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7. Abstract

AYRES, J. M. 1993 *100-NR-1 SURFACE RADIATION SURVEY*, WHC-SD-EN-TI-085, Rev 0, Westinghouse Hanford Company, Richland, Washington

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1.0 SCOPE

This report summarizes and documents the results of the radiological surveys conducted from April through July 1992 over a partial area of the 100-NR-1 Operable Unit, Hanford Site, Richland, Washington (Figure 1). In addition, this report explains the survey methodology using the Ultrasonic Ranging and Data System (USRADS) and the manual survey methodology used for a small subarea of the operable unit.

The 100-NR-1 radiological survey field task consisted of two activities: the determination of radiological baseline operable unit-specific background conditions and the radiological survey of the operable unit area.

The radiological survey of the 100-NR-1 Operable Unit, along with the background study, were conducted by Site Investigative Surveys/Restoration and Remediation Health and Safety Organization of the Westinghouse Hanford Company. The majority of the survey methodology was based on utilization of the USRADS for automated recording of the gross gamma radiation levels at or near 6 in. and at 3 ft from the surface soil. A 400- by 200-ft area located below the high-voltage electrical lines just south of the 100-N fence was surveyed by manually logging the data from these gamma instruments at the same geometry relative to the soil surface.

Because of various factors such as survey speed, sparsity of coverage, and changing detector geometry, the sodium iodide counts-per-minute data acquired are primarily nonquantitative and should not be interpreted to meet radiological release criteria.

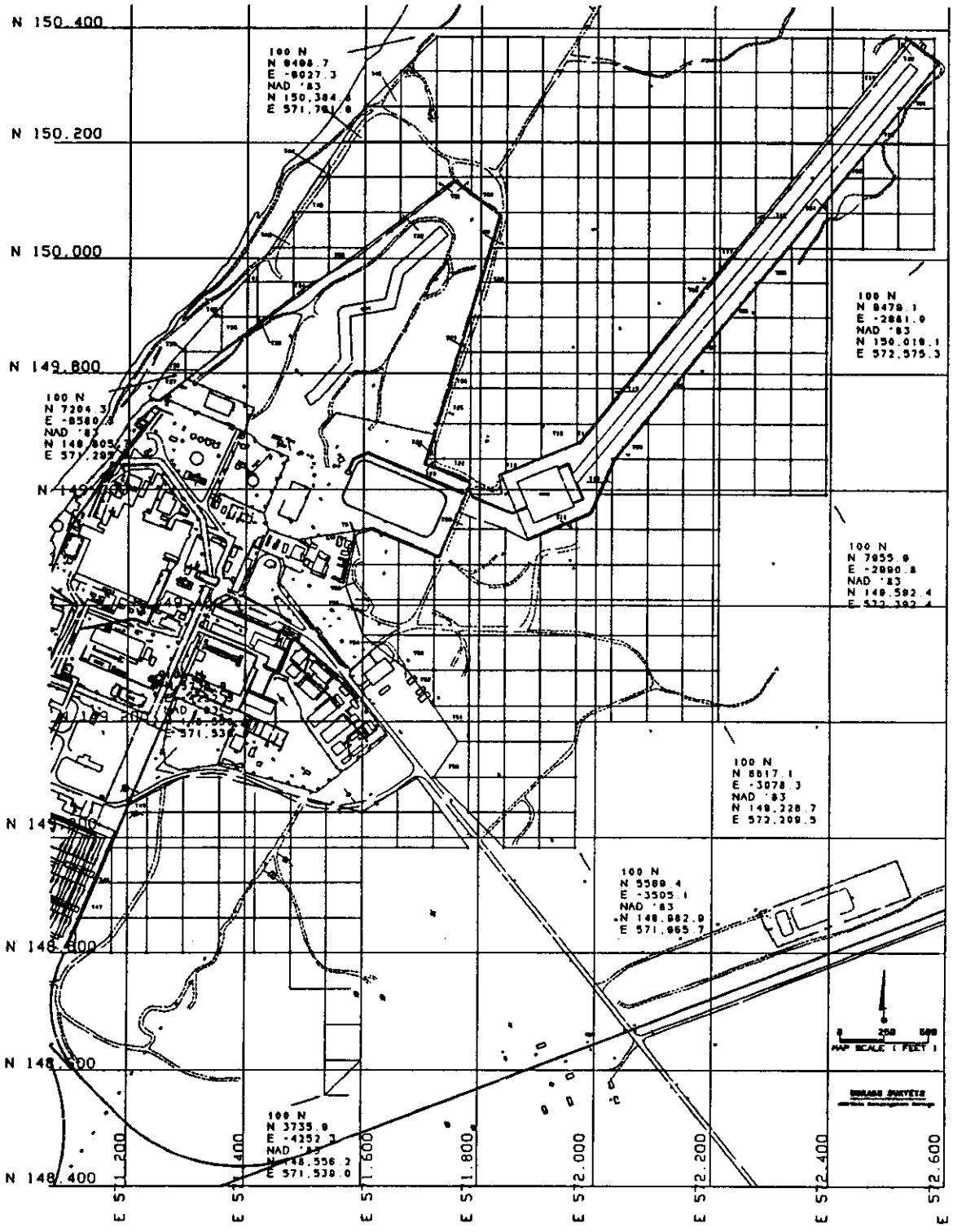
2.0 PURPOSE

The purpose of this survey was to identify previously unknown areas of surface and, potentially, subsurface radioactive contamination in the 100-NR-1 Operable Unit that will require further study.

3.0 PROCEDURE

The radiological surveys were conducted following the procedures contained in the WHC-IP-0692.A, *Heath Physics Procedures Manual* (1992 et seq.), in particular, Section 11.20.02, "Ultrasonic Ranging and Data System (USRADS): Connecting the Equipment," Rev. 0; Section 11.20.01, "Ultrasonic Ranging and Data System (USRADS): Equipment Setup," Rev. 0; Section 1.25.13, "Ultrasonic Ranging and Data System (USRADS): System Calibration," Rev. 0; and Section 11.20.03, "Ultrasonic Ranging and Data System (USRADS): Performing the Survey," Rev. 0.

Figure 1. 100-NR-1 Surface Radiation Survey.



The radiological surveys were conducted using both a digital count rate meter with a sodium iodide detector reporting in counts per minute (cpm) and a dose rate meter reporting microroentgens per hour (μR/hr). The count rate meter was set for gross counting, i.e., window "out". The window setting allows detection of low, intermediate, and high energy photons.

For the majority of the area surveyed, these instruments were connected to a CHEMRAD Tennessee Corp. Series 2000 USRADS. The USRADS equipment is used to record the detector readings versus the location of the readings, to generate a map of the survey area, and to save the data on computer storage media.

High-voltage power lines disrupted the USRADS radio transmissions in the area immediately below them, and this small area was surveyed by manually logging the radiation/contamination detection instrument's output.

4.0 LOW BACKGROUND SITE

4.1 INTRODUCTION

The Low Background survey was conducted to establish baseline radiological background conditions in a designated test plot known to have no history of radiological operations. The radiological data collected during this survey are considered representative of the undisturbed soil surfaces in the 100 Areas of the Hanford Site. The survey was conducted on July 17, 18, and 19, 1991.

4.1 LOCATION

The Low Background test plot, shown in Figure 2, is located in the 600 Area, between the 100-D/DR and 100-H Areas, approximately 2,000 ft from the Columbia River. The site had been previously staked on 100-ft intersects oriented along a north-south axis. The total size of the background plot is 500 by 500 ft.

4.2 DISCUSSION

The survey was conducted using a Ludlum Model 2221 digital rate meter with a Ludlum Model 44-2, 1- by 1-in. sodium iodide detector and a Ludlum Model 19 Ur meter. The meters were coupled to the USRADS for the purpose of recording the data from the output of the individual detectors versus the location of that data within the survey area.

Seven individual surveys were performed to completely cover the 250,000-ft^2 site. A total of 5,796 data points were collected within this site. A summary of the survey results can be found in Table 1. The survey grid layout and a composite track map of survey area are shown in Figure 3. Each grid block was traversed on approximately 25-ft transects.

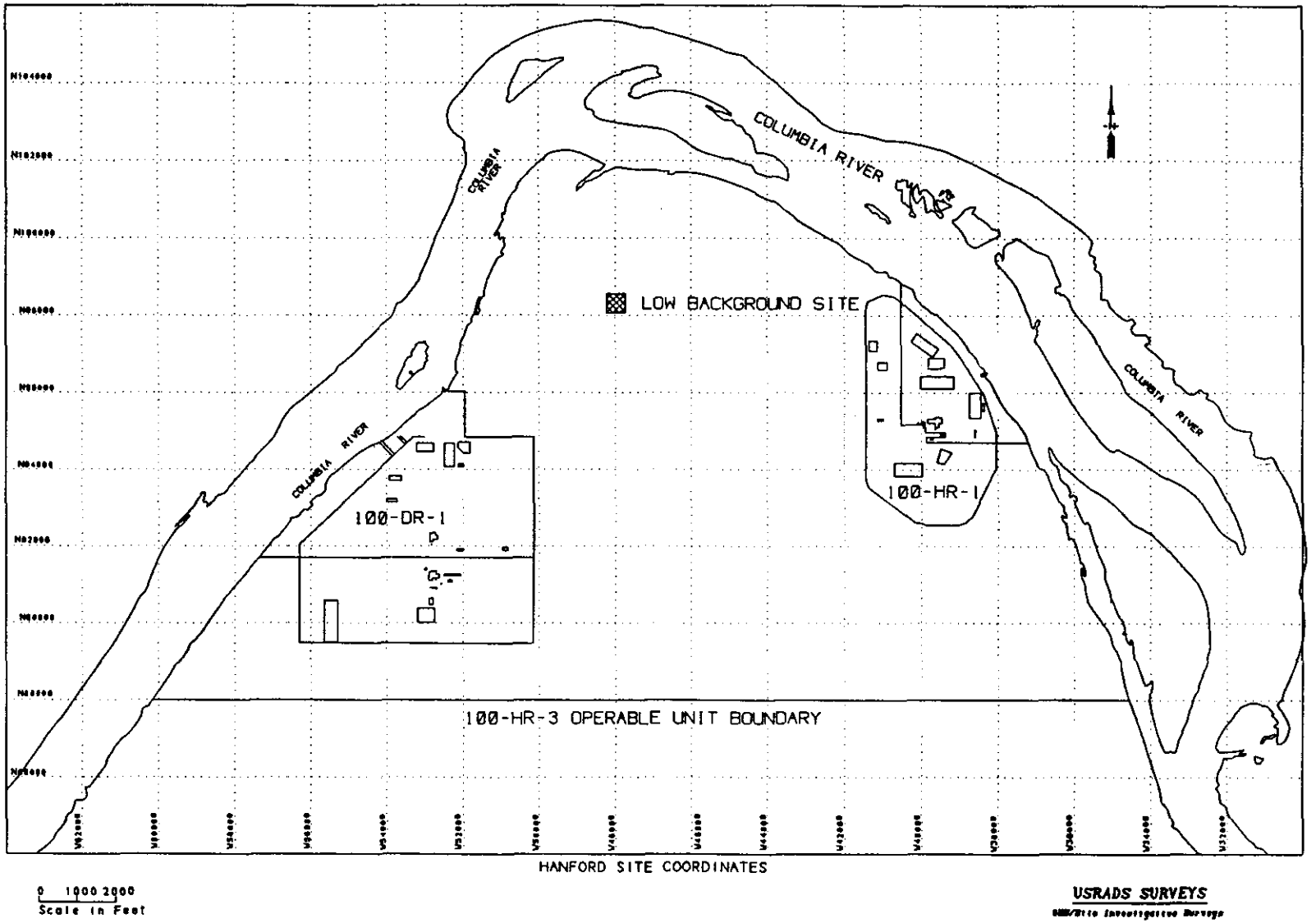
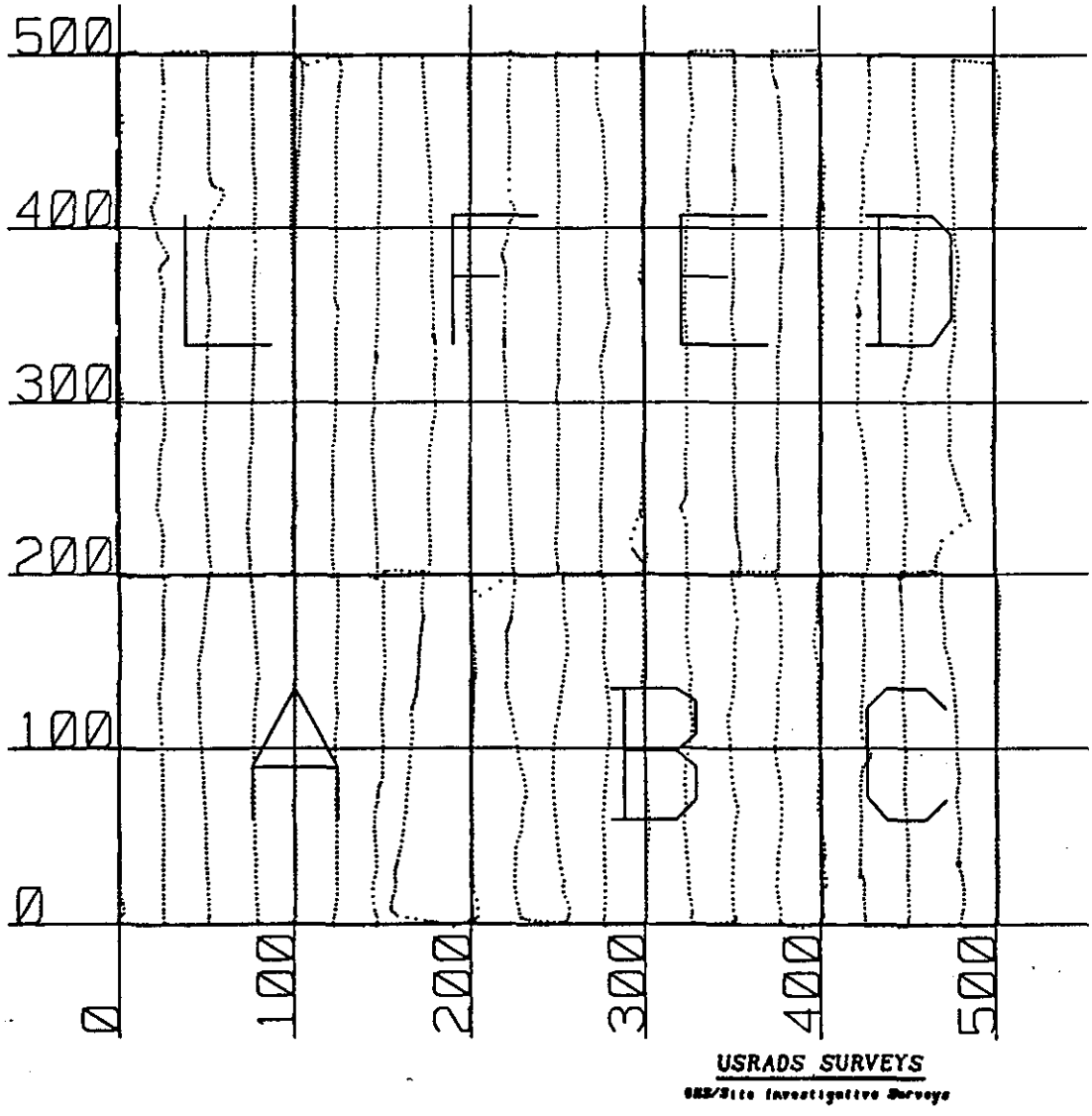


Figure 2. Low Background Survey Test Plot.

Table 1. Low Background Survey Results.

Survey	Date	Grid	Data points	Max cpm	Mean cpm	Sigma	Max μR	Mean μR	Sigma
lbs2a	07/16/91	a	861	3960	2437.63	404.04	14.42	9.67	1.72
lbs2b	07/17/91	b	1320	3480	2417.45	367.39	15.62	9.58	1.81
lbs2c	07/17/91	c	792	3540	2335.23	381.49	13.82	9.4	1.57
lbs2d	07/17/91	d	755	3840	2409.93	402.36	16.52	9.88	1.77
lbs2e	07/18/91	e	804	3660	2371.79	391.61	14.42	9.35	1.88
lbs2f	07/18/91	f	668	3540	2331.65	416.68	13.82	9.18	1.62
lbs2l	07/19/91	l	596	3540	2454.77	370.66	13.82	9.53	1.73
		TOTAL	5796	MEAN	2394.06		MEAN	9.51	

Figure 3. Survey Grid Layout and Composite Track Map of Survey Area.



As the surveyor traverses the survey area, the USRADS records the output data from the radiation detector versus the location of where in the survey area the data was detected--each second. Therefore, while the survey is in progress, a real-time map of the survey area is generated. When the survey is completed, the survey data set is saved on a computer disk.

The background count rate was established by averaging the mean count rate for each survey. Using the formula $BKGD=\sum X/7$, the average background count rate for the Low Background Site was calculated to be 2,394 cpm and the average dose rate to be 9.51 µR/hr.

The minimum detectable count rate was then calculated by employing the formula:

$$2m\sqrt{\left(\frac{Rb}{Ts}\right)+\left(\frac{Rb}{Tb}\right)}$$

where:

Ts = gross sample count time (min)
Tb = background counting time (min)
Rb = background count rate in counts per minute
M = 1.645 (constant for 90% confidence level).

Based on the above formula, the minimum detectable count rate was 1,763 + 2,394 cpm = 4,157 cpm.

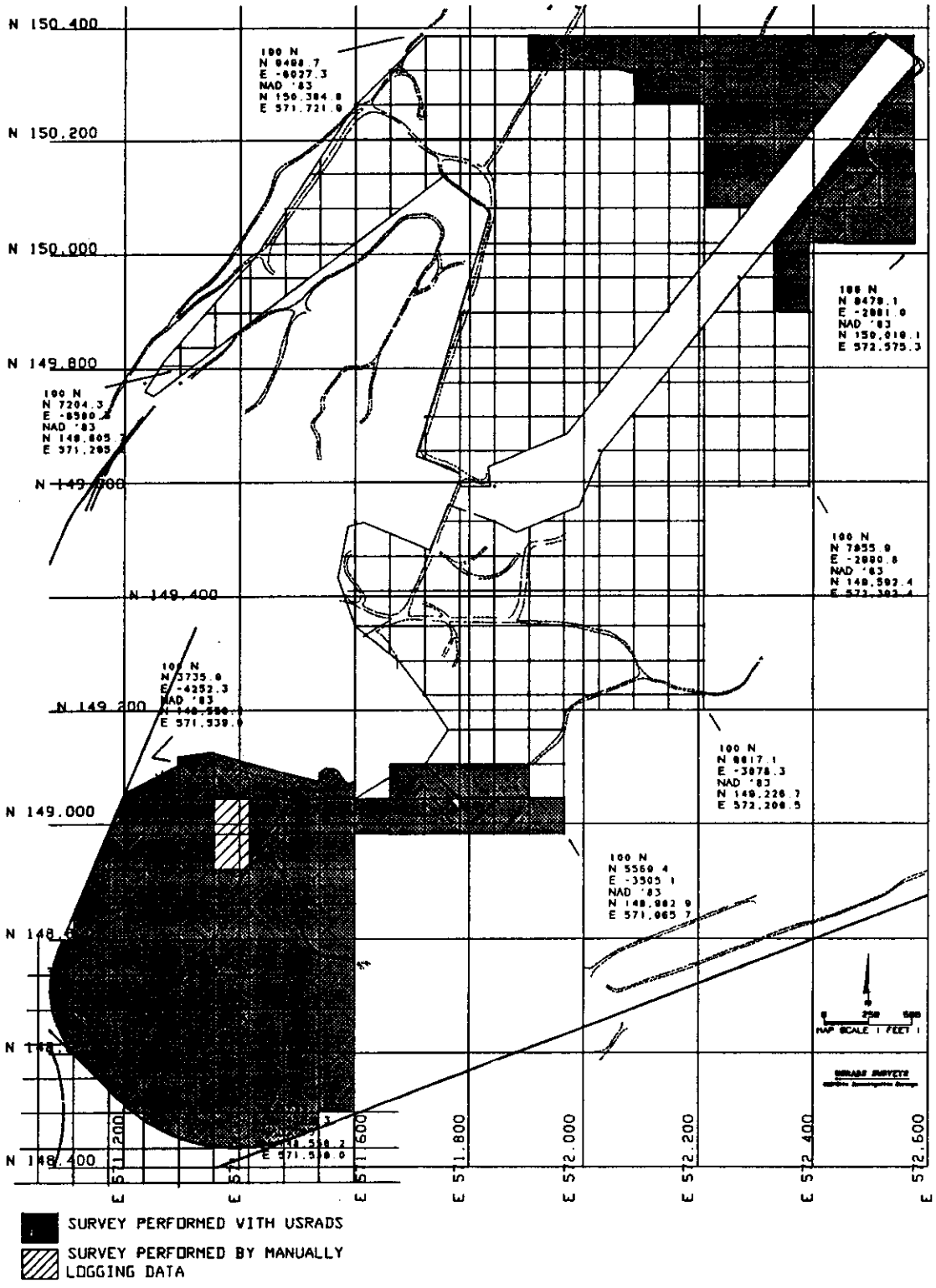
One of the features of the USRADS is the ability to enter a "threshold" setting upon initiating a survey. The threshold setting is a value that, when exceeded, the data point plotted on the CPU monitor is highlighted. This feature alerts the CPU operator that the counts-per-minute data have exceeded the threshold, or preset value. For the purpose of conducting the 100-NR-1 RI/FS surface radiation survey, it was desirable to establish a value for the threshold where readings above the setting could be considered for further investigations. The threshold value established for the entire 100-NR-1 Site Survey was 3,900 cpm. This value is practical based on the premise that too low of a setting would highlight normal fluctuations above the calculated mean, and too high of a setting would cut off the low end of surface radiation that might be present.

5.0 100-NR-1 SITE

5.1 INTRODUCTION

Approximately 117 acres of 100-NR-1 was surveyed with the USRADS equipment (Figure 4). Within this area a total of 127,621 data points were collected. Each of these data points represents two gross gamma radiation readings, counts per minute with a sodium iodide detector at 6 in. and a dose rate with a micro-R meter at 3 ft, along with the physical coordinates of the readings. A total of 169 individual surveys were conducted in order to complete the area.

Figure 4. Actual Positions of Surveyed Areas.



The 1.83-acre area beneath high-voltage lines was surveyed with the same gamma-detecting instrumentation at the same distances from the soil surface by manually logging the instrument's output.

Site Investigative Surveys was unable to perform a valid radiological contamination survey of the remainder of 100-NR-1 due to elevated radiation readings and "skyshine" from past 100-N Reactor operations emitting from the 1325-N Crib, 1301-N Crib, and the "golf ball".

5.2 LOCATION

Prior to initiating the radiological survey of the 100-NR-1 Operable Unit, a grid system was established so that the individual surveys could be controlled and tied together. Kaiser Engineers Hanford conducted a civil survey of this area and provided a map and list of coordinates for each grid stake. Site Investigative Surveys placed additional grid stakes in an area north of the 100-N railroad tracks. Each grid was given a numeric or alpha-numeric designator and the entire area surveyed broken into three subsections for reporting purposes (Figure 5).

5.3 INSTRUMENTATION

Gamma detection instrumentation is as follows:

- Ludlum Model 2221 Digital Scaler/Rate Meter, PNL No. 5580
- Ludlum Model 2221 Digital Scaler/Rate Meter, PNL No. 5581
- Ludlum Model 2221 Digital Scaler/Rate Meter, PNL No. 5582
- Ludlum Model 19 microR Meter, PNL No. 5028
- Ludlum Model 19 microR Meter, PNL No. 5029.

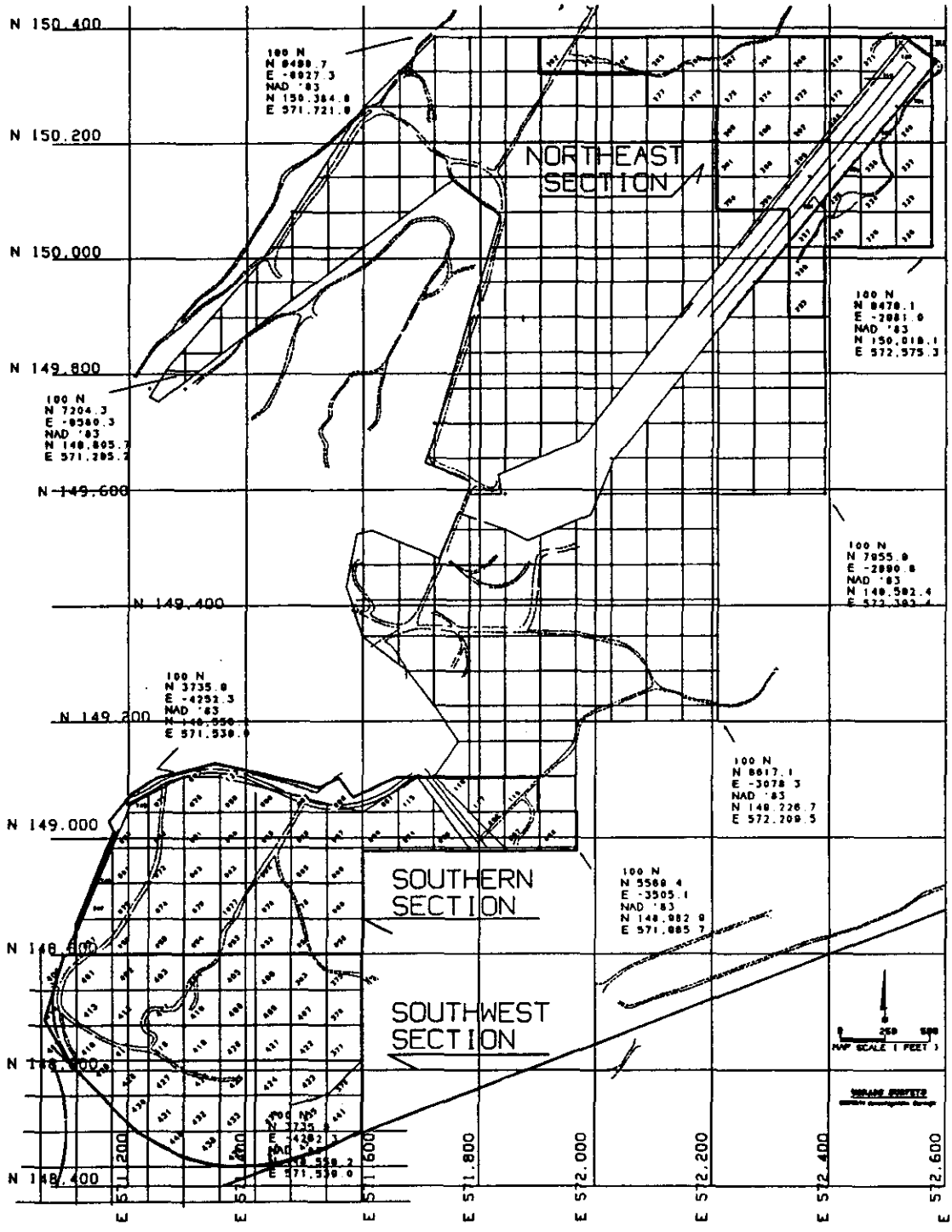
These instruments are maintained and calibrated by Pacific Northwest Laboratory.

Radiation survey instruments were checked at the beginning of each day for the proper instrument response. This was accomplished by placing a ^{137}Cs or U-Nat Check Source next to the detector and observing the instrument's response to the source. Local background radiation checks were also performed by taking three 1-min counts.

5.3.1 Manual Survey Methodology

This survey was performed by manually logging the NaI count rate meters digital scale reading and the Model 19's analog dose rate meter reading approximately every 25 ft within grids 083 and 090. The Model 2221 count rate meter and the Model 19 were held approximately 6 in. and 3 ft above the ground, respectively.

Figure 5. Numerical Locations of Grids.



5.3.2 Manual Survey Results

Statistically elevated readings were not observed with any of the utilized instrumentation. Table 2 gives the manual survey statistics.

Table 2. Manual Survey Statistics.

Grid	Date	Data points	Max cpm	Mean cpm	Std dev	Max µR	Mean µR	Std dev
83	4/28/92	80	2210	1911.99	130.82	11	9.35	0.71
90	4/28/92	80	2101	1732.41	146.43	11.00	9.05	0.71

5.3.3 USRADS Methodology

Each survey entailed setting up the USRADS equipment in a grid block, connecting the radiation survey meters to the USRADS data pack, calibrating the USRADS equipment, and performing the survey. Calibration of the USRADS is performed prior to starting a survey. The purpose of the calibration sequence is to reestablish the positioning instrumentation after the equipment is moved to a new location.

Every attempt was made to traverse each grid block on approximately 25-ft transects; however, due to the roughness of the terrain and varying vegetation growth this was not always possible. Speed of survey was approximately 1 m/sec. The gamma detector was maintained about 6 in. from the soil surface by suspending the detector from a boom attached to the surveyor's backpack. The dose rate meter was mounted to this boom 3 ft from the soil surface. In this manner detector geometry remained relatively constant throughout the entire survey.

5.3.4 USRADS Survey Results

Statistically elevated radiation/contamination readings were observed in 14 surveys encompassing 12 grid blocks. With the exception of Survey NR377A, grid 377, all elevated readings were found at the edges of the area surveyed, where the radiation shine from 100-N source terms began to affect the gamma-detecting instrumentation used. Each elevated count rate reading found was coincidental with an elevation of the µR dose rate observed. Table 3 cross-references these 14 surveys with Westinghouse Hanford Company Radiation Survey Report Numbers.

While performing Survey NR377A, the surveying technician lost his balance and fell, disconnecting the USRADS cable interface with the count rate meter. This disruption caused a momentary false rise in the count rate recorded. This small area was resurveyed and showed no indications of elevated radiation or radioactive contamination.

Figures 6, 7, and 8 are composite survey track maps, and Tables 4, 5, and 6 are survey statistics for each individual survey performed.

Table 3. USRADS Surveys with Elevated Readings Cross-Referenced with Westinghouse Hanford Company Radiation Survey Report Numbers.

Survey	Date	Grid	Data points	Max cpm	Mean cpm	Sigma	Max μR	Mean μR	Sigma	WHC survey report #
NR098A	04/27/92	098(S)	774	4320	2592.09	467.06	20.12	12.16	2.29	102957
NR098B	04/27/92	098(N)	504	4320	3101.67	491.78	22.22	14.69	2.43	102957
NR096A	04/29/92	096	1029	4200	2749.15	502.69	22.52	14.18	2.66	102959
NR097A	04/28/92	097	1183	4620	2839.17	489.25	23.72	13.97	2.59	102960
NR262A	05/05/92	262	764	4920	3365.42	549.95	26.12	18.25	3.09	102961
NR118A	05/01/92	118	1037	5640	3489.78	663.49	27.02	17.51	3.55	102962
NR117A	05/01/92	117	922	4680	3332.02	542.12	25.82	15.92	3.32	102962
NR263B	05/11/92	263(s)	517	4740	3555.32	517.9	22.22	14.97	2.31	102963
NR263A	05/08/92	263(n)	841	4680	3186.71	477.81	21.32	14.02	2.2	102963
NR265A	05/12/92	265	824	3900	2536.38	390	18.02	11.49	1.92	102963
NR264A	05/11/92	264	1210	4680	2930.13	443.37	20.12	12.64	2.2	102963
NR223A	05/13/92	223	851	4380	2811.54	537.1	23.72	15.85	2.98	102964
NR277A	05/21/92	277	834	4500	2917.19	456.67	20.72	12.82	2.3	102965
NR276A	05/21/92	276	1275	6780	2356.24	468.05	17.72	11.34	2.07	102965
NR116A	05/22/92	116(W)	750	3900	2436.24	435.34	22.82	13.92	2.75	102970
NR377A	04/06/92	377	1283	53340	3448.57	7295.65	12.92	7.74	1.89	102978

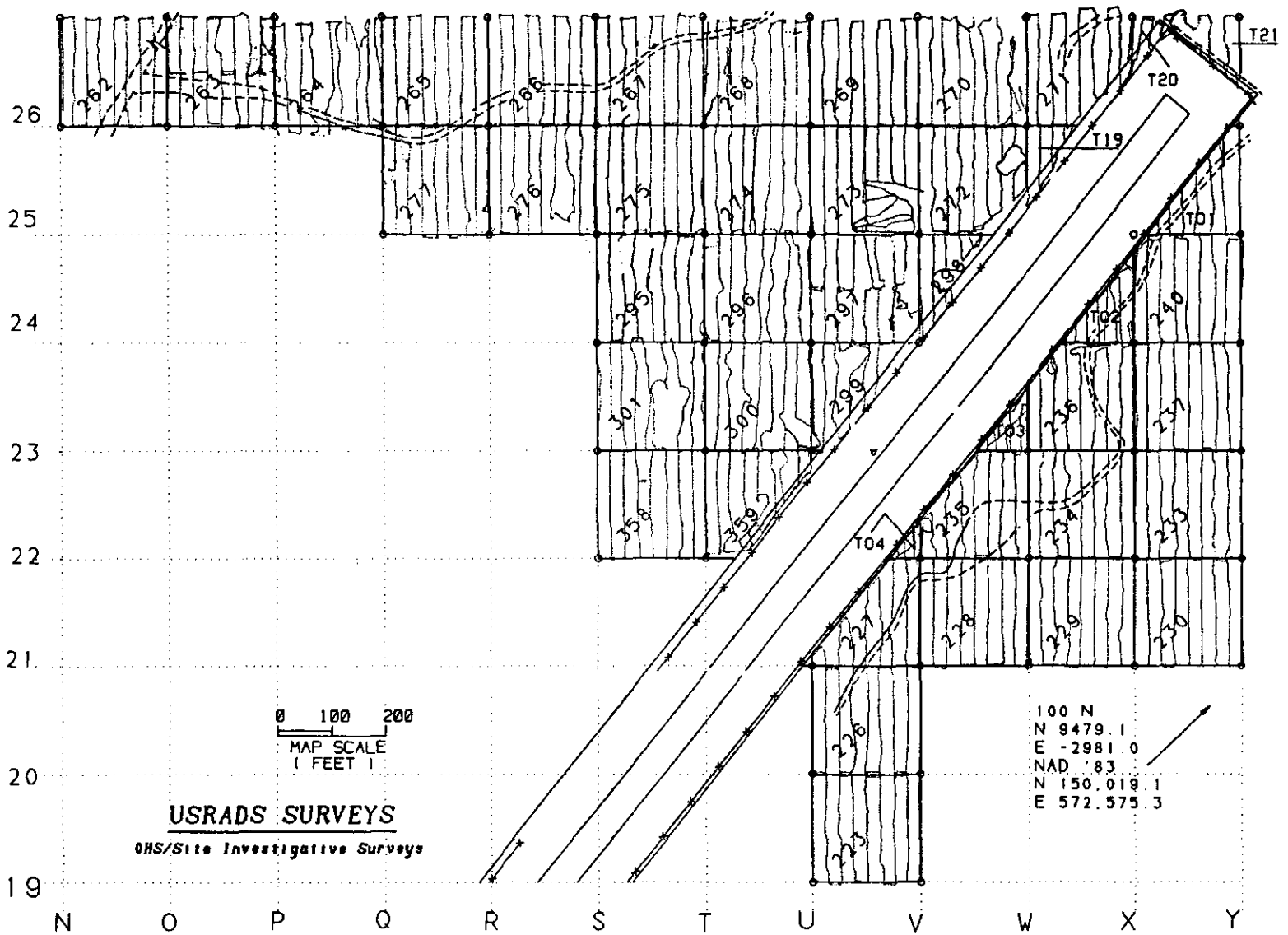


Figure 6. Composite Track Map - Northeast Section.

Figure 7. Composite Track Map - Southern Section.

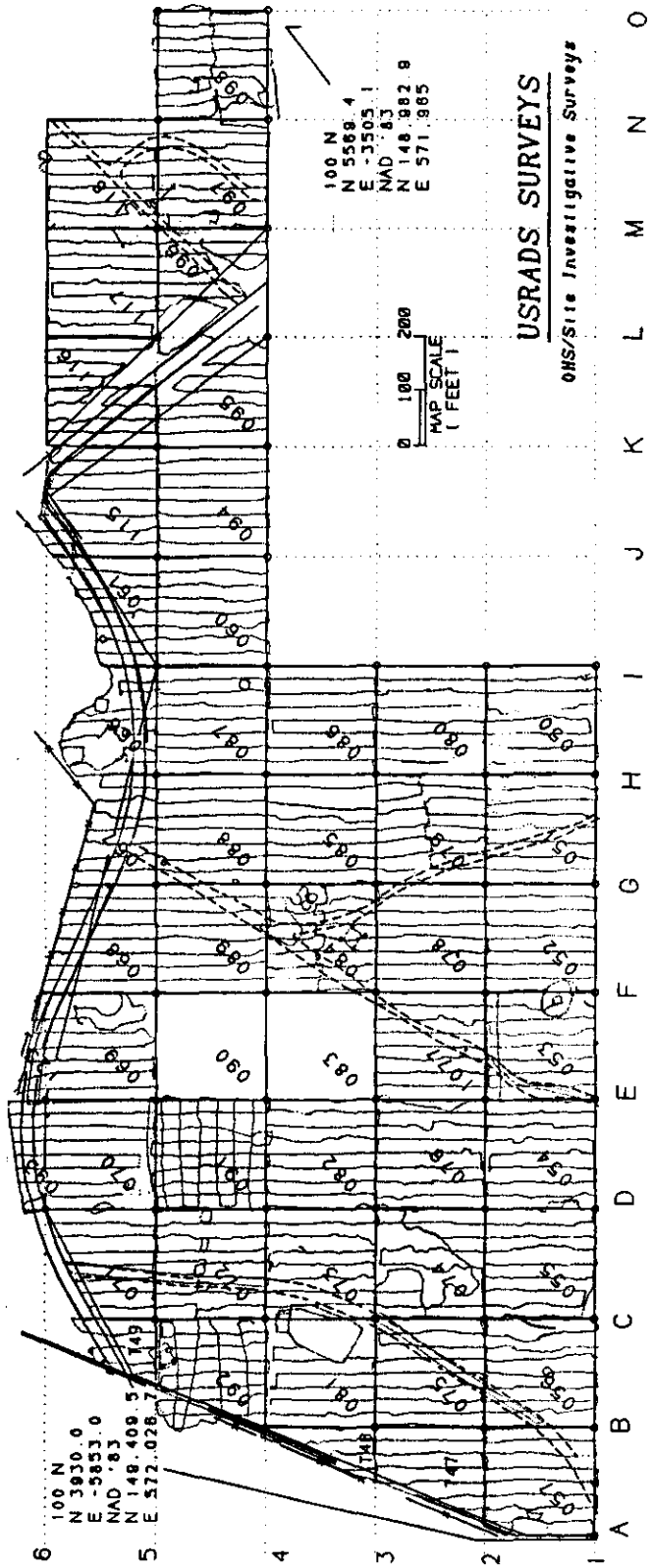


Figure 8. Composite Track Map - Southwest Section.

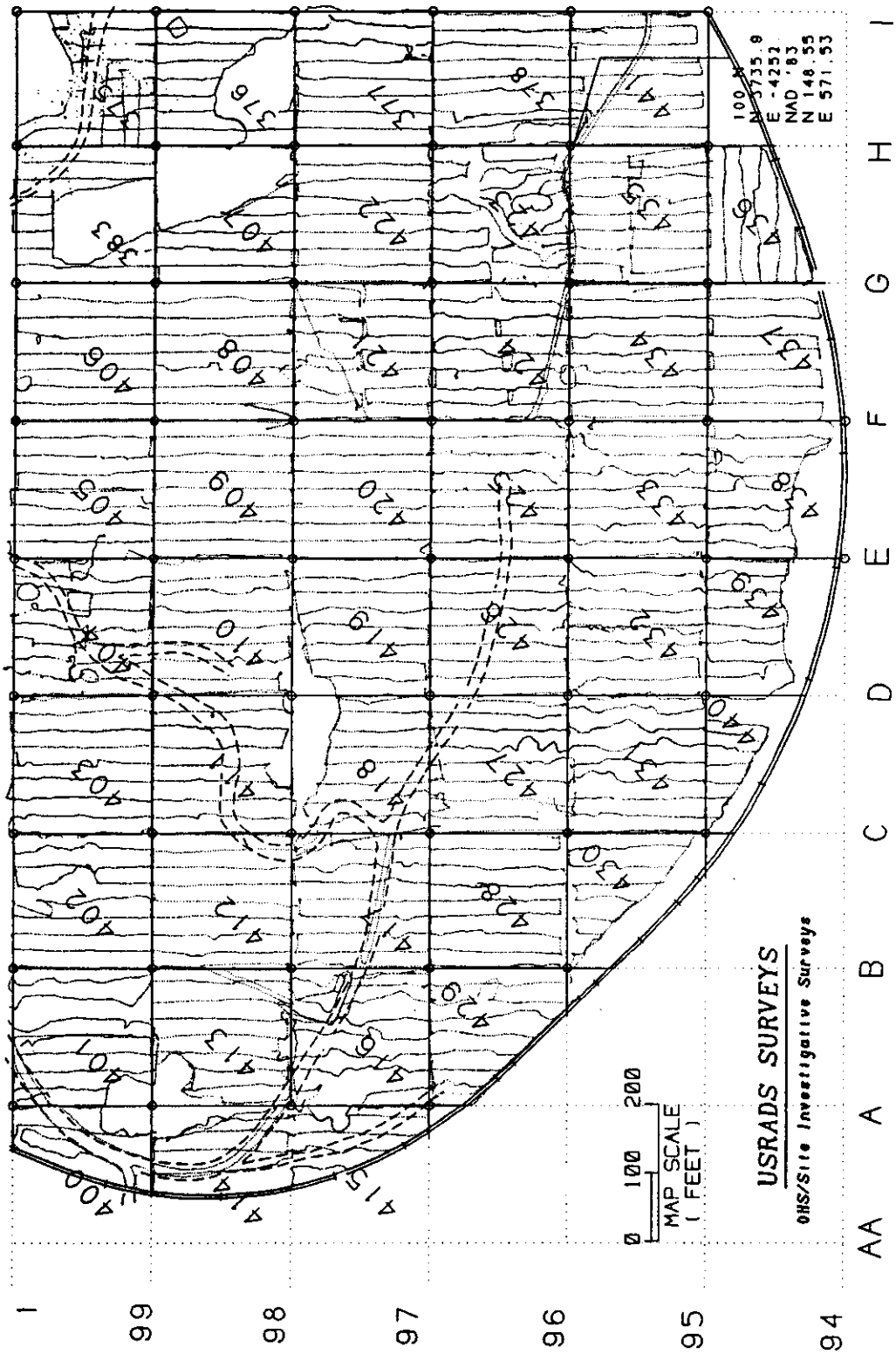


Table 4. USRADS Survey Statistics for Northeastern Section of 100-NR-1 Operable Unit. (sheet 1 of 3)

Survey	Date	Grid	Data points	Max cpm	Mean cpm	Sigma	Max µR	Mean µR	Sigma
NR223A	05/13/92	223	851	4380	2811.54	537.1	23.72	15.85	2.98
NR226A	05/13/92	226	924	3660	2435.06	402.02	18.92	12.67	2.31
NR227A	05/12/92	227	637	3240	2176.67	377.92	18.92	11.7	2.09
NR228A	05/12/92	228	925	3300	2057.64	409.27	17.42	10.32	2
NR229B	05/05/92	229	749	3240	2317.89	356.5	16.52	11.09	1.93
NR230A	05/04/92	230	748	3240	2025.24	363.64	15.32	10.24	1.74
NR233A	04/30/92	233	810	2940	2054.52	350.71	15.92	9.45	1.85
NR234A	05/08/92	234	800	3300	2019.98	388.17	15.32	9.28	1.92
NR235A	05/12/92	235	819	2700	1864.62	356.93	14.72	9.33	1.89
NR236A	05/01/92	236	1075	3000	1943.61	364.44	14.42	8.8	1.73
NR237A	05/01/92	237	776	2940	1961.83	348.51	13.22	8.77	1.6
NR240A	04/29/92	240	772	3000	2030.28	353.26	14.42	8.9	1.78
NR262A	05/05/92	262	764	4920	3365.42	549.95	26.12	18.25	3.09
NR263A	05/08/92	263(n)	841	4680	3186.71	477.81	21.32	14.02	2.2
NR263B	05/11/92	263(s)	517	4740	3555.32	517.9	22.22	14.97	2.31
NR264A	05/11/92	264	1210	4680	2930.13	443.37	20.12	12.64	2.2
NR265A	05/12/92	265	824	3900	2536.38	390	18.02	11.49	1.92
NR266A	05/12/92	266	781	3540	2229.14	375.63	15.92	10.39	1.88
NR267A	05/12/92	267	847	2940	1953.08	356.15	15.62	9.7	1.74
NR268A	05/13/92	268	1095	2940	1971.23	342.94	14.72	9.58	1.93
NR269B	06/05/92	269(E)	441	2520	1524.08	317.75	12.92	8.41	2.03

Table 4. USRADS Survey Statistics for Northeastern Section of 100-NR-1 Operable Unit. (sheet 2 of 3)

Survey	Date	Grid	Data points	Max cpm	Mean cpm	Sigma	Max µR	Mean µR	Sigma
N269A	06/05/92	269(W)	581	2760	1569.19	347.98	12.92	8.27	1.82
NR270A	06/09/92	270	881	2400	1373.53	337.98	13.22	7.62	1.79
NR271A	06/16/92	271	972	2700	1573.33	323.72	13.52	7.31	1.67
NR272B	06/04/92	272(E)	526	2520	1243.57	312.03	12.62	7.1	1.55
NR272A	06/04/92	272(W)	642	2160	1318.6	255.25	11.42	7.48	1.64
NR273B	06/03/92	273(E)	673	2280	1391.41	299.71	13.22	8.01	1.77
NR273A	06/03/92	273(W)	586	2460	1594.71	326.09	15.02	9.1	1.91
NR274C	06/03/92	274(E)	452	2760	1744.65	351.82	15.02	9.77	1.77
NR274A	06/03/92	274(W)	512	2760	1795.2	347.29	14.72	10.15	1.73
NR275B	06/03/92	275(E)	491	2880	1845.34	386.6	16.22	10.24	1.94
NR275A	06/03/92	275(W)	481	3000	2027.78	352.82	18.32	11.14	2.07
NR276A	05/21/92	276	1275	6780	2356.24	468.05	17.72	11.34	2.07
NR277A	05/21/92	277	834	4500	2917.19	456.67	20.72	12.82	2.3
NR295A	06/29/92	295	1153	3660	2336.57	412.71	16.52	10.3	2.14
NR296A	06/29/92	296	939	3000	1934.82	360.07	15.02	9.04	1.82
NR297C	06/29/92	297(N)	713	2940	1865	372.98	13.52	8.66	1.81
NR297A	06/10/92	297(S)	692	2700	1594.94	371.41	14.12	9.13	1.72
T-18A	06/22/92	298	557	2100	1326.89	282.01	12.62	8.3	1.7
NR299A	06/22/92	299	536	1980	1356.72	285.95	14.42	8.95	1.82
NR300B	06/26/92	300	1063	3060	2004.67	338.6	15.62	9.74	1.93
NR301A	06/26/92	301	796	3540	2208.17	442.54	21.32	12.27	2.74

Table 4. USRADS Survey Statistics for Northeastern Section of 100-NR-1 Operable Unit. (sheet 3 of 3)

Survey	Date	Grid	Data points	Max cpm	Mean cpm	Sigma	Max µR	Mean µR	Sigma
NR358A	06/26/92	358	942	3900	2437.64	453.48	23.42	14.1	2.86
NR359A	06/25/92	359	926	3360	1999.18	430.2	21.32	12.06	2.66
NR375A	04/07/92	375	1447	3000	1891.76	350.89	14.12	8.21	1.74
NRT01A	05/21/92	T01	647	2700	1713.01	328.92	12.62	8.5	1.77
NRT02A	05/21/92	T02	463	2880	1761.51	346.06	13.22	8.74	1.74
NRT03A	05/14/92	T03	310	2580	1532.13	303.55	13.52	8.38	1.78
NRT04A	05/14/92	T04	270	2880	2056	388.2	14.72	10.21	1.78
NRT19A	06/22/92	T19	307	1920	1172.64	286.4	10.82	7.01	1.44
NRT20A	06/30/92	T20	528	2460	1643.86	333.04	11.42	6.99	1.53
NRT21A	06/30/92	T21	371	2460	1620.97	286.39	12.62	7.49	1.59

Table 5. USRADS Survey Statistics for Southern Section of 100-NR-1 Operable Unit. (sheet 1 of 3)

Survey	Date	Grid	Data points	Max cpm	Mean cpm	Sigma	Max µR	Mean µR	Sigma
NR050A	04/08/92	050	902	3180	2141.11	367.67	13.82	9.05	1.72
NR051A	04/08/92	051	722	3120	1959.31	347.43	13.52	8.93	1.58
NR052A	04/10/92	052	861	3540	1982.09	497.84	95.72	9.18	5.42
NR053A	04/14/92	053	974	2820	1712.96	342.36	12.02	7.66	1.7
NR054A	04/20/92	054	994	2580	1624.47	323.02	12.02	7.25	1.67
NR055A	04/21/92	055	1174	2400	1468.16	299.25	11.42	6.52	1.53
NR056A	04/01/92	056	977	2340	1396.89	303.57	14.12	7.4	1.78
NR057A	04/01/92	057	1103	2400	1343.45	323.34	11.72	7.05	1.65
NR060A	04/24/92	060	854	3480	2247.96	379.77	15.92	10.08	1.91
NR061A	04/24/92	061	1086	3780	2460.17	443.98	17.42	10.97	2.08
NR066A	04/22/92	066	1067	3720	2284.33	377.02	15.92	10.11	1.92
NR067A	04/22/92	067	655	3180	2242.53	388.15	17.42	9.78	1.79
NR068A	04/21/92	068	1049	3360	2210.79	379.96	15.92	9.58	1.77
NR069A	04/21/92	069/123	1222	3060	1871.39	344.82	14.12	8.46	1.79
NR070A	04/23/92	070/093	1187	2880	1837.81	333.8	12.92	7.97	1.71
NR071A	04/06/92	071	886	3120	1769.26	366.95	12.62	8.13	1.71
NR072A	04/06/92	072	556	2580	1670.07	341.93	10.82	6.76	1.42
NR072B	04/06/92	072	420	2460	1677.86	315.62	11.12	7.32	1.4
NR073A	04/22/92	073	1045	2400	1574.12	311.35	10.82	6.91	1.53
NR074A	04/21/92	074	1230	2580	1498.98	303.4	10.82	6.71	1.42
NR075A	04/02/92	075	915	3120	1879.48	380.2	12.32	8.04	1.53

Table 5. USRADS Survey Statistics for Southern Section of 100-NR-1 Operable Unit. (sheet 2 of 3)

Survey	Date	Grid	Data points	Max cpm	Mean cpm	Sigma	Max µR	Mean µR	Sigma
NR076A	04/23/92	076	1090	2640	1516.4	337.3	11.72	7.06	1.67
NR077A	04/10/92	077	915	3120	1903.87	380.95	12.62	8.23	1.71
NR078A	04/10/92	078	763	2940	1975.83	391.44	13.82	8.59	1.82
NR079C	04/14/92	079	436	2820	1930.73	297.41	13.52	8.79	1.52
NR079B	04/14/92	079	556	2700	1886.87	330.22	12.62	8.63	1.66
NR080A	04/08/92	080	802	3420	2148.4	434.26	220.82	10.42	13.23
NR081A	04/02/92	081	910	2340	1517.67	307.2	13.22	7.66	1.76
NR082A	04/23/92	082	944	2460	1474.64	314.59	11.42	6.72	1.62
NR084A	04/20/92	084-N	567	3180	1977.14	370.82	16.22	8.78	1.96
NR084B	04/20/92	084-S	546	3060	1915.38	337.11	13.22	8.67	1.81
NR085A	04/17/92	085	770	3120	2032.05	361.16	14.12	9.17	1.76
NR086A	04/15/92	086	783	3060	2154.02	367.47	15.02	9.62	1.73
NR087A	04/15/92	087	769	3360	2484.5	362.13	15.92	10.96	1.9
NR088A	04/17/92	088	840	3480	2216.57	374.46	16.22	9.81	1.91
NR089A	04/17/92	089	751	3180	2079.47	367.27	15.32	9.66	1.75
NR091A	04/06/92	091	1238	2700	1735.64	321.63	13.82	8	1.77
NR092A	04/03/92	092	1255	2760	1660.45	389.04	12.32	7.35	1.75
NR094A	04/23/92	094	748	3240	2176.52	357.02	15.92	9.73	1.96
NR095A	04/23/92	095	751	3540	2275.05	435.38	16.82	10.44	1.97
NR096A	04/29/92	096	1029	4200	2749.15	502.69	22.52	14.18	2.66
NR097A	04/28/92	097	1183	4620	2839.17	489.25	23.72	13.97	2.59

Table 5. USRADS Survey Statistics for Southern Section of 100-NR-1 Operable Unit. (sheet 3 of 3)

Survey	Date	Grid	Data points	Max cpm	Mean cpm	Sigma	Max µR	Mean µR	Sigma
N2098B	04/27/92	098(N)	504	4320	3101.67	491.78	22.22	14.69	2.43
NR098A	04/27/92	098(S)	774	4320	2592.09	467.06	20.12	12.16	2.29
NR115A	05/21/92	115	936	3720	2371.73	466.49	22.82	13.69	2.88
NR116B	05/22/92	116(E)	532	3780	2642.03	456.14	26.42	15.91	3.09
NR116A	05/22/92	116(W)	750	3900	2436.24	435.34	22.82	13.92	2.75
NR117A	05/01/92	117	922	4680	3332.02	542.12	25.82	15.92	3.32
NR118A	05/01/92	118	1037	5640	3489.78	663.49	27.02	17.51	3.55
NRT47A	07/10/92	T47	720	2580	1598	372.99	12.92	7.02	1.72
NRT48A	07/10/92	T48	465	3420	1779.1	449.62	15.02	7.39	2.02
NRT-49	07/10/92	T49	564	2880	1849.68	353.57	13.22	7.65	1.76

Table 6. USRADS Survey Statistics for Southwest Section of 100-NR-1 Operable Unit. (sheet 1 of 4)

Survey	Date	Grid	Data points	Max cpm	Mean cpm	Sigma	Max µR	Mean µR	Sigma
NR375A	04/07/92	375	1447	3000	1891.76	350.89	14.12	8.21	1.74
NR376A	04/07/92	376	1094	2760	1773.56	355.5	12.62	7.39	1.66
NR377A	04/06/92	377	1283	53340	3448.57	7295.65	12.92	7.74	1.89
NR378A	04/06/92	378	1086	2820	1874.03	357.25	12.62	8.04	1.65
NR383A	04/07/92	383	1063	3180	1813.72	425.47	12.62	8.16	1.89
NR400A	07/13/92	400	662	2700	1572.24	379.74	11.72	6.79	1.7
NR401A	06/30/92	401(E)	664	2220	1426.36	285.07	12.62	7.44	1.67
NR401C	07/07/92	401(W)	586	2520	1556.83	343.71	12.62	7.22	1.74
NR402A	07/07/92	402	1153	2640	1599.5	325.23	12.02	7.26	1.54
NR403B	06/26/92	403(E)	505	1980	1175	287.26	10.52	6.81	1.55
NR403A	06/26/92	403(W)	588	2100	1236.73	282.66	12.62	7.3	1.7
NR404C	07/09/92	404(N)	934	2280	1384.63	276.62	12.02	6.75	1.51
NR404A	06/29/92	404(S)	725	2100	1209.68	258.36	11.72	6.58	1.59
NR405A	06/16/92	405(E)	475	2340	1341.09	401.55	12.32	7.64	1.59
NR405B	06/16/92	405(W)	623	2340	1349.28	317.4	12.62	7.41	1.61
NR406B	06/16/92	406(E)	375	2280	1507.68	306.44	12.62	8.5	1.59
NR406A	06/16/92	406(W)	461	2160	1460.95	311.8	12.92	8.56	1.65
NR407A	06/03/92	407	686	2580	1516.79	339.6	12.92	8.12	1.82
NR408A	06/16/92	408(E)	401	2400	1512.57	307.41	12.62	8.4	1.74
NR408C	06/16/92	408(W)	564	2820	1363.62	492.01	14.12	8.37	1.65

Table 6. USRADS Survey Statistics for Southwest Section of 100-NR-1 Operable Unit. (sheet 2 of 4)

Survey	Date	Grid	Data points	Max cpm	Mean cpm	Sigma	Max µR	Mean µR	Sigma
NR409B	06/17/92	409(E)	413	2340	1439.85	314.43	13.52	7.88	1.71
NR409A	06/17/92	409(W)	489	2520	1529.08	393.95	12.92	8.31	1.57
NR410A	06/29/92	410	782	2520	1503.61	346.75	13.52	7.94	1.83
NR411B	06/26/92	411(B)	486	2280	1401.11	296.99	15.32	8.22	1.74
NR411A	06/26/92	411(W)	572	2100	1504.3	290.23	14.12	8.43	1.72
NR412B	06/26/92	412(E)	531	2340	1414.58	318.09	13.52	8.75	1.74
NR412A	06/26/92	412(W)	361	1980	1261	288.06	11.72	8.16	1.5
NR413A	06/30/92	413	940	2820	1440.89	313.47	12.62	7.55	1.62
NR414A	07/13/92	414	715	3780	1605.82	445.33	13.52	7.54	1.96
NR415A	07/13/92	415	612	2940	1697.55	470.73	12.02	7.36	2.01
NR416A	07/01/92	416	1564	2100	1335.73	297.35	13.52	7.55	1.72
NR417A	07/02/92	417	1046	2460	1496.44	329.19	14.72	8.08	1.83
NR418A	06/29/92	418	838	2400	1460	329.09	12.62	7.81	1.61
NR419A	06/29/92	419	828	2640	1523.04	319.8	13.82	8.14	1.71
NR420A	06/17/92	420(E)	423	2280	1494.89	327.19	12.32	8.07	1.54
NR420B	06/17/92	420(W)	400	2220	1450.35	274.36	12.32	8.14	1.73
NR421B	06/05/92	421(N)	585	2460	1640.62	293.94	13.82	9.18	1.67
NR421A	06/04/92	421(S)	500	2460	1625.52	342.67	15.32	9.16	1.91
NR422A	06/03/92	422	834	2640	1574.46	385.14	13.22	8.54	1.83
NR423B	06/02/92	423(N)	490	2280	1453.84	333.65	12.32	8.02	1.59
NR423A	06/02/92	423(S)	894	2520	1438.86	320.15	13.22	8.07	1.81

Table 6. USRADS Survey Statistics for Southwest Section of 100-NR-1 Operable Unit. (sheet 3 of 4)

Survey	Date	Grid	Data points	Max cpm	Mean cpm	Sigma	Max µR	Mean µR	Sigma
NR424B	06/04/92	424(N)	516	3060	1492.67	353.31	14.42	8.27	1.83
NR424A	06/04/92	424(S)	625	2940	1588.7	362.22	12.92	8.38	1.87
NR425B	06/17/92	425(E)	515	2340	1409.36	321.88	11.72	7.9	1.57
NR425A	06/17/92	425(W)	481	2580	1356.3	331.91	12.02	7.2	1.81
NR426A	06/18/92	426(E)	494	2340	1332.75	325.2	14.12	7.3	1.87
NR426B	06/18/92	426(W)	354	2280	1365.76	303.43	12.32	7.82	1.48
NR427B	06/25/92	427(E)	500	2100	1263.84	307.26	13.22	8.09	1.81
NR427A	06/25/92	427(W)	502	2100	1279.12	278.28	13.22	7.77	1.76
NR428B	07/02/92	428	864	2400	1442.22	301.95	12.32	7.71	1.74
NR429A	07/01/92	429	870	2400	1316.07	420.98	13.52	7.22	2.02
NR430A	07/15/92	430	651	2940	1855.94	399.07	14.12	8.53	1.82
NR431A	07/07/92	431	1076	2700	1599.7	359.55	12.32	7.28	1.69
NR432B	06/25/92	432(E)	547	1920	1134	254.16	12.62	7.19	1.58
NR432A	06/18/92	432(W)	594	1980	1240.51	296.39	10.82	7.08	1.59
NR433B	06/18/92	433(E)	513	2040	1280.35	286.24	11.42	6.86	1.61
NR433A	06/18/92	433(W)	540	2280	1257	274.35	11.12	6.7	1.57
NR434A	06/03/92	434	865	2400	1445.2	306.45	14.12	8.36	1.81
NR435A	06/02/92	435(N)	570	2880	1647.26	407.2	13.82	8.91	1.76
NR435B	06/02/92	435(S)	549	2460	1538.47	373.21	12.62	8.38	1.66
NR436A	07/08/92	436	633	2280	1509.67	320.33	12.62	7	1.66
NR437A	06/03/92	437	624	2400	1431.92	309.18	12.02	7.81	1.64

Table 6. USRADS Survey Statistics for Southwest Section of 100-NR-1 Operable Unit. (sheet 4 of 4)

Survey	Date	Grid	Data points	Max cpm	Mean cpm	Sigma	Max µR	Mean µR	Sigma
NR438A	07/09/92	438	802	2460	1503.97	342.44	12.02	7.05	1.72
NR439A	07/09/92	439	724	2640	1600.36	321.35	13.52	7.18	1.72
NR440A	07/15/92	440	450	3180	1761.6	362.81	11.72	8.28	1.64
NR441A	07/08/92	441	1030	2640	1686.87	351.34	13.52	7.99	1.78

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