist 431.410	V.ang 269 40'57"	H.ang 209 25'36"
	Desc FTAW-6B		
OBS F2 0014-1026	Dist 168.470	V.ang 269 05'46"	H.ang 245 07'23"
	Desc FTAW-7		
OBS F2 0014-1025	Dist 164.530	V.ang 269 06'10"	H.ang 248 52'58"
	Desc FTAW-7B		
OBS F2 0014-1024	Dist 138.990	V.ang 268 37'17"	H.ang 59 19'56"
	Desc FTAW-5		
OBS F2 0014-1023	Dist 307.460	V.ang 270 03'36"	H.ang 182 19'01"
	Desc FTAW-1B		
OBS F2 0014-0013	Dist 485.700	V.ang 270 42'48"	H.ang 180 00'07"
	Desc IP		
SET TV 0014	Count 007		
OBS MC 0014-0013	Dist 485.776	V.ang 88 40'50"	H.ang 39 31'16"
	Desc IP		
OBS MC 0014-1023	Dist 307.508	V.ang 88 58'52"	H.ang 41 50'16"
	Desc FTAW-1B		
OBS MC 0014-1024	Dist 138.956	V.ang 89 15'40"	H.ang 278 51'03"
	Desc FTAW-5		
OBS MC 0014-1025	Dist 164.520	V.ang 89 06'34"	H.ang 108 24'02"
	Desc FTAW-7B		
OBS MC 0014-1026	Dist 168.462	V.ang 89 09'28"	H.ang 104 38'35"
	Desc FTAW-7		
OBS MC 0014-1027	Dist 431.417	V.ang 89 38'01"	H.ang 68 56'49"
	Desc FTAW-6B		
OBS MC 0014-1028	Dist 421.048	V.ang 88 36'59"	H.ang 68 15'36"
	Desc FTAW-6		
POS TV 1023	N 323546.952	E 2726902.89	H
	Desc FTAW-1B		

POS TV 1024	N 323339.261	E 2726560.52	H
	Desc FTAW-5		
POS TV 1025	N 323265.957	E 2726853.90	H
	Desc FTAW-7B		
POS TV 1026	N 323275.301	E 2726860.78	H
	Desc FTAW-7		
POS TV 1027	N 323472.860	E 2727100.42	H
	Desc FTAW-6B		
POS TV 1028	N 323473.792	E 2727088.80	H
	Desc FTAW-6		
BKB TV 0014-0013	Azm 39 31'16"	H.ang 0 00'07"	
STN TP 0014	N 323317.883	E 2726697.81	H 359.640
	HI 5.140	Desc NL	
TARGET	HT 7.000		
BKB TP 0014-0013	Azm 39 31'16"	H.ang 0 00'00"	
OBS F1 0014-0013	Dist 485.670	V.ang 89 09'39"	H.ang 0 00'00"
	Desc IP		
TARGET	HT 10.800		
POS TP 1029	N 323582.945	E 2726964.15	H 363.827
	Desc FTAB-16		
POS TP 1030	N 323517.551	E 2727069.95	H 362.445
	Desc FTAB-15		
POS TP 1031	N 323580.110	E 2727079.51	H 363.388
	Desc FTAB-14		
POS TP 1032	N 323641.534	E 2726993.62	H 363.847
	Desc FTAB-13		
POS TP 1033	N 323671.876	E 2727045.14	H 364.378
	Desc FTAB-12		
POS TP 1034	N 323739.952	E 2726964.36	H 364.923
	Desc FTAB-7		
POS TP 1035	N 323673.237	E 2726941.11	H 364.495
	Desc FTAB-10		
TARGET	HT 20.500		
POS TP 1036	N 323642.515	E 2726886.86	H 363.891
	Desc FTAB-11		
POS TP 1037	N 323700.925	E 2726797.37	H 365.148
	Desc FTAB-8		
POS TP 1038	N 323749.271	E 2726812.70	H 365.803
	Desc FTAB-5		
TARGET	HT 23.000		
POS TP 1039	N 323746.076	E 2726887.29	H 365.750
	Desc FTAB-6		
TARGET	HT 24.000		
POS TP 1040	N 323695.998	E 2726872.16	H 365.015
	Desc FTAB-9		
STN TV 0015	N 324237.222	E 2725432.87	H
	HI 5.140	Desc IP	
TARGET	HT		
OBS F1 0015-0016	Dist 663.910	V.ang 92 03'48"	H.ang 359 59'59"
	Desc IP		

OBS F1 0015-1041	Dist 200.470 Desc 9SLW-5	V.ang 92 20'19"	H.ang 35 30'58"
OBS F2 0015-1041	Dist 200.470 Desc 9SLW-5	V.ang 267 39'45"	H.ang 215 30'52"
OBS F2 0015-0016	Dist 663.920 Desc IP	V.ang 267 56'18"	H.ang 179 59'59"
SET TV 0015	Count 002		
OBS MC 0015-0016	Dist 663.750 Desc IP	V.ang 91 37'09"	H.ang 339 52'28"
OBS MC 0015-1041	Dist 200.326 Desc 9SLW-5	V.ang 90 52'08"	H.ang 15 23'24"
POS TV 1041	N 324430.342 Desc 9SLW-5	E 2725486.03	H
BKB TV 0015-0016	Azm 339 52'28"	H.ang 359 59'59"	
STN TV 0016	N 324860.222 HI 4.875	E 2725204.57 Desc IP	H
OBS F1 0016-0015	Dist 664.000 Desc IP	V.ang 87 46'35"	H.ang 0 00'00"
OBS F1 0016-1042	Dist 310.010 Desc 9SLW-1C	V.ang 89 33'55"	H.ang 6 00'32"
OBS F2 0016-1042	Dist 310.010 Desc 9SLW-1C	V.ang 270 26'06"	H.ang 186 00'28"
OBS F2 0016-0015	Dist 664.000 Desc IP	V.ang 272 13'25"	H.ang 179 59'56"
SET TV 0016	Count 002		
OBS MC 0016-0015	Dist 664.207 Desc IP	V.ang 87 21'22"	H.ang 159 52'28"
OBS MC 0016-1042	Dist 310.085 Desc 9SLW-1C	V.ang 88 39'52"	H.ang 165 53'00"
POS TV 1042	N 324559.583 Desc 9SLW-1C	E 2725280.18	H
BKB TV 0016-0015	Azm 159 52'28"	H.ang 359 59'56"	
STN TP 0016	N 324860.222 HI 4.875	E 2725204.57 Desc IP	H 340.750
BKB TP 0016-0015	Azm 159 52'28"	H.ang 359 59'59"	
OBS F1 0016-0015	Dist 663.990 Desc IP	V.ang 87 46'35"	H.ang 359 59'59"
TARGET	HT 6.150		
POS TP 1043	N 324625.184 Desc 9SL-TP4	E 2725212.05	H 342.807
POS TP 1044	N 324698.519 Desc 9SL-TP4	E 2725148.62	H 341.590
POS TP 1045	N 324743.297 Desc S-15B	E 2725175.38	H 341.515
POS TP 1046	N 324763.528 Desc S-14B	E 2725197.98	H 341.550
POS TP 1047	N 324782.407 Desc S-13B	E 2725220.83	H 341.459
POS TP 1048	N 324807.817 Desc S-9B	E 2725204.61	H 341.088

POS TP 1049	N 324788.081 Desc S-10B	E 2725181.75	H 341.078
POS TP 1050	N 324768.765 Desc S-11B	E 2725158.83	H 341.096
POS TP 1051	N 324749.505 Desc S-12B	E 2725136.24	H 340.748
POS TP 1052	N 324773.388 Desc S-8B	E 2725120.32	H 340.249
POS TP 1053	N 324793.425 Desc S-7B	E 2725143.34	H 340.626
POS TP 1054	N 324812.438 Desc S-6B	E 2725165.24	H 340.731
POS TP 1055	N 324832.852 Desc S-5B	E 2725187.47	H 341.048
POS TP 1056	N 324836.509 Desc S-2B	E 2725149.36	H 340.224
POS TP 1057	N 324818.361 Desc S-3B	E 2725127.14	H 340.009
POS TP 1058	N 324794.838 Desc S-4B	E 2725106.31	H 339.955
POS TP 1059	N 324723.500 Desc S-16B	E 2725152.96	H 341.339
POS TP 1060	N 324857.678 Desc S-1B	E 2725171.05	H 340.387
POS TP 1061	N 324690.376 Desc 9SL-TP2	E 2724973.85	H 338.372
POS TP 1062	N 324596.790 Desc 9SL-TP2	E 2725016.39	H 339.775
POS TP 1063	N 324185.256 Desc 9SL-TP1	E 2724751.65	H 342.427
TARGET	HT 15.650		
POS TP 1064	N 324283.479 Desc 9SL-TP1	E 2724733.15	H 335.844
TARGET	HT 6.150		
POS TP 1065	N 324900.005 Desc 9SL-TP3	E 2725031.38	H 327.256
POS TP 1066	N 324904.483 Desc 9SL-TP3	E 2724926.70	H 323.428
STN TV 0020	N 325161.315 HI	E 2724884.05 Desc PK	H
TARGET	HT		
OBS F1 0020-0017	Dist 811.360 Desc IP	V.ang 89 03'29"	H.ang 0 00'00"
OBS F1 0020-1067	Dist 60.530 Desc 9SLW-3C	V.ang 90 20'30"	H.ang 69 27'20"
OBS F1 0020-1068	Dist 563.640 Desc 9SLW-4C	V.ang 89 03'34"	H.ang 178 56'51"
OBS F2 0020-1068	Dist 563.650 Desc 9SLW-4C	V.ang 270 56'27"	H.ang 358 56'57"
OBS F2 0020-1067	Dist 60.520	V.ang 269 39'29"	H.ang 249 27'07"

	Desc 9SLW-3C		
OBS F2 0020-0017	Dist 811.350	V.ang 270 56'40"	H.ang 180 00'01"
	Desc IP		
SET TV 0020	Count 003		
OBS MC 0020-0017	Dist 811.355	V.ang 89 03'25"	H.ang 35 47'28"
	Desc IP		
OBS MC 0020-1067	Dist 60.525	V.ang 90 20'31"	H.ang 105 14'41"
	Desc 9SLW-3C		
OBS MC 0020-1068	Dist 563.645	V.ang 89 03'34"	H.ang 214 44'21"
	Desc 9SLW-4C		
POS TV 1067	N 325145.401	E 2724942.44	H
	Desc 9SLW-3C		
POS TV 1068	N 324698.201	E 2724562.90	H
	Desc 9SLW-4C		
BKB TV 0020-0017	Azm 35 47'28"	H.ang 0 00'01"	
STN TV 0018	N 325819.348	E 2725358.53	H
	HI	Desc IP	
BKB SO 0018-0016	Azm 189 07'09"	H.ang 0 00'00"	
OBS F1 0018-0016	Dist 971.560	V.ang 89 00'58"	H.ang 0 00'00"
	Desc IP		
OBS F1 0018-0016	Dist 971.490	V.ang 89 09'54"	H.ang 0 00'00"
	Desc IP		
OBS F1 0018-0019	Dist 2080.780	V.ang 89 43'19"	H.ang 227 19'41"
	Desc MNW		
OBS F2 0018-0019	Dist 2080.790	V.ang 270 16'45"	H.ang 47 19'33"
	Desc MNW		
OBS F2 0018-0016	Dist 971.500	V.ang 270 50'10"	H.ang 179 59'53"
	Desc IP		
SET TV 0018	Count 002		
OBS MC 0018-0016	Dist 971.495	V.ang 89 09'52"	H.ang 189 07'09"
	Desc IP		
OBS MC 0018-0019	Dist 2080.785	V.ang 89 43'17"	H.ang 56 26'50"
	Desc MNW		
POS TV 0019	N 326969.397	E 2727092.58	H
	Desc MNW		
BKB TV 0018-0016	Azm 189 07'09"	H.ang 359 59'53"	

SDR2 V02-088(3)	Copyright 1985-90 by Datacom Groun ltd. All rights reserved. Serial no 05-Apr-00 05:20		
	Angle : Degrees	Dist : Feet	Press : Inch Hg
	Temp : Fahrenht	Coord : N-E-Elv	H.obs : Right
JOB	Job ID WG-WEL1		
NOTE	DC-MB		
SCALE	S.F. 1.000000000		
NOTE CP	Sea level crn:N		
NOTE CP	C and R crn : N		
NOTE CP	Atmos crn : Y		
INSTR	SET Theo <No text> V.obs : Zenith P.C. mm 0.000	EDM <No text> Serial no 000000 Edm o/s <Null>	Serial no 000000 Mount: not applc Refl o/s <Null>
POS KI 0011	Nrth 329986.379 Code PK	East 2727584.540	Elv <Null>
POS KI 0012	Nrth 329309.010 Code PK	East 2727822.960	Elv <Null>
STN TV 0012	Nrth 329309.010 Theo ht <Null>	East 2727822.960 Code PK	Elv <Null>
ATMOS	Press 30.00	Temp 40.0	
OBS F1 0012-0011	Dist 401.150 Code PK	V.obs 90-26'06"	H.obs 0-00'00"
OBS F1 0012-1100	Dist 268.520 Code W-2B	V.obs 90-55'50"	H.obs 93-46'17"
OBS F2 0012-1100	Dist 268.510 Code W-2B	V.obs 269-04'13"	H.obs 273-46'11"
OBS F2 0012-0011	Dist 401.160 Code PK	V.obs 269-33'56"	H.obs 179-59'50"
SET TV 0012	Count 002		
OBS MC 0012-0011	Dist 401.150 Code PK	V ang 90-26'05"	Dircn S36½27'50W
OBS MC 0012-1100	Dist 268.512 Code W-2B	V ang 90-55'49"	Dircn N49½45'51W
POS TV 1100	Nrth 329482.429 Code W-2B	East 2727618.000	Elv <Null>
BKB TV 0012-0011	Dircn S36½27'50W	H.obs 359-59'50"	
STN TP 1100	Nrth 329482.429 Theo ht <Null>	East 2727618.000 Code PRW-2B	Elv <Null>

STARTING, ENDING POINT #s : 1,1028
LIST COORDINATES

PT#	NORTH	EAST	ELEV
1	332181.5100002	715166.410000	
	CHIMES		
2	326969.4100002	727092.560000	
	MNW		
3	328380.6100002	726406.440000	
	PK A		
4	327062.9600002	726976.910000	
	HUB 4		
5	330918.8100002	726184.150000	
	PK		
6	332180.6600002	715169.590000	
	PK C		
7	331051.0100002	726625.850000	
	PK D		
10	330066.3470002	726933.730000	
	PK		
11	328986.3790002	727584.540000	
	PK		
12	329309.0100002	727822.960000	
	PK		
13	323692.5270002	727006.870000	
	IP		
14	323317.8830002	726697.810000	
	NL		
15	324237.2220002	725432.870000	
	IP		
16	324860.2220002	725204.570000	340.750000
	IP		
17	325819.3690002	725358.490000	
	IP		
18	325819.3480002	725358.530000	
	IP		
19	326969.3970002	727092.580000	
	MNW		
20	325161.3150002	724884.050000	
	PK		
1000	329580.2830002	727274.400000	
	PRW-7B		
1001	329586.2800002	727282.340000	
	PRW-7		
1002	329291.5170002	727872.950000	
	PRW-4B		
1003	329135.1230002	727758.830000	
	PRW-5B		
1004	329125.6680002	727752.520000	

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    PRW-5
1005 329745.7700002727500.870000
    PRW-6
1006 329757.5600002727520.070000
    PRW-6B
1007 329207.6220002727717.680000   309.757000
    PRB-6
1008 329264.4440002727660.500000   306.632000
    PRB-5
1009 329304.8050002727623.550000   304.982000
    PRB-4
1010 329441.0920002727636.810000   302.360000
    PRB-7
1011 329407.9070002727678.830000   303.479000
    PRB-8
1012 329371.2810002727725.110000   304.603000
    PRB-9
1013 329340.5840002727765.490000   306.176000
    PRB-10
1014 329398.3960002727830.420000   306.321000
    PRB-14
1015 329459.8010002727885.340000   306.799000
    PRB-18
1016 329493.0240002727841.250000   304.932000
    PRB-17
1017 329433.2690002727786.340000   303.925000
    PRB-13
1018 329464.8220002727716.410000   303.233000
    PRB-12
1019 329524.2880002727798.640000   303.910000
    PRB-16
1020 329553.4570002727742.670000   303.618000
    PRB-15
1021 329502.4770002727691.260000   303.898000
    PRB-11
1022 329346.8050002727566.340000   303.365000
    PRB-3
1023 323546.9520002726902.890000
    FTAW-1B
1024 323339.2610002726560.520000
    FTAW-5
1025 323265.9570002726853.900000
    FTAW-7B
1026 323275.3010002726860.780000
    FTAW-7
1027 323472.8600002727100.420000
    FTAW-6B
1028 323473.7920002727088.800000
    FTAW-6
```

STARTING, ENDING POINT #s : 1028,1044
LIST COORDINATES

PT#	NORTH	EAST	ELEV
1028	323473.7920002	727088.800000	
FTAW-6			
1029	323582.9450002	726964.150000	363.827000
FTAB-16			
1030	323517.5510002	727069.950000	362.445000
FTAB-15			
1031	323580.1100002	727079.510000	363.388000
FTAB-14			
1032	323641.5340002	726993.620000	363.847000
FTAB-13			
1033	323671.8760002	727045.140000	364.378000
FTAB-12			
1034	323739.9520002	726964.360000	364.923000
FTAB-7			
1035	323673.2370002	726941.110000	364.495000
FTAB-10			
1036	323642.5150002	726886.860000	363.891000
FTAB-11			
1037	323700.9250002	726797.370000	365.148000
FTAB-8			
1038	323749.2710002	726812.700000	365.803000
FTAB-5			
1039	323746.0760002	726887.290000	365.750000
FTAB-6			
1040	323695.9980002	726872.160000	365.015000
FTAB-9			
1041	324430.3420002	725486.030000	
9SLW-5			
1042	324559.5830002	725280.180000	
9SLW-10			
1043	324625.1840002	725212.050000	342.807000
9SL-TP4			
1044	324698.5190002	725148.620000	341.590000
9SL-TP4			

STARTING, ENDING POINT #s : 1061,1100
LIST COORDINATES

PT#	NORTH	EAST	ELEV
1061	324690.3760002	724973.850000	338.372000
9SL-TP2			
1062	324596.7900002	725016.390000	339.775000
9SL-TP2			
1063	324185.2560002	724751.650000	342.427000
9SL-TP1			
1064	324283.4790002	724733.150000	335.844000

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    9SL-TP1
1065 324900.0050002725031.380000   327.256000
    9SL-TP3
1066 324904.4830002724926.700000   323.428000
    9SL-TP3
1067 325145.4010002724942.440000
    9SLW-3C
1068 324698.2010002724562.900000
    9SLW-4C
1100 329482.4290002727618.000000     0.000000
```

STARTING, ENDING POINT #s :

BOUCHER & JAMES, INC.
CONSULTING ENGINEERS • DOYLESTOWN

November 11, 1991

Mr. Donald Blackert
Project Manager
HALLIBURTON NUS ENVIRONMENTAL CORP.
Foster Plaza, Bldg. 7
661 Andersen Drive
Pittsburgh, PA 15220

RE: SURVEY REPORT FOR
WELLS, BORINGS, AND TEST PITS
NAS WILLOW GROVE

Dear Don:

With this letter I am sending you a report of the survey location of the monitoring wells, soil borings, and test pits for the Privet Road Site, the Ninth Street Landfill Site, and the Fire Training Area Site. If, after you review the report, you have any questions, please do not hesitate to call.

In the future, Boucher & James, Inc. would be pleased to submit proposals on any other surveying or engineering projects which you have.

Sincerely,

Timothy D. Hydrusko

Timothy D. Hydrusko, P.L.S., P.P.
Survey Manager

TDH/sa
Enclosure
tdh\9110929.ltr

Civil • Structural • Municipal Engineering • Environmental Site Planning / Land Planning • Surveying
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The Atrium of Quakertown, 127 S. 5th Street, Suite 300, Quakertown, PA 18951 • (215) 538-7880
Buckingham FAX No. (215) 794-3987 / Quakertown FAX No. 538-3977