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MAR 04 1992
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ENGINEERING DATA TRANSMITTAL

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16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRP 5.43)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1	2	Cog.Eng. M. Wendling	[signature]	2-17-92		G.C. Henckel	[signature]	2/18/92	(20)	1	2
1	2	Cog. Mgr. W.L. Johnson	[signature]	2/18	H4-55						
		QA									
		Safety									
		Env.									
		EDMC (2)									
		IRM CLEARANCE (1)									

18.	19.	20.	21. DOE APPROVAL (if required)
G.C. Henckel [signature] 2/18/92 Signature of EDT Originator / Date	Authorized Representative for Receiving Organization / Date	W.L. Johnson [signature] 2/18/92 Cognizant/Project Engineer's Manager / Date	Ltr. No. [] Approved [] Approved w/comments [] Disapproved w/comments

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SUPPORTING DOCUMENT

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Process trenches, ultrasonic ranging and data system, USRADS, radiological surveys, and expedited response action	Name: Marc Wendling Signature Organization/Charge Code 81225/PC12A

APPROVED FOR PUBLIC RELEASE 2/25/92 D Solil

7. Abstract

This document summarizes the results of the radiological surveys conducted over the entire surface of the 316-5 Process Trench Site. In addition, this document explains the survey methodology using the Ultrasonic Ranging and Data System (USRADS) automatic data recording equipment to monitor the gross gamma radiation levels of the surface soil.

9. Impact Level 4

10. RELEASE STAMP

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316-5 PROCESS TRENCH SITE

USRADS SURVEYS

Pre and Post Remediation

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316-5 PROCESS TRENCH USRADS SURVEYS

SCOPE

This report summarizes the results of the radiological surveys conducted over the entire surface of the 316-5 Process Trench Site,300 Area, Hanford Site, Richland, Washington. In addition, this report explains the survey methodology using the Ultrasonic Ranging and Data System (USRADS) automatic data recording equipment.

The radiological surveys of the 316-5 PT Site, along with the background study, were conducted by Site Investigative Surveys, Occupational Health and Safety organization of the Westinghouse Hanford Company. The survey methodology was based on utilization of the Ultrasonic Ranging and Data System (USRADS) for automated recording of the gross gamma radiation levels of the surface soil.

INSTRUMENTATION

Two surveys were conducted at the PT site. The first survey was conducted in February, 1991 prior to remediation activities. The Pre-Remediation survey was performed using a Ludlum Model 2221 count rate meter with a 1" X 1" NaI Ludlum Model 44-2 radiation detector. A post remediation survey was conducted in late October, early November, 1991 utilizing both the 2221/44-2 NaI count rate meter and a Ludlum Model 19 uR meter.

The radiological surveys were conducted by interfacing the contamination/radiation detection instrument(s) with a CHEMRAD Tennessee Corp. Series 2000 USRADS. 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. The USRADS equipment is used to record the detector readings verses the location of the readings, generate a map of the survey area and save the data on computer storage mediums.

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, will highlight the data point plotted on the CPU monitor. This feature alerts the CPU operator that the cpm data has exceeded the threshold, or preset value. For the purpose of conducting the 316-5 PT surveys, it was desired to establish a value for the threshold where readings above the setting could be considered surface contamination. The threshold value established for the entire 316-5 Process Trench Site survey was twice the background count rate determined at the Low Background Test Site (Appendix) or 3,900 cpm. This value is valid based on the premise that too low a setting would highlight normal fluctuations above the calculated mean, and too high a setting would cut off the low end of surface contamination that might be present.

METHODOLOGY

Prior to performing the surveys, a grid block system was utilized at the site in order to establish horizontal control and tie the individual surveys together. Each survey of the area entailed setting up the USRADS equipment in a grid block; connecting the radiation survey meter(s) 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 to the calibration sequence is to reestablish the positioning of instrumentation after the equipment is moved to a new location.

Each grid block was traversed in a cross hatched pattern on approximately ten foot centers.The gamma detector was maintained 6 inches from the soil surface by suspending the detector from a boom attached to the surveyors backpack. For the post remediation survey a uR detector was also mounted approximately three feet above the soil surface. Detector geometry remained relatively constant throughout the entire survey. Survey speed was approximately one meter/sec.

As the surveyor traverses the survey area, the USRADS records the output data from the radiation detector verses 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.

Radiation survey instruments were checked at the beginning of each day for the proper instrument response. This was accomplished by placing a Uranium Check Source next to the detector and observing the instrument's response to the source. Local background radiation checks were also performed. This involved taking three-one minute counts and calculating the average of the three counts.

RESULTS

For both surveys the entire fenced area at the Process Trench Site was surveyed, with the exception of the steep embankments and the covered trenches themselves. This fenced area encompasses approximately 423,200 sq. feet or 9.7 acres.

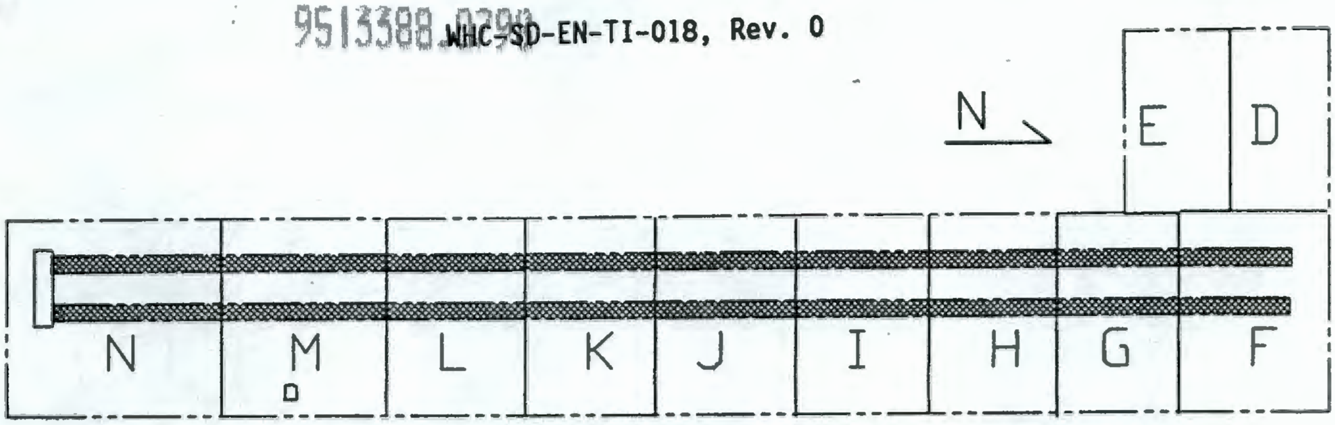
The pre-remediation survey consisted of eleven individual USRADS surveys collecting 30,453 data points. Page 3 shows the grid block layout for the site and the table summarizes the individual survey statistics.

The post-remediation survey also consisted of eleven surveys totaling 29,356 data points. It is summarized on page 4.

Page 5 is a composite survey track map of both pre and post-remediation surveys. Data points greater than 3900 CPM with the NaI detector (>MDC) are highlighted in red (boldface if black and white report copy).

On pages 6 and 7 are 3-D graphic maps of the site with the Z axis representing the NaI detectors count rates.

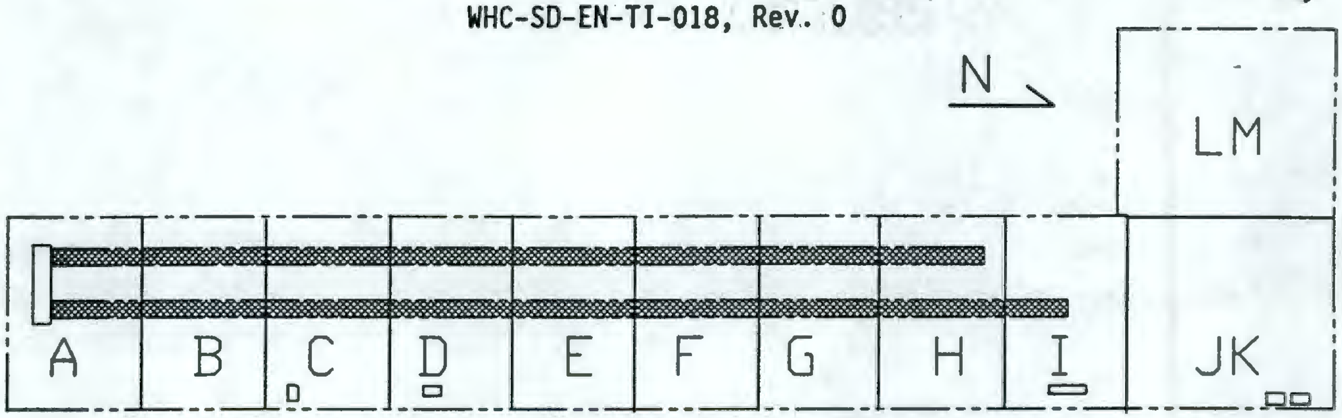
Appendixes A and B are USRADS software generated track maps of the individual pre and post-remediation surveys respectively. Appendix C is a summary of the Low Background Site survey where background levels were determined.



PRE-REMEDIATION USRADS SURVEYS GRID LAYOUT FEB 1991

NaI COUNT RATE METER SURVEY STATISTICS

SURVEY	DATE	GRID	DATA PTS	MAX CPM	MEAN CPM	SD CPM
316-5D	02/12/91	D	3006	14940	3560.94	2473.91
316-5E	02/13/91	E	3209	13260	3592.22	2039.94
316-5F	02/14/91	F	2516	6380	2099.63	609.67
316-5G	02/15/91	G	2646	3580	2070.43	299.04
316-5H	02/17/91	H	2514	3500	1867.43	291.25
316-5I	02/20/91	I	2695	3800	2004.36	311.07
316-5J	02/22/91	J	2410	3400	2079.57	273.62
316-5K	02/23/91	K	2332	4680	2402.67	492.15
316-5L	02/25/91	L	2438	6300	2566.42	570.27
316-5M	02/26/91	M	2713	7580	3029.97	864.57
316-5N	02/27/91	N	3974	10840	3468.03	1219.84



POST-REMEDIATION USRADS SURVEYS GRID LAYOUT OCT/NOV 1991

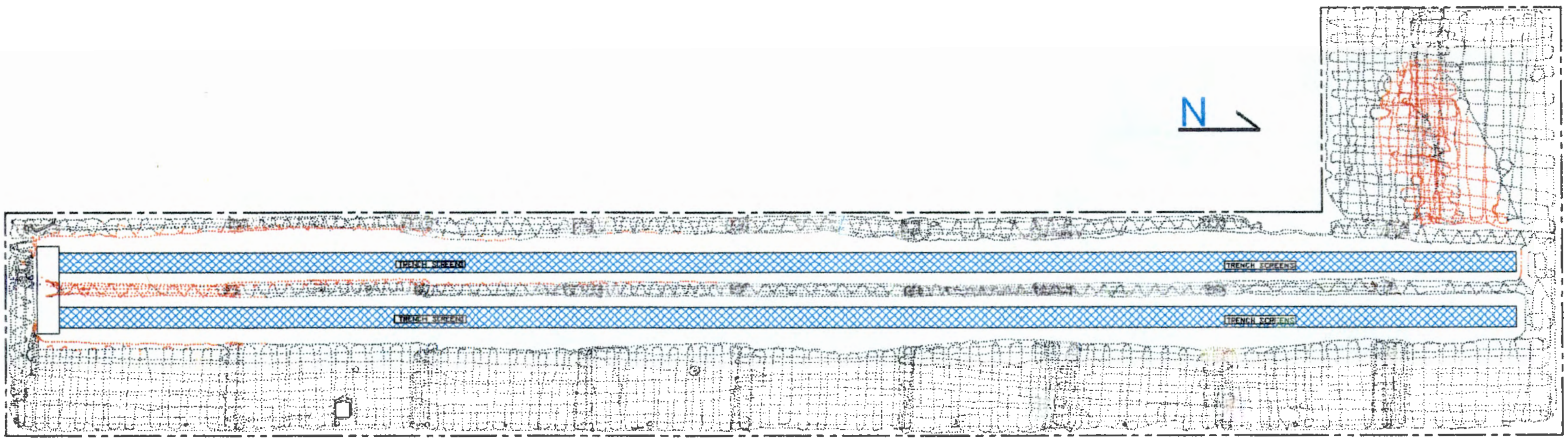
NaI COUNT RATE METER SURVEY STATISTICS

SURVEY	DATE	GRID	DATA PTS	MAX CPM	MEAN CPM	SD CPM
316-5A	10/26/91	A	2154	2740	2000.5	233.95
316-5B	10/26/91	B	1989	2780	1935.14	235.5
316-5C	10/27/91	C	1812	2660	1852.43	210.38
316-5D	10/27/91	D	1931	2500	1772.44	188.46
316-5E	10/27/91	E	1996	2740	1725.95	205.47
316-5F	10/27/91	F	1875	2340	1687.3	191.36
316-5GA	11/02/91	G	1968	2320	1691.19	182.41
316-5HA	11/02/91	H	1997	2320	1683.55	197.49
316-5IA	11/02/91	I	3031	2220	1614.6	176.59
316-5JKA	11/03/91	J+K	4721	2400	1656.82	187.24
316-5LMA	11/03/91	L+M	5882	2620	1666.92	194.62

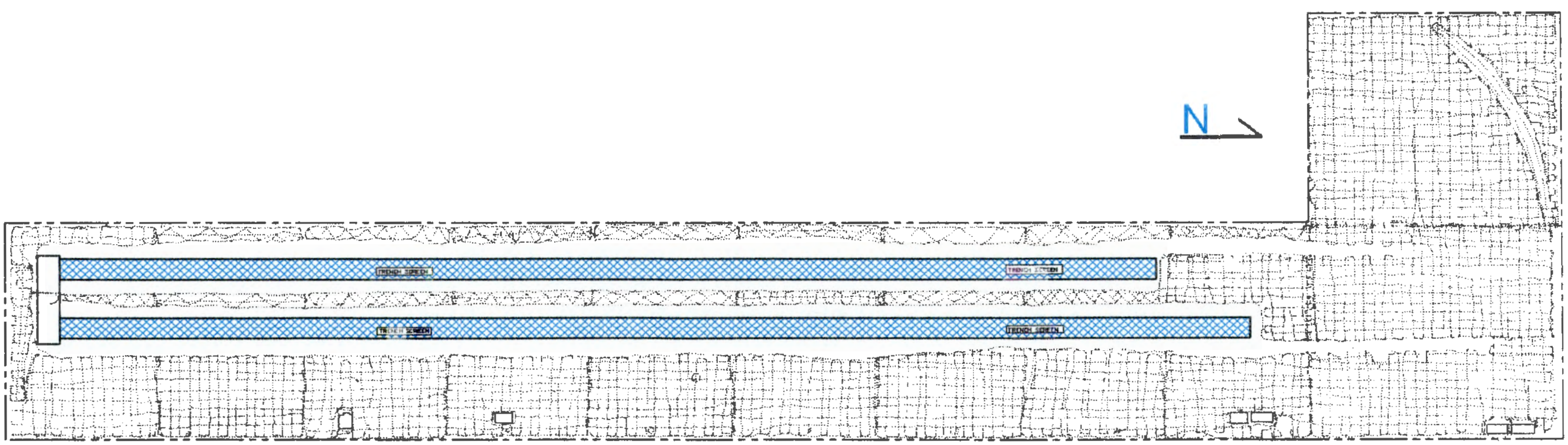
uR METER SURVEY STATISTICS

SURVEY	DATE	GRID	DATA PTS	MAX uR	MEAN uR	SD uR
316-5A	10/26/91	A	2154	17.52	11.75	1.48
316-5B	10/26/91	B	1989	16.22	11.13	1.45
316-5C	10/27/91	C	1812	15.22	10.54	1.22
316-5D	10/27/91	D	1931	14.02	10.1	1.15
316-5E	10/27/91	E	1996	14.82	9.75	1.22
316-5F	10/27/91	F	1875	13.32	9.25	1.08
316-5GA	11/02/91	G	1968	22.02	10.79	2.12
316-5HA	11/02/91	H	1997	23.52	10.95	2.66
316-5IA	11/02/91	I	3031	24.42	10.69	2.45
316-5JKA	11/03/91	J+K	4721	27.82	11.15	2.65
316-5LMA	11/03/91	L+M	5882	22.62	10.55	2.09

316-5 PROCESS TRENCHES USRADS SURVEYS



PRE-REMEDIATION USRADS SURVEY· COMPOSITE TRACK MAP FEB 1991 (RED DENOTES >3900 CPM W/NaI)



POST-REMEDIATION USRADS SURVEY· COMPOSITE TRACK MAP OCT/NOV 1991

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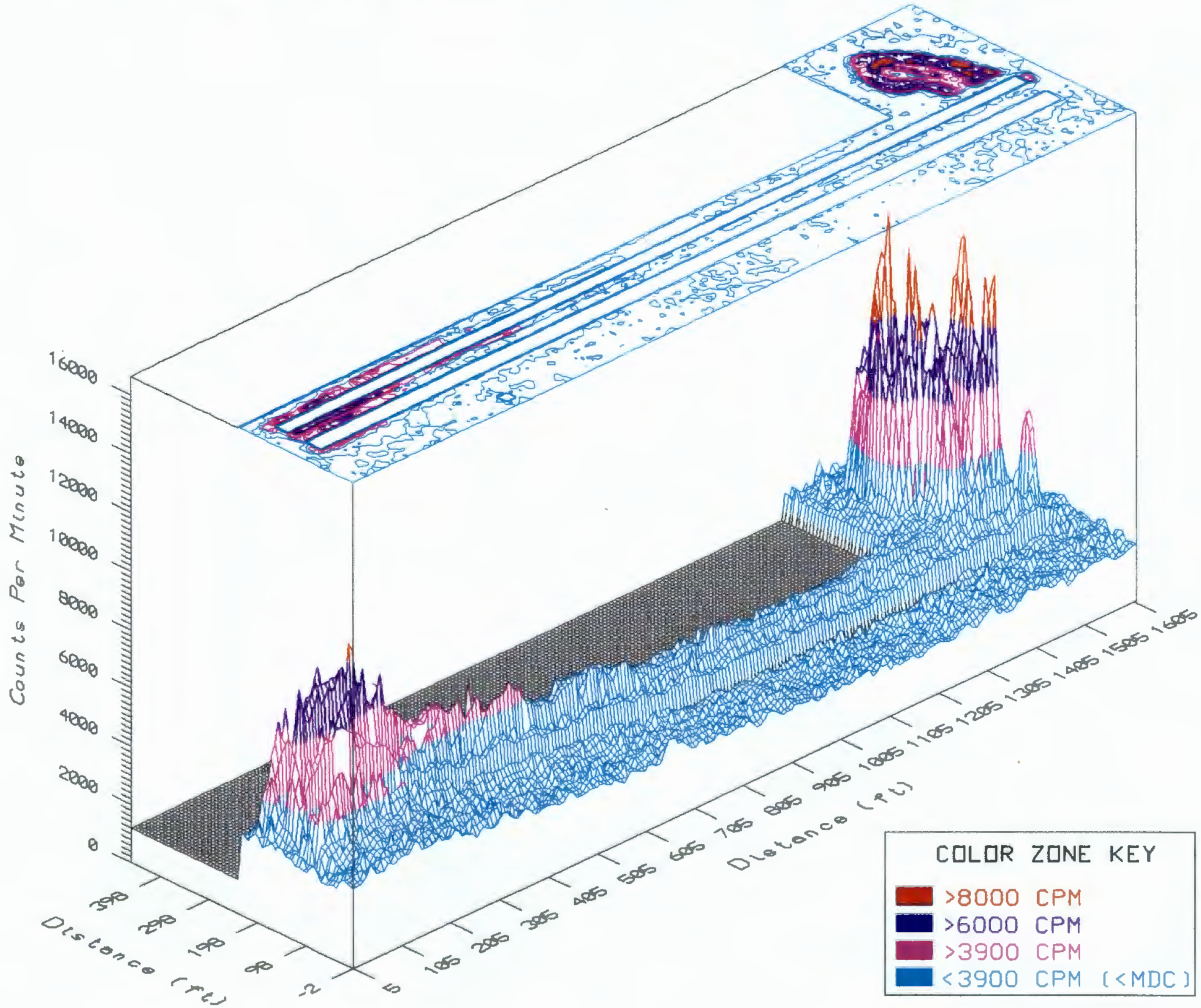
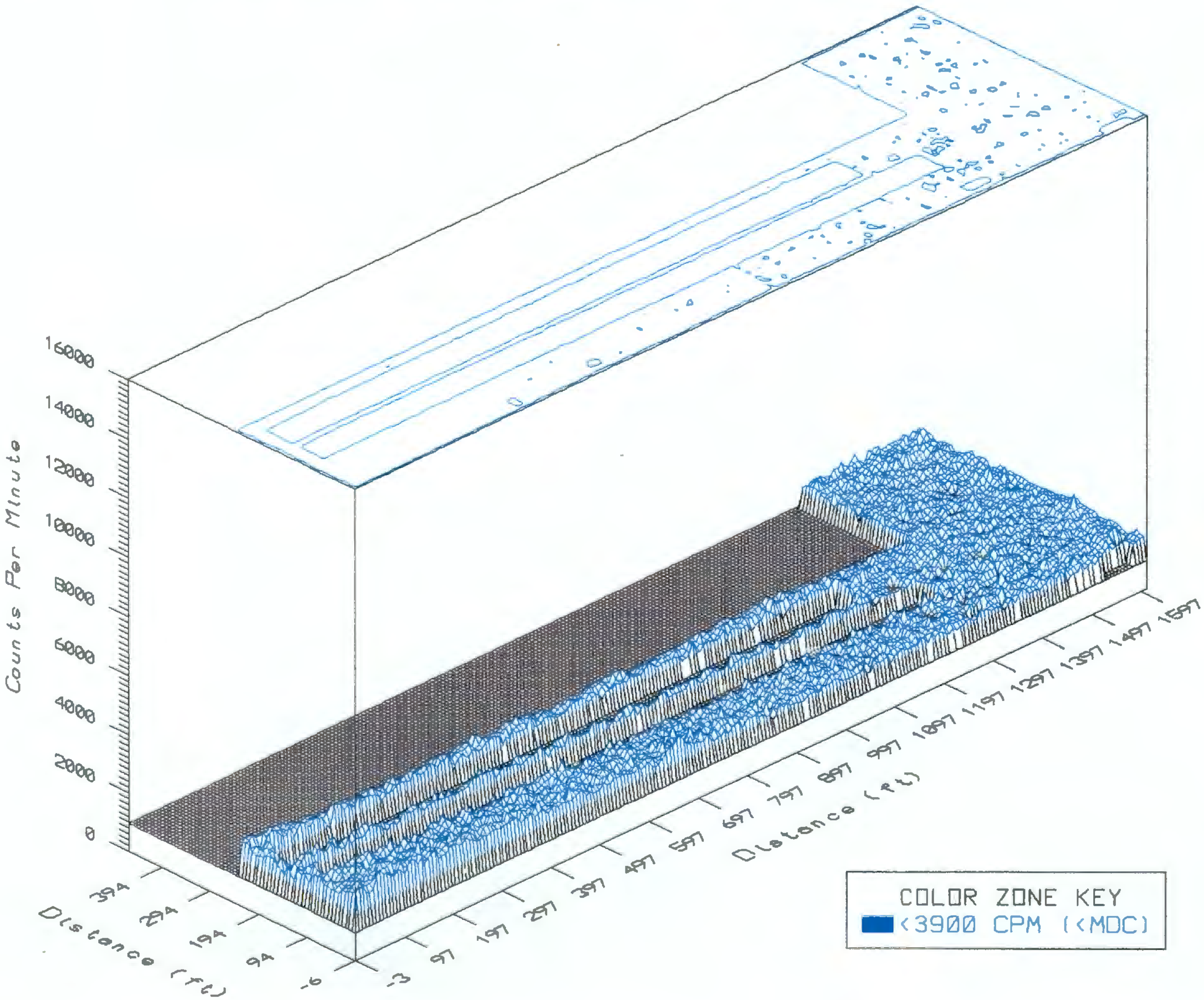
Pre-Remediation Radiological Profile of 316-5 Process Trench Site



Post-Remediation Radiological Profile
of 316-5 Process Trench Site



9513388.0801

316-5 PROCESS TRENCH SITE

USRADS SURVEYS

Pre and Post Remediation

APPENDIX A

Pre-Remediation Surveys

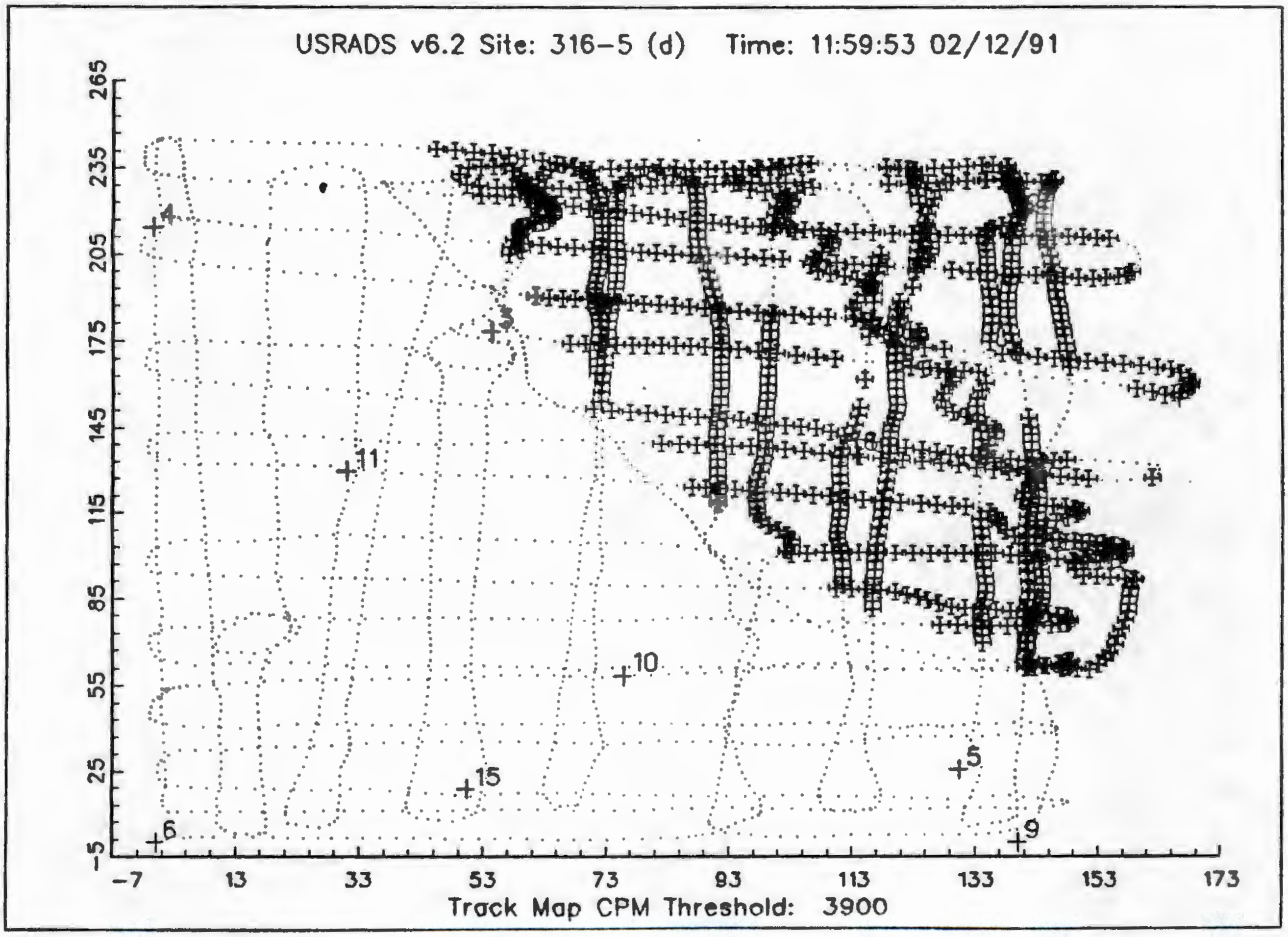
USRADS Software Generated Track Maps

Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 3006 data points

The Statistics for the selected data signal are
min = 0.00 max = 14940.00 mean = 3560.94 stddev = 2473.91

Enter CPM display threshold : 3900

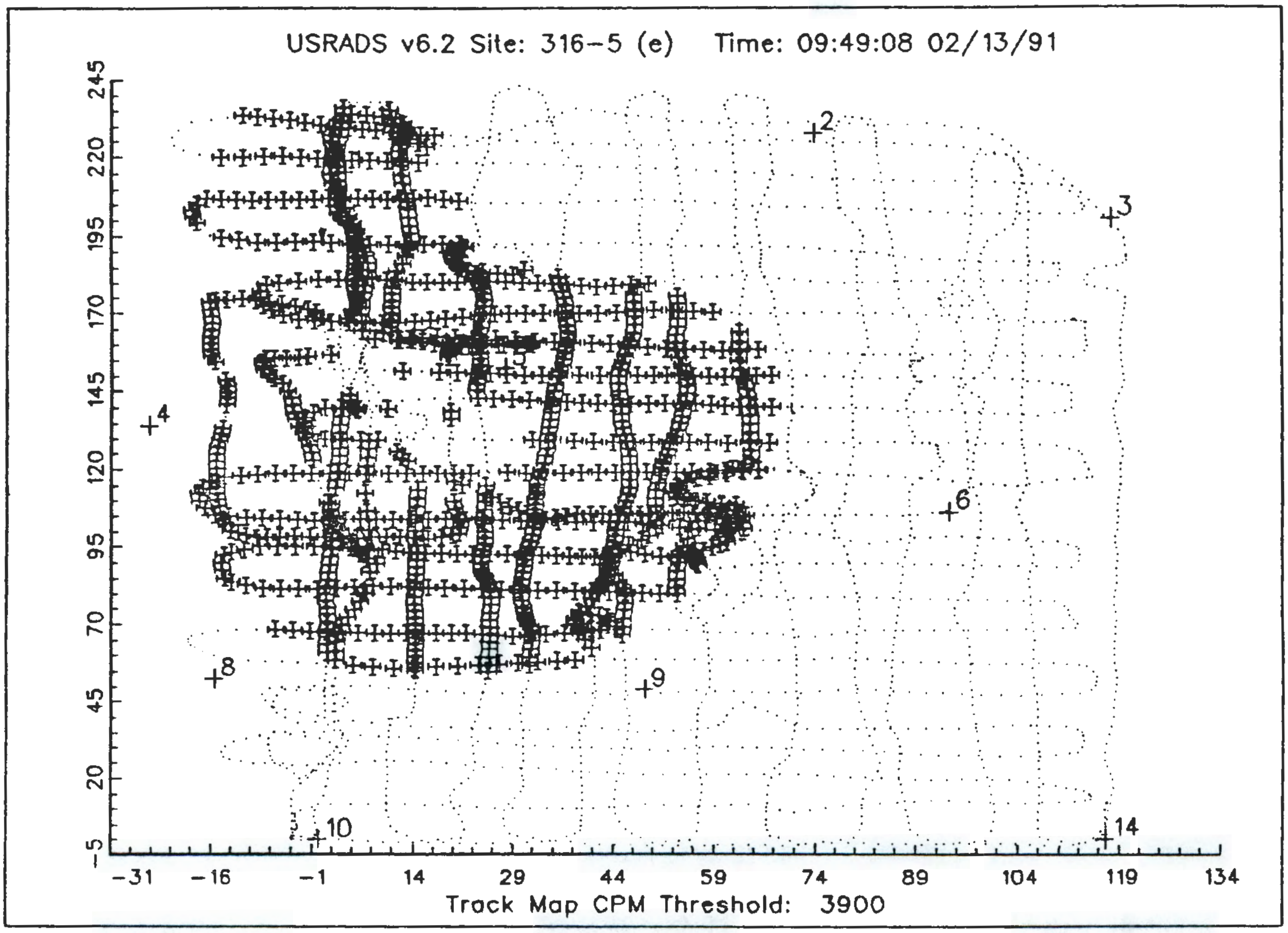


Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 3209 data points

The Statistics for the selected data signal are
min = 1480.00 max = 13260.00 mean = 3592.22 stddev = 2039.94

Enter CPM display threshold : 3900

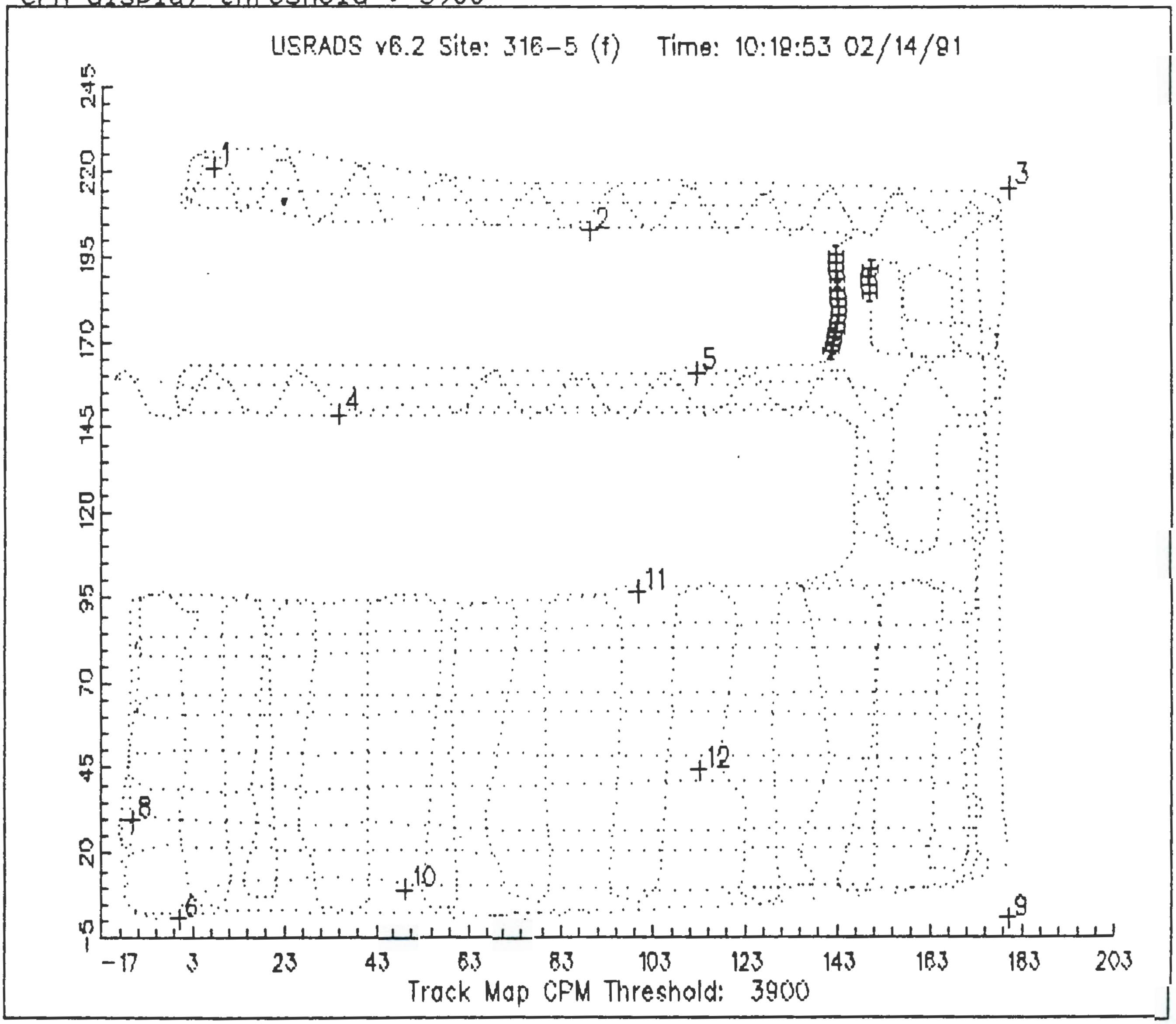


Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 2516 data points

The Statistics for the selected data signal are
min = 0.00 max = 6380.00 mean = 2099.63 stddev = 609.67

Enter CPM display threshold : 3900

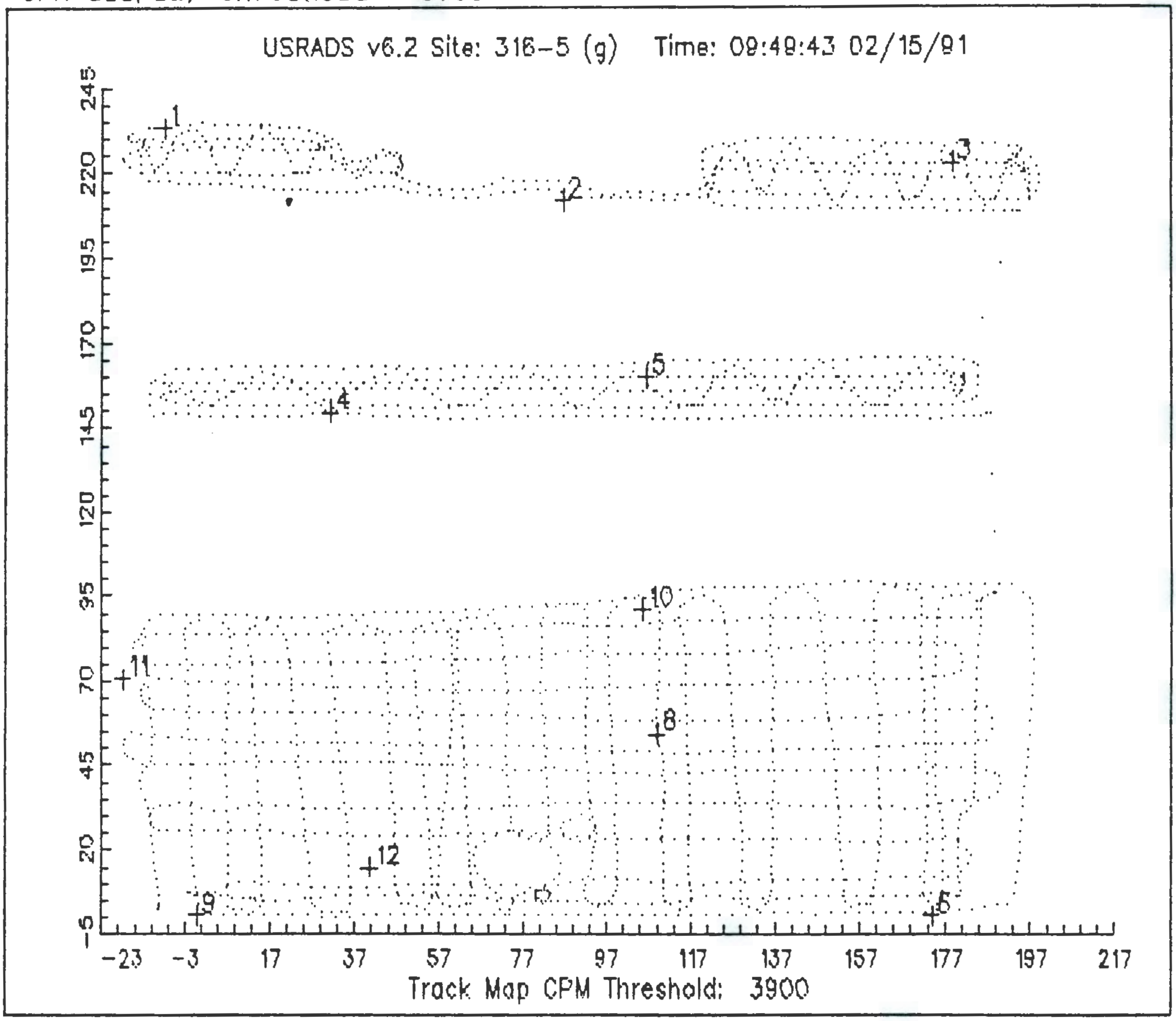


Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 2646 data points

The Statistics for the selected data signal are
min = 1160.00 max = 3580.00 mean = 2070.43 stddev = 299.04

Enter CPM display threshold : 3900



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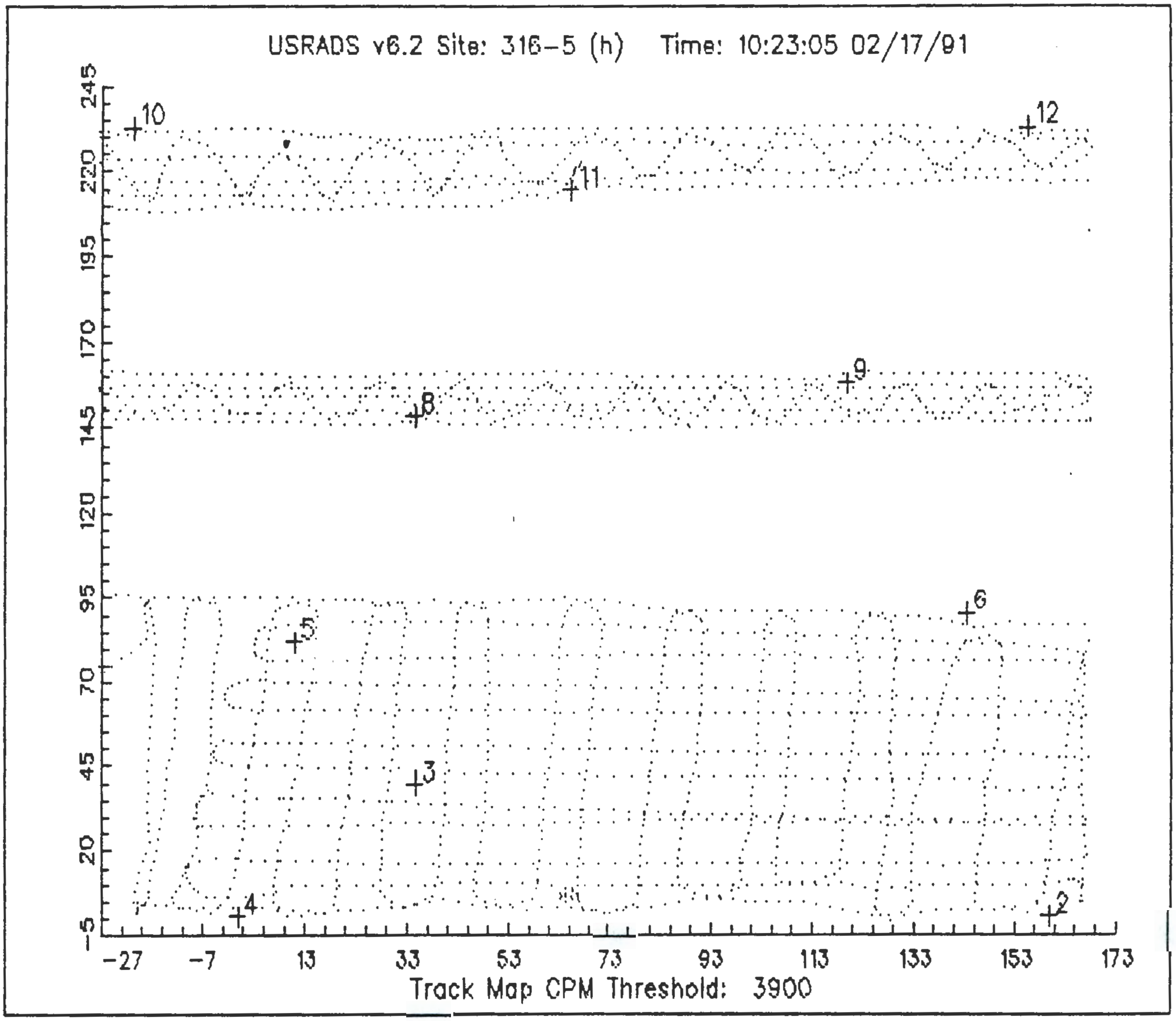
Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 2514 data points

The Statistics for the selected data signal are
min = 1180.00   max = 3500.00   mean = 1867.43   stddev = 291.25

Enter CPM display threshold : 3900

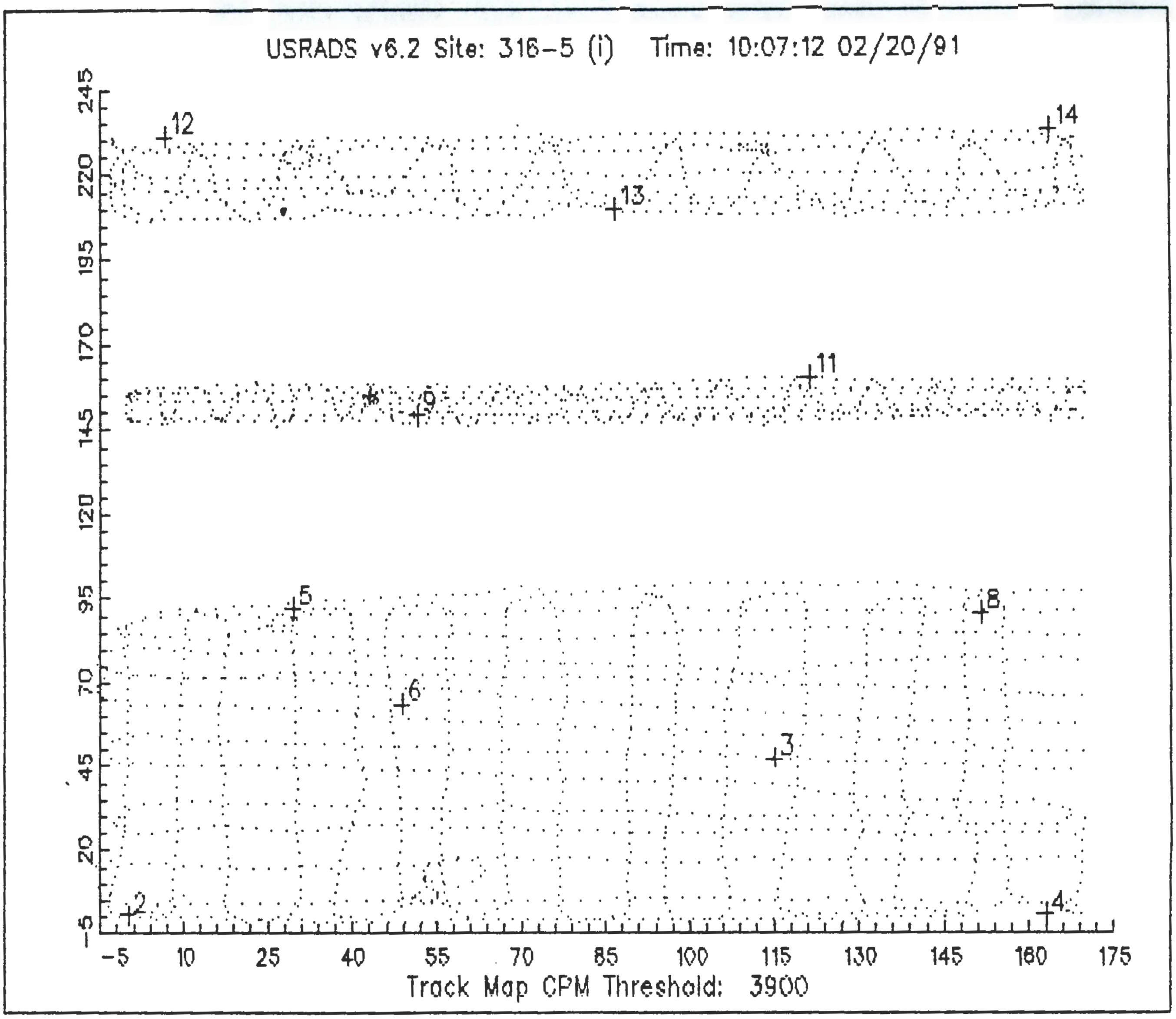


Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 2695 data points

The Statistics for the selected data signal are
min = 1280.00 max = 3800.00 mean = 2004.36 stddev = 311.07

Enter CPM display threshold : 3900

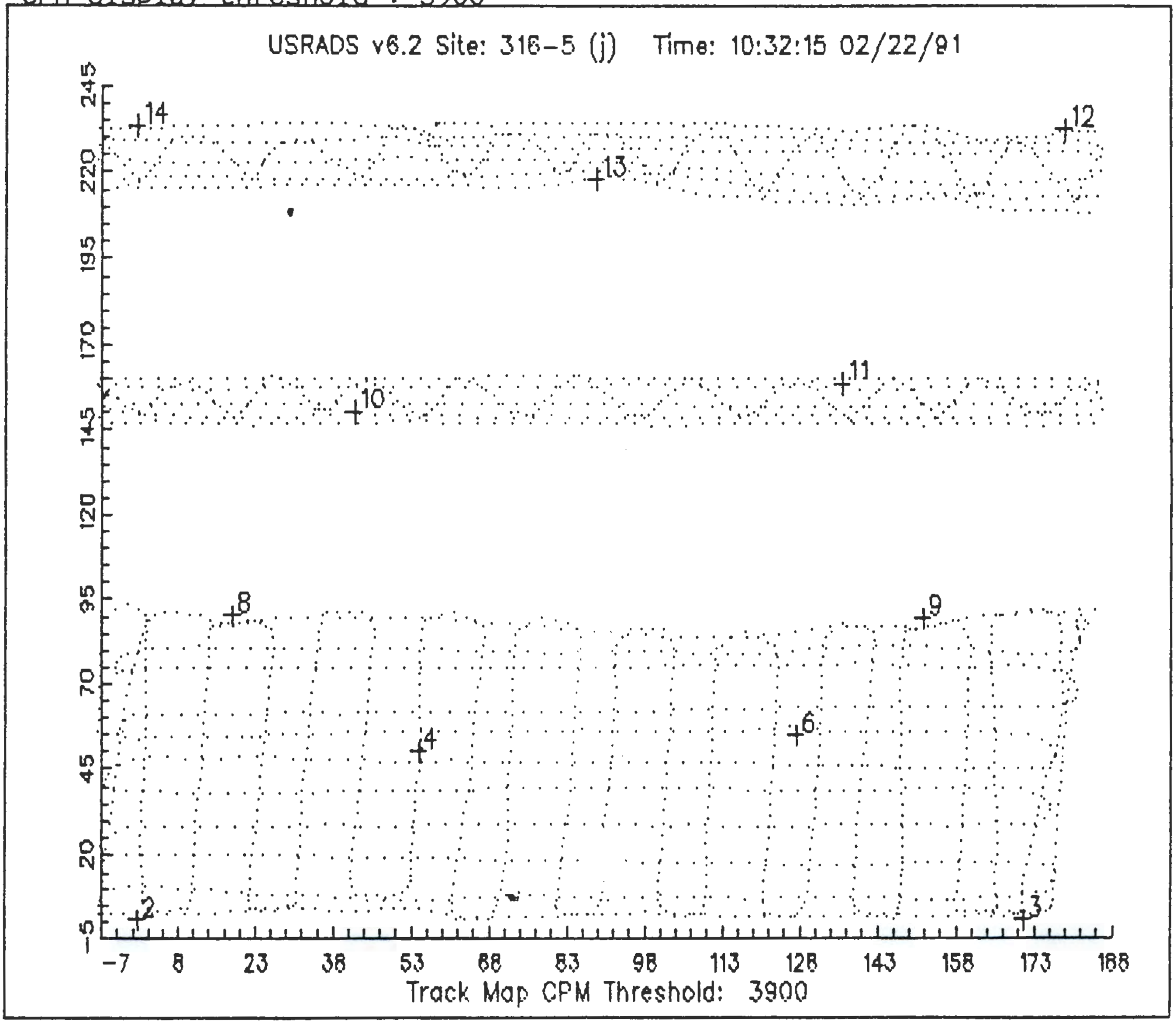


Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 2410 data points

The Statistics for the selected data signal are
min = 1320.00   max = 3400.00   mean = 2079.57   stddev = 273.62

Enter CPM display threshold : 3900

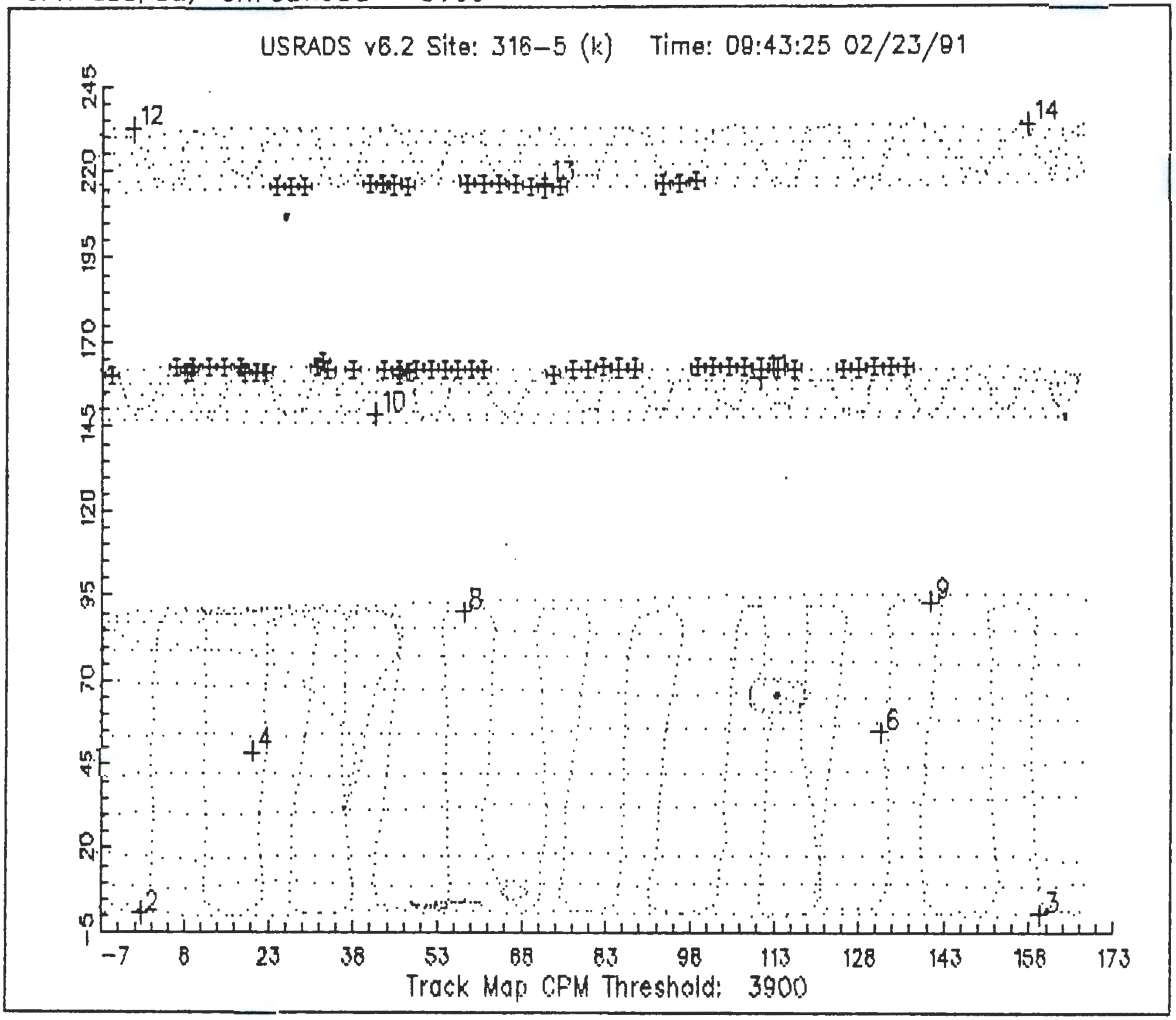


Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 2332 data points

The Statistics for the selected data signal are
min = 1500.00 max = 4680.00 mean = 2402.67 stddev = 492.15

Enter CPM display threshold : 3900

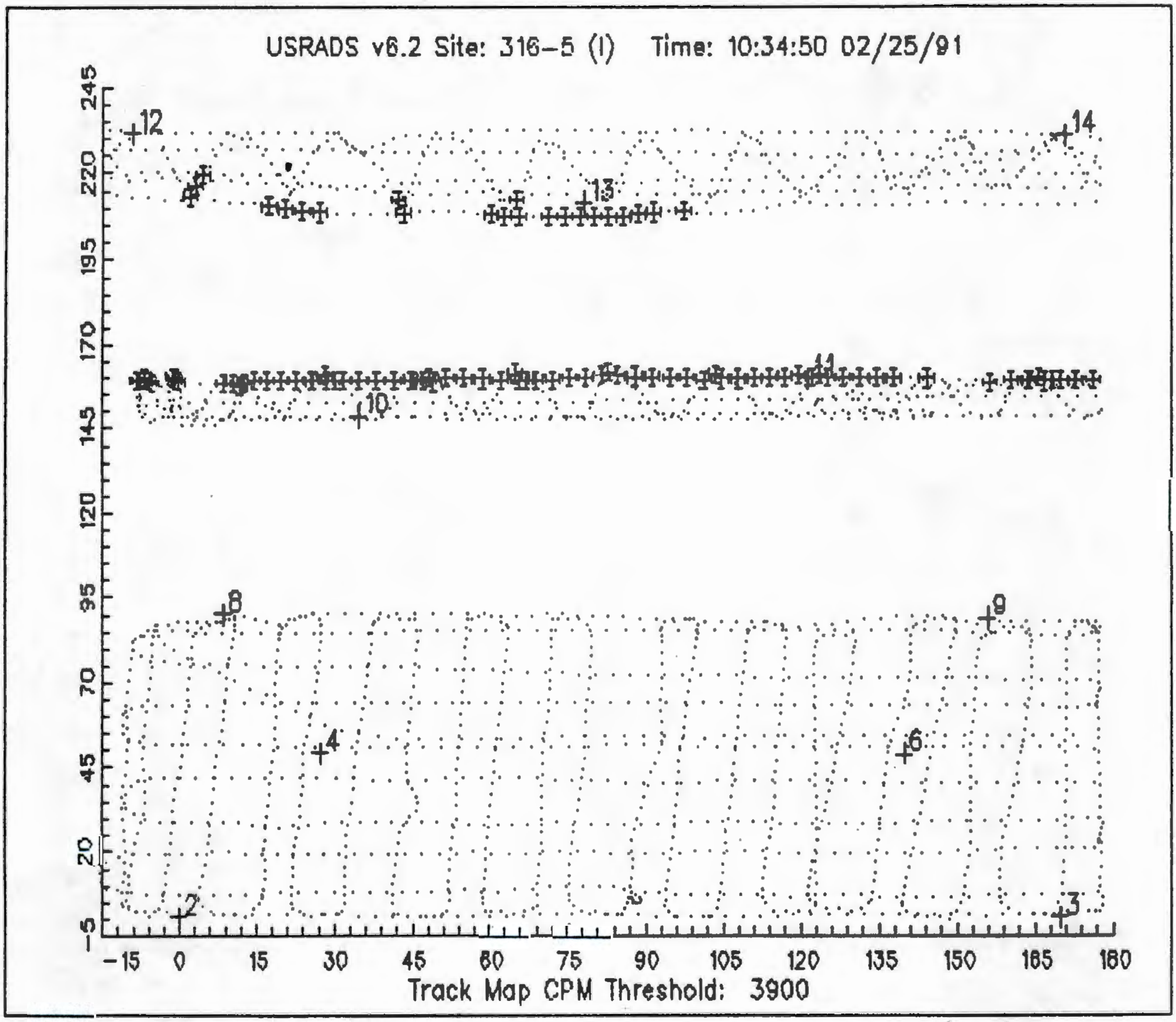


Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 2438 data points

The Statistics for the selected data signal are
min = 1580.00 max = 6300.00 mean = 2566.42 stddev = 570.27

Enter CPM display threshold : 3900

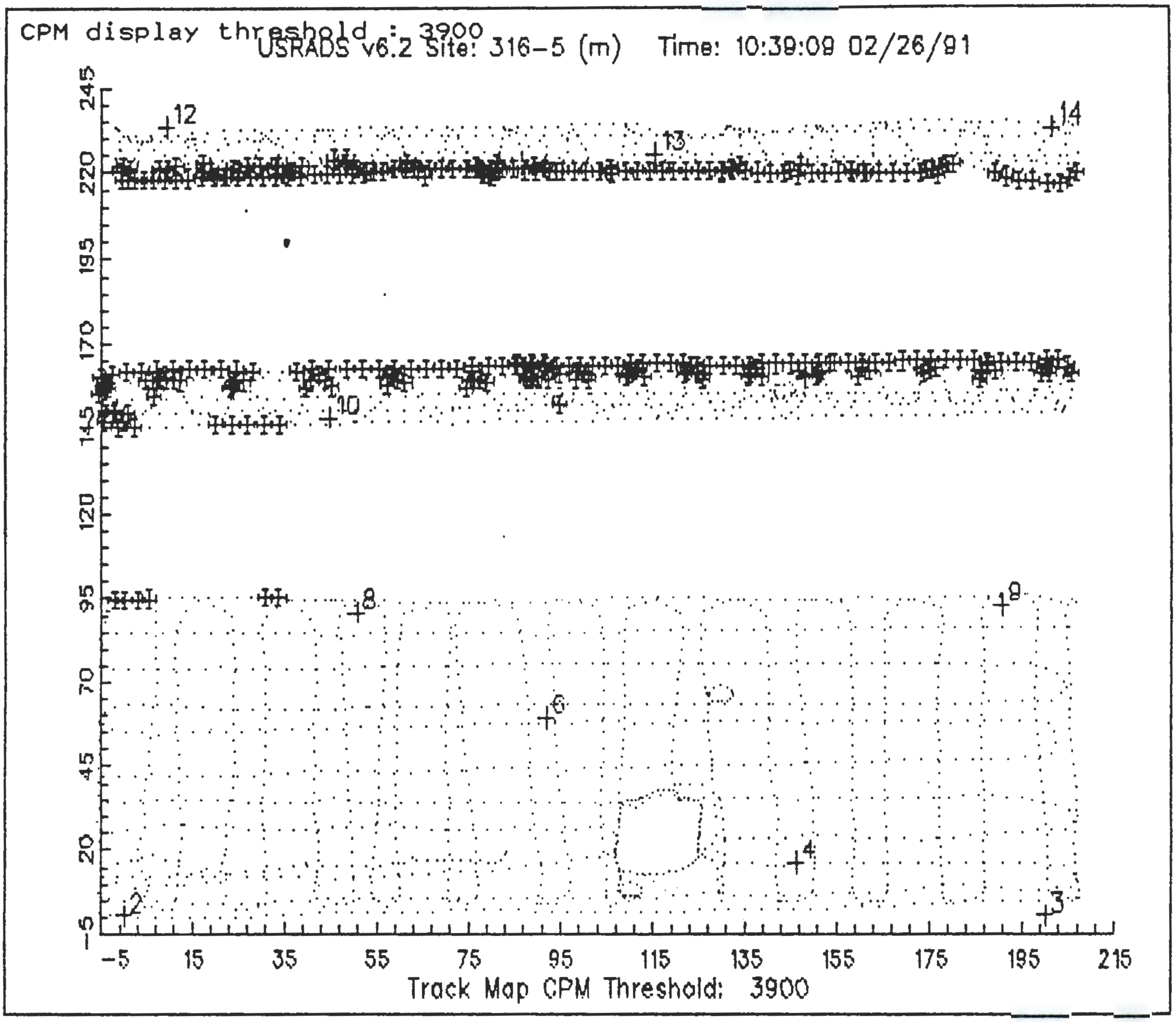


Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 2713 data points

The Statistics for the selected data signal are
min = 0.00 max = 7580.00 mean = 3029.97 stddev = 864.57

Enter CPM display threshold : 3900

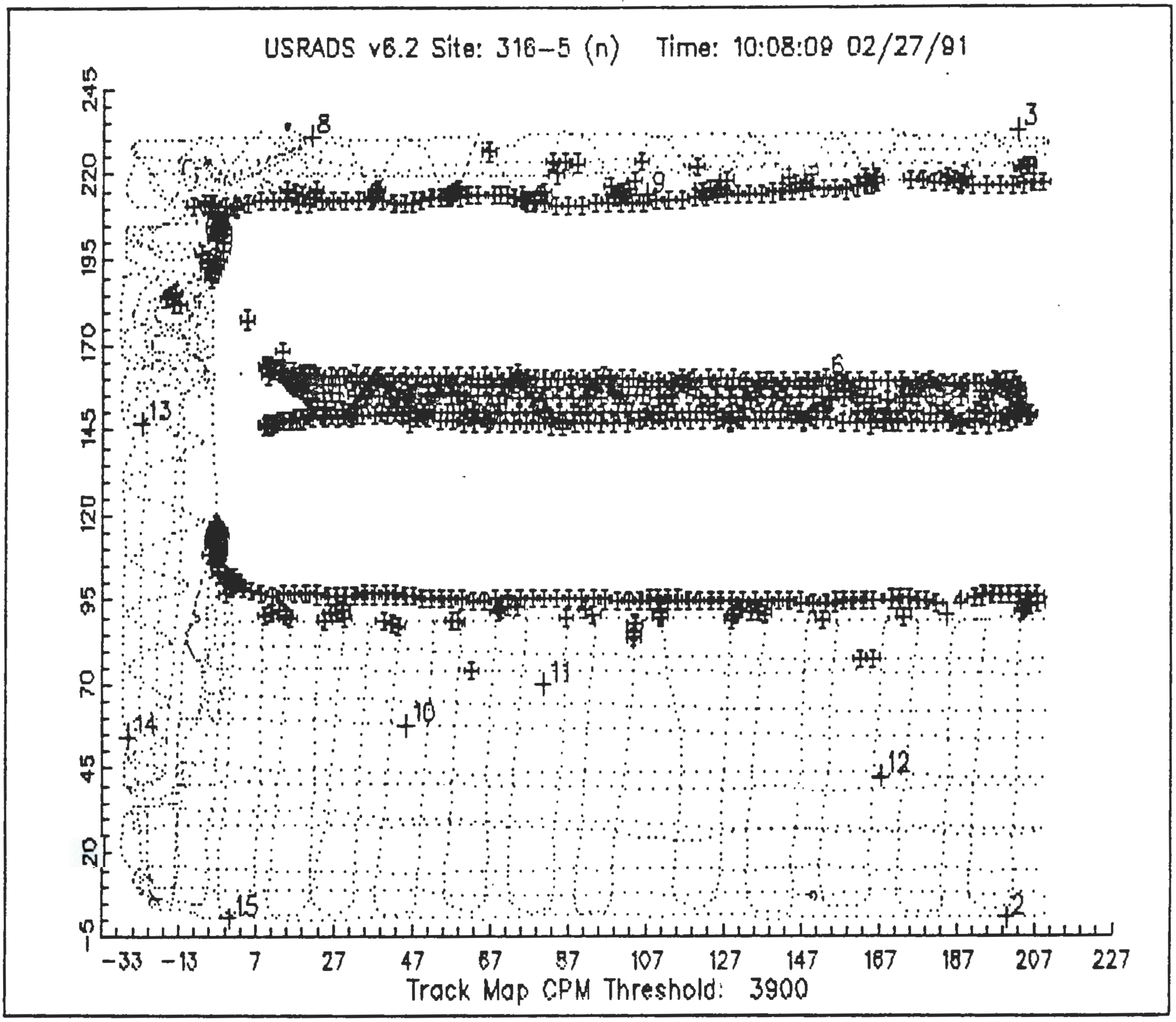


Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 3974 data points

The Statistics for the selected data signal are
min = 1880.00 max = 10840.00 mean = 3468.03 stddev = 1219.84

Enter CPM display threshold : 3900



316-5 PROCESS TRENCH SITE

USRADS SURVEYS

Pre and Post Remediation

APPENDIX B

Post-Remediation Surveys

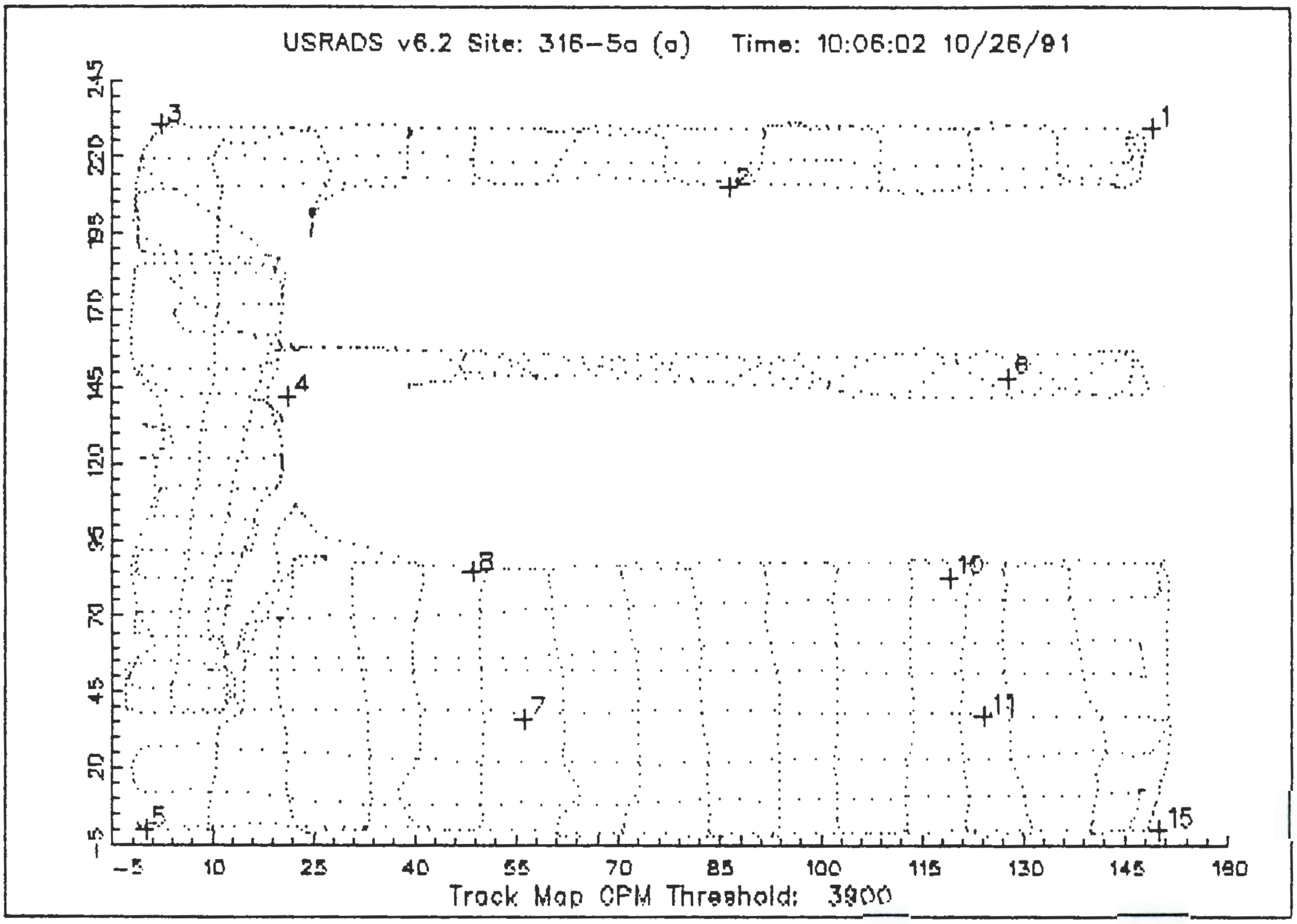
USRADS Software Generated Track Maps

Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 2154 data points

The Statistics for the selected data signal are
min = 1080.00 max = 2740.00 mean = 2000.50 stddev = 233.95

Enter CPM display threshold : 3900



Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 2154 data points

The Statistics for the selected data signal are
min = 6.52 max = 17.52 mean = 11.75 stddev = 1.48

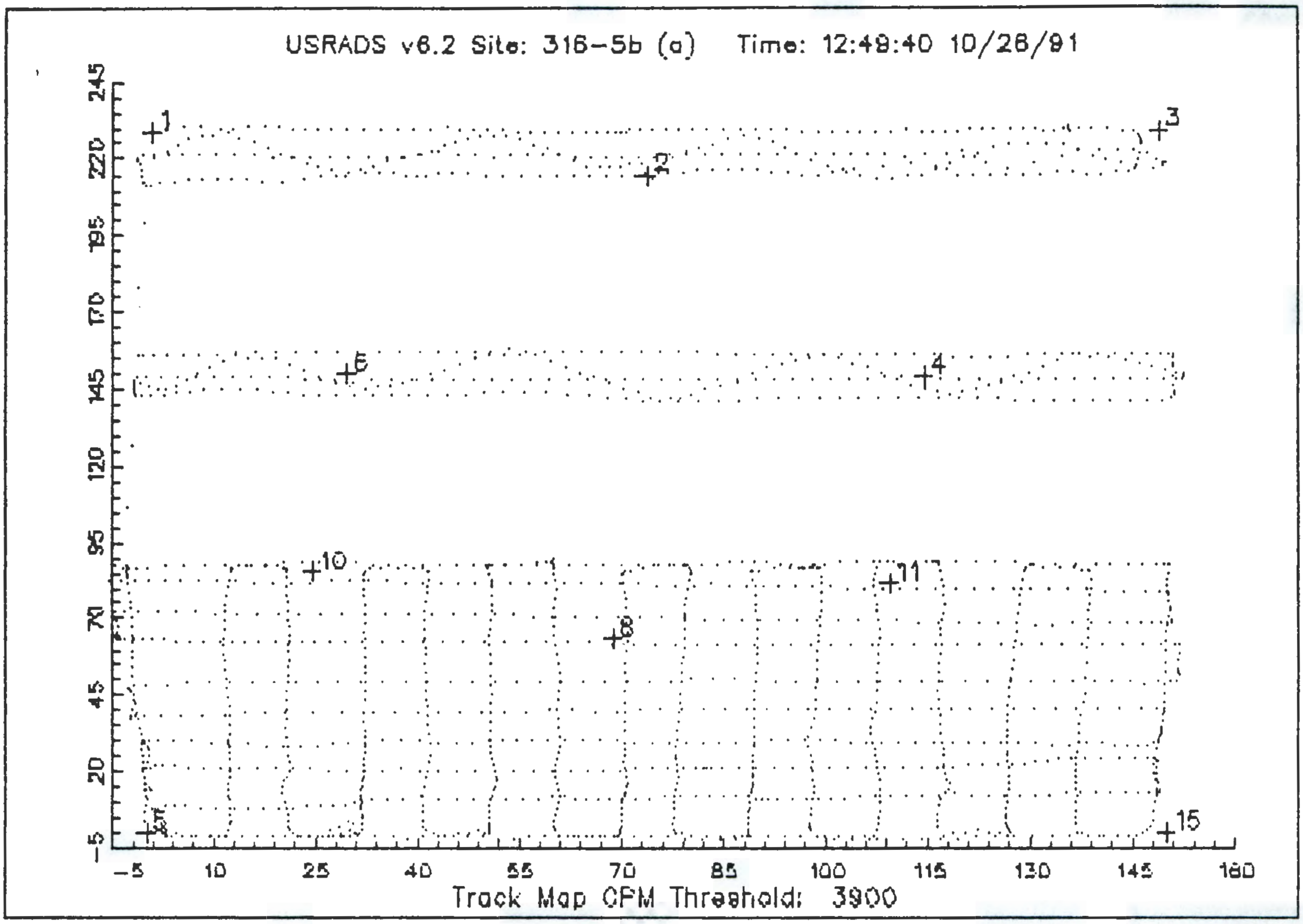
Enter uR/H display threshold : 25

Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1989 data points

The Statistics for the selected data signal are
min = 1120.00 max = 2780.00 mean = 1935.14 stddev = 235.50

Enter CPM display threshold : 3900



Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1989 data points

The Statistics for the selected data signal are
min = 6.92 max = 16.22 mean = 11.13 stddev = 1.45

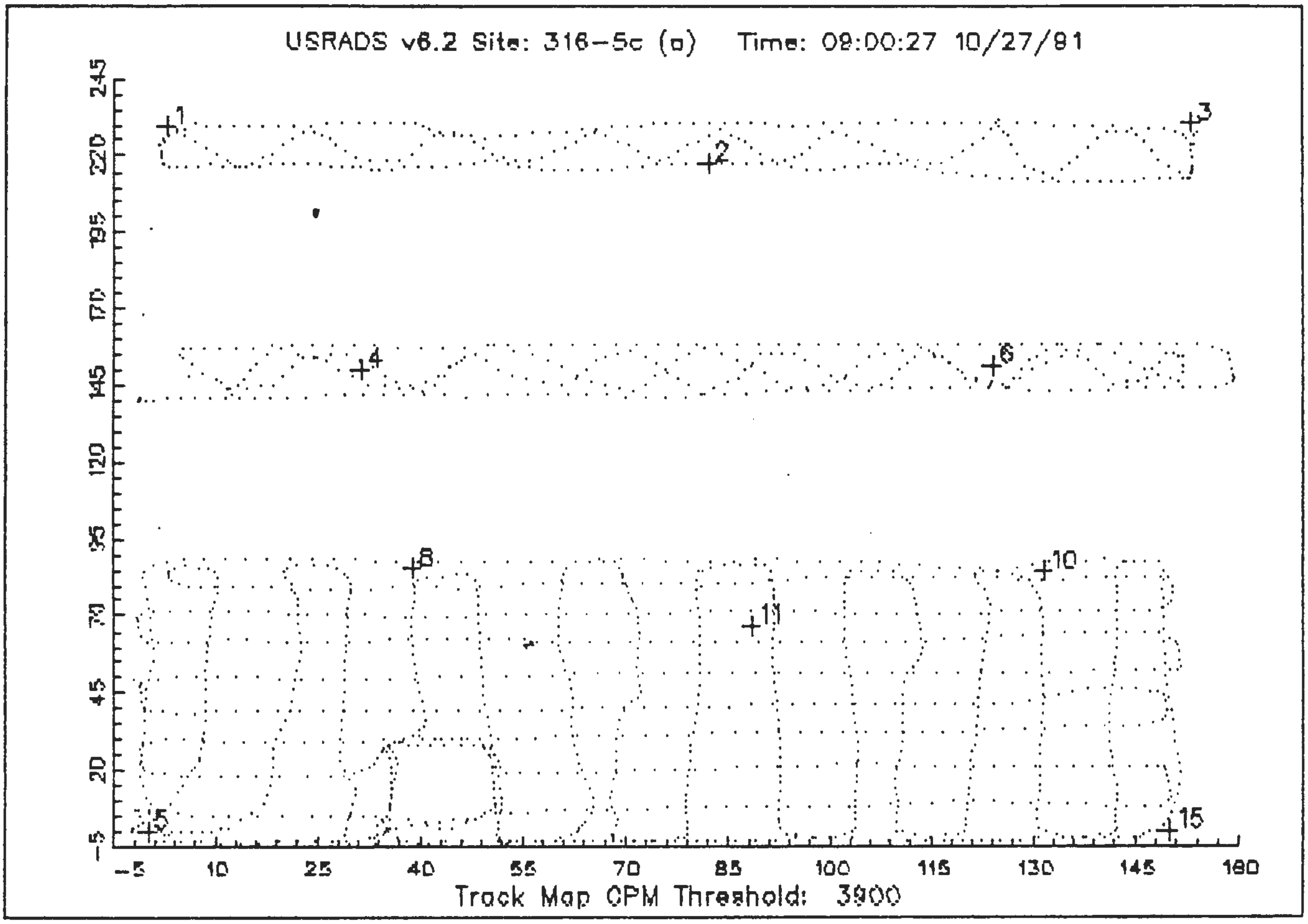
Enter uR/H display threshold : 25

Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1812 data points

The Statistics for the selected data signal are
min = 1120.00 max = 2660.00 mean = 1852.43 stddev = 210.38

Enter CPM display threshold : 3900



Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1810 data points

The Statistics for the selected data signal are
min = 7.22 max = 15.22 mean = 10.54 stddev = 1.22

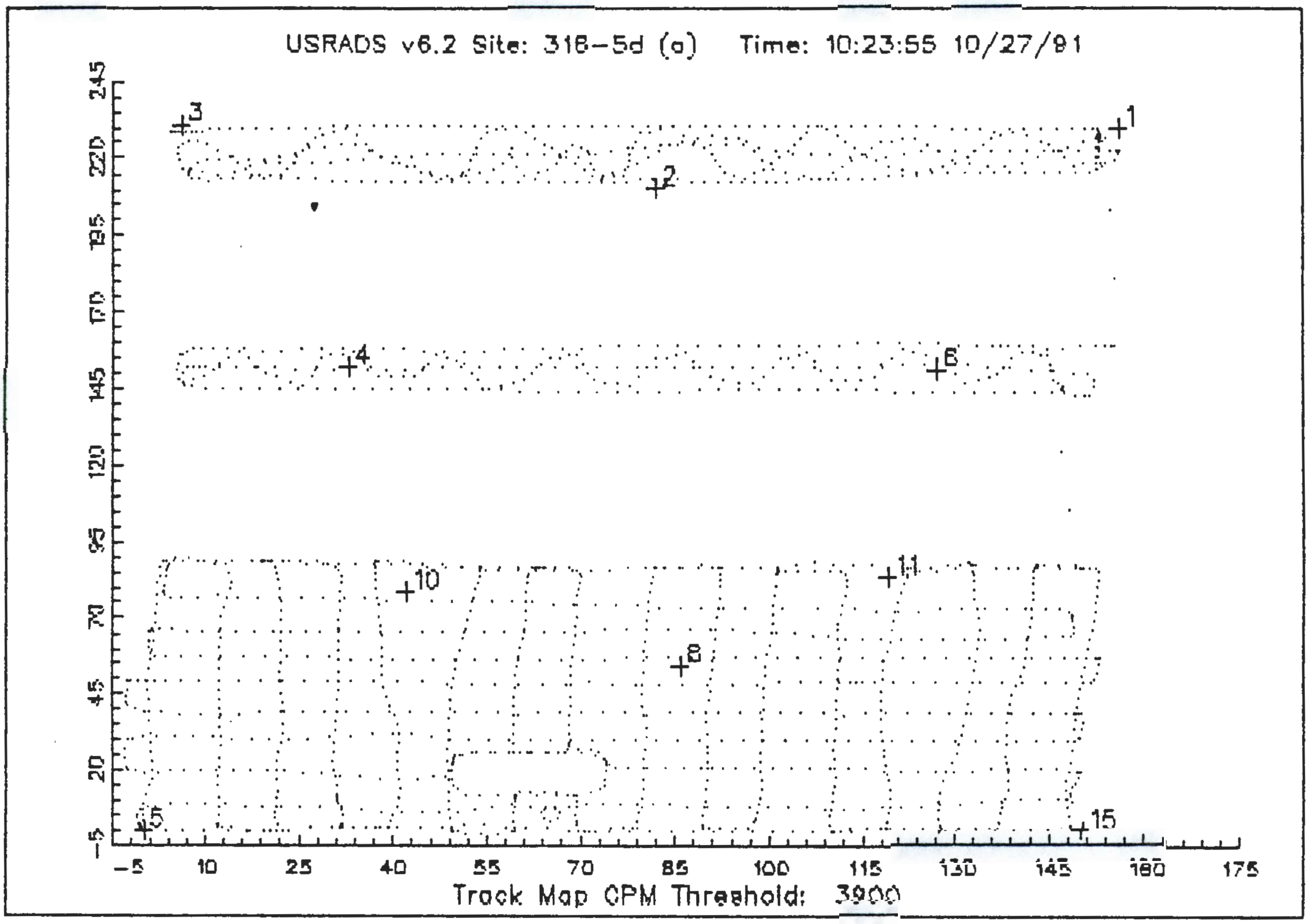
Enter uR/H display threshold : 25

Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1931 data points

The Statistics for the selected data signal are
min = 700.00 max = 2500.00 mean = 1772.44 stddev = 188.46

Enter CPM display threshold : 3900



Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1931 data points

The Statistics for the selected data signal are
min = 6.52 max = 14.02 mean = 10.10 stddev = 1.15

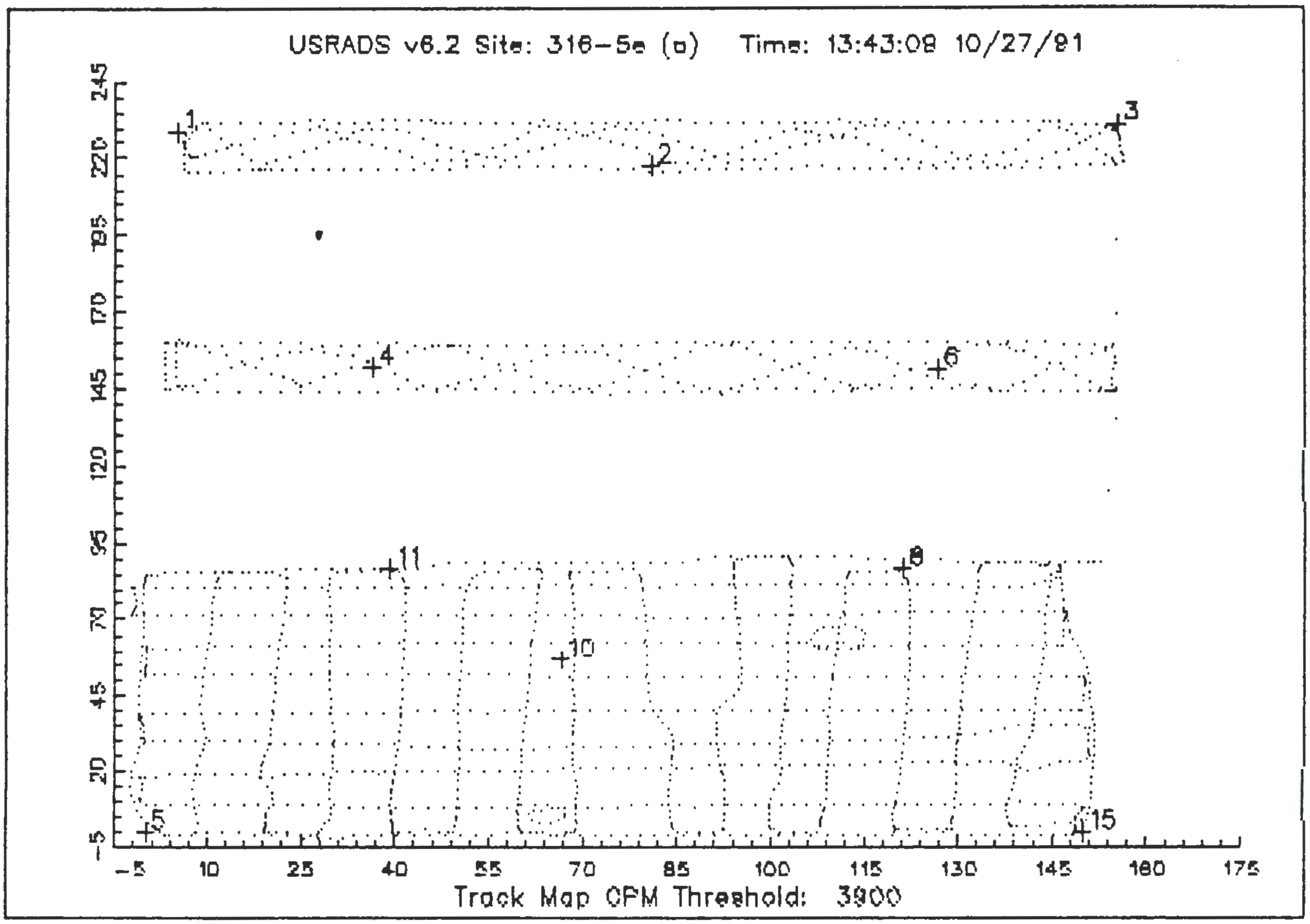
Enter uR/H display threshold : 25

Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1996 data points

The Statistics for the selected data signal are
min = 1200.00 max = 2740.00 mean = 1725.95 stddev = 205.47

Enter CPM display threshold : 3900



Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1996 data points

The Statistics for the selected data signal are
min = 6.12 max = 14.82 mean = 9.75 stddev = 1.22

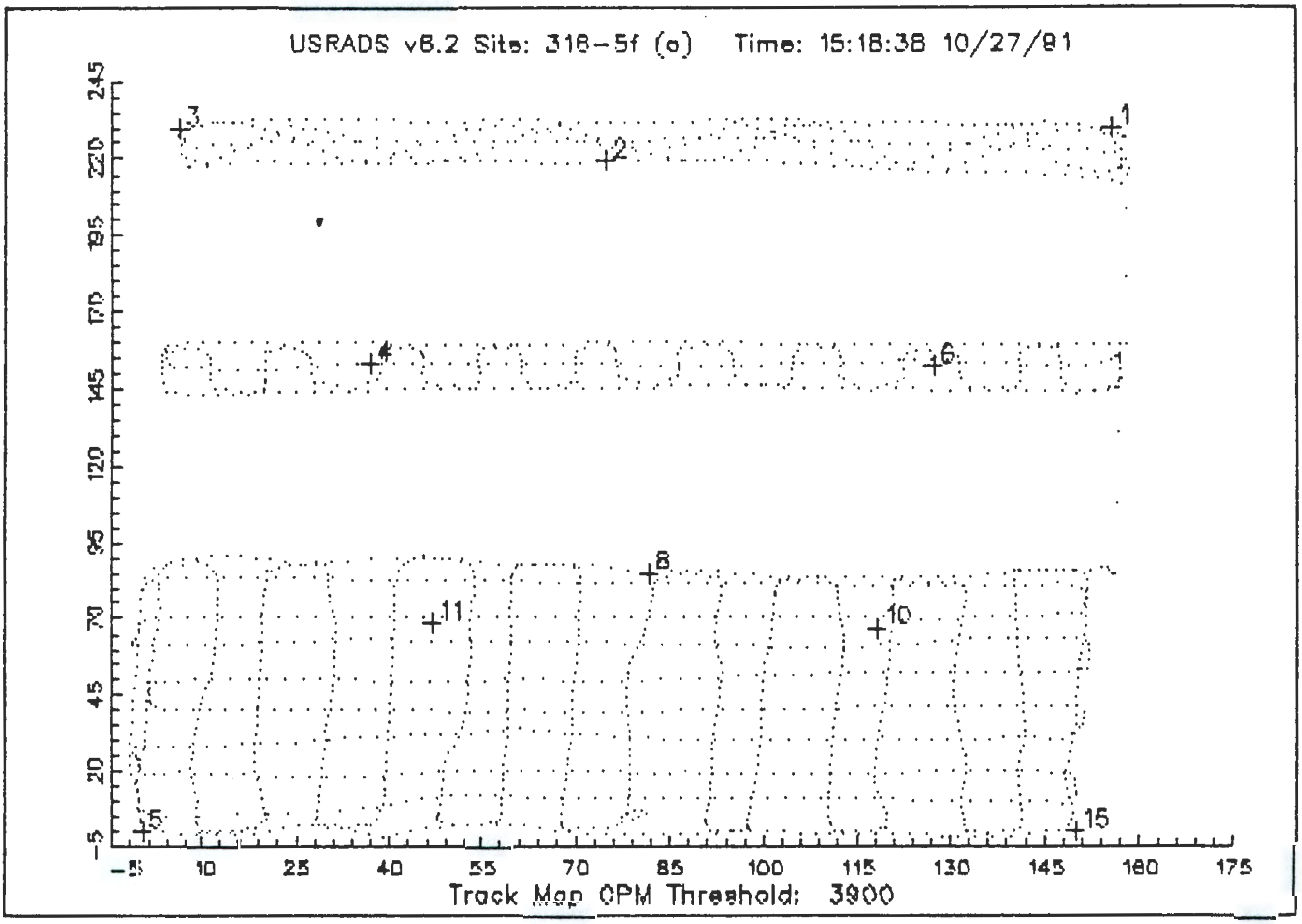
Enter uR/H display threshold : 25

Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1875 data points

The Statistics for the selected data signal are
min = 1140.00 max = 2340.00 mean = 1687.30 stddev = 191.36

Enter CPM display threshold : 3900



Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1875 data points

The Statistics for the selected data signal are
min = 5.82 max = 13.32 mean = 9.25 stddev = 1.08

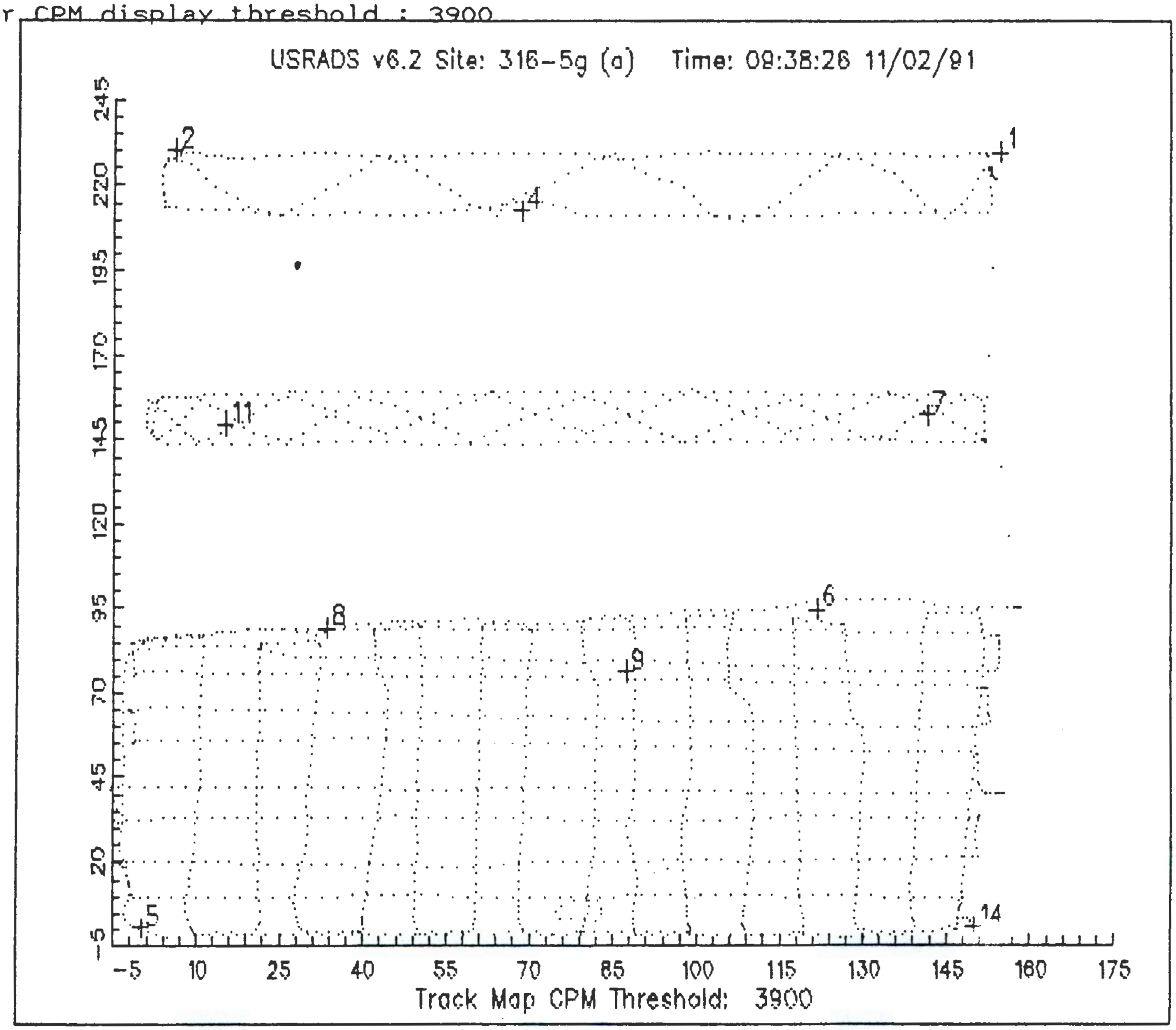
Enter uR/H display threshold : 25

Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1968 data points

The Statistics for the selected data signal are
min = 1040.00 max = 2320.00 mean = 1691.19 stddev = 182.41

Enter CPM display threshold : 3900



Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1968 data points

The Statistics for the selected data signal are
min = 6.72 max = 22.02 mean = 10.79 stddev = 2.12

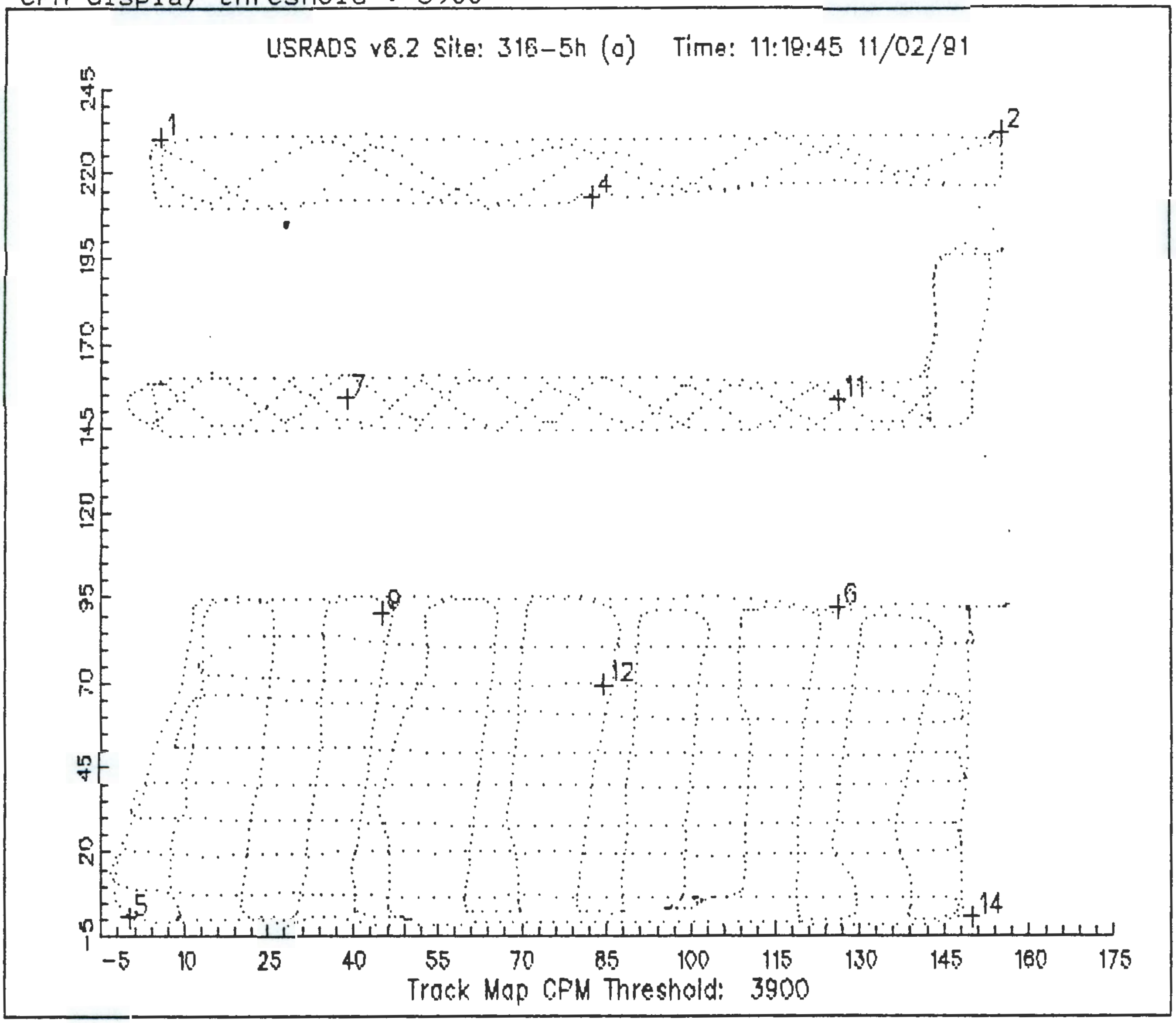
Enter uR/H display threshold : 25

Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1997 data points

The Statistics for the selected data signal are
min = 440.00 max = 2320.00 mean = 1683.55 stddev = 197.49

Enter CPM display threshold : 3900



Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 1997 data points

The Statistics for the selected data signal are
min = 6.12 max = 23.52 mean = 10.95 stddev = 2.66

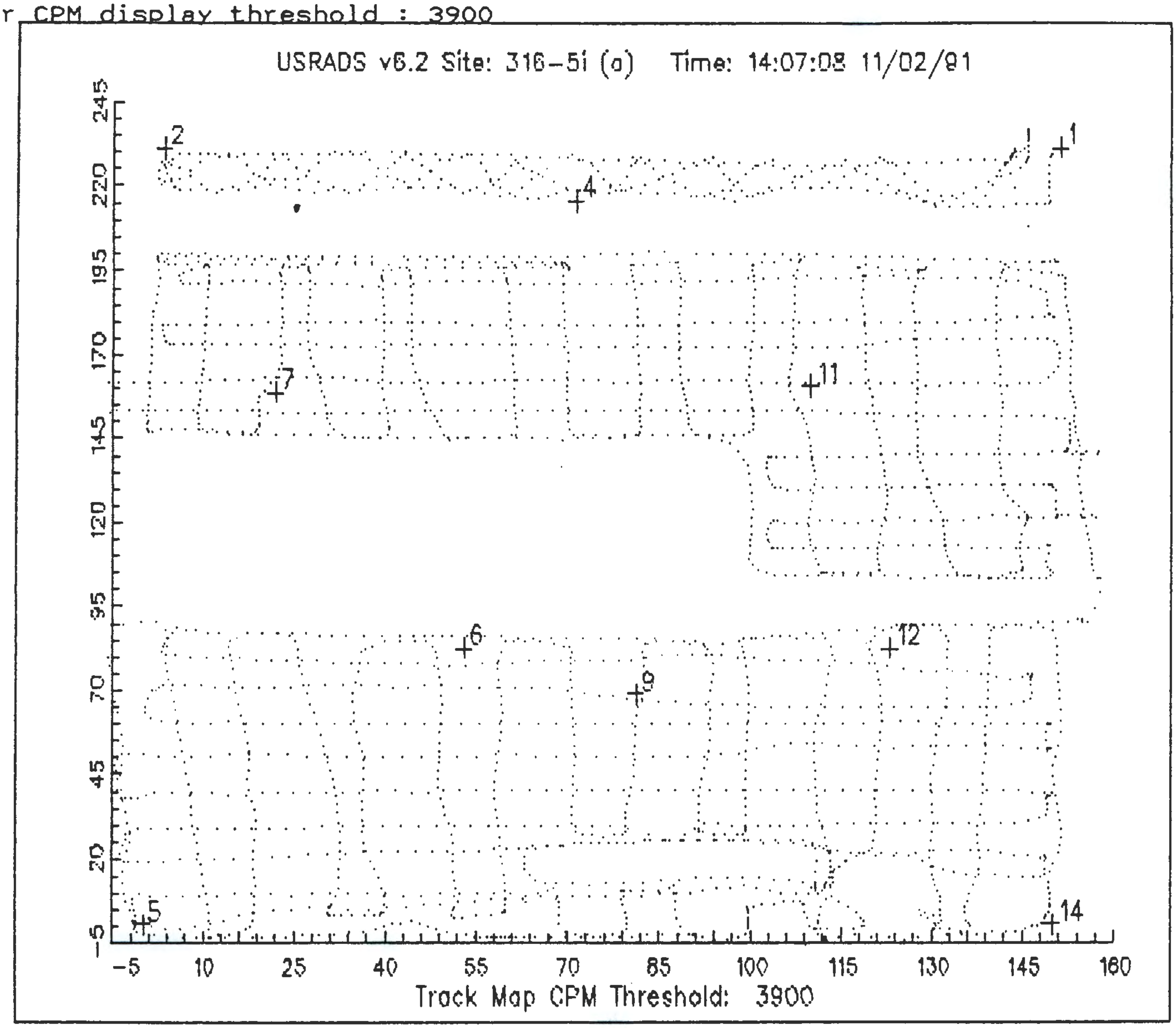
Enter uR/H display threshold : 25

Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 3031 data points

The Statistics for the selected data signal are
min = 1100.00   max = 2220.00   mean = 1614.60   stddev = 176.59

Enter CPM display threshold : 3900



Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 3030 data points

The Statistics for the selected data signal are
min =   5.42   max = 24.42   mean = 10.69   stddev =   2.45

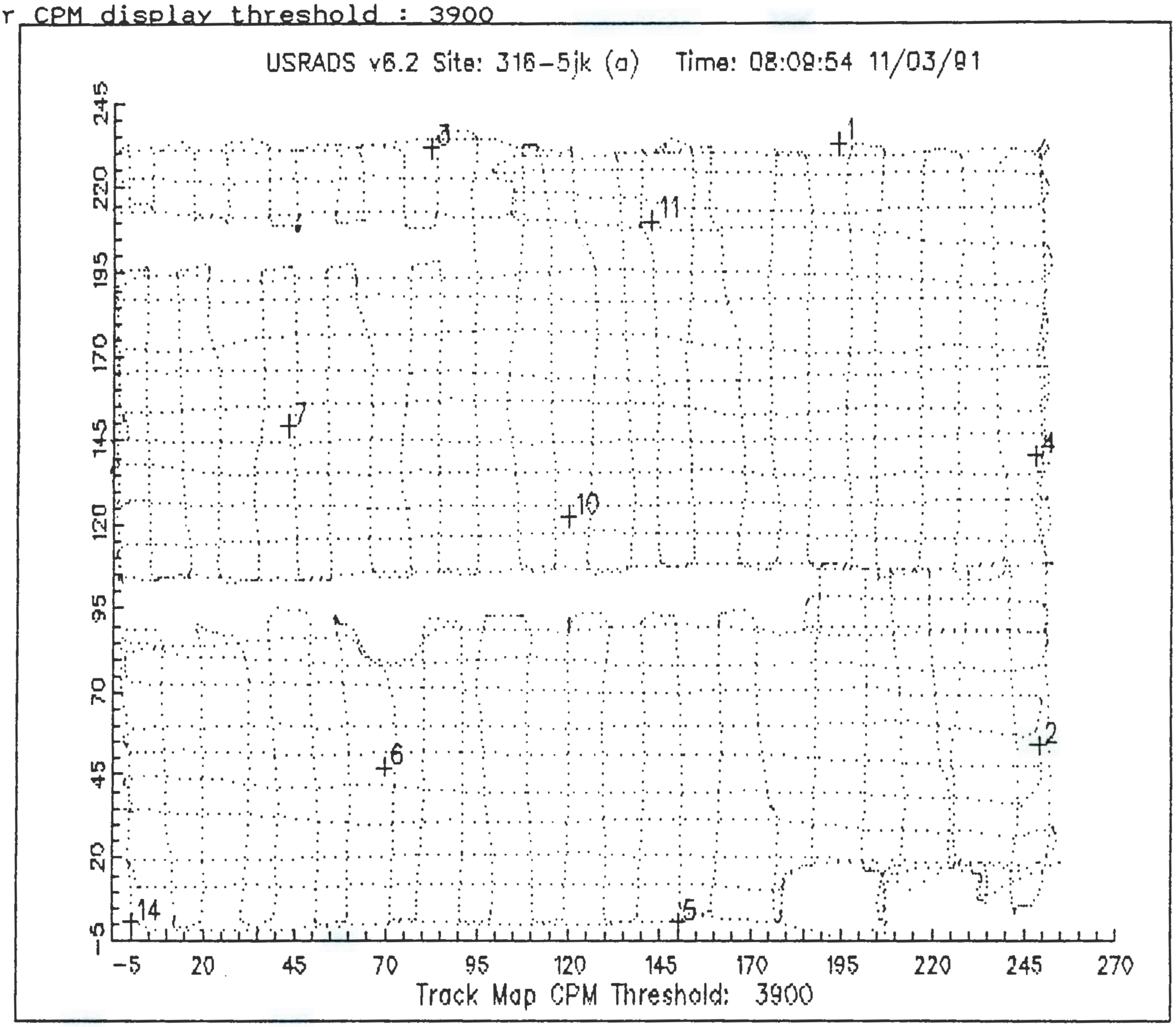
Enter uR/H display threshold : 25

Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 4721 data points

The Statistics for the selected data signal are
min = 880.00 max = 2400.00 mean = 1656.82 stddev = 187.24

Enter CPM display threshold : 3900



Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 4722 data points

The Statistics for the selected data signal are
min = 5.92 max = 27.82 mean = 11.15 stddev = 2.65

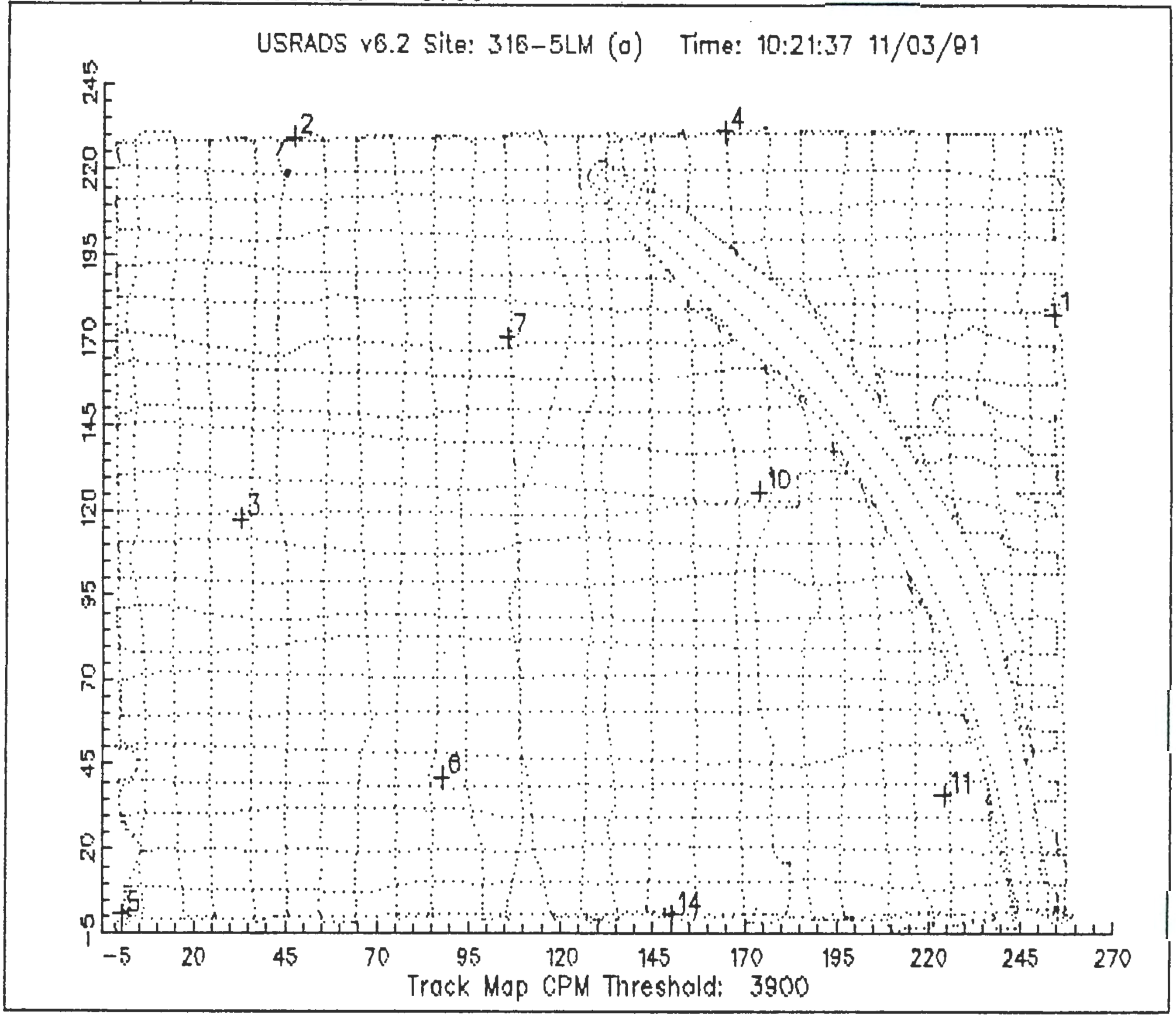
Enter uR/H display threshold : 25

Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 5882 data points

The Statistics for the selected data signal are
min = 0.00 max = 2620.00 mean = 1666.92 stddev = 194.62

Enter CPM display threshold : 3900



Calculating the stats for the selected data channel and analysis region.

For the selected Analysis Limits there are 5882 data points

The Statistics for the selected data signal are
min = 5.92 max = 22.62 mean = 10.55 stddev = 2.09

Enter uR/H display threshold : 25

316-5 PROCESS TRENCH SITE

USRADS SURVEYS

Pre and Post Remediation

APPENDIX C

Low Background Test Site Survey

LOW BACKGROUND SITE SURVEY

Introduction

The Low Background survey was conducted to establish baseline radiological background conditions. The radiological data collected during this survey is considered representative of the undestrubed soil surfaces of the Hanford Site. The survey was conducted on April 10, 15 and 16, 1991.

Location

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

Discussion

The survey was conducted using a Ludlum Model 2221 digital rate meter with a Ludlum Model 44-2, 1 by 1 inch sodium iodide detector. The Ludlum meter was coupled to the USRADS for the purpose of recording the data from the output of the detector verses the location of the data within the survey area.

A total of six individual surveys were performed to completely cover the 250,000 square foot site. A total of 4,924 data point were collected within the survey site. A summary of the survey results can be found in Table 1. Except for survey LBSa, each survey was traversed on approximately 25 foot transects.

Table 1. Summary Radiological Data for Low Background Site.

SURVEY	AREA (SQ.FT)	DATA POINTS	MEAN (CPM)	SIGMA (CPM)
LBSa	40,000	635	1,477	210
LBSc	40,000	829	1,932	310
LBSd	60,000	1,055	2,203	209
LBSi	60,000	1,146	2,192	212
LBSj	20,000	656	2,085	218
LBSk	30,000	603	1,828	213
TOTAL	250,000	4,924		

The background count rate was established by averaging the mean count rate for each survey. Using the formula: $BKGD=\sum\overline{X}\div 6$, the average background count rate for the Low Background Site was calculated to be 1,951 cpm, say 1,950 cpm. The standard deviation for the average is calculated using the formula:

$$s_{\bar{x}}=\frac{\sqrt{(s_a^2+s_b^2+...s_z^2)}}{n}$$

Based on the formula above, the standard deviation is +/- 95 cpm.

One of the features of USRADS is the ability to enter a "Threshold". 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 cpm data has exceeded the threshold, or preset value. For the purpose of conducting the 316-5 Process Trench Site survey, it was desired to establish a value for the threshold, where readings above the setting could be considered surface contamination. The threshold value established for the entire 316-5 survey was twice the background count rate determined above, or 3,900 cpm. This value is practical base on the premiss that too low a setting would highlight normal fluctuations above the calculated mean, and too high a setting would cut off the low end of surface contamination that might be present.

9513388.0816

INFORMATION RELEASE REQUEST

References: WHC-CM-3-4

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New ID Number: WHC-SD-EN-TI-018, Rev. 0

Existing ID Number (include revision, volume, etc.): NA

If previously cleared, list ID number: NA

Date Release Required: 2/25/92

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Unclassified Category: UC-N/A

Impact Level: 4

COMPLETE FOR SPEECH OR PRESENTATION

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Date(s) of Conference or Meeting: NA

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Part 2

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