

39 <sub>1</sub> <sup>+</sup>	30 <sub>1</sub> <sup>+</sup>	22 <sub>1</sub> <sup>+</sup>	32 <sub>2</sub> <sup>+</sup>	
42 <sub>1</sub> <sup>+</sup>	48 <sub>1</sub> <sup>+</sup>	39 <sub>1</sub> <sup>+</sup>	39 <sub>1</sub> <sup>+</sup>	25 <sub>1</sub> <sup>+</sup>
37 <sub>1</sub> <sup>+</sup>	49 <sub>3</sub> <sup>+</sup>	47 <sub>2</sub> <sup>+</sup>	30 <sub>1</sub> <sup>+</sup>	36 <sub>1</sub> <sup>+</sup>
47 <sub>1</sub> <sup>+</sup>	43 <sub>1</sub> <sup>+</sup>	38 <sub>2</sub> <sup>+</sup>	40 <sub>1</sub> <sup>+</sup>	52 <sub>1</sub> <sup>+</sup>
32 <sub>1</sub> <sup>+</sup>	23 <sub>&lt;1</sub> <sup>+</sup>	23 <sub>3</sub> <sup>+</sup>	69 <sub>2</sub> <sup>+</sup>	51 <sub>&lt;1</sub> <sup>+</sup>
27 <sub>1</sub> <sup>+</sup>	57 <sub>1</sub> <sup>+</sup>	50 <sub>1</sub> <sup>+</sup>	76 <sub>1</sub> <sup>+</sup>	49 <sub>1</sub> <sup>+</sup>
14 <sub>2</sub> <sup>+</sup>	54 <sub>1</sub> <sup>+</sup>	60 <sub>1</sub> <sup>+</sup>	28 <sub>1</sub> <sup>+</sup>	34 <sub>1</sub> <sup>+</sup>
38 <sub>2</sub> <sup>+</sup>	30 <sub>2</sub> <sup>+</sup>	20 <sub>2</sub> <sup>+</sup>	21 <sub>1</sub> <sup>+</sup>	45 <sub>1</sub> <sup>+</sup>
		28 <sub>2</sub> <sup>+</sup>	35 <sub>2</sub> <sup>+</sup>	23 <sub>2</sub> <sup>+</sup>

**ANSTEC APERTURE CARD**  
Also Available on Aperture Card

TOP BOUNDARY OF NORTH PILE  
BASE OF NORTH PILE

WAREHOUSE BUILDING #4

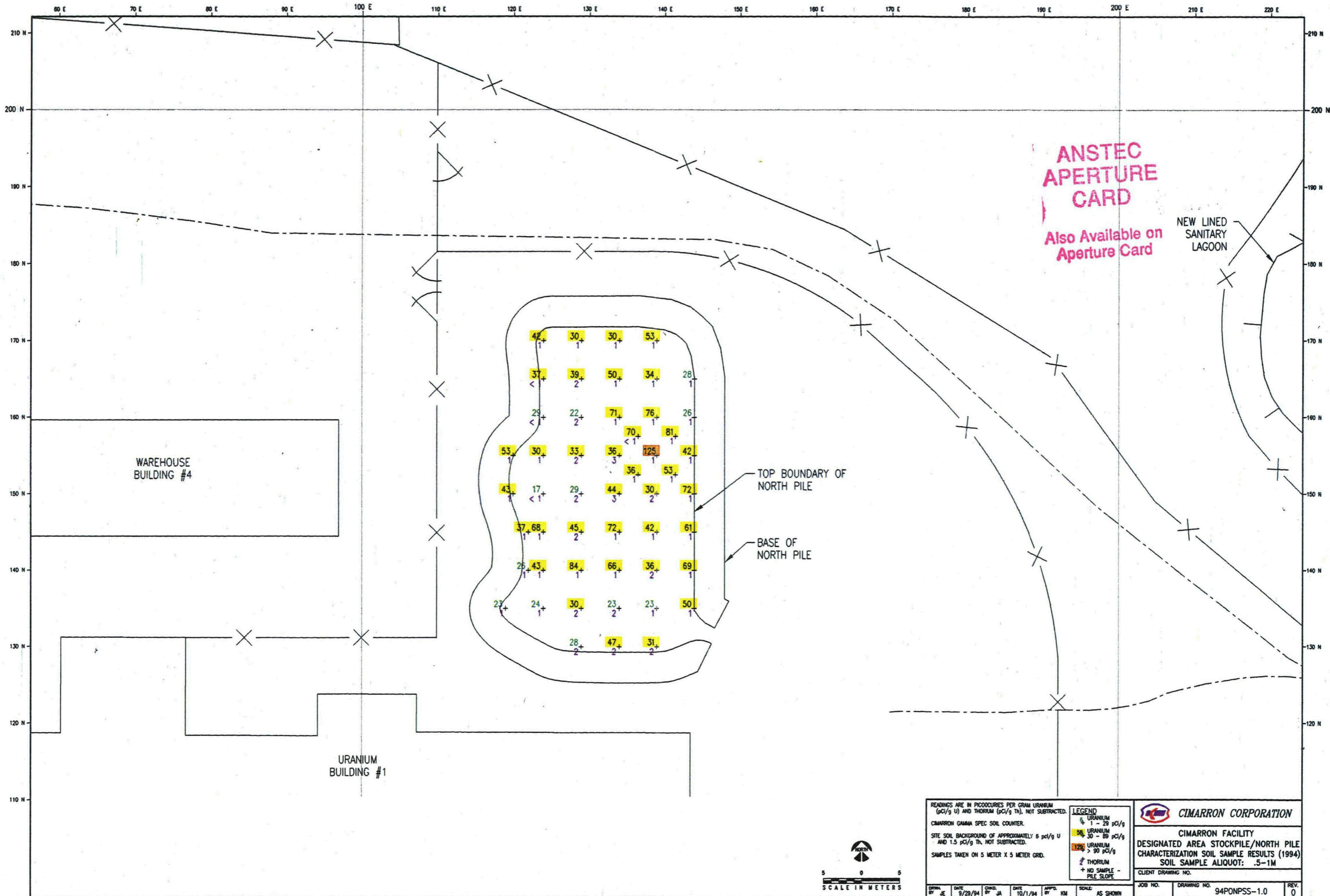
URANIUM BUILDING #1

NEW LINED SANITARY LAGOON

READINGS ARE IN PICOCURIES PER GRAM URANIUM (pCi/g U) AND THORIUM (pCi/g Th), NOT SUBTRACTED. CIMARRON GAMMA SPEC SOIL COUNTER. SITE SOIL BACKGROUND OF APPROXIMATELY 6 pCi/g U AND 1.5 pCi/g Th, NOT SUBTRACTED. SAMPLES TAKEN ON 5 METER X 5 METER GRID.		<b>LEGEND</b> 1 - 29 pCi/g URANIUM 58 - 89 pCi/g URANIUM 90 pCi/g URANIUM THORIUM + NO SAMPLE - PILE SLOPE	<p><b>CIMARRON CORPORATION</b></p> <p>CIMARRON FACILITY          DESIGNATED AREA STOCKPILE/NORTH PILE          CHARACTERIZATION SOIL SAMPLE RESULTS (1994)          SOIL SAMPLE ALIQUOT: 0-5M</p> <p>CLIENT DRAWING NO.</p>
DRAWN BY: JE DATE: 9/29/94 COND. BY: JA DATE: 10/1/94 APP'D. BY: KM SCALE: AS SHOWN	JOB NO. DRAWING NO. 94PONPSS-0.5 REV. 0	9412080115 -H	



9412080115 -H



**ANSTEC  
APERTURE  
CARD**  
Also Available on  
Aperture Card

NEW LINED  
SANITARY  
LAGOON

WAREHOUSE  
BUILDING #4

URANIUM  
BUILDING #1

TOP BOUNDARY OF  
NORTH PILE

BASE OF  
NORTH PILE

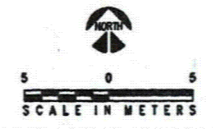
42 <sub>1</sub>	30 <sub>1</sub>	30 <sub>1</sub>	53 <sub>1</sub>	
37 <sub>1</sub>	39 <sub>2</sub>	50 <sub>1</sub>	34 <sub>1</sub>	28 <sub>1</sub>
29 <sub>1</sub>	22 <sub>2</sub>	71 <sub>1</sub>	76 <sub>1</sub>	26 <sub>1</sub>
		70 <sub>1</sub>	81 <sub>1</sub>	
53 <sub>1</sub>	30 <sub>1</sub>	33 <sub>2</sub>	36 <sub>1</sub>	42 <sub>1</sub>
			36 <sub>1</sub>	53 <sub>1</sub>
43 <sub>1</sub>	17 <sub>1</sub>	29 <sub>2</sub>	44 <sub>3</sub>	30 <sub>2</sub>
				72 <sub>1</sub>
37 <sub>1</sub>	68 <sub>1</sub>	45 <sub>2</sub>	72 <sub>1</sub>	42 <sub>1</sub>
				61 <sub>1</sub>
25 <sub>1</sub>	43 <sub>1</sub>	84 <sub>1</sub>	66 <sub>1</sub>	36 <sub>2</sub>
				69 <sub>1</sub>
23 <sub>1</sub>	24 <sub>1</sub>	30 <sub>2</sub>	23 <sub>2</sub>	23 <sub>1</sub>
				50 <sub>1</sub>
		28 <sub>2</sub>	47 <sub>2</sub>	31 <sub>2</sub>

READINGS ARE IN PICOCURIES PER GRAM URANIUM (pCi/g U) AND THORIUM (pCi/g Th), NOT SUBTRACTED. CIMARRON GAMMA SPEC SOIL COUNTER. SITE SOIL BACKGROUND OF APPROXIMATELY 6 pCi/g U AND 1.5 pCi/g Th, NOT SUBTRACTED. SAMPLES TAKEN ON 5 METER X 5 METER GRID.

**LEGEND**  
 1 - 29 pCi/g URANIUM  
 30 - 89 pCi/g URANIUM  
 90 pCi/g URANIUM  
 2 THORIUM  
 + NO SAMPLE - PILE SLOPE

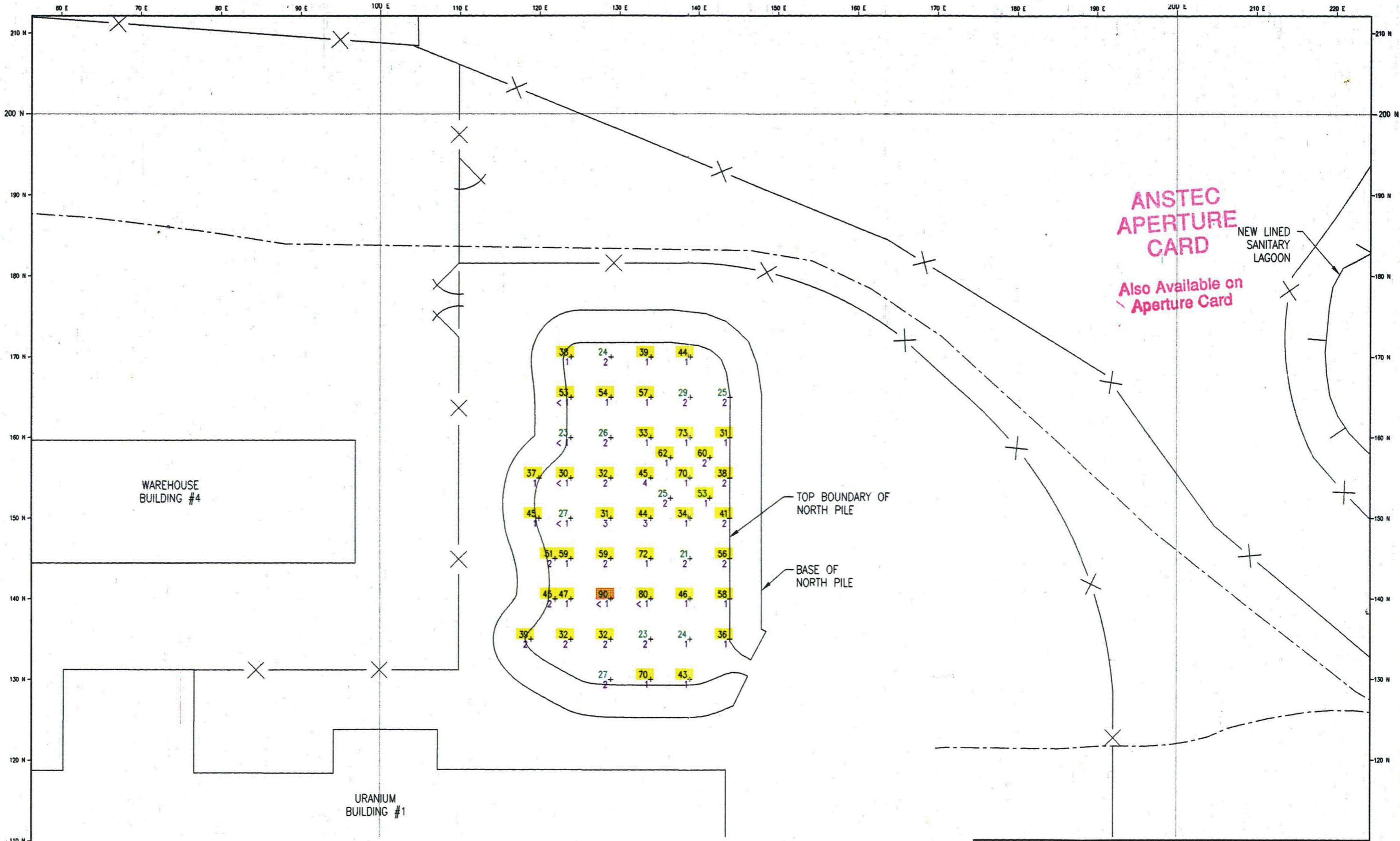
**CIMARRON CORPORATION**  
 CIMARRON FACILITY  
 DESIGNATED AREA STOCKPILE/NORTH PILE  
 CHARACTERIZATION SOIL SAMPLE RESULTS (1994)  
 SOIL SAMPLE ALIQUOT: .5-1M  
 CLIENT DRAWING NO. 94PONPSS-1.0  
 JOB NO. DRAWING NO. 94PONPSS-1.0 REV. 0

DATE 9/29/94 DATE 10/1/94  
 DRAWN BY JE CHECKED BY JA APP'D BY KM  
 SCALE AS SHOWN



9412080115

142



**ANSTEC APERTURE CARD**  
 Also Available on Aperture Card

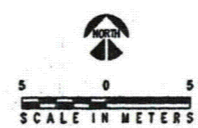
WAREHOUSE BUILDING #4

URANIUM BUILDING #1

TOP BOUNDARY OF NORTH PILE

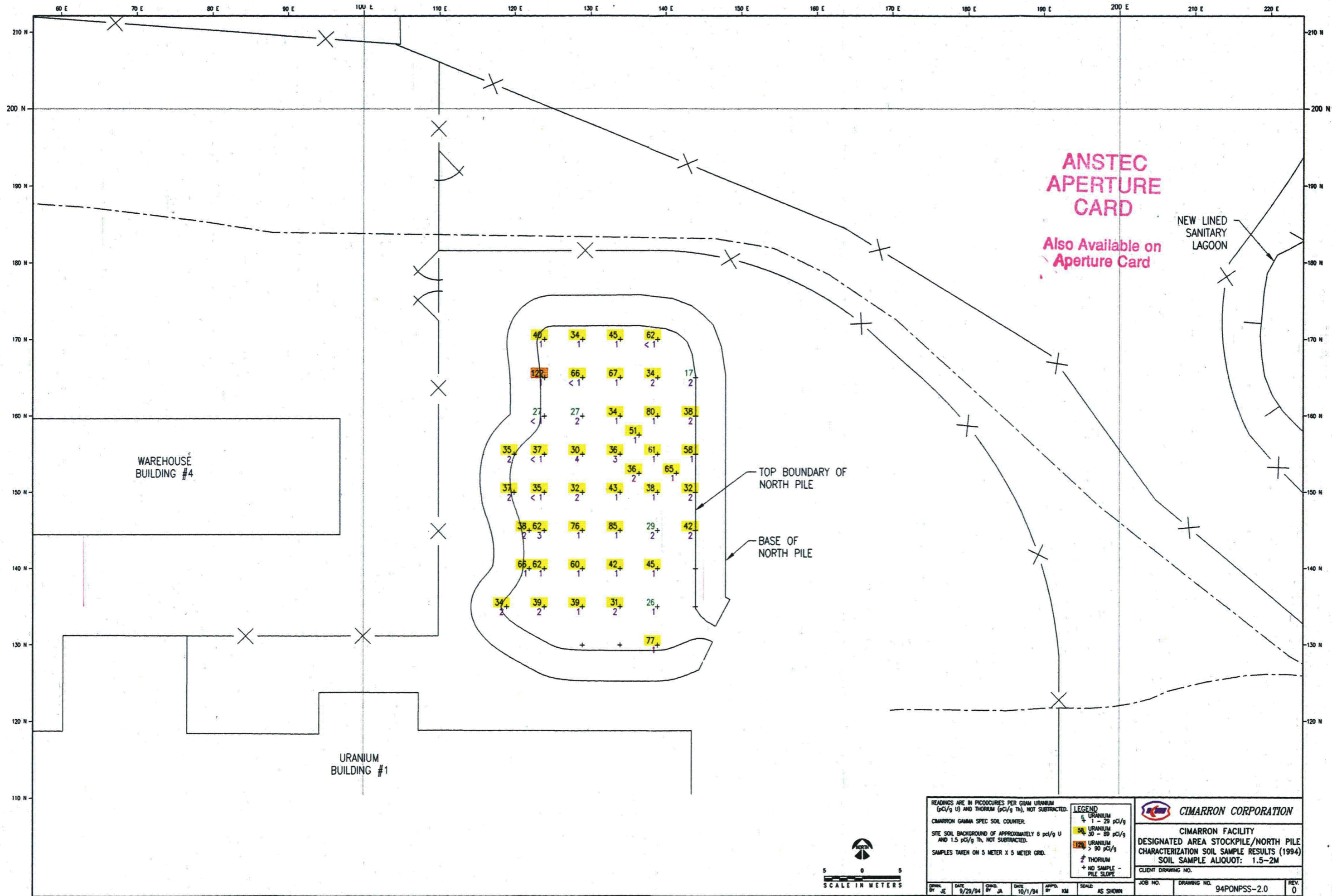
BASE OF NORTH PILE

READINGS ARE IN PICOCURIES PER GRAM URANIUM (pci/g U) AND THORIUM (pci/g Th), NOT SUBTRACTED. CIMARRON GAMMA SPEC SOIL COUNTER. SITE SOIL BACKGROUND OF APPROXIMATELY 6 pci/g U AND 1.5 pci/g Th, NOT SUBTRACTED. SAMPLES TAKEN ON 5 METER X 5 METER GRID.		<b>LEGEND</b> 1 - 29 pci/g URANIUM 30 - 89 pci/g URANIUM 90+ pci/g URANIUM # THORIUM + NO SAMPLE - PILE SLOPE	<b>CIMARRON CORPORATION</b> CIMARRON FACILITY DESIGNATED AREA STOCKPILE/NORTH PILE CHARACTERIZATION SOIL SAMPLE RESULTS (1994) SOIL SAMPLE ALIQUOT: 1-1.5M CLIENT DRAWING NO.
DRAWN BY: JE DATE: 9/29/94 CHECKED BY: JA DATE: 10/1/94 APPROVED BY: KM SCALE: AS SHOWN	JOB NO. 94PONPSS-1.5 DRAWING NO. 9412080115 REV. 0		



9412080115

143



READINGS ARE IN PICOCURIES PER GRAM URANIUM (pCi/g U) AND THORIUM (pCi/g Th), NOT SUBTRACTED.  
CIMARRON GAMMA SPEC SOIL COUNTER.  
SITE SOIL BACKGROUND OF APPROXIMATELY 6 pCi/g U AND 1.5 pCi/g Th, NOT SUBTRACTED.  
SAMPLES TAKEN ON 5 METER X 5 METER GRID.

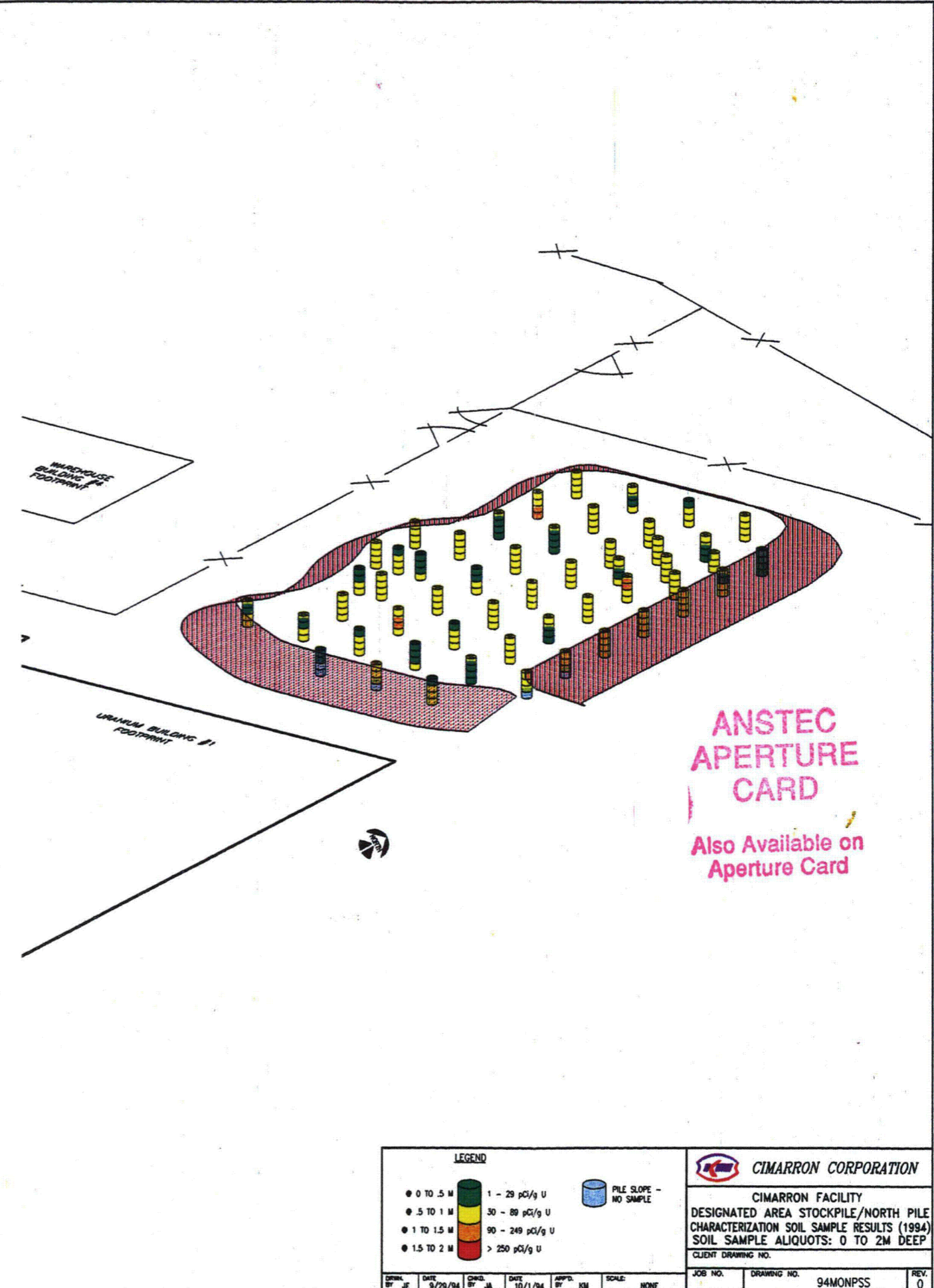
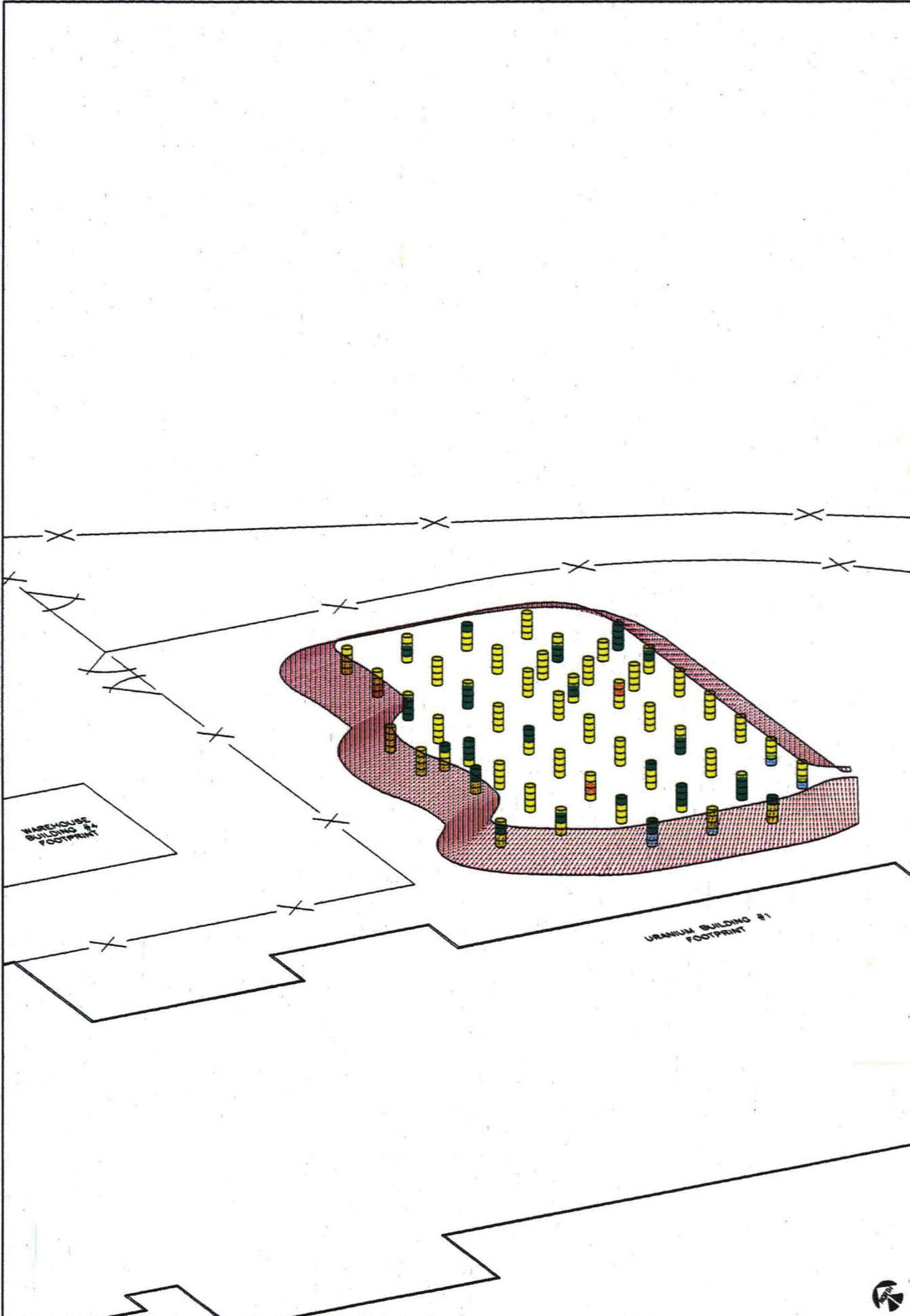
**LEGEND**  
 □ URANIUM 1 - 29 pCi/g  
 □ URANIUM 30 - 89 pCi/g  
 □ URANIUM > 90 pCi/g  
 □ THORIUM  
 + NO SAMPLE - PILE SLOPE

**CIMARRON CORPORATION**  
**CIMARRON FACILITY**  
 DESIGNATED AREA STOCKPILE/NORTH PILE  
 CHARACTERIZATION SOIL SAMPLE RESULTS (1994)  
 SOIL SAMPLE ALIQUOT: 1.5-2M  
 CLIENT DRAWING NO.

DATE: 9/29/94  
 DATE: 10/1/94  
 SCALE: AS SHOWN  
 JOB NO. 94PONPSS-2.0  
 DRAWING NO. 9412080115  
 REV. 0

9412080115

Handwritten signature or initials.



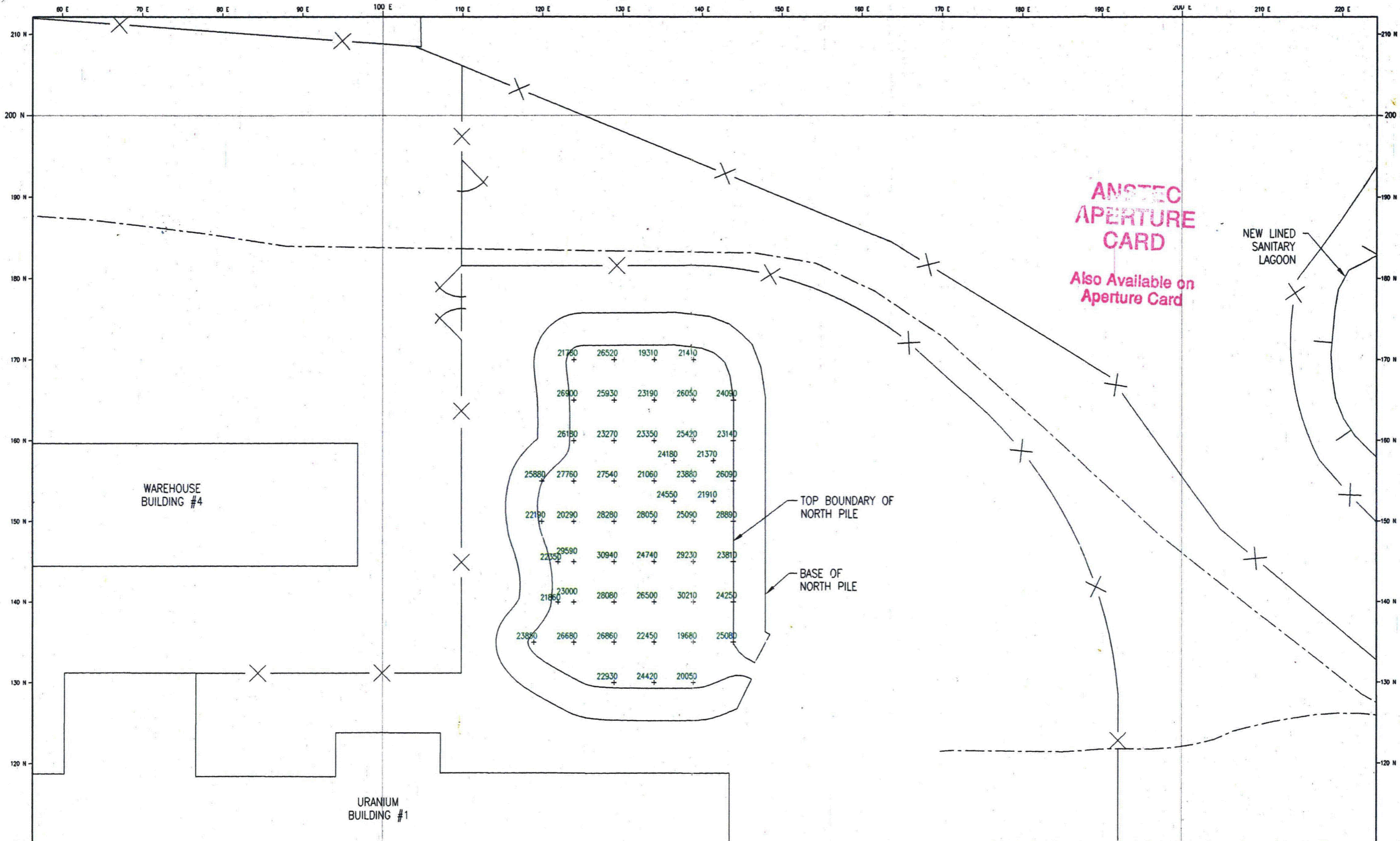
LEGEND			
● 0 TO .5 M	1 - 29 pCi/g U	FILE SLOPE - NO SAMPLE	
● .5 TO 1 M	30 - 89 pCi/g U		
● 1 TO 1.5 M	90 - 249 pCi/g U		
● 1.5 TO 2 M	> 250 pCi/g U		

<b>CIMARRON CORPORATION</b>	
CIMARRON FACILITY	
DESIGNATED AREA STOCKPILE/NORTH PILE	
CHARACTERIZATION SOIL SAMPLE RESULTS (1994)	
SOIL SAMPLE ALIQUOTS: 0 TO 2M DEEP	
CLIENT DRAWING NO.	
JOB NO.	DRAWING NO. 94MONPSS
DATE 9/29/94	DATE 10/1/94
SCALE: NONE	REV. 0

9412080115

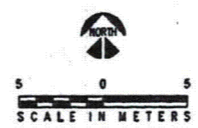
145



ANSTEC APERTURE CARD  
Also Available on Aperture Card

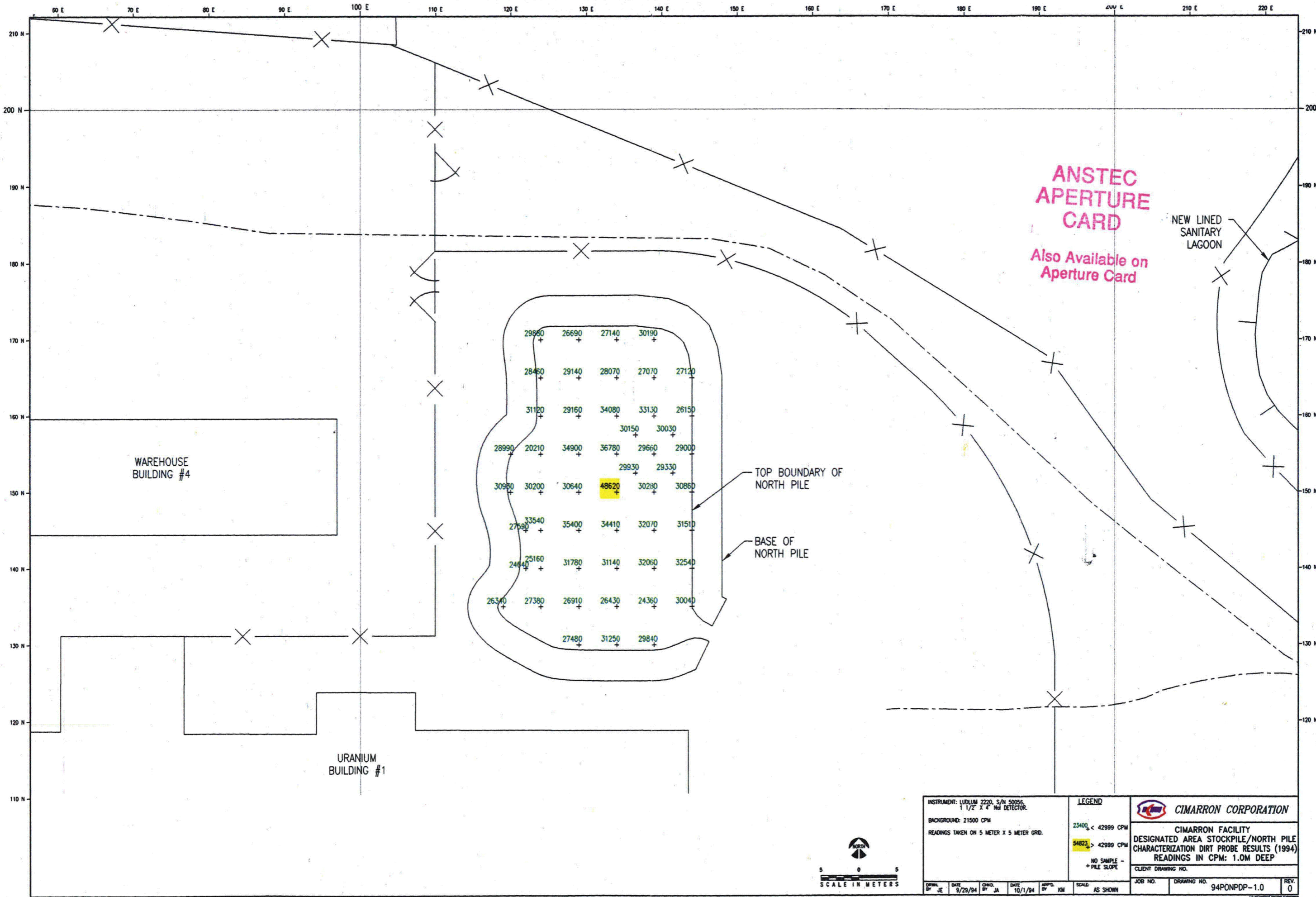
TOP BOUNDARY OF NORTH PILE  
BASE OF NORTH PILE

INSTRUMENT: LUDLUM 220, S/N 50056 1 1/2" X 4" NaI DETECTOR.		LEGEND		CIMARRON CORPORATION	
BACKGROUND: 21500 CPM		23400 < 42999 CPM		CIMARRON FACILITY	
READINGS TAKEN ON 5 METER X 5 METER GRID.		54823 > 42999 CPM		DESIGNATED AREA STOCKPILE/NORTH PILE	
		NO SAMPLE -		CHARACTERIZATION DIRT PROBE RESULTS (1994)	
		+ PILE SLOPE		READINGS IN CPM: .5M DEEP	
				CLIENT DRAWING NO.	
				JOB NO.	DRAWING NO. 94PONPDP-0.5
				REV. 0	



9412080115

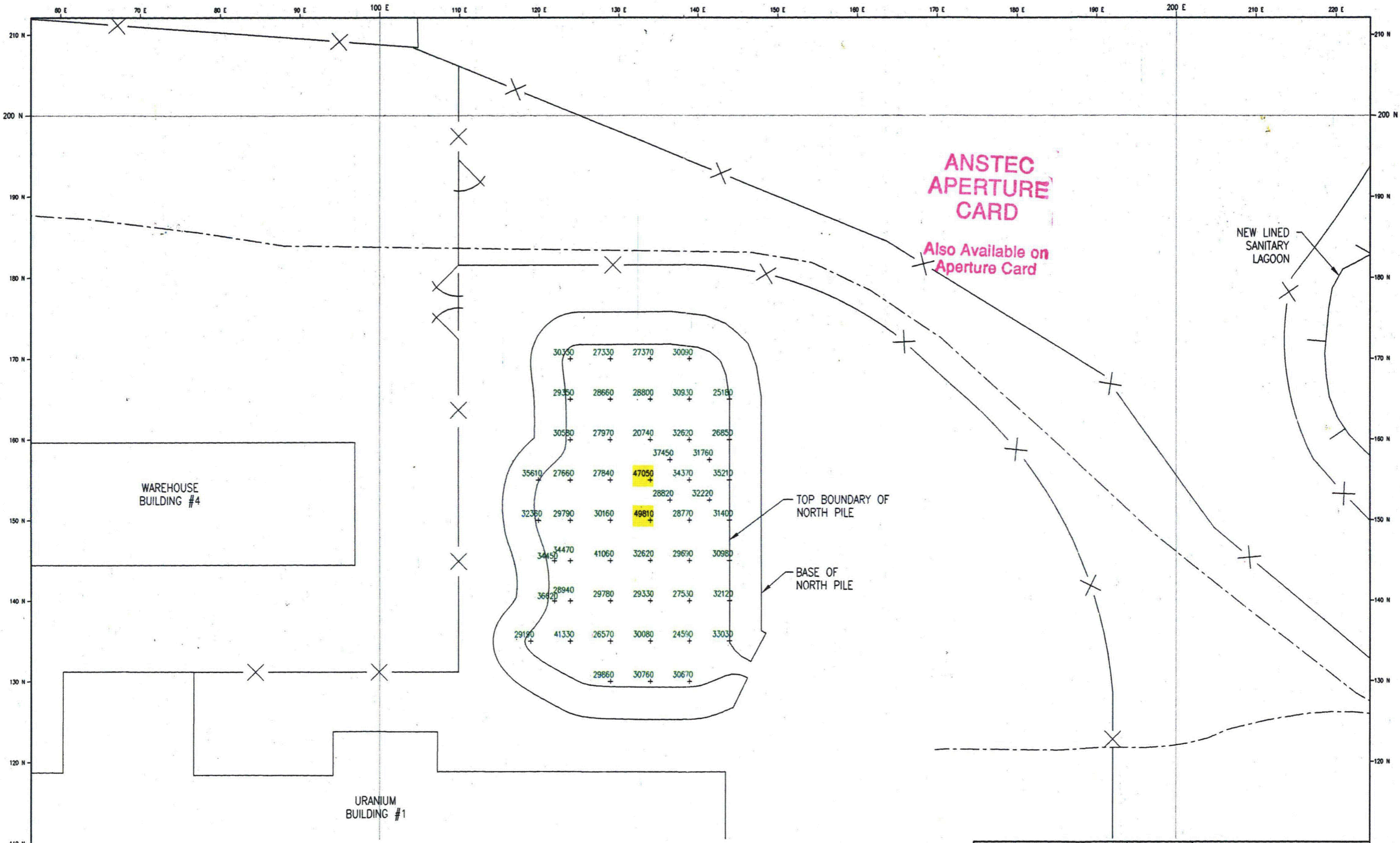
Handwritten signature/initials.



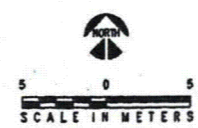
INSTRUMENT: LUDLUM 2220, S/N 50055 1 1/2" X 4" NaI DETECTOR.		LEGEND		CIMARRON CORPORATION	
BACKGROUND: 21500 CPM		23400 < 42999 CPM		CIMARRON FACILITY	
READINGS TAKEN ON 5 METER X 5 METER GRID.		54823 > 42999 CPM		DESIGNATED AREA STOCKPILE/NORTH PILE	
		NO SAMPLE - + PILE SLOPE		CHARACTERIZATION DIRT PROBE RESULTS (1994)	
				READINGS IN CPM: 1.0M DEEP	
				CLIENT DRAWING NO.	
				JOB NO.	DRAWING NO. 94PONPDP-1.0
DATE: 9/29/94	DATE: 10/1/94	SCALE: AS SHOWN	REV. 0		



9412080115 -1417



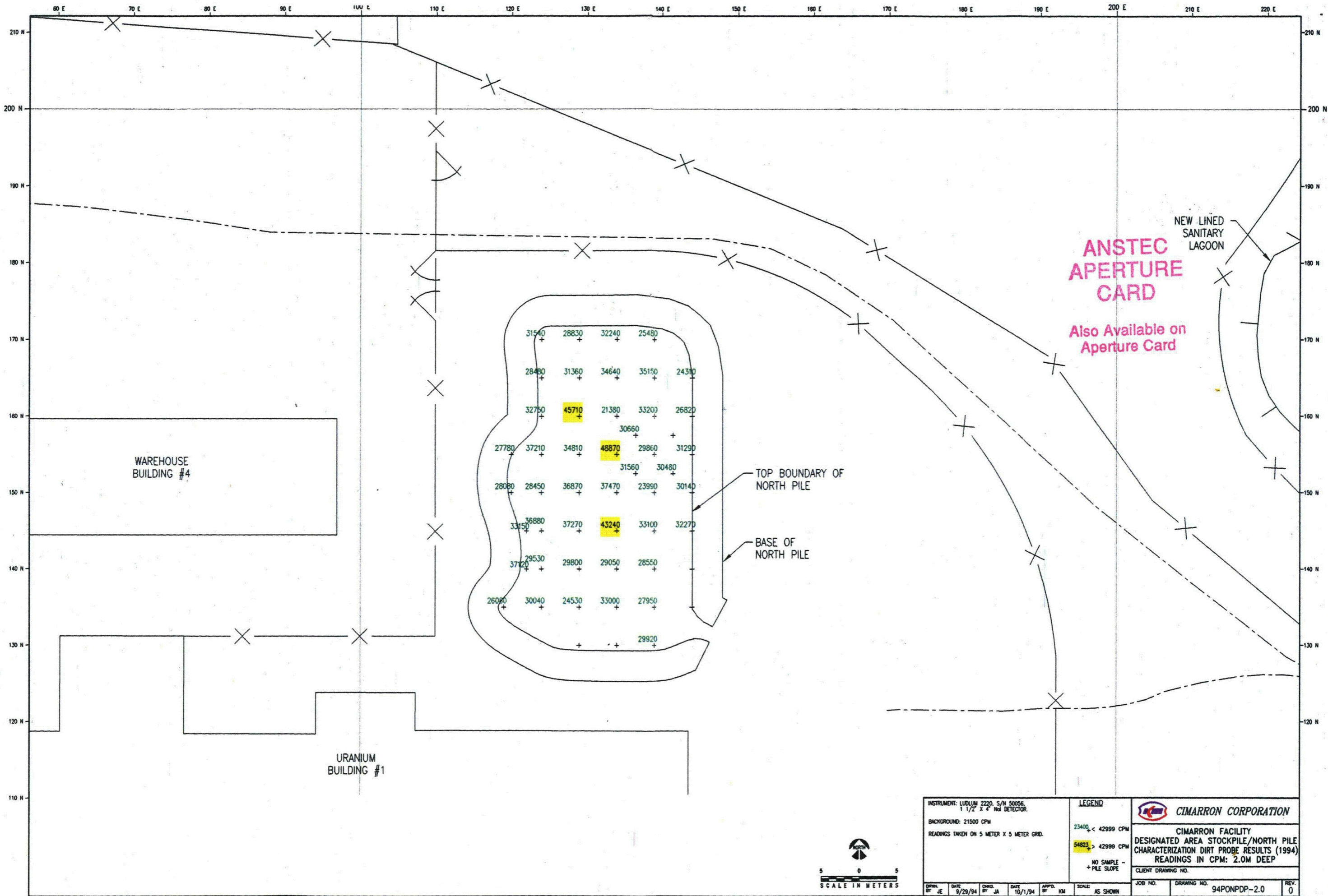
INSTRUMENT: LUDLUM 2220, S/N 50056 1 1/2" x 4" NaI DETECTOR. BACKGROUND: 21500 CPM READINGS TAKEN ON 5 METER X 5 METER GRID.		<b>LEGEND</b> 23400 < 42999 CPM 54823 > 42999 CPM NO SAMPLE - + PILE SLOPE	<b>CIMARRON CORPORATION</b> CIMARRON FACILITY DESIGNATED AREA STOCKPILE/NORTH PILE CHARACTERIZATION DIRT PROBE RESULTS (1994) READINGS IN CPM: 1.5M DEEP CLIENT DRAWING NO.
DRAWN BY: JE DATE: 9/29/94 CHKD. BY: JA DATE: 10/1/94 APP'D. BY: KM SCALE: AS SHOWN	JOB NO. 94PONPDP-1.5 DRAWING NO. 9412080115 REV. 0		



9412080115

140





31540	28830	32240	25480	
28480	31360	34640	35150	24310
32750	45710	21380	33200	26820
		30660		
27780	37210	34810	48870	29860
		31560	30480	31290
28080	28450	36870	37470	23990
		36880	37270	33100
33150			43240	32270
37120	29530	29800	29050	28550
26080	30040	24530	33000	27950
				29920

**ANSTEC APERTURE CARD**  
Also Available on Aperture Card

TOP BOUNDARY OF NORTH PILE  
BASE OF NORTH PILE

WAREHOUSE BUILDING #4

URANIUM BUILDING #1

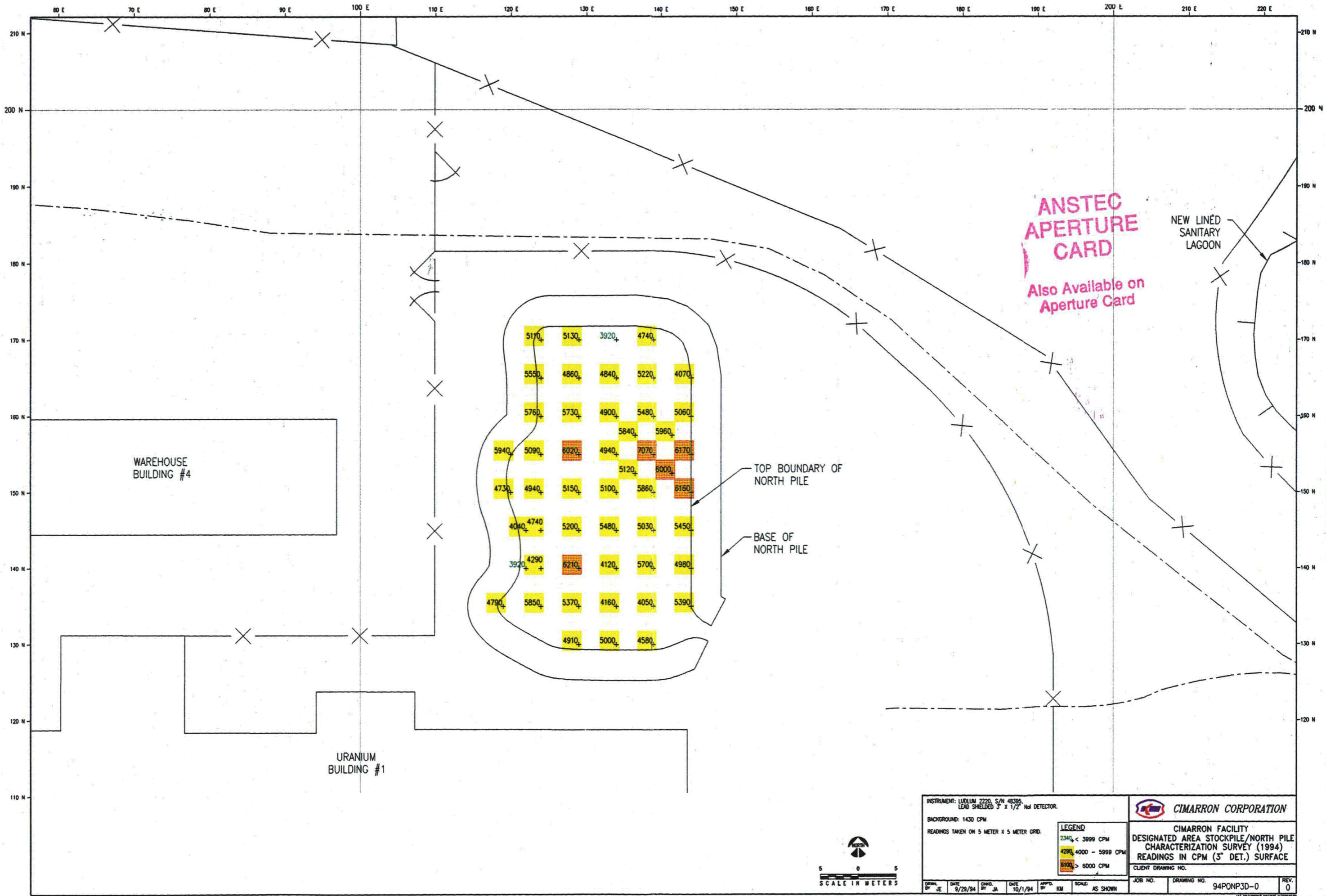
NEW LINED SANITARY LAGOON

INSTRUMENT: LUDLUM 2220, S/N 50056, 1 1/2" x 4" NaI DETECTOR. BACKGROUND: 21500 CPM READINGS TAKEN ON 5 METER X 5 METER GRID.		<b>LEGEND</b> 23400 < 42999 CPM 54823 > 42999 CPM NO SAMPLE - + PILE SLOPE	<b>CIMARRON CORPORATION</b> CIMARRON FACILITY DESIGNATED AREA STOCKPILE/NORTH PILE CHARACTERIZATION DIRT PROBE RESULTS (1994) READINGS IN CPM: 2.0M DEEP CLIENT DRAWING NO.
DRAWN BY: JE DATE: 9/29/94 CHKD. BY: JA DATE: 10/1/94 APPD. BY: KM	SCALE: AS SHOWN	JOB NO. 94PONPDP-2.0 DRAWING NO. 9412080115 REV. 0	



9412080115

149



5170	5130	3920	4740	
5550	4860	4840	5220	4070
5760	5730	4900	5480	5060
		5840	5960	
5940	5090	6020	4940	7070
		5120	6000	6170
4730	4940	5150	5100	5860
				6160
4040	4740	5200	5480	5030
				5450
3920	4290	6210	4120	5700
				4980
4790	5850	5370	4160	4050
				5390
		4910	5000	4580

**ANSTEC APERTURE CARD**  
Also Available on Aperture Card

TOP BOUNDARY OF NORTH PILE  
BASE OF NORTH PILE

WAREHOUSE BUILDING #4

URANIUM BUILDING #1

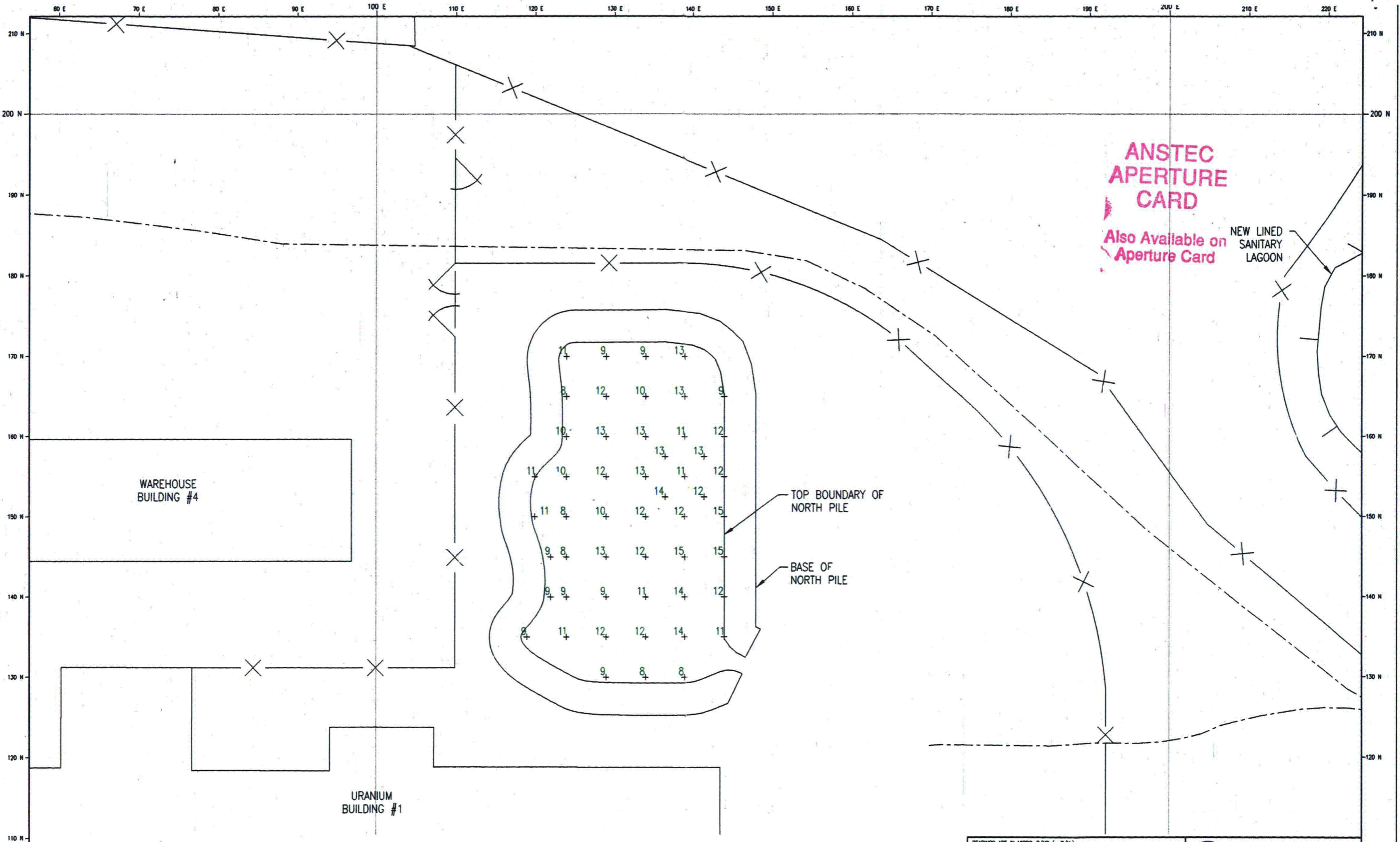
NEW LINED SANITARY LAGOON



INSTRUMENT: LUDLUM 2220, S/N 48395 LEAD SHIELDED 3" X 1 1/2" NaI DETECTOR.		<b>CIMARRON CORPORATION</b>	
BACKGROUND: 1430 CPM		CIMARRON FACILITY	
READINGS TAKEN ON 5 METER X 5 METER GRID.		DESIGNATED AREA STOCKPILE/NORTH PILE	
		CHARACTERIZATION SURVEY (1994)	
		READINGS IN CPM (3" DET.) SURFACE	
		CLIENT DRAWING NO.	
DRN: JE	DATE: 9/29/94	CHKD: JA	DATE: 10/1/94
APPD: KM	SCALE: AS SHOWN	JOB NO.:	DRAWING NO. 94PONP3D-0
		REV. 0	

9412080115

*Handwritten signature/initials*



READINGS ARE IN MICRO-R/HR (µR/hr)

INSTRUMENT: LUDLUM MICRO-R METER  
 MODEL NO: 125  
 SERIAL NO: 9081  
 BACKGROUND: 7 µR/hr

**CIMARRON CORPORATION**

CIMARRON FACILITY  
 DESIGNATED AREA STOCKPILE/NORTH PILE  
 CHARACTERIZATION MICRO-R SURVEY (1994)  
 AT LAND SURFACE

CLIENT DRAWING NO.

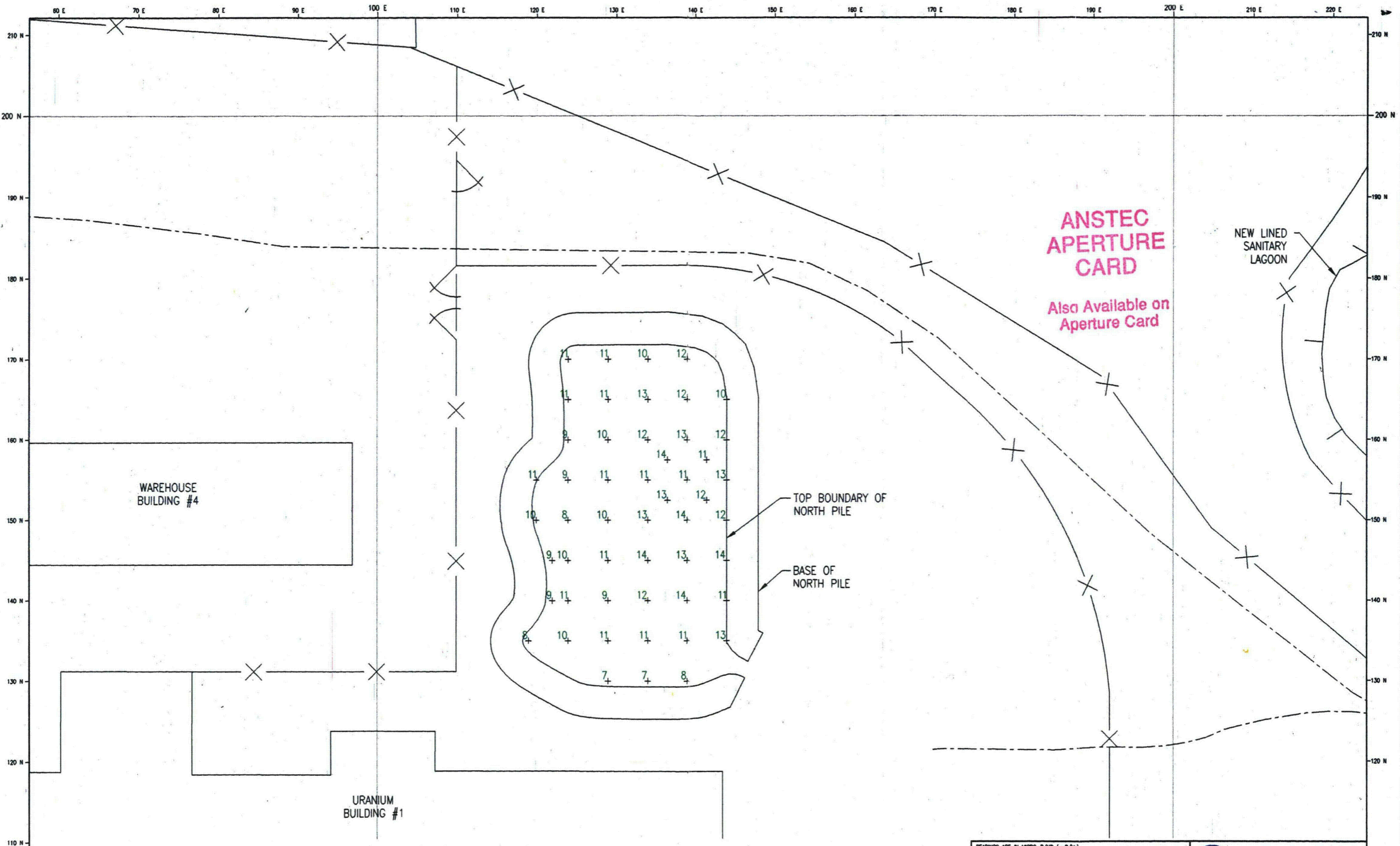
DATE	BY	DATE	BY	DATE	BY	SCALE
9/29/94	JE	10/1/94	JA			AS SHOWN

JOB NO. 94PONPUR-0  
 DRAWING NO. 94PONPUR-0  
 REV. 0

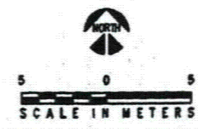


9412080115

151



READINGS ARE IN MICRO-R/HR ( $\mu\text{R}/\text{hr}$ ) INSTRUMENT: LUDLUM MICRO-R METER MODEL NO: 125 SERIAL NO: 9081 BACKGROUND: 7 $\mu\text{R}/\text{hr}$			
CIMARRON FACILITY DESIGNATED AREA STOCKPILE/NORTH PILE CHARACTERIZATION MICRO-R SURVEY (1994) AT ONE METER ABOVE SURFACE			
CLIENT DRAWING NO.			
JOB NO.	DRAWING NO.	94PONPUR-1	REV. 0



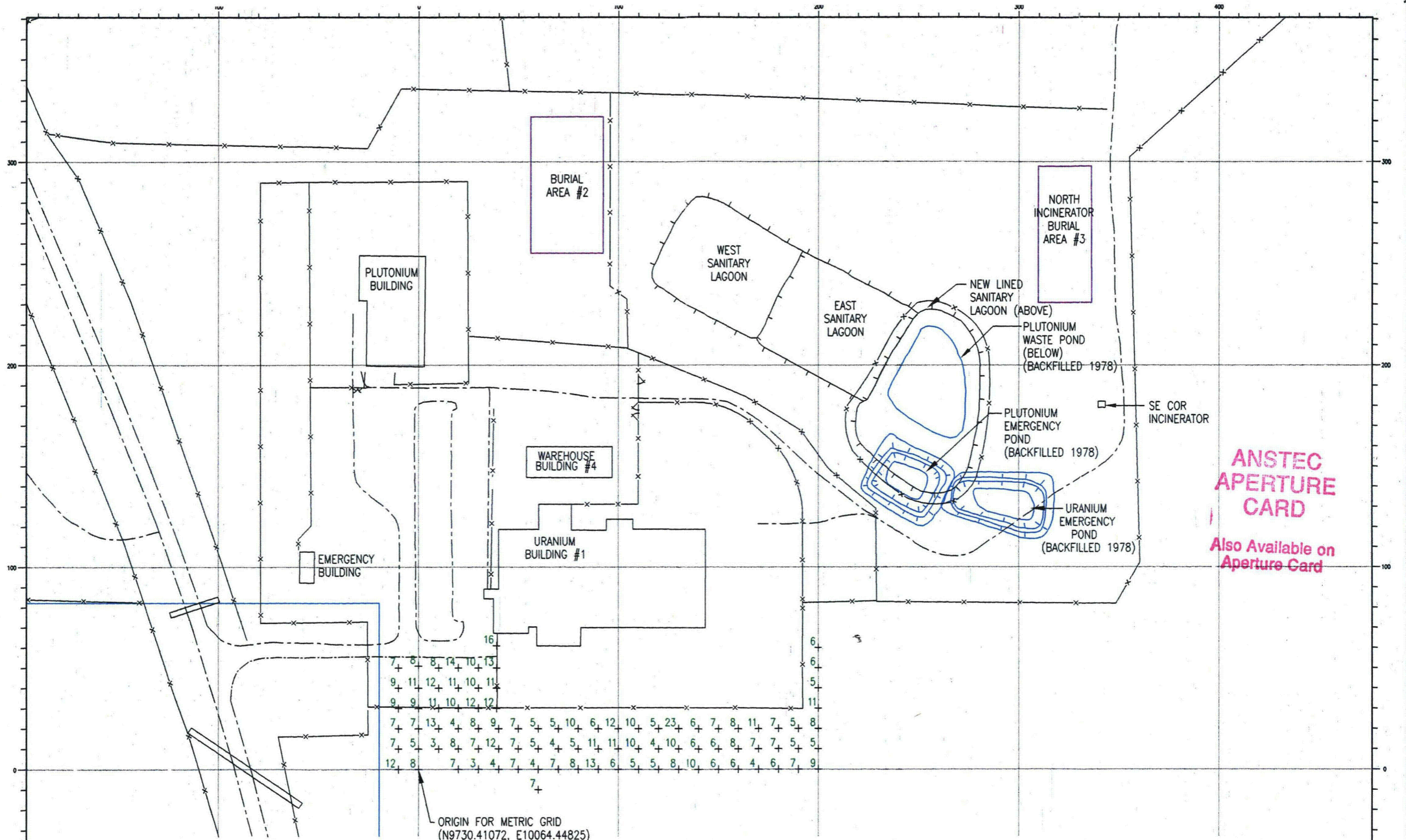
9412080115

157A









READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U).  
 CIMARRON GAMMA SPEC SOIL COUNTER.  
 SITE SOIL BACKGROUND OF APPROXIMATELY 5 pCi/g U, NOT SUBTRACTED.

LEGEND

- 1 - 29 pCi/g U
- 30 - 89 pCi/g U
- > 90 pCi/g U

SAMPLES TAKEN ON 10 METER X 10 METER GRID.  
 SAMPLES TAKEN BEFORE REMEDIATION.

SCALE: AS SHOWN

**CIMARRON CORPORATION**  
 CIMARRON FACILITY  
 SOUTH OF URANIUM YARD  
 PRE-REMEDIATION SOIL SAMPLE RESULTS (1990)  
 SOIL SAMPLE ALIQUOT: 2'-3' DEEP  
 CLIENT DRAWING NO. 90PRSUSS-3

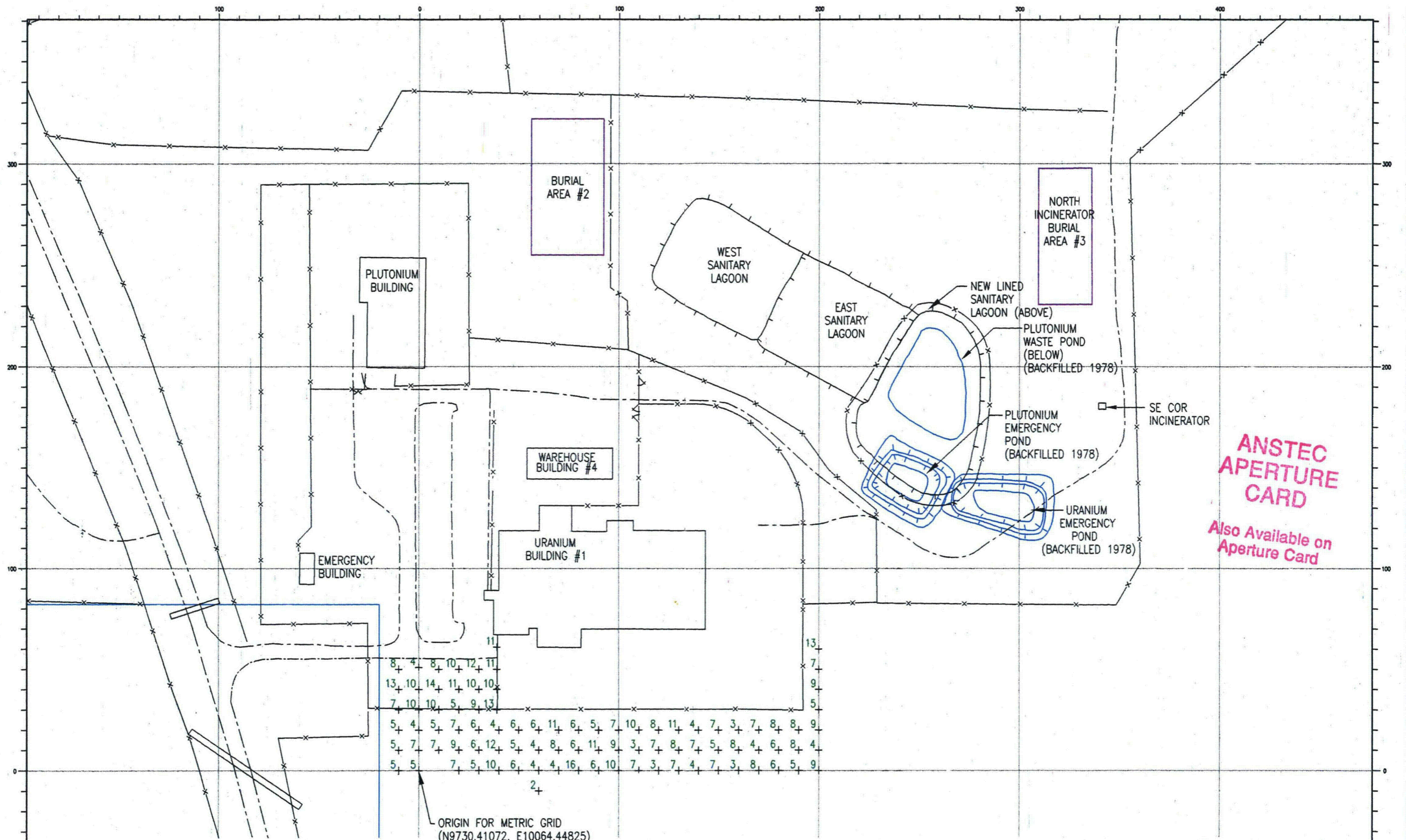
JOB NO. DRAWING NO. 90PRSUSS-3 REV. 0



9412080115

10-33-01





**ANSTEC APERTURE CARD**  
 Also Available on Aperture Card

READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U).  
 CIMARRON GAMMA SPEC SOIL COUNTER.  
 SITE SOIL BACKGROUND OF APPROXIMATELY 6 pCi/g U, NOT SUBTRACTED.

**LEGEND**

- ☐ 1 - 29 pCi/g U
- ▨ 30 - 89 pCi/g U
- ⊞ > 90 pCi/g U

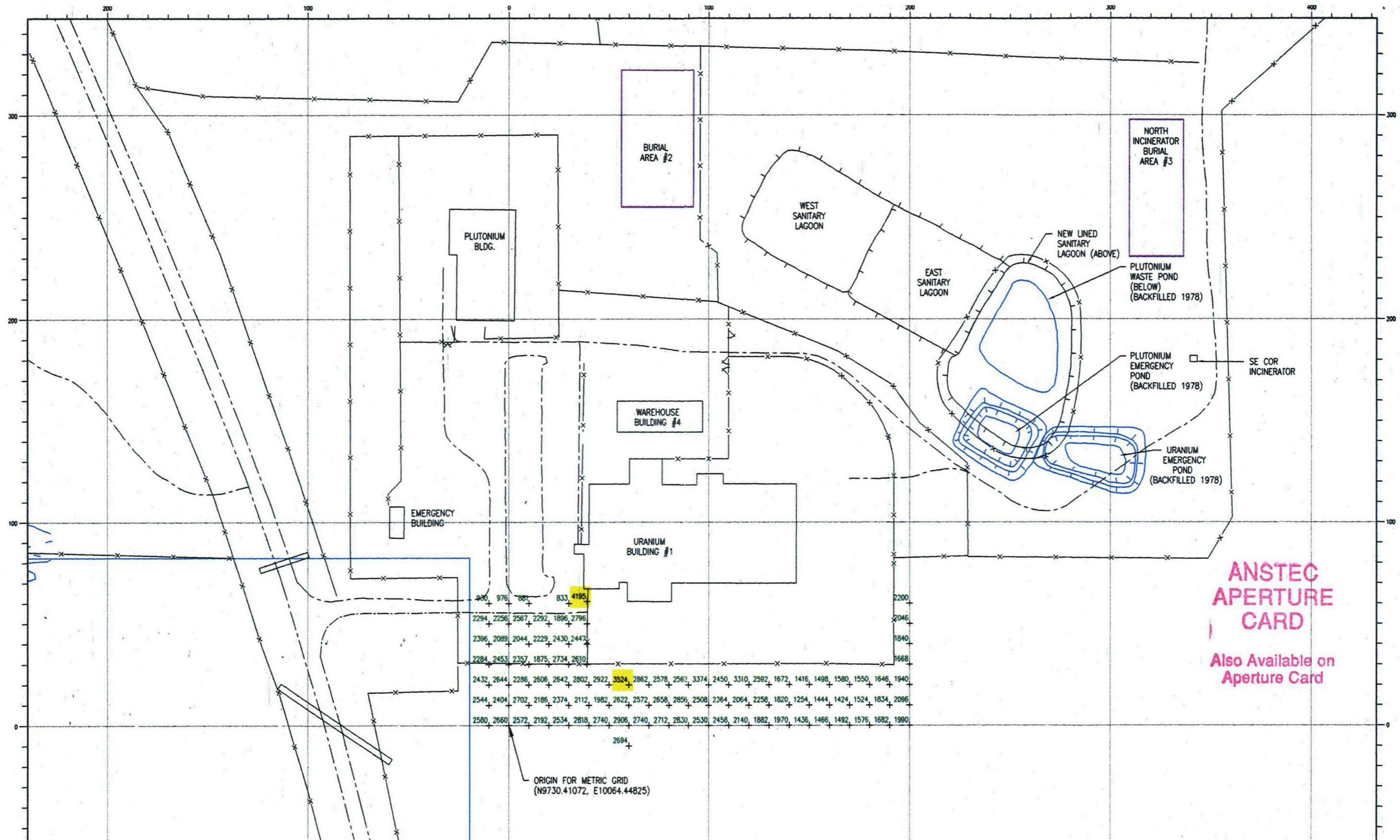
SAMPLES TAKEN ON 10 METER X 10 METER GRID.  
 SAMPLES TAKEN BEFORE REMEDIATION.

**CIMARRON CORPORATION**  
 CIMARRON FACILITY  
 SOUTH OF URANIUM YARD  
 PRE-REMEDIATION SOIL SAMPLE RESULTS (1990)  
 SOIL SAMPLE ALIQUOT: 3'-4' DEEP  
 CLIENT DRAWING NO. 90PRSUSS-4  
 JOB NO. DRAWING NO. 90PRSUSS-4 REV. 0



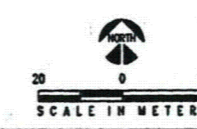
9412080115

156



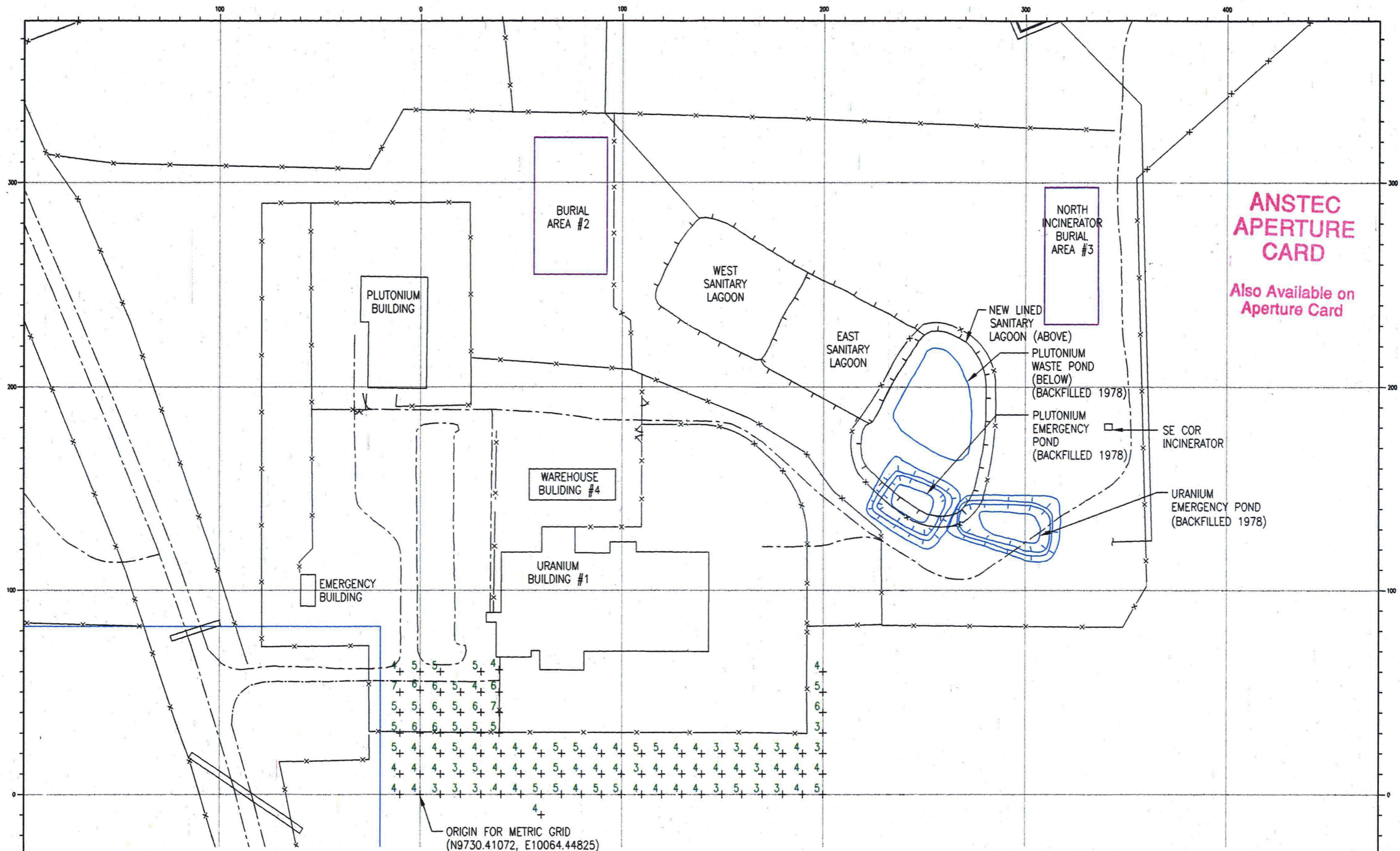
**ANSTEC APERTURE CARD**  
 Also Available on Aperture Card

INSTRUMENT: LUDLUM 2220 S/N 48395 LEAD SHIELDED 5' X 1/2" NaI DETECTOR.			<b>CIMARRON CORPORATION</b> CIMARRON FACILITY SOUTH OF URANIUM YARD PRE-REMEDIATION GAMMA SURVEY (1990) READINGS IN CPM (3" DET.)	
READINGS TAKEN ON A 10 METER X 10 METER GRID. SURVEY PERFORMED BEFORE REMEDIATION.			CLIENT DRAWING NO.	
<b>LEGEND</b> 2294 < 3500 CPM 4261 3500 - 5000 CPM 5300 > 5000 CPM	JOB NO.	DRAWING NO. 90PRSU3D-0	REV. 0	
DRWN BY JE DATE 9/14/94 CDRN BY JA DATE 10/1/94 APPR BY KM SCALE AS SHOWN				



9412080115

156-01



**ANSTEC APERTURE CARD**

Also Available on Aperture Card

READINGS ARE IN MICRO-R/Hr. (µR/Hr.) INSTRUMENT: LUDLUM MICRO-R METER MODEL NO: 125 SERIAL NO: 9081 ESTABLISHED SITE BACKGROUND OF 7 µR/Hr., NOT SUBTRACTED. SAMPLES TAKEN ON A 10 METER BY 10 METER GRID READINGS TAKEN BEFORE REMEDIATION. (EXCEPT FOR WEST SANITARY LAGOON).		<b>CIMARRON CORPORATION</b> CIMARRON FACILITY SOUTH OF URANIUM YARD PRE-REMEDIATION MICRO-R SURVEY (1990) AT LAND SURFACE CLIENT DRAWING NO.
JOB NO. 90PRSUUR-0 DRAWING NO. 90PRSUUR-0 REV. 0	DATE 9/14/94 CHECKED BY JA DATE 10/1/94 APP'D BY KM SCALE: AS SHOWN	



9412080115

157



## 14.0 Uranium Process Buildings and Equipment

For the uranium process, uranium hexafluoride ( $UF_6$ ) was received and converted into a fuel material such as uranium dioxide pellets. Within the continuous process line, gaseous  $UF_6$  was converted to ammonium diuranate (ADU). The ADU was reduced in a calciner to  $UO_2$  powder. The powder was ground, mixed and pelletized. These processes along with several ancillary lines, were housed within the Uranium Process Buildings and adjacent storage facilities. Because the process involved the storage and transport of liquid, gases and powders, spills resulted in the nonroutine release of licensed materials. In general, these releases were contained and to the extent practical, the affected area decontaminated. However, the several years of operation and the way the floors were engineered resulted in the spread of subsurface contamination. Additionally, positive controls were in place to limit effluent releases in the process and ventilation discharges. However, because of the large volume of air ventilated through the roof, even if the concentration were controlled below 10% of MPC, a sizable amount of uranium would be lost to the environment. For example, in 1970, Kerr-McGee estimated that from 40 Kg to 300 Kg/year could be lost through the roof ventilation system. This section will address the characterization of the process buildings within which these releases occurred.

The decontamination and decommissioning of the uranium processing equipment and buildings began in 1977. Equipment has either been decontaminated and/or removed, or is in the final process of being decontaminated and/or removed. A number of the interior walls and floor sections have been removed. Surfaces have been washed, scraped, chipped and/or scabbled to remove surface contamination. Subfloor drains and contaminated soils have been also excavated and removed. Some of these areas have been released by the NRC for backfilling. The Uranium Building (Building #1) is still in the process of being decontaminated. The Liquid Storage Building (Building #2) has been dismantled and removed. The Solvent Extraction Building (Building #3) and the Vaporizer Room concrete floor also have been dismantled and removed. The Uranium Warehouse building (Building #4), which was not used as part of the fuel cycle process, currently is being utilized by Kerr-McGee for nonnuclear process development.

### 14.1 Uranium Warehouse Building (Building #4):

The warehouse is a sheet-metal building (50 ft. x 160 ft.) which was never used to process radioactive materials. However, fuel assemblies were inspected and assembled for a short period of time within this building. Cimarron personnel requested permission

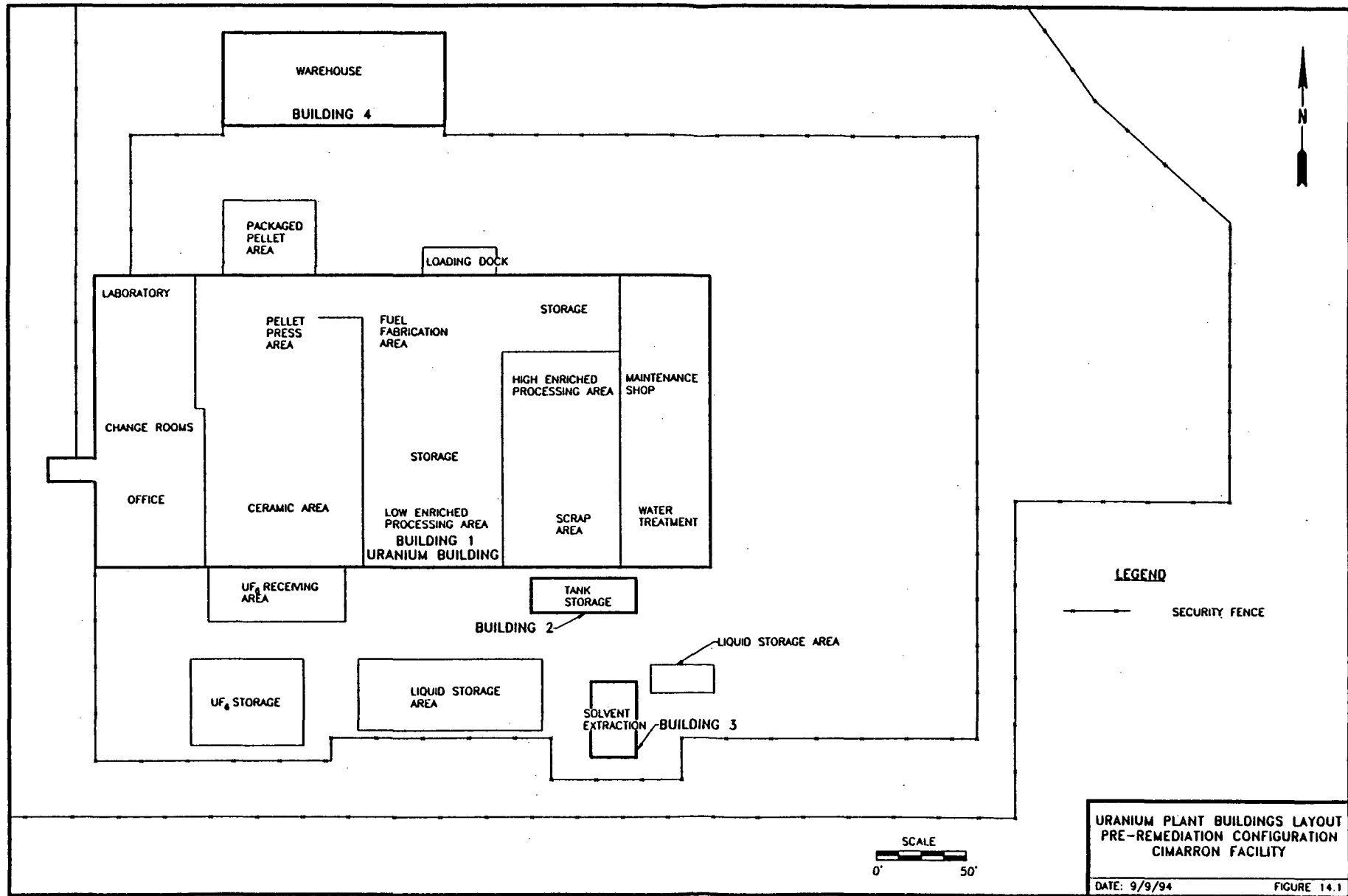
from the NRC on December 28, 1979 to decontaminate the warehouse and use the building for coal liquification processing. Approval was granted on December 28, 1979 by the NRC. However, a license amendment was not issued. This building is covered under Uranium License SNM-928. The NRC's December approval letter stated:

"We agree with your proposal to decontaminate the building to below the NRC guidelines for release for unrestricted use prior to using it for non-nuclear activities; however, we will not eliminate this area as a place of use under your license since it is an integral part of the Cimarron facilities".

Final release surveys were completed on the inside and outside surface of this building in 1980. The results for the floor survey showed an average fixed activity of 500 dpm/100 cm<sup>2</sup> alpha with a maximum fixed activity of 2,254 dpm/100 cm<sup>2</sup> alpha. The walls, fixtures and other surfaces showed an average fixed activity of less than 500 dpm/100 cm<sup>2</sup> alpha with a maximum fixed activity of 2,500 dpm/100 cm<sup>2</sup> alpha. The NRC gave approval on March 28, 1980 to use the Coal Building for nonnuclear purposes based upon these surveys. The survey conducted in 1980 was for alpha only. Additional surveys were conducted in the Coal Building in 1993 for both alpha and beta/gamma. This survey revealed several small areas with elevated levels of beta activity in the concrete floor which required decontamination. An alpha survey performed at the same time showed a maximum fixed activity of 500 dpm/100 cm<sup>2</sup> and average of 200 dpm/100 cm<sup>2</sup>.

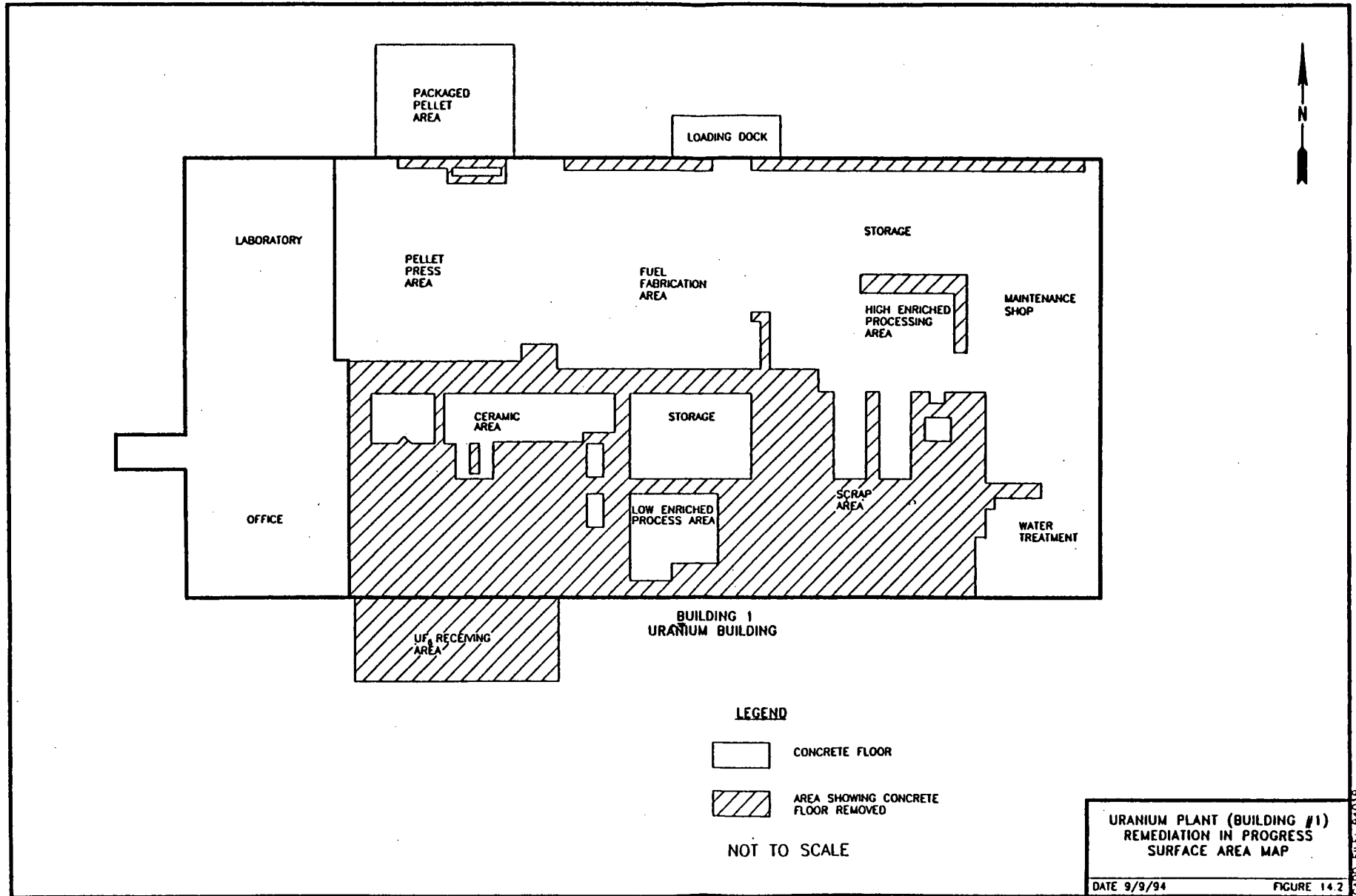
#### 14.2 Uranium Building (Building #1):

The Uranium Building is a one-story sheet metal building (160 ft. x 340 ft.) which contained the offices, laboratory, and change rooms, plus the majority of the equipment utilized for uranium fuel processing. The general layout of the building is shown on Figure 14.1. The process equipment was removed from the main processing area, surveyed, decontaminated, and/or shipped off site for disposal. The majority of the contaminated concrete has been surveyed, decontaminated, and removed, as required. The areas where concrete has been removed are shown on Figure 14.2. Contaminated soil under the concrete has been removed or is in the process of being removed. The floor drains and other drain lines also have been removed.



URANIUM PLANT BUILDINGS LAYOUT  
PRE-REMEDIATION CONFIGURATION  
CIMARRON FACILITY  
DATE: 9/9/94  
FIGURE 14.1

CADD FILE: 94003



61074-94-114 CAD FILE



The following discussions include greater detail on the status of the Uranium Building characterization and decontamination efforts. Final surveys are currently being performed.

A. Characterization Data (Roof and Exterior Walls):

A final alpha survey has been completed on the Uranium Building roof. A roof grid was set up for the different sections of the roof and direct and swipe surveys were taken at the grid intersect points. A summary of the readings by roof section are included in Table 14.1. The maximum direct reading by section varied from 496 dpm/100 cm<sup>2</sup> to 3,622 dpm/100 cm<sup>2</sup>, with the average being 662 dpm/100 cm<sup>2</sup>. A total of 6,496 readings were taken on the 55,000 ft<sup>2</sup> roof area.

From May through August, 1991, each outside wall panel around the north, south and east side of the Uranium Building was taken down, decontaminated and surveyed for alpha on both sides. This survey was conducted with an Eberline PRM-6 count rate meter. The concrete footings were decontaminated and surveyed and new foot plates were installed prior to replacement of individual wall panels. If wall panels were damaged or could not be decontaminated, replacement panels or panel sections from the Solvent Extraction Building were used. The final survey results for the panels are summarized below in Table 14.2:

TABLE 14.2

READINGS IN DPM/100 CM<sup>2</sup>

Location	Number of Panels	Maximum Direct	Average Direct	Smearable
North Wall	136	6,000	760	<200
South Wall	280	6,000	1,059	<200
East Wall	150	5,000	998	<200

Table 14.1

U-PLANT ROOF FINAL ALPHA RELEASE SURVEY

Readings are DPM/100 cm<sup>2</sup>

DIRECT TOTAL

REMOVABLE TOTAL

		Number Readings	Average DPM	Max DPM	Number Readings	Average DPM	Max DPM
U-PLANT ROOFTOP	Sections A1-F11	330	1,016.42	3,632	330	8.91	36.0
	Sections G1-L11	330	987.35	1,984	330	8.35	45.00
	Sections M1-R11	330	927.87	2,144	330	6.29	22.00
	Sections S1-X11	330	830.52	2,472	330	5.75	33.00
	Sections A12-F22	330	233.55	1,728	330	7.40	50.00
	Sections G12-L22	330	160.09	808	330	5.47	17.80
	Sections M12-R22	330	335.97	1,496	330	6.29	27.00
	Sections S12-X22	330	327.87	1,920	330	7.00	69.00
	Sections A23-F33	330	657.44	2,040	330	12.48	96.00
	Sections G23-L33	330	1,840.00	1,456	330	13.52	87.00
	Sections M23-R33	330	505.50	2,704	330	4.12	31.00
	Sections S23-X33	330	476.40	2,336	330	5.06	51.00
	Sections A34-F44	330	1,028.72	2,064	330	9.08	27.00
	Sections G34-L44	330	572.83	2,224	330	10.18	87.00
	Sections M34-R44	330	998.24	2,608	330	8.58	67.00
	Sections S34-X44	330	855.18	2,650	330	6.50	27.00
Sections A45-F48	138	510.15	936	138	8.62	42.00	
Sections G45-L49	138	941.94	2,592	138	7.87	27.00	
Sections M45-R49	138	314.42	750	138	4.48	22.00	
Sections S45-X49	138	344.10	1,070	138	3.81	15.00	
U-PLANT GUARD SHACK ROOF		110	618.91	3,100	110	7.42	49.00
SOUTH CANOPY ROOF IN FRONT							
WEST CANOPY ROOF IN FRONT							
U-PLANT ROOF DOCK		60	288.53	744	60	10.57	51.00
U-PLANT PELLET STORAGE ROOF		219	186.13	496	219	5.93	48.00
U-PLANT VAPORIZER ROOM ROOF		275	1,042.31	2,440	275	4.95	20.00
<b>U-PLANT ROOF TOTALS</b>		<b>6,496</b>	<b>662.48</b>	<b>3,632</b>	<b>6,496</b>	<b>7.51</b>	<b>96</b>

## B. Characterization Data (Office and Lab Areas):

A preliminary alpha survey was performed on the Uranium Building office and laboratory areas. This preliminary survey was initiated in January, 1989. Later in the project the ceiling tiles were removed, vacuumed and surveyed with an Eberline PRM-6 meter with a Radeco alpha scintillation detector. This initial survey indicated a maximum of 10,000 dpm/100 cm<sup>2</sup> direct alpha and 2,000 dpm/cm<sup>2</sup> smearable alpha (approximately 1,000 dpm/100 cm<sup>2</sup> average direct alpha and 200 dpm/100 cm<sup>2</sup> average smearable alpha). Any ceiling tiles exceeding 2,000 dpm/100 cm<sup>2</sup> direct alpha and 500 dpm/100 cm<sup>2</sup> smearable alpha were disposed of off site. The ceiling, ceiling beams and rafters, conduit, piping and duct work were all surveyed with an Eberline PRM-6 meter with a Radeco alpha scintillation detector. This initial survey indicated a maximum of 27,000 dpm/100 cm<sup>2</sup> direct alpha and 10,000 dpm/100 cm<sup>2</sup> smearable alpha (approximately 4,000 dpm/100 cm<sup>2</sup> average direct alpha and approximately 2,000 dpm/100 cm<sup>2</sup> average smearable alpha).

The entire attic area was vacuumed and cleaned. A second survey of the attic was conducted with a Ludlum 2220 meter with a Ludlum 43-4 detector modified to use P-10 gas to increase detector sensitivity. Any areas identified as greater than 5,000 dpm/100 cm<sup>2</sup> alpha were acid washed and surveyed once more. Areas which could not be cleaned to less than 5,000 dpm/100 cm<sup>2</sup> alpha were resurveyed to ensure that they were less than 15,000 dpm/100 cm<sup>2</sup> alpha and that they would average less than 5,000 dpm/100 cm<sup>2</sup> alpha.

A survey was performed for this entire attic area using a Ludlum 2220 meter with a Ludlum 43-68 or 43-4 detector. This survey provided an average of 1,900 dpm/100 cm<sup>2</sup> direct alpha and 15 dpm/100 cm<sup>2</sup> smearable alpha. All permanent fixtures were surveyed with a Ludlum 2220 meter with a Ludlum 43-68 detector, using grids where possible. The survey was completed in March, 1990.

## C. Characterization Data (Wet Ceramic Area):

In April, 1977, Cimarron personnel initiated a procedure for characterizing and decontaminating the Uranium Building walls, floors, and ceiling surfaces, including the Wet Ceramic Area. During initial characterization, all surfaces were

surveyed with an Eberline PRM-6 meter with a Radeco alpha scintillation probe or with a portable instrument (Ludlum 2220 or 2221) with a gas proportional alpha detector. All areas greater than 4,000 dpm/100 cm<sup>2</sup> alpha were marked. All floor surfaces and the bottom two meters of each wall were completely surveyed. All hot spots greater than or equal to 15,000 dpm/100 cm<sup>2</sup> direct and 1,000 dpm/100 cm<sup>2</sup> smearable were decontaminated. This general procedure was and is being utilized to characterize and remediate other areas within the Uranium Building.

The concrete floor in the West Ceramic area was surveyed and removed. Floor materials were decontaminated and were placed in drainage areas on site. Soil samples were collected and analyzed for total uranium on a 2m x 2m grid, at depths from 0 to 4 ft. The results of this sampling are shown on Drawings No. 90PRCPSS-1 through 90PRCPSS-4. These analyses indicated that soil contamination was deeper than 4 ft. Option #4 contaminated soil was excavated and shipped off site for disposal and Option #2 soil was stockpiled on site for future on-site disposal. Follow up soil sampling was completed in 1992 which indicated that the soil remaining in this area meets the guideline value for release. Soil samples were collected at the base of the excavation at 0 to 1 feet and 1 to 2 feet depths. The analytical results for the composited soil samples are shown on Drawings No. 92POCPSS-0 and 92POCPSS-1.

At the request of the NRC's Region III Office, the Environmental Survey and Site Assessment Program of ORISE conducted an independent confirmatory radiological survey of the Wet Ceramic Area. The objective of the confirmatory survey was to develop independent document reviews and radiological data for use by the NRC in evaluating the accuracy of the licensee's survey report. ORISE utilized a 2m x 2m grid system for surveys and soil sample collection.

The confirmatory survey was performed by ORISE on June 22 through 24, 1992<sup>17</sup>. ORISE found several areas that "indicated that soil contamination still existed in the Wet Ceramic Area which exceed the NRC guideline values". However, the ORISE confirmatory survey included an area outside of the Ceramic Area where Cimarron personnel were still decontaminating. When this issue was clarified, the NRC issued a verbal approval to Cimarron allowing the backfilling of

the Wet Ceramic area. This area has been backfilled with clean soil.

D. Characterization Data (Scrap Recovery Area):

The Scrap Recovery Area has been characterized and remediated. The concrete floor and contaminated soil below the concrete floor has been removed. A past gamma survey of this area on a 2m x 2m grid has been completed, with readings placed on Drawing No. 93POSP3D-0. Also a Micro-R survey of this area, taken at the soil surface and at one meter, has been completed. These readings are shown on Drawings No. 93POSPUR-0 and 93POSPUR-1. The final soil sample analytical data for this area has been placed on Drawing No. 93POSPSS-0. This drawing shows five areas where sample results were slightly above the guideline value of 30 pCi/g total uranium. However, with background subtracted, all sampling results are below the guideline value.

By letter dated November 15, 1993, Kerr-McGee requested approval from the NRC to backfill the Scrap Recovery Area in the Uranium Building. The NRC reviewed the sampling and survey results of the Scrap Recovery Area that were submitted in Kerr-McGee's July 8, 1993, and November 15, 1993 reports. Additionally, a confirmatory data review was completed by ORISE at the request of the NRC. Based upon the information submitted to ORISE and their report, the NRC approved the backfilling of the scrap recovery area by letter dated January 10, 1994<sup>18</sup>.

E. Characterization Data (Pellet, Fabrication, and Maintenance Storage Areas):

These areas within the Uranium Building included portions of the process where liquids were not handled, thus the potential for spillage was minimal. For this reason, contamination migration into or below the concrete was substantially less than that found in other areas of the Uranium Building. However, due to the existence of process and drain lines at several locations beneath the Uranium Building, portions of the concrete floor had to be removed. Drain line removal is discussed in Section 15.0. Concrete floors in these areas have been surveyed and scabbled to remove surface contamination. The ceiling and wall support posts were also

scanned and decontaminated. The final surveys for these areas are not complete.

F. Characterization Data (Maintenance Shop and Water Treatment Areas):

Portions of these areas are still being used for survey and decontamination of building concrete rubble and asphalt and have not been final surveyed. However, as these areas did not contain any liquid fuel fabrication processes, only surface contamination is expected in this area.

G. Characterization Data (Status of Process Area Final Alpha Survey):

A substantial amount of the process area has been final surveyed for alpha. The surveys were completed utilizing a Ludlum 2220 with either a 43-68 probe (100 cm<sup>2</sup>) or 43-4 probe (60 cm<sup>2</sup>). The 43-4 probe was used when surveying pipes, hangers, supports and beams. The status of the individual areas, which are shown in Figure 14.1, are summarized below:

a) The Ceramic Area final alpha survey is approximately 98% complete. A summary on the survey results are as follows:

- Ceramic Walls

Alpha Max. Direct	3080 dpm/100 cm <sup>2</sup>
Alpha Avg. Direct	<800 dpm/100 cm <sup>2</sup>
Alpha Smearable	<10 dpm/100 cm <sup>2</sup>

- Ceramic Support Beams & Ceiling

Alpha Max Direct	4805 dmp/100 cm <sup>2</sup>
Alpha Avg. Direct	<2000 dpm/100 cm <sup>2</sup>
Alpha Smearable	<25 dpm/100 cm <sup>2</sup>

- Ceramic Area Floor

The Concrete within this area has been removed, surveyed, decontaminated as required and placed on site for erosion control.

b) The Pellet Area final alpha survey is approximately 98% complete. A summary of the survey results are as follows:

- Pellet Area Walls

Alpha Max Direct	4016 dpm/100cm <sup>2</sup>
Alpha Avg. Direct	<800 dpm/100cm <sup>2</sup>
Alpha Smearable	<20 dpm/100cm <sup>2</sup>

- Pellet Area Ceiling & Beams

Alpha Max Direct	4800 dpm/100cm <sup>2</sup>
Alpha Avg. Direct	<1500 dpm/100cm <sup>2</sup>
Alpha Smearable	<20 dpm/100cm <sup>2</sup>

- Pellet Area Floors

Alpha Max Direct	4990 dpm/100cm <sup>2</sup>
Alpha Avg. Direct	<300 dpm/100cm <sup>2</sup>
Alpha Smearable	<10 dpm/100cm <sup>2</sup>

c) The Fuel Fabrication Area final alpha survey is approximately 70% complete. A summary of the survey results completed to date are as follow:

- Storage Area Walls

Alpha Max Direct	4682 dpm/100cm <sup>2</sup>
Alpha Avg. Direct	<1000 dpm/100cm <sup>2</sup>
Alpha Smearable	<20 dpm/100cm <sup>2</sup>

- Storage Area Ceiling

Alpha Max Direct	4698 dpm/100 cm <sup>2</sup>
Alpha Avg. Direct	<2000 dpm/100cm <sup>2</sup>
Alpha Smearable	<20 dpm/100cm <sup>2</sup>

d) The Packaged Pellet Storage Area final survey is approximately 95% complete. A summary of the survey results completed to date are as follows:

- Packaged Pellet Area Floor

Alpha Max Direct 4840 dpm/100cm<sup>2</sup>  
Alpha Avg. Direct <1200 dpm/100cm<sup>2</sup>  
Alpha Smearable <20 dpm/100cm<sup>2</sup>

- Packaged Pellet Area Ceiling & Beams

Alpha Max Direct 4200 dpm/100cm<sup>2</sup>  
Alpha Avg. Direct <1000 dpm/100cm<sup>2</sup>  
Alpha Smearable <30 dpm/100cm<sup>2</sup>

- Packaged Pellet Area Walls

Alpha Max Direct 4340 dpm/100cm<sup>2</sup>  
Alpha Avg. Direct <1000 dpm/100cm<sup>2</sup>  
Alpha Smearable <50 dpm/100cm<sup>2</sup>

e) The Scrap Area final alpha survey is only approximately 10% complete. the concrete floor in this area has been removed.

f) The Storage Area final alpha survey is only approximately 10% complete.

g) The Maintenance Shop and Water Treatment final alpha survey has not been started at this time.

#### 14.3 Uranium Tank Storage Building (Building #2):

This steel clad building (20 ft. x 57 ft.) was located just south of the Uranium Building. Building #2 was used to house 44 tanks that were 10 inches in diameter and 20 feet tall. The tanks were used to store uranium nitrate scrap solutions of less than 5% enrichment. This solution was held for subsequent reclamation by processing through the solvent extraction building. The tanks were separated by concrete isolation barriers.



The concrete contained in the isolation barriers and the floor was contaminated because of the tank overflows, pipe leaks and pump leakage that had occurred within this building. Additionally, the soils under and surrounding the building were contaminated.

The piping, tanks, and pumps were removed from the north side of Building #2 between January 9, 1987 and February 24, 1987. The piping, tanks, and pumps were removed from the south side of Building #2 from June 1, 1988 through July 19, 1988. This equipment either was shipped off site as LSA radioactive waste or was decontaminated, surveyed and released. The building was surveyed, dismantled, and/or disposed of as required based upon alpha survey results from September 12, 1988 through November 18, 1988. The concrete divider in Building #2 was decontaminated by wet blasting and vacu-blasting from May 4, 1989 through July 3, 1989. The concrete divider then was surveyed with a pancake probe for both alpha and beta/gamma. When the concrete divider was released and removed from the restricted area, it was hauled to on-site drainage areas as rip-rap for erosion control.

The building concrete floor and footings also were decontaminated and removed from the restricted area. The concrete that could be released was placed in on-site drainage areas for erosion control from July 12, 1989 through August 4, 1989. Contaminated soils from beneath Building #2 initially were removed from August 24, 1989 through October 19, 1989. Option #2 and Option #4 soils were removed down to four feet in the Building #2 area from January 11, 1990 through November 17, 1990. Additional Option #4 soils were removed down to approximately 12 feet. A total of 19,500 ft<sup>3</sup> of soil and concrete were shipped off site for disposal at a licensed LLRW facility. The Building #2 area was backfilled with Option #2 material up to four feet below grade on February 26, 1990. The removal of this Option #2 soil and placement in the Option #2 stockpile was initiated on February 1, 1994 and is still and has been completed.

All survey and soil sampling data for this area is addressed under the Uranium Plant yard area.

#### 14.4 Solvent Extraction Building (Building # 3):

This metal building (25 ft. x 40 ft.) was dismantled completely in 1986. After surveys were conducted, parts of the building siding were shipped off-site as radioactive waste and other parts were decontaminated and used as replacement siding for the Uranium

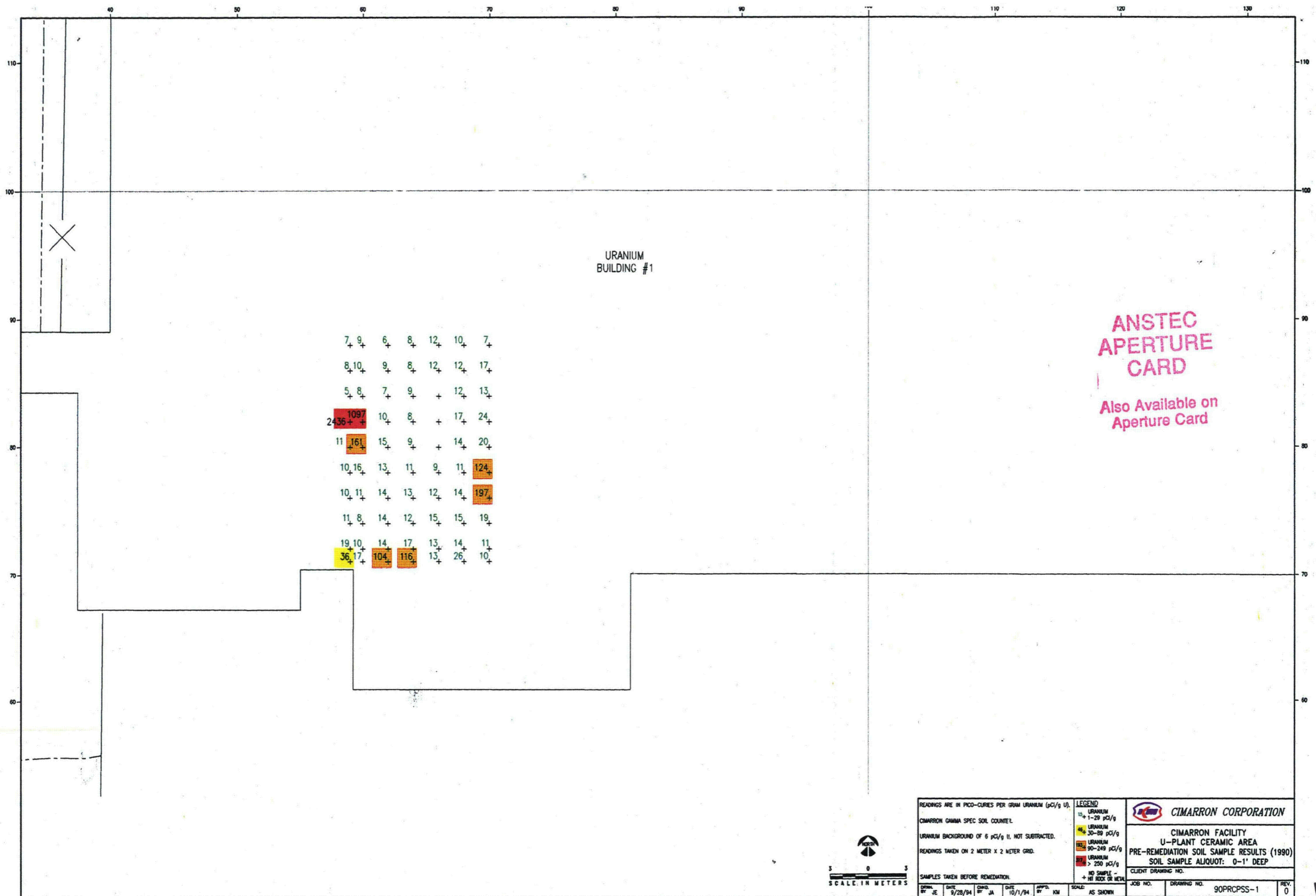
Building. Some of the equipment from this building was shipped off-site as waste and other pieces of equipment were decontaminated. The concrete flooring from this building was surveyed for alpha only, decontaminated and then released from the restricted area and used for on-site erosion control. Contaminated soil located in areas below the previous location of the Solvent Extraction Building has been excavated and segregated as required to meet the Option #1 or Option #2 limits. All survey and soil sampling data for this area is addressed under the Uranium Plant yard area.

#### 14.5 UF<sub>6</sub> Receiving (Vaporizer Building):

This metal building (30 ft. x 75 ft.) was located adjacent to the south wall of the Uranium Building. It was within this building that the cylinders of UF<sub>6</sub>, received from the AEC diffusion plants, were heated with steam to vaporize the UF<sub>6</sub> for processing into fuel. Decontamination and decommissioning activities were initiated for the Vaporizer Building on August 1, 1991. The Vaporizer Building inner wall was removed, surveyed, decontaminated as required, and replaced. The interiors of the south and west walls have been surveyed and decontaminated as required. Additionally, the east wall, which has been 40 percent removed, has been surveyed on the inside. The roof for this building, which is still in place, has been surveyed and the results summarized on Table 14.1. The concrete floor has been surveyed, decontaminated and removed. The concrete from this area also was used for on-site erosion control. Contaminated soil from under this building has been excavated and stockpiled in the on-site Option-2 material stockpile awaiting on-site disposal. Final survey data for this area are discussed under the Uranium Plant yard area. Decommissioning activities for the Vaporizer Building floor were completed on December 18, 1991.

#### 14.6 Emergency Building:

This building, during facility operations, housed medical personnel, records, and emergency decontamination showers. The building is now being used for records storage. This building will be surveyed prior to final release.

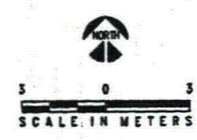


URANIUM  
BUILDING #1

ANSTEC  
APERTURE  
CARD

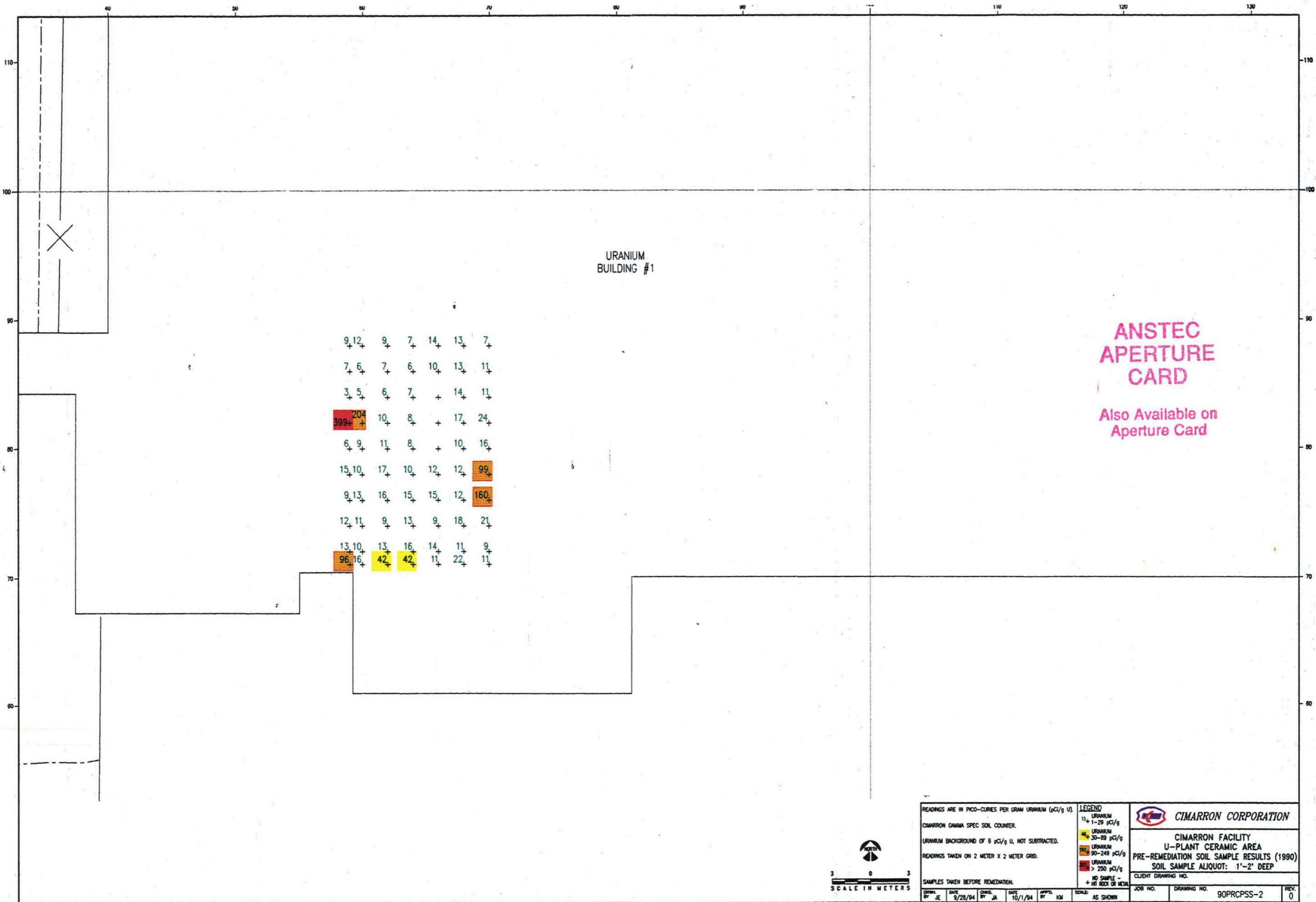
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11	161	15	9	+	14	20
10	16	13	11	9	11	124
10	11	14	13	12	14	197
11	8	14	12	15	15	19
19	10	14	17	13	14	11
36	17	104	116	13	26	10



READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U). CIMARRON GAMMA SPEC SOIL COUNTER. URANIUM BACKGROUND OF 6 pCi/g U, NOT SUBTRACTED. READINGS TAKEN ON 2 METER X 2 METER GRID. SAMPLES TAKEN BEFORE REMEDIATION.		<b>LEGEND</b> 13+ URANIUM 1-29 pCi/g 46+ URANIUM 30-89 pCi/g 93+ URANIUM 90-249 pCi/g 87+ URANIUM > 250 pCi/g NO SAMPLE - + HIT ROCK OR MEAN	<b>CIMARRON CORPORATION</b>  CIMARRON FACILITY U-PLANT CERAMIC AREA PRE-REMEDIATION SOIL SAMPLE RESULTS (1990) SOIL SAMPLE ALIQUOT: 0-1' DEEP CLIENT DRAWING NO.
DRAWN BY: JE DATE: 9/28/94 CHECKED BY: JA DATE: 10/1/94 APP'D BY: KM SCALE: AS SHOWN	JOB NO.	DRAWING NO. 90PRCPSS-1 REV. 0	9412080115

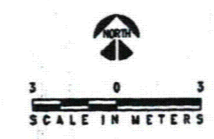
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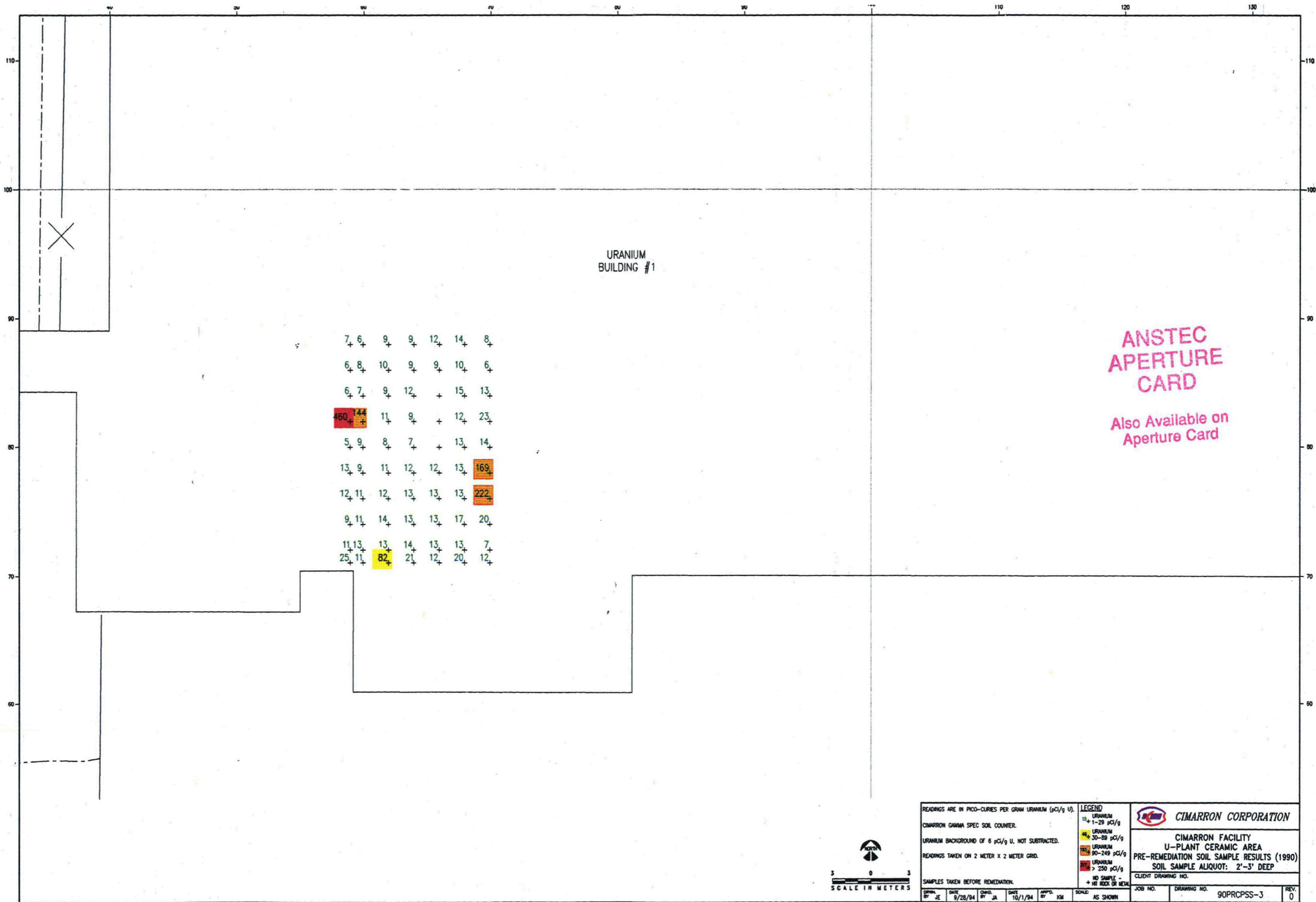
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READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U). CIMARRON GAMMA SPEC SOIL COUNTER. URANIUM BACKGROUND OF 5 pCi/g U, NOT SUBTRACTED. READINGS TAKEN ON 2 METER X 2 METER GRID.				<b>LEGEND</b> 15+ URANIUM + 1-29 pCi/g 40+ URANIUM 30-89 pCi/g 90-249 URANIUM 90-249 pCi/g 250+ URANIUM > 250 pCi/g NO SAMPLE - + HIT ROCK OR METAL		<b>CIMARRON CORPORATION</b> CIMARRON FACILITY U-PLANT CERAMIC AREA PRE-REMEDIATION SOIL SAMPLE RESULTS (1990) SOIL SAMPLE ALIQUOT: 1'-2" DEEP CLIENT DRAWING NO.			
SAMPLES TAKEN BEFORE REMEDIATION.				JOB NO.		DRAWING NO.		REV.	
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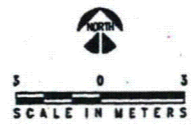
READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U).  
CIMARRON GAMMA SPEC SOIL COUNTER.  
URANIUM BACKGROUND OF 6 pCi/g U, NOT SUBTRACTED.  
READINGS TAKEN ON 2 METER X 2 METER GRID.SAMPLES TAKEN BEFORE REMEDIATION.

LEGEND  
 15+ URANIUM 1-29 pCi/g  
 46+ URANIUM 30-89 pCi/g  
 169+ URANIUM 90-249 pCi/g  
 222+ URANIUM > 250 pCi/g  
 NO SAMPLE -  
 + HI ROCK OR METAL

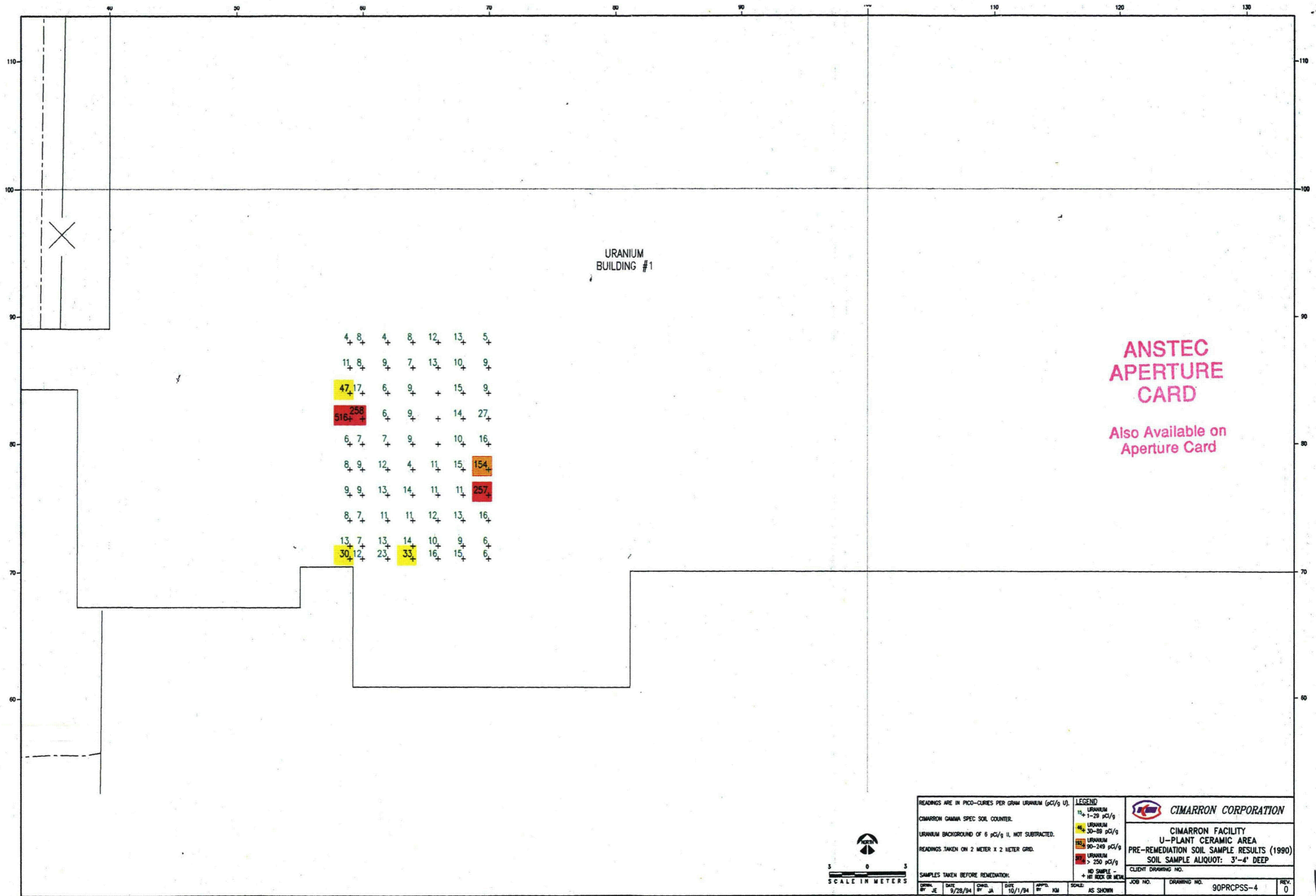
CIMARRON CORPORATION  
 CIMARRON FACILITY  
 U-PLANT CERAMIC AREA  
 PRE-REMEDATION SOIL SAMPLE RESULTS (1990)  
 SOIL SAMPLE ALIQUOT: 2'-3' DEEP  
 CLIENT DRAWING NO.

SCALE: AS SHOWN  
 JOB NO. DRAWING NO. 90PRCPSS-3 REV. 0

DATE 9/28/94 BY JA DATE 10/1/94 BY KM



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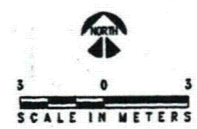
URANIUM BUILDING #1

ANSTEC APERTURE CARD

Also Available on Aperture Card

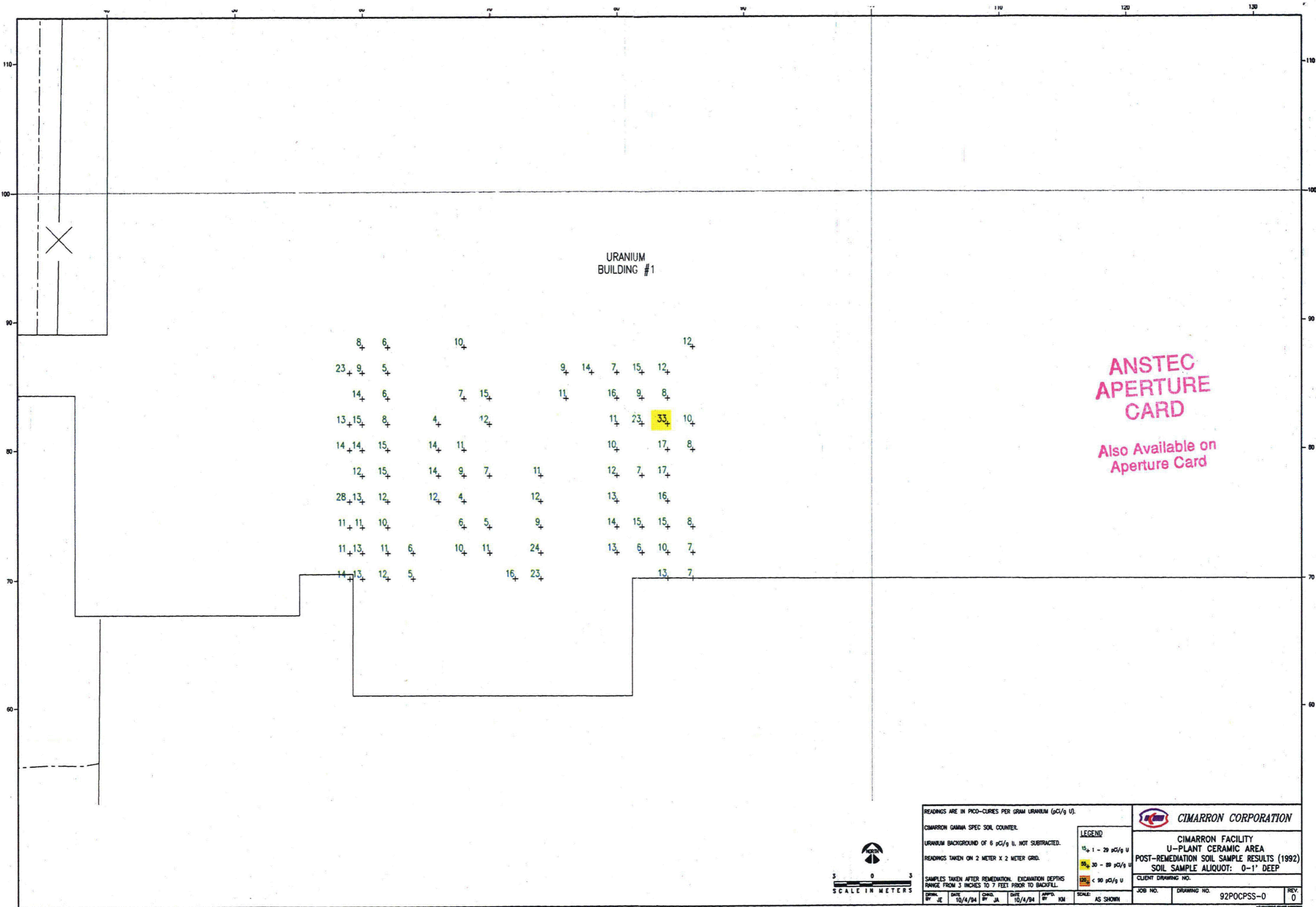
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READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U). CIMARRON GAMMA SPEC SOIL COUNTER. URANIUM BACKGROUND OF 6 pCi/g U, NOT SUBTRACTED. READINGS TAKEN ON 2 METER X 2 METER GRID. SAMPLES TAKEN BEFORE REMEDIATION.				<b>LEGEND</b> 15+ 1-29 pCi/g 46+ 30-89 pCi/g 154+ 90-249 pCi/g 257+ > 250 pCi/g NO SAMPLE - + HIT ROCK OR METAL		<b>CIMARRON CORPORATION</b> CIMARRON FACILITY U-PLANT CERAMIC AREA PRE-REMEDIATION SOIL SAMPLE RESULTS (1990) SOIL SAMPLE ALIQUOT: 3'-4' DEEP CLIENT DRAWING NO.	
DRAWN BY: JE DATE: 9/28/94 CHG. BY: JA DATE: 10/1/94 APP'D. BY: KM	SCALE: AS SHOWN	JOB NO.	DRAWING NO. 90PRCPSS-4	REV. 0			



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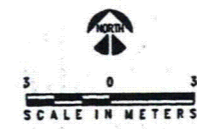
162



URANIUM  
BUILDING #1

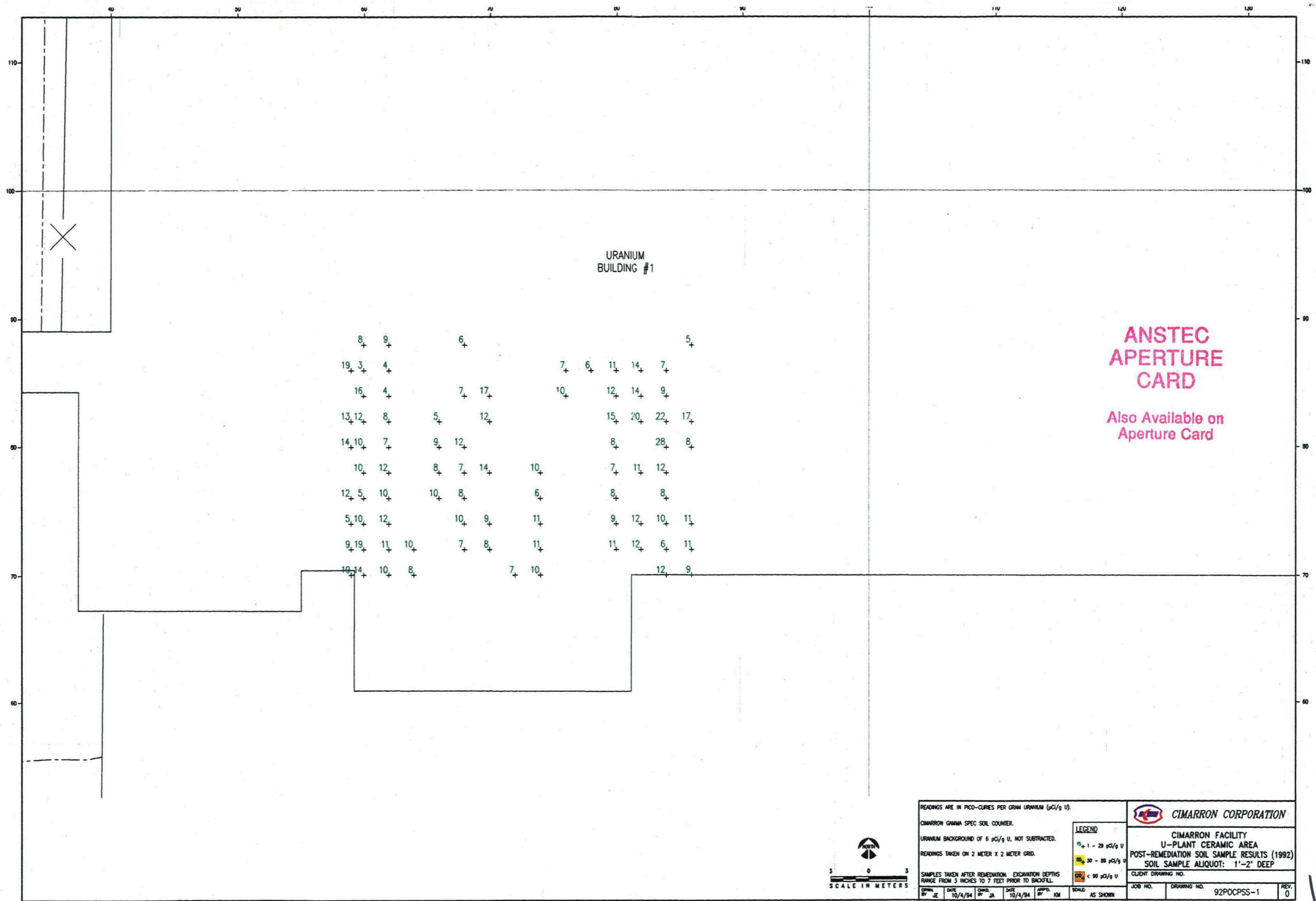
ANSTEC  
APERTURE  
CARD  
  
Also Available on  
Aperture Card

READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U). CIMARRON GAMMA SPEC SOIL COUNTER. URANIUM BACKGROUND OF 6 pCi/g U, NOT SUBTRACTED. READINGS TAKEN ON 2 METER X 2 METER GRID. SAMPLES TAKEN AFTER REMEDIATION. EXCAVATION DEPTHS RANGE FROM 3 INCHES TO 7 FEET PRIOR TO BACKFILL.			
LEGEND 15+ - 29 pCi/g U 30 - 89 pCi/g U > 90 pCi/g U		CIMARRON FACILITY U-PLANT CERAMIC AREA POST-REMEDATION SOIL SAMPLE RESULTS (1992) SOIL SAMPLE ALIQUOT: 0-1' DEEP CLIENT DRAWING NO.	
DRAWN BY: JE DATE: 10/4/94 CHKD. BY: JA DATE: 10/4/94 APP'D. BY: KIM	SCALE: AS SHOWN	JOB NO.	DRAWING NO. 92POCPSS-0 REV. 0



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163

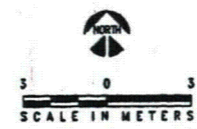


URANIUM  
BUILDING #1

**ANSTEC  
APERTURE  
CARD**

Also Available on  
Aperture Card

READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U). CIMARRON GAMMA SPEC SOIL COUNTER. URANIUM BACKGROUND OF 6 pCi/g U, NOT SUBTRACTED. READINGS TAKEN ON 2 METER X 2 METER GRID. SAMPLES TAKEN AFTER REMEDIATION. EXCAVATION DEPTHS RANGE FROM 3 INCHES TO 7 FEET PRIOR TO BACKFILL.					
<b>LEGEND</b> 15+ 1 - 29 pCi/g U 55+ 30 - 89 pCi/g U 85+ < 90 pCi/g U				<b>CIMARRON FACILITY</b> U-PLANT CERAMIC AREA POST-REMEDIATION SOIL SAMPLE RESULTS (1992) SOIL SAMPLE ALIQUOT: 1'-2" DEEP CLIENT DRAWING NO.	
DRAWN BY: JE DATE: 10/4/94 CHG. BY: JA DATE: 10/4/94 APP'D. BY: KM	SCALE: AS SHOWN	JOB NO. 92POCPSS-1 DRAWING NO. 92POCPSS-1 REV. 0			

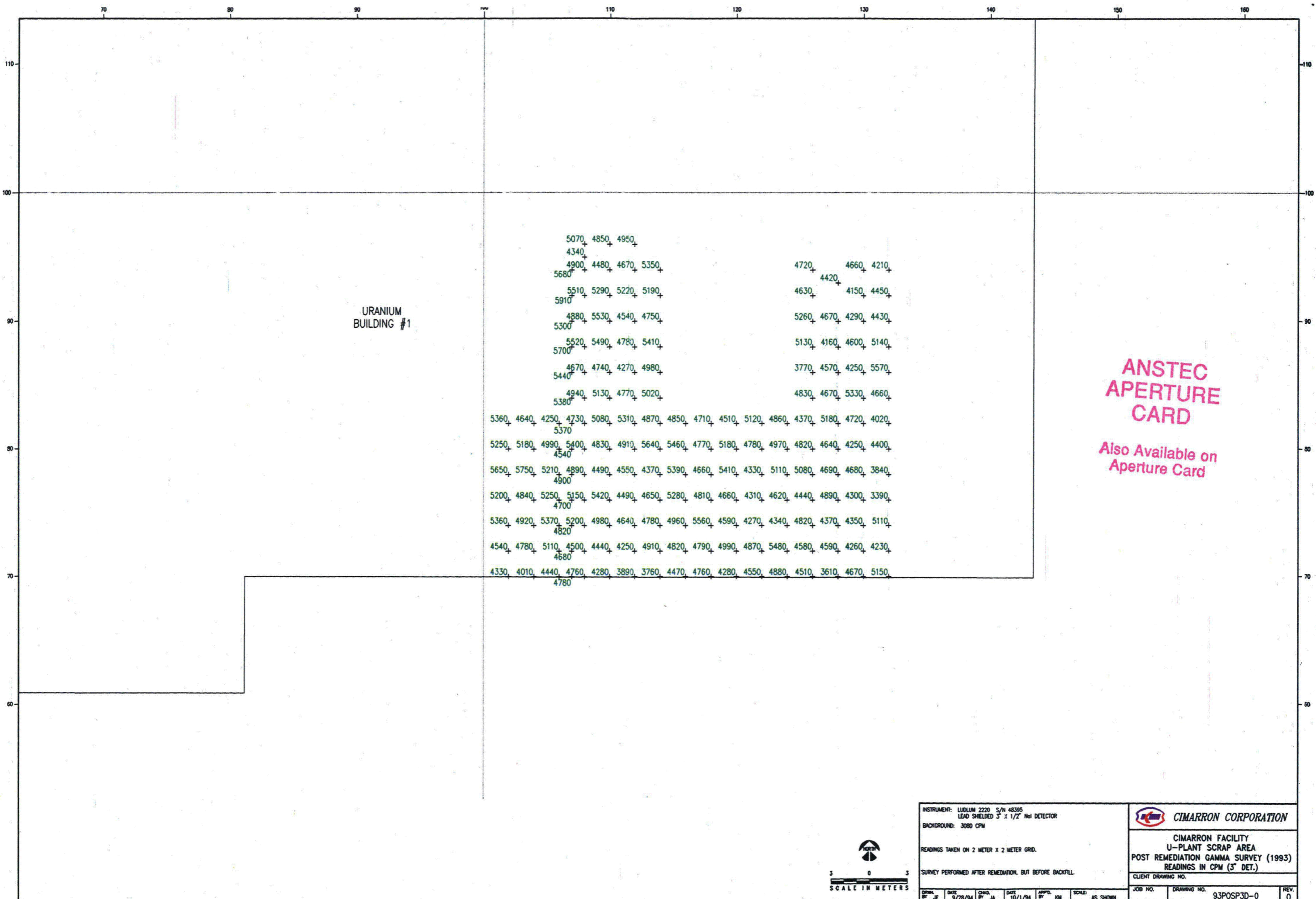


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164






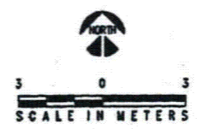


URANIUM BUILDING #1

ANSTEC APERTURE CARD

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INSTRUMENT: LUDLUM 2220 S/N 48395 LEAD SHIELDED 3" x 1 1/2" NaI DETECTOR				 <b>CIMARRON CORPORATION</b> CIMARRON FACILITY U-PLANT SCRAP AREA POST REMEDIATION GAMMA SURVEY (1993) READINGS IN CPM (3" DET.)			
BACKGROUND: 3080 CPM							
READINGS TAKEN ON 2 METER X 2 METER GRID.				CLIENT DRAWING NO.			
SURVEY PERFORMED AFTER REMEDIATION, BUT BEFORE BACKFILL.				JOB NO. DRAWING NO. 93POSP3D-0 REV. 0			
DRWN. BY: JE	DATE: 9/28/94	CHKD. BY: JA	DATE: 10/1/94	APPR. BY: KM	SCALE: AS SHOWN		



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## 15.0 Drain Lines

The process drain lines that were located at the Cimarron facility are shown on Drawing No. 85PRUT. This drawing shows the drain lines located under the Uranium Building and also throughout the Cimarron facility. In most cases, these process effluent drain lines have been removed and only sanitary drain lines have been replaced. Drain lines from the Uranium Building to the Waste Ponds and Sanitary Lagoons, and from the Waste Ponds to the Cimarron River have been removed. All three Sanitary Lagoons are no longer in service. Specific drain lines are discussed in greater detail in the following sections.

### A. Characterization Data (Main Drain Lines from the Uranium Building to Waste Pond #1):

Portions of this four-inch PVC discharge line were removed in 1985 (from the fence of the restricted area to Waste Pond #1) and in 1992 (Uranium Building to the Option #2 stockpile). The section of this drain line under the Option #2 eastern stockpile is still in place and will be excavated when the Option #2 stockpile is moved from this area.

Survey data are available for a portion of the excavated discharge line trench from the restricted area fence to Uranium Waste Pond #1. These data have been placed on Drawing No. 85POSTUR-0. The survey was conducted in the bottom, on the surface, and at one meter above the surface of the excavated area. Soil data are available for the pipeline run for the area within the restricted area. This data showed the presence of soil beneath the Eastern Option #2 stockpile requiring excavation. Four results varied from 3 pCi/g to 3,301 pCi/g total uranium.

The 1990 soil sampling that was conducted on a 10m x 10m grid, at depths from 0 to 4 ft., included the area where this drainage line was located. One soil sample showed a concentration of 65 pCi/g uranium. All other soil sample concentrations were less than 30 pCi/g uranium. The results of this sampling effort are shown on Drawings No. 90PRUYSS-0 through 90PRUYSS-4 which are included in the attachments to Section 6.0.

This drain line had several leaks during the Cimarron facility operational period. Approximately 150 drums of contaminated soil were excavated and shipped off-site for disposal from a leak located just south and east of Uranium Waste Pond #1. The

excavated area was surveyed and the trench was released for backfilling.

B. Characterization Data (Liquid Waste Line from Uranium Building to the two Emergency Ponds):

This drain line was used for liquid effluents discharged from the Uranium Building to these two evaporation ponds. The four-inch PVC line was excavated and removed in July, 1985. A gamma survey was conducted after the pipe was removed. Several areas had elevated concentrations of uranium in the soil which were remediated prior to backfilling. The original documentation for the soil survey and soil sample data is not available. However, the 1990 soil sample data that are shown on Drawings No. 90PRUYSS-0 through 90PRUYSS-4 included the area where this liquid waste line was previously located. These drawings are included as attachments to Section 6.0.

C. Characterization Data (Drain Line from Closed Sanitary Lagoons to Cimarron River):

This four-inch steel drain line was used for liquid effluent discharges from the Sanitary Lagoons to the Cimarron River during Cimarron Facility operations. The effluent was sampled prior to discharge to ensure that the effluent would meet Cimarron license limits. A weir box with a continuous sampler was used to collect a 24-hour sample which was analyzed daily.

This drain line was excavated and removed in June, 1985. A gamma survey was conducted after this drain line was removed. The surveys were taken at the bottom, at the surface and at one meter above the surface of the excavated trench. These survey results are shown on Drawing No. 85POSTUR-0.

Additionally, Cimarron personnel have surveyed, cored, and sampled the length of the area previously traversed by this drain line. The surveys and soil sampling were completed in late June, 1994, and were taken at 10m intervals for the length of the excavated and backfilled piperun. Soil samples were collected at depths from 0 to 4 ft., with the first two samples taken at six-inch intervals. The soil samples were analyzed for total uranium and thorium. The soil sampling results are shown on Drawings No. 94POERSS-0 through 94POERSS-4. The radiation surveys were taken with an unshielded 3 in. NaI detector and a Micro-R meter.

Background was 4,000 cpm for the 3 in. detector and 7  $\mu$ R/hr for the Micro-R meter. The gamma surveys and Micro-R survey results are shown on Drawings No. 94POER3D-0, 94POERUR-0 and 94POERUR-1. A total of 98 locations were surveyed and sampled with the following results:

- Three-inch. NaI detector - The survey reading varied from a high of 4,970 cpm at 455N-105E, to a low of 1,920 at 385N-106E with the average for the 98 survey points being 3,419 cpm.
- Micro-R survey meter - The exposure reading varied from a high of 10  $\mu$ R/hr to a low of 4  $\mu$ R/hr at one meter and from 11  $\mu$ R/hr to 5  $\mu$ R/hr at ground surface. The average readings were 7.0  $\mu$ R/hr at 1 meter and 7.6  $\mu$ R/hr at ground surface.
- Soil Total Uranium Analytical Results - Soil samples were collected at 10m intervals at depths down to 4 ft. A total of 480 soil samples were collected and analyzed for total uranium. The average activity for all samples was 8.7 pCi/g total uranium. Four samples exceeded the 30 pCi/g Option No. 1 limit; they were:

<u>Location</u>	<u>Depth Interval</u>	<u>Activity (pCi/g)</u>
395N-105E	1' - 2'	37
425N-105E	1' - 2'	52
455N-105E	1' - 2'	52
835N-105E	3' - 4'	59

The analytical results discussed above include background which has not been subtracted. Also, the three samples collected at the 1- to 2-foot depth between 395N and 455N are located in the drainage way just north of the Sanitary Lagoons.

- Soil Total Thorium Analytical Results - The 480 soil samples also were analyzed for total thorium. All results were in the 0 to 2 pCi/g range except one reading at 835N-105E (3' - 4' depth) being 3 pCi/g.

D. Characterization Data (Drain Line from Uranium Waste Pond #1 to the Cimarron River, including the Siphon Line):

This 6-inch PVC drain line was installed for liquid effluent discharges from Waste Pond #1 to the Cimarron River. This drain line was utilized for only two discharges from Waste Pond #1 to the Cimarron River.

A review of the records for these two discharges to the Cimarron River from Waste Pond #1 indicate that no liquids with concentrations greater than 1.0 MPC were released to the Cimarron River. One release consisted of 1,600 gallons of water with a concentration of 0.9 MPC and the other release consisted of 775 gallons of water with a concentration of 0.68 MPC.

Excavation and removal of this drain line was completed in June, 1985 along with the associated 1-inch siphon drain line. A gamma survey was conducted after the drain line was removed. The survey was taken at the bottom, at the surface and at one meter above the surface of the excavated area. No contaminated soil was identified in this area. These survey results are shown on Drawing No. 85POSTUR-0.

To verify 1985 survey data, additional sampling was undertaken. The survey and soil sampling were completed June, 1994, and were taken at 10m intervals for the length of the excavated and backfilled drain pipe run. Soil samples were collected at depth from 0 to 4 ft. The radiation surveys were taken with an unshielded 3-inch NaI detector (cpm) and a Micro-R meter. Background was 4,000 for the 3-inch detector cpm and 7  $\mu$ R/hr for the Micro-R meter. A total of 74 locations were surveyed and 355 soil samples were collected and analyzed for total uranium and thorium. The soil samples all were less than 30 pCi/g total uranium, with the average being 8.4 pCi/g. The volumes for total thorium were all within the range of 0 to 2 pCi/g. The soil sampling results are shown on Drawings No. 94POERSS-0 through 94POERSS-4.

The Micro-R survey reading both for the surface and at one meter above grade were in the range of 7  $\mu$ R/hr to 10  $\mu$ R/hr. The 3-inch NaI detector readings varied from 2,650 to 5,180 cpm. The gamma survey and Micro-R survey results are shown on Drawings No. 94POER3D-0, 94POERUR-0 and 94POERUR-1.



E. Characterization Data (Drain Line connecting Uranium Waste Pond #1 to Waste Pond #2):

This 4-inch PVC drain line was used for liquid effluent discharges from Waste Pond #1 to Waste Pond #2. Liquid effluent discharges from Waste Pond #1 to Waste Pond #2 involved only slightly contaminated water. Waste Pond #2 was used for evaporation purposes only.

Excavation and removal of this drain line were conducted in June, 1985. A gamma survey was conducted after the pipe was removed. The surveys were taken at the bottom, at the surface and at one meter above the surface of the excavated area. No contaminated soil was identified in this area.

F. Characterization Data (4-inch Potable Water Treatment Line from east end of the Uranium Building to Sanitary Lagoons):

This potable water line was utilized to backwash the potable water treatment system, including the sand filter, ion exchange, and water softener. The line was connected to the outfall of the Sanitary Lagoon weir box. Radioactive materials were not discharged through this line. This water line was removed in 1985.

G. Characterization Data (Other Drain Lines):

This section addresses drain lines under the Uranium Building, from the west side of the Uranium Building to the Sanitary Lagoons (Uranium Building lab and restroom/change room), from the dock area on the north side of the Uranium Building to the Sanitary Lagoons; and from the east end of the Uranium Building to the Sanitary Lagoons. The drain lines discussed in this section are shown on Drawing No. 85PRUT.

The following is a brief history of when specific drain lines were excavated and removed. All drain lines that were removed were surveyed and either released or disposed of off site at a commercial LLRW disposal facility. The soil surrounding the drain lines was surveyed to determine if the soil was contaminated. Additionally, soil samples were collected and analyzed on site for total uranium. All process drain lines have been removed except for a section of the lab/change room sanitary drain (West drain) under the Building #4. This section of the sanitary drain line has been decontaminated and surveyed for free release. This survey was completed in March, 1993 with no survey results exceeding

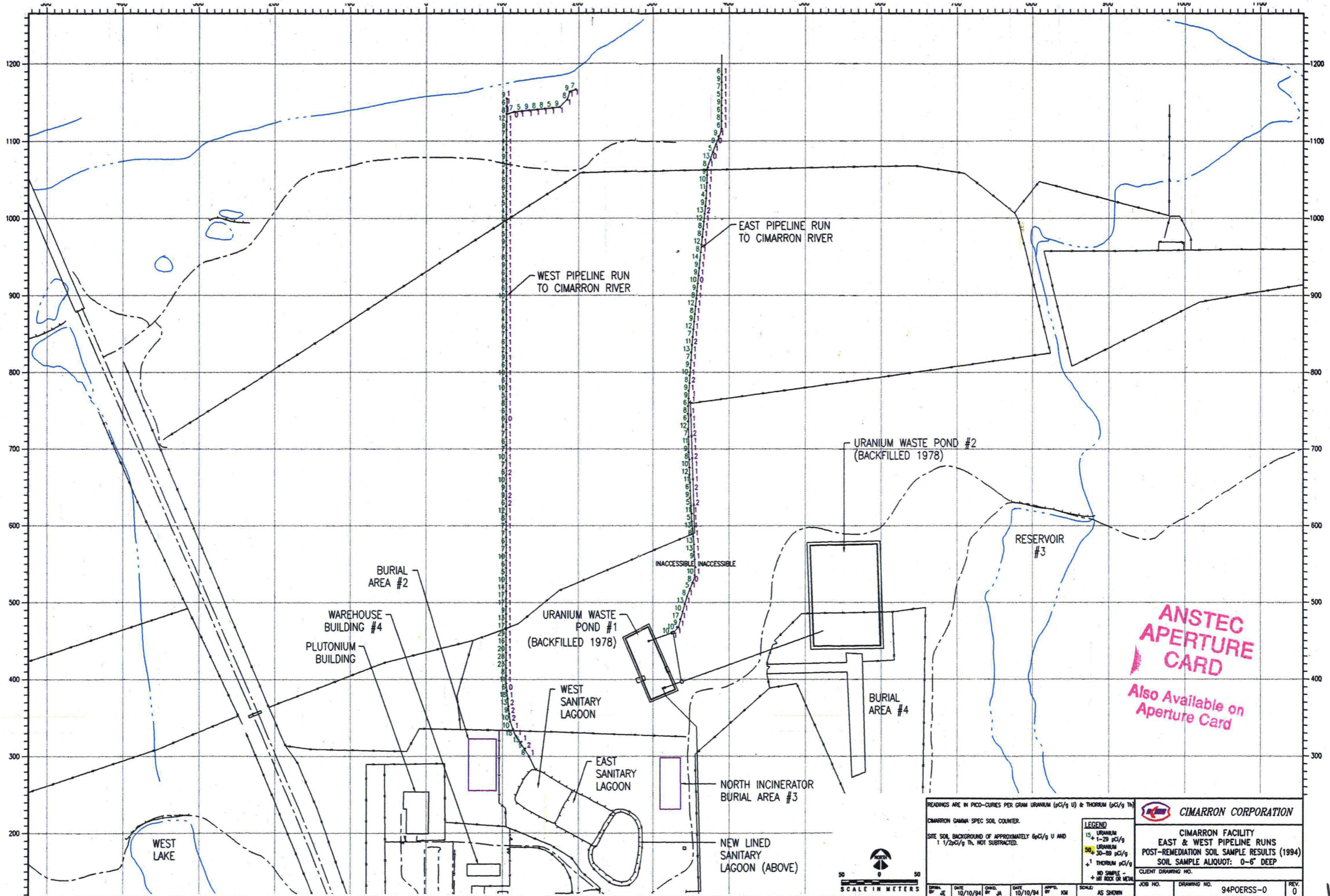
2,000 dpm/100 cm<sup>2</sup> alpha (background was 1,800 dpm/100 cm<sup>2</sup> alpha). Soil along the sanitary drain line excavation was sampled for total uranium. A total of 68 samples were collected and analyzed in the site laboratory. Samples ranged from 7 pCi/g to 25 pCi/g total uranium, with the average being 9.3 pCi/g. The drain line excavation from the east end of the Uranium Building and from the dock area to the Sanitary Lagoons was sampled. Four soil samples from locations adjacent to the outer wall of the building exceeded the 30 pCi/g Option #1 limit.

As mentioned previously, a portion of the drain line from the Uranium Building to Uranium Waste Pond #1 located under the eastern Option #2 stockpile is still in place. This section of drain line will be excavated once the Option #2 stockpile is moved. The status of the drain lines under the Uranium Building are:

- Drain lines under the laboratory were removed between January and February, 1990.
- Drain lines under the Wet Ceramic area were removed in April, 1990 and January, 1991. This area was included in the 1991 confirmatory survey performed by ORISE prior to backfilling.
- Drain lines under the Scrap Area Floor were removed from September, 1990 through February, 1991. This area was included in an ORISE confirmatory review.
- Drain lines along the North wall of the Uranium Building were removed from March, 1991 through May, 1991.

Soil samples were collected from the drain lines under the Uranium Building that discharges from the east end of the building to the Sanitary Lagoons. These drains included the Wet Ceramic area and Scrap area. A total of 101 samples were collected with the highest being 32 pCi/g total uranium. The average was 13.5 pCi/g.





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READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U) & THORIUM (pCi/g Th)

CIMARRON GAMMA SPEC SOIL COUNTER.

SITE SOIL BACKGROUND OF APPROXIMATELY 6pCi/g U AND 1 1/2pCi/g Th. NOT SUBTRACTED.

**LEGEND**

- 15 URANIUM +1-29 pCi/g
- 50 URANIUM 30-89 pCi/g
- +1 THORIUM pCi/g
- NO SAMPLE -
- + NET ROCK OR METAL

**CIMARRON CORPORATION**

CIMARRON FACILITY  
 EAST & WEST PIPELINE RUNS  
 POST-REMEDIATION SOIL SAMPLE RESULTS (1994)  
 SOIL SAMPLE ALIQUOT: 0-6" DEEP

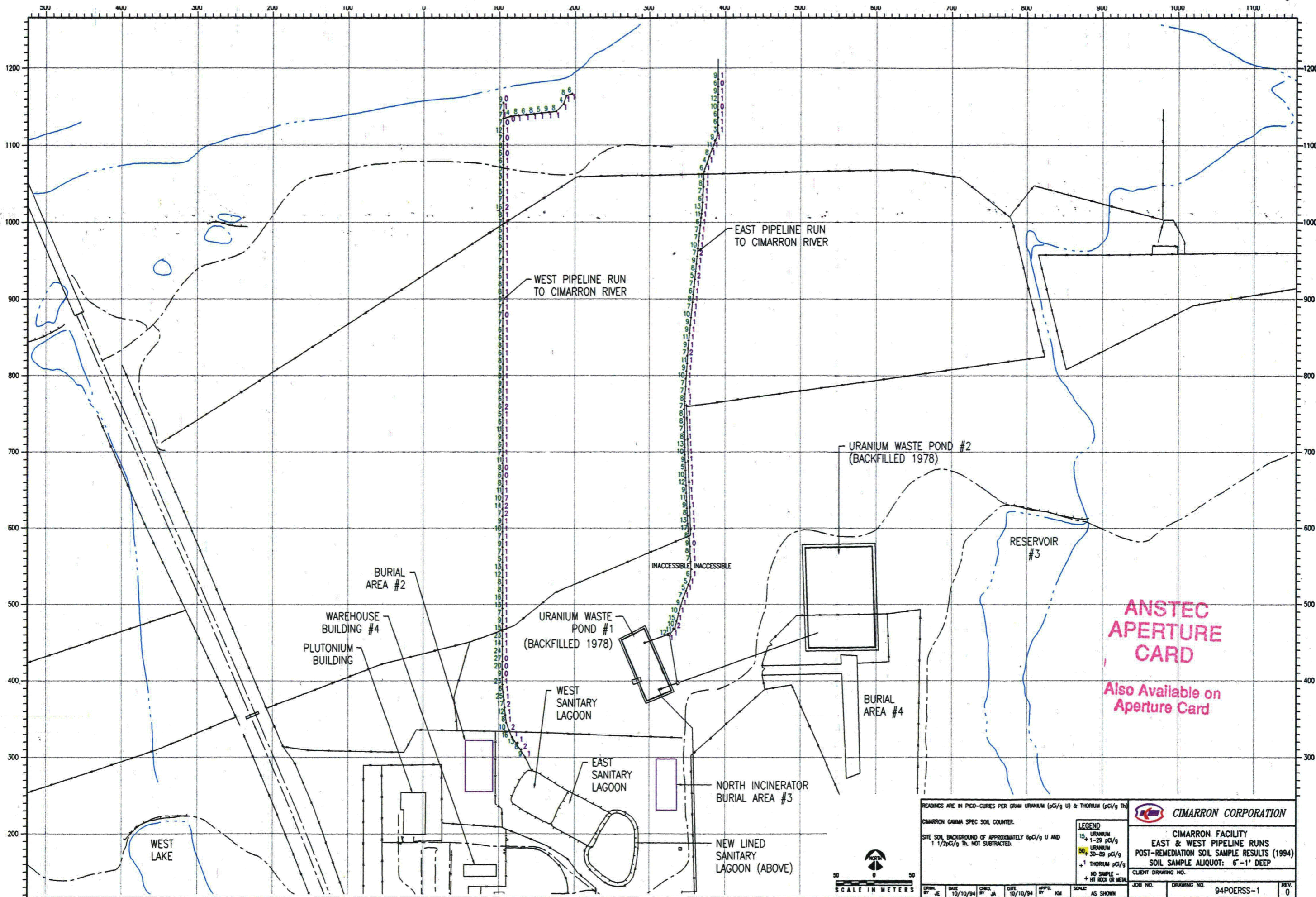
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JOB NO. \_\_\_\_\_ DRAWING NO. 94POERS-0 REV. 0

DATE 10/10/94 CHD. BY JA DATE 10/10/94 APPD. BY KM SCALE: AS SHOWN



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READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U) & THORIUM (pCi/g Th)

CIMARRON GAMMA SPEC SOIL COUNTER.

SITE SOIL BACKGROUND OF APPROXIMATELY 6pCi/g U AND 1 1/2pCi/g Th, NOT SUBTRACTED.

**LEGEND**

- 15- URANIUM
- + 1-29 pCi/g
- 50- URANIUM
- 30-89 pCi/g
- +1 THORIUM pCi/g
- NO SAMPLE -
- + HI ROCK OR METAL

**CIMARRON CORPORATION**

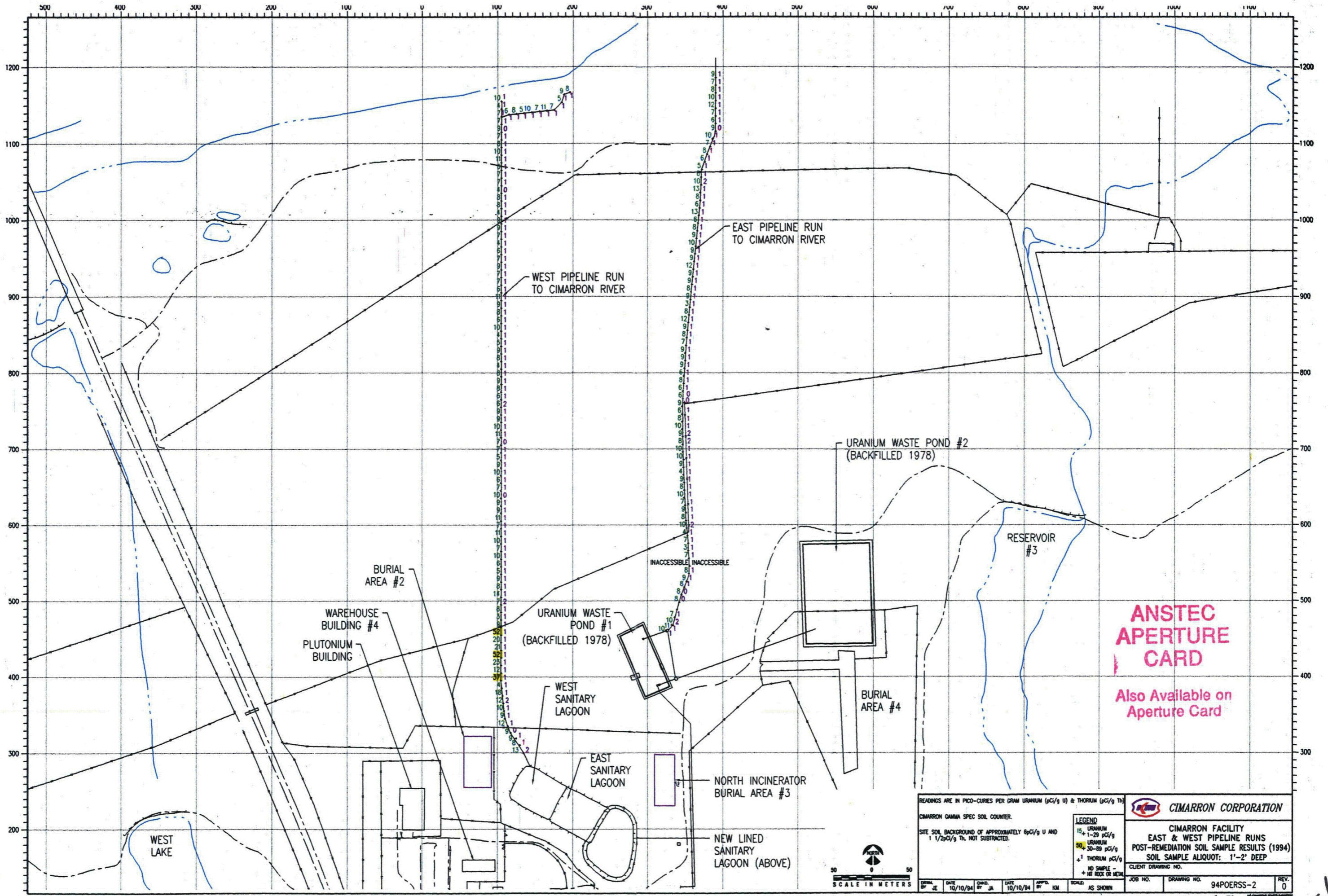
**CIMARRON FACILITY**  
**EAST & WEST PIPELINE RUNS**  
**POST-REMEDIATION SOIL SAMPLE RESULTS (1994)**  
**SOIL SAMPLE ALIQUOT: 6"-1" DEEP**

CLIENT DRAWING NO. \_\_\_\_\_

JOB NO. \_\_\_\_\_ DRAWING NO. 94POERS-1 REV. 0

DATE 10/10/94 CHD. BY JA DATE 10/10/94 APPD. BY KIM SCALE AS SHOWN

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READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U) & THORIUM (pCi/g Th)

CIMARRON GAMMA SPEC SOIL COUNTER.

SITE SOIL BACKGROUND OF APPROXIMATELY 9pCi/g U AND 1 1/2pCi/g Th. NOT SUBTRACTED.

**LEGEND**

- 15+ URANIUM 1-29 pCi/g
- 50+ URANIUM 30-89 pCi/g
- 1 THORIUM pCi/g
- NO SAMPLE -
- + HT ROCK OR METAL

**CIMARRON CORPORATION**

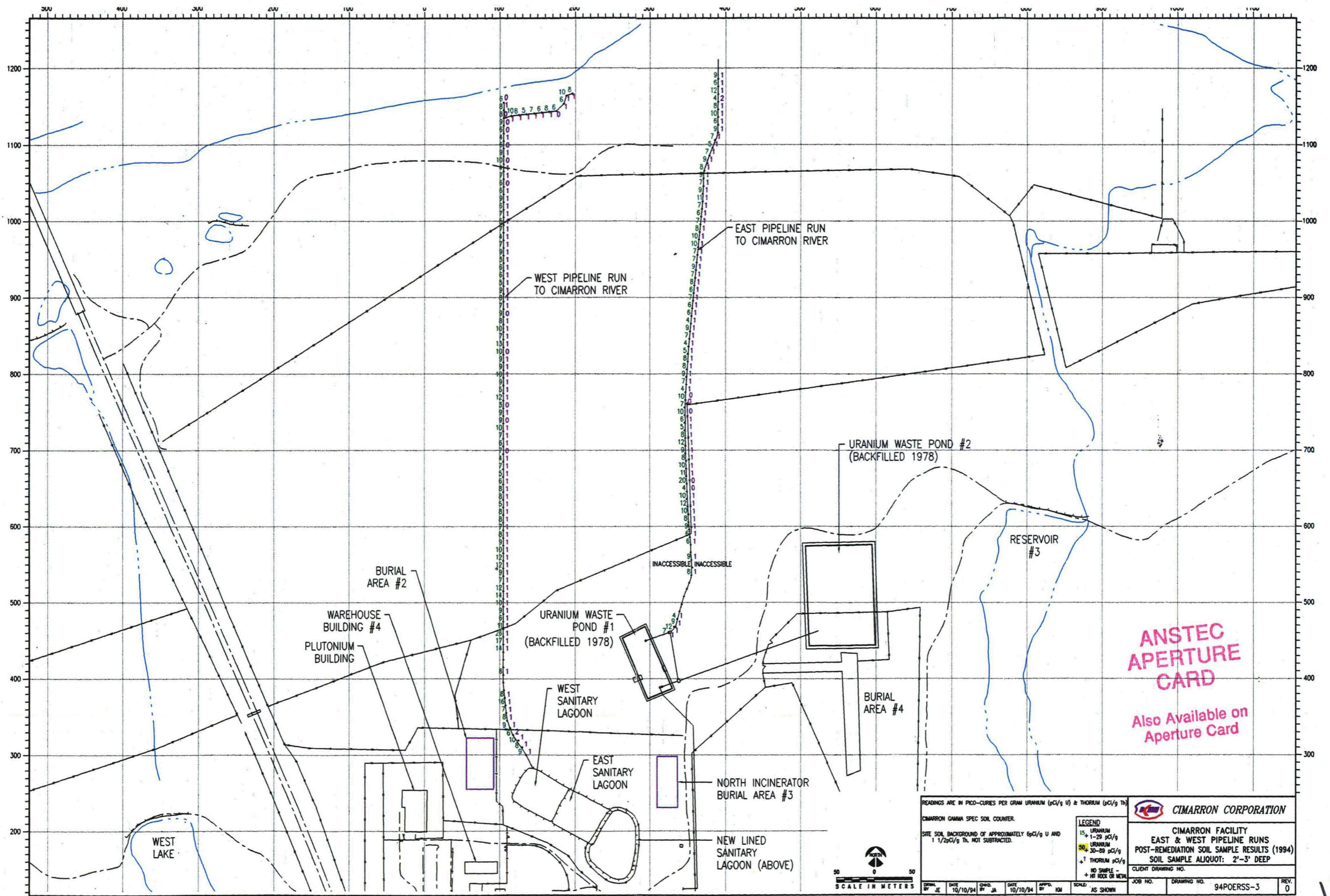
**CIMARRON FACILITY  
EAST & WEST PIPELINE RUNS  
POST-REMEDIATION SOIL SAMPLE RESULTS (1994)  
SOIL SAMPLE ALIQUOT: 1'-2' DEEP**

CLIENT DRAWING NO. \_\_\_\_\_

DRWN. BY: JE	DATE: 10/10/94	CHG. BY: JA	DATE: 10/10/94	APPR. BY: KM	SCALE: AS SHOWN
JOB NO. _____	DRAWING NO. 94POERS-2	REV. 0			



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READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U) & THORIUM (pCi/g Th)

CIMARRON GAMMA SPEC SOIL COUNTER.

SITE SOIL BACKGROUND OF APPROXIMATELY 6pCi/g U AND 1 1/2pCi/g Th. NOT SUBTRACTED.

LEGEND

- 15+ URANIUM 1-29 pCi/g
- 50+ URANIUM 30-89 pCi/g
- +1 THORIUM pCi/g
- NO SAMPLE -
- + HIT ROCK OR METAL

CIMARRON CORPORATION

CIMARRON FACILITY  
EAST & WEST PIPELINE RUNS  
POST-REMEDIATION SOIL SAMPLE RESULTS (1994)  
SOIL SAMPLE ALIQUOT: 2"-3" DEEP

CLIENT DRAWING NO.

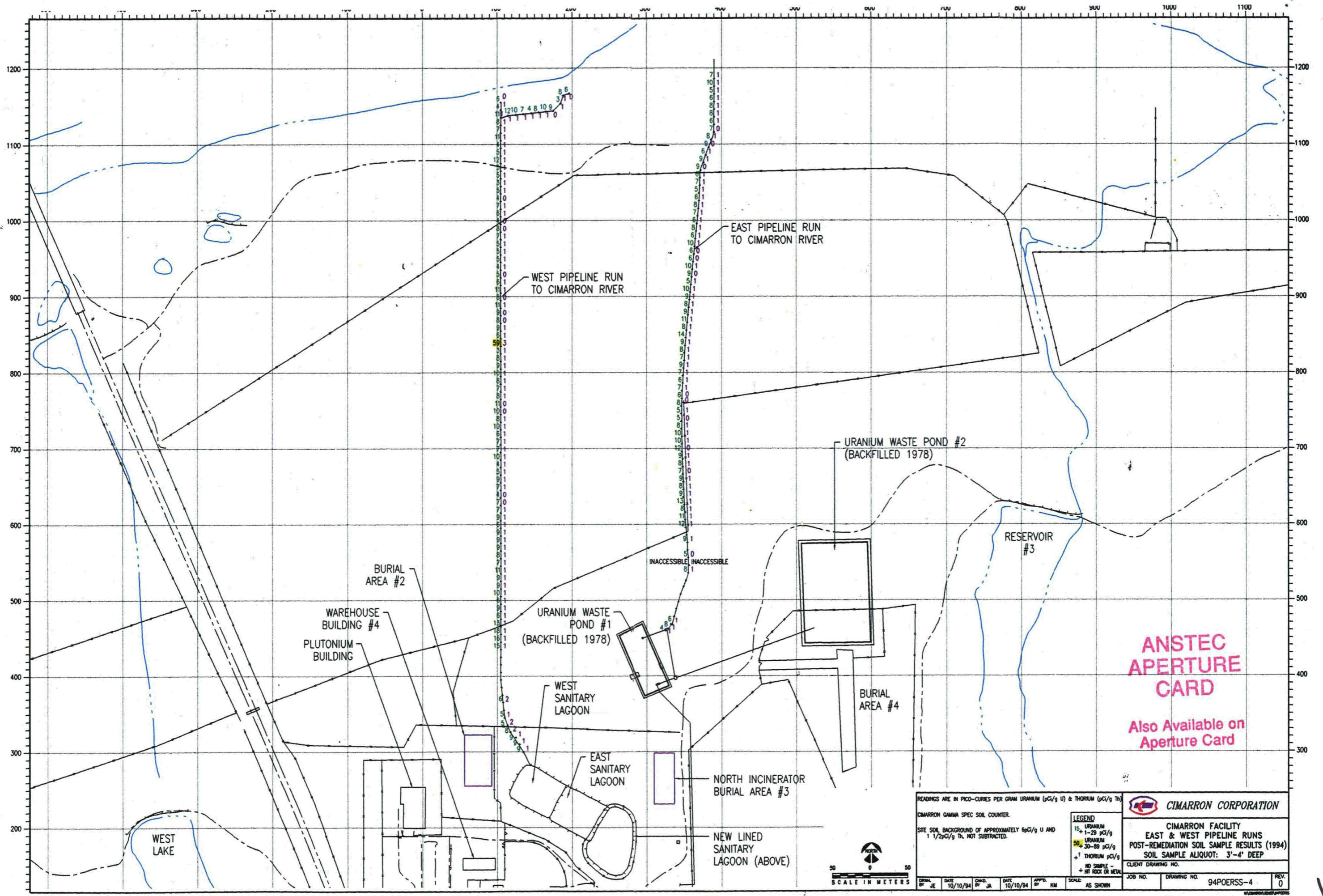
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DRAWN BY JE DATE 10/10/94 CHKD. BY JA DATE 10/10/94 APP'D. BY KM SCALE AS SHOWN



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173



READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U) & THORIUM (pCi/g Th)

CIMARRON GAMMA SPEC SOIL COUNTER.

SITE SOIL BACKGROUND OF APPROXIMATELY 6pCi/g U AND 1 1/2pCi/g Th, NOT SUBTRACTED.

**LEGEND**

- 15+ URANIUM 1-29 pCi/g
- 50+ URANIUM 30-89 pCi/g
- +1 THORIUM pCi/g
- NO SAMPLE -
- NET ROCK OR METAL

**CIMARRON CORPORATION**

**CIMARRON FACILITY**  
**EAST & WEST PIPELINE RUNS**  
**POST-REMEDIATION SOIL SAMPLE RESULTS (1994)**  
**SOIL SAMPLE ALIQUOT: 3'-4' DEEP**

CLIENT DRAWING NO. \_\_\_\_\_

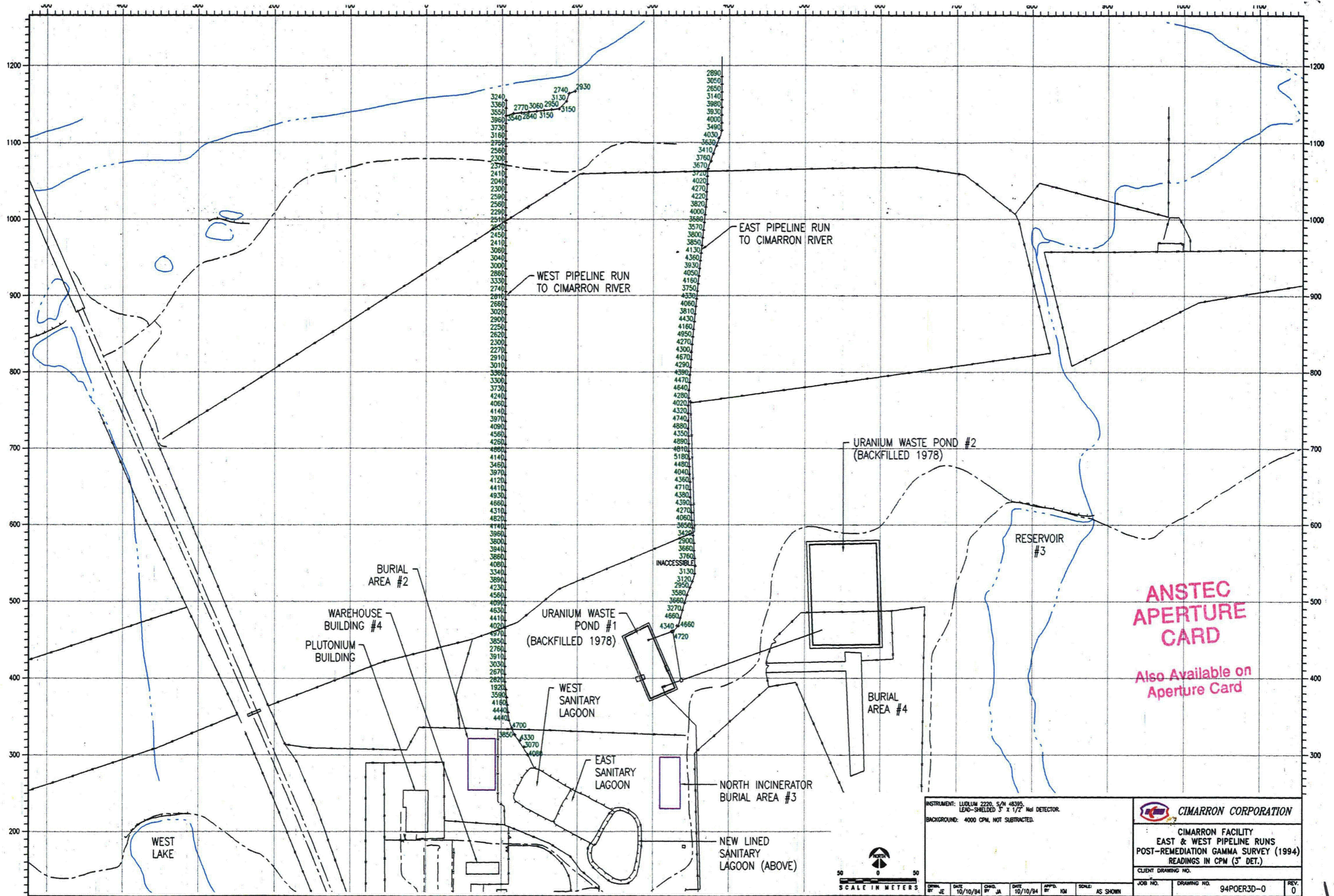
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DATE 10/10/94 CHKD. BY JA DATE 10/10/94 APPD. BY KM SCALE AS SHOWN



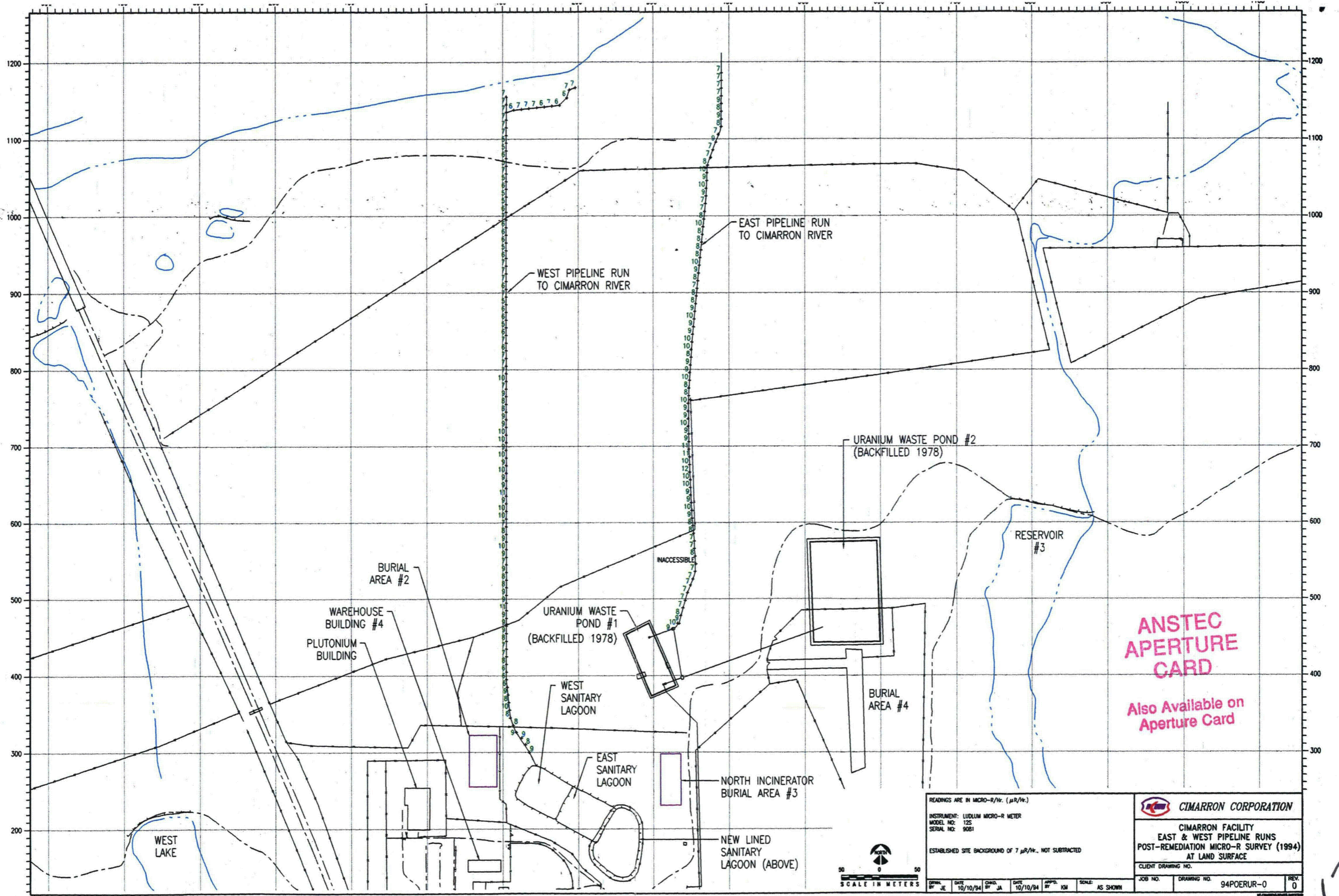
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175



READINGS ARE IN MICRO-R/Hr. ( $\mu R/Hr.$ )  
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 ESTABLISHED SITE BACKGROUND OF 7  $\mu R/Hr.$ , NOT SUBTRACTED

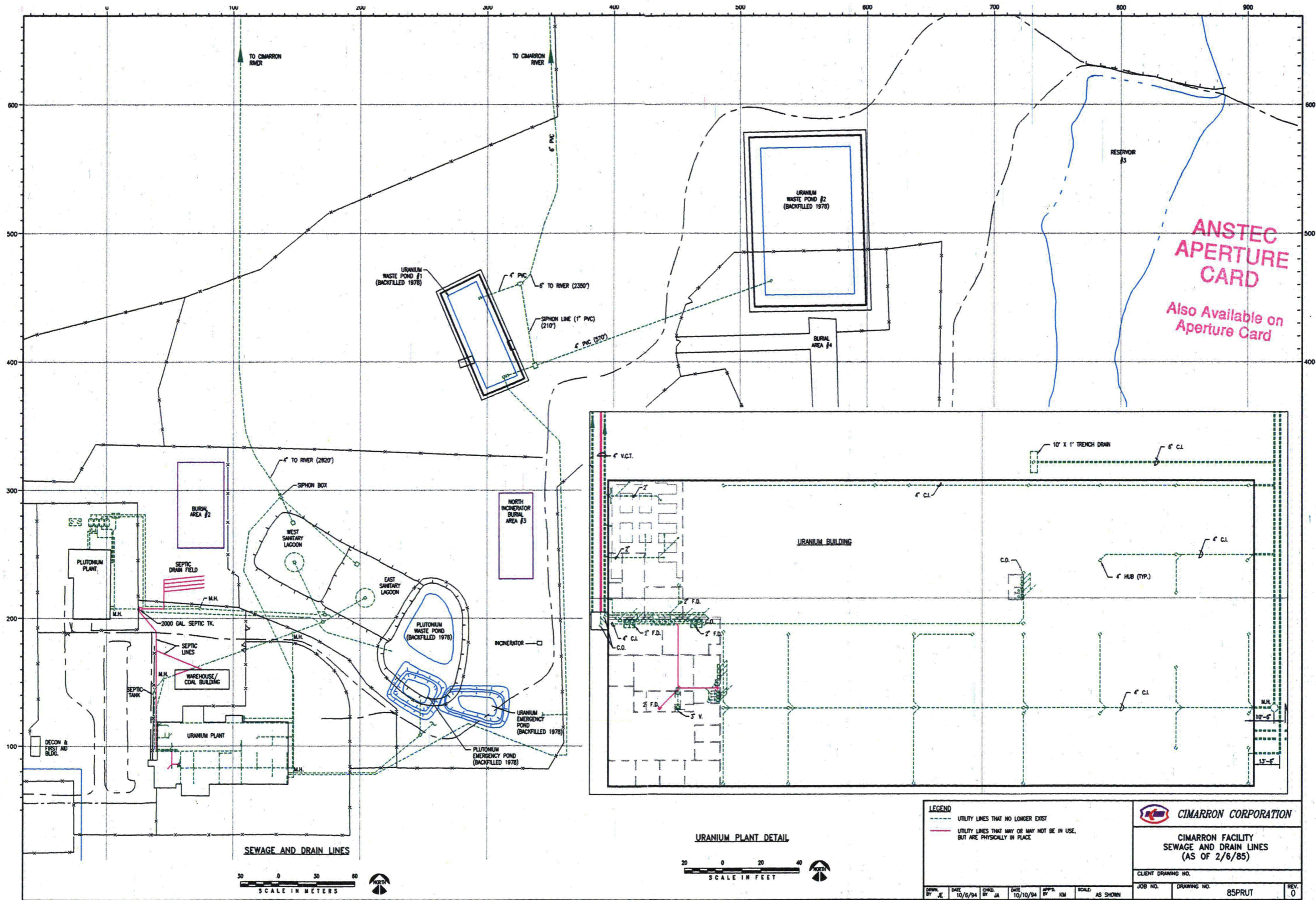


CIMARRON FACILITY EAST & WEST PIPELINE RUNS POST-REMEDIATION MICRO-R SURVEY (1994) AT LAND SURFACE		
CLIENT DRAWING NO.		
JOB NO.	DRAWING NO.	REV.
	94POEUR-0	0

9412080115

176





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SEWAGE AND DRAIN LINES



URANIUM PLANT DETAIL



**LEGEND**

- UTILITY LINES THAT NO LONGER EXIST
- UTILITY LINES THAT MAY OR MAY NOT BE IN USE, BUT ARE PHYSICALLY IN PLACE

DRWN BY: JE	DATE: 10/6/84	CHD BY: JA	DATE: 10/10/84	APP'D BY: KM	SCALE: AS SHOWN
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**CIMARRON CORPORATION**

**CIMARRON FACILITY  
SEWAGE AND DRAIN LINES  
(AS OF 2/6/85)**

CLIENT DRAWING NO. \_\_\_\_\_

JOB NO. _____	DRAWING NO. 85PRUT	REV. 0
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178

## 16.0 Site Reservoirs and Drainage Areas

### 16.1 Reservoir #1 and Drainage Area (West of HWY #74)

Reservoir #1 and the drainage area from Highway #74 to Reservoir #1 are located west of the Uranium Building. This reservoir collects drainage generally from areas south of the Uranium Building. This reservoir is shown on Drawing No. 94MOST-RF4. Reservoir #1 is located west of the Uranium Building.

#### A. Characterization Data:

Cimarron personnel conducted an investigation of the drainage area west of Highway #74 to determine if runoff from the southern portion of the Uranium Building yard had affected this area. This preliminary investigation showed soil concentrations up to 70 pCi/g uranium in the drainage area leading to Reservoir #1. This drainage area was characterized and remediated. All contaminated soil with total uranium concentrations above 30 pCi/g was removed and stockpiled in the on-site Option #2 stockpile. At the completion of this remediation effort, this drainage area was characterized again along with the banks and the bottom of Reservoir #1. Soil samples around Reservoir #1 and within this drainage area to Reservoir #1 were collected in 1991. The soil sampling was conducted on a 10m x 10m grid at depths of 0 to 4 ft. in the drainage area. The soil samples were collected on an approximate 10m x 10m linear grid at a depth of 0 to 6 inches around the perimeter of Reservoir #1. In addition, random sludge samples were taken from the bottom of Reservoir #1. The soil and sludge samples were analyzed at the Cimarron facility laboratory for total uranium. These soil sample data have been placed on Drawings No. 91PORISS-0 through 91PORISS-4. The sludge sample analysis data are shown on Drawing No. 91PORISS-5. All soil and sludge sample concentrations were below 30 pCi/g total uranium.

#### B. Environmental Data:

An annual surface water sample is taken as part of the Cimarron facility environmental monitoring program at sample location #1204. Surface water sampling conducted prior to 1976 indicated elevated levels of uranium. Typical

sample analysis results from the pre-1976 annual environmental sampling program were 8.28 dpm/L plutonium and 160 dpm/L total uranium. Data from 1977 through 1993 indicates levels characteristic of background.

Concentrations of gross alpha, gross beta, and total uranium in 1992 and 1993 were less than detection limits.

#### 16.2 Drainage Area from Reservoir #1 to the Cimarron River

This drainage area is not included in the annual environmental sampling program. However, Reservoir #1 is included in the annual environmental sampling program and water sample results from the last two years show that concentrations of total uranium were less than detection limits. The 1979 Micro-R survey for the 1,100-acre Cimarron site included this drainage area west of Highway #74. The survey results are shown on Drawing No. 79PRSAUR-0, and were at background levels (This drawing is included as an attachment to Section 6.0.). A scoping survey was also conducted on this drainage area in 1994. A Ludlum Model 2220 with a 3 in. x 0.5 in. NaI detector was used to perform the scoping survey. Soil samples were taken at locations where the highest readings were recorded for this drainage area. All soil samples had uranium concentrations within background levels. This area is not considered an affected area.

#### 16.3 Reservoir #2 (East Reservoir)

Reservoir #2 was constructed to provide process water to the Cimarron facility during operations. A surface water sample is taken as part of the annual environmental monitoring program and the historic data indicates gross alpha, gross beta, and total uranium concentrations at background levels. This reservoir is shown on Drawing No. 94MOST-RF4. Reservoir #2 is located at the eastern edge of the 1,100-acre site. This Reservoir is not considered an affected area.

#### 16.4 Drainage Area from Reservoir #2 to the Flood Plain (catch basin)

The 1979 Micro-R survey for the 1,100 acre Cimarron site included this drainage area. The survey results are shown on Drawing No. 79PRSAUR-0 and were at background levels. Concrete released from the decommissioning of the Uranium Facility was placed in this drainage area for erosion control. The concrete released prior to 1989 was surveyed for alpha only. A survey utilizing a gas proportional beta/gamma detector was utilized in 1993 to survey

concrete in this drainage area. This survey identified several pieces of concrete in this drainage area exceeding 15,000 dpm/100 cm<sup>2</sup> fixed beta/gamma<sup>19</sup>. This drainage area may contain concrete rubble which exceeds the free release limit for beta/gamma. Averaging of survey results in accordance with NUREG/CR-5849 will be performed during the final release survey of this area.

#### 16.5 Reservoir #3 (Middle Reservoir)

Reservoir #3 was constructed to provide backup process water to Cimarron during operations. A surface water sample is taken as part of the annual environmental monitoring program and the historic data indicates gross alpha, gross beta, and total uranium concentrations at background levels. This reservoir is shown on Drawing No. 94MOST-RF4. Reservoir #3 is located just east of Uranium Waste Pond #2. This Reservoir is not considered an affected area.

#### 16.6 Drainage Area from Reservoir #3 to the Flood Plain (catch basin)

The 1979 Micro-R survey for the 1,100-acre Cimarron site included this drainage area. The survey results are shown on Drawing No. 79PRSAUR-0 and were at background levels. Concrete released from the decommissioning of the Uranium Process was placed in this drainage area for erosion control. The concrete released prior to 1989 was surveyed for alpha only. A survey utilizing a gas proportional beta/gamma detector was utilized in 1993 to survey concrete in this drainage area. This survey identified several pieces of concrete in this drainage area exceeding 15,000 dpm/100 cm<sup>2</sup> fixed beta/gamma. This drainage area may contain concrete rubble which exceeds the free release limit for beta/gamma. Averaging of survey results in accordance with NUREG/CR-5849 will be performed during the final release survey of this area.

#### 16.7 Drainage Area/River Flood Plain Area east of Highway #74

This area was included in the 1979 site-wide random Micro-R survey. The results are shown on Drawing No. 79PRSAUR-0. The readings taken were at background levels. A portion of the drainage area is considered an affected area.

## 16.8 Concrete Released from the Restricted Area

Cimarron personnel initiated decontamination and removal of concrete rubble from pads, building floors, and support tiers within the restricted area in 1986. Concrete which was released from the restricted area was surveyed for alpha prior to 1989. Concrete that was released from the restricted area subsequent to 1989 was surveyed for both alpha and beta/gamma. Cimarron personnel conducted a survey in 1993 utilizing a gas proportional survey instrument to perform beta/gamma surveys of concrete released from the restricted area prior to 1989. This survey identified several pieces of concrete in this drainage area exceeding 15,000 dpm/100 cm<sup>2</sup> fixed beta/gamma. A follow-up survey was conducted in May, 1994 on concrete placed in several drainage areas.

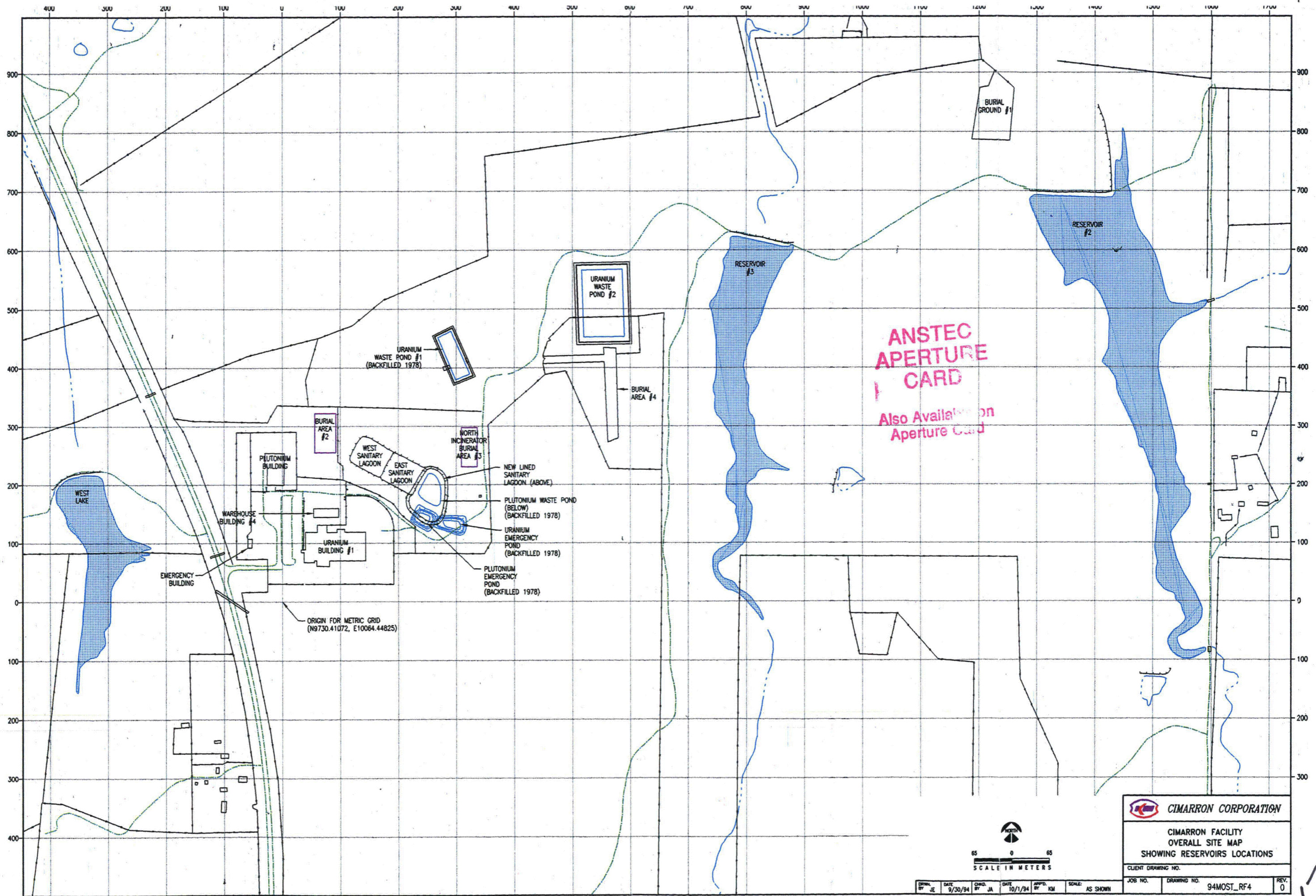
Numerous large pieces of concrete were surveyed in the drainage area northeast of Burial Ground #1. The concrete was surveyed with a Ludlum 2220 with a 43-68 probe. Of the forty-one pieces of concrete surveyed, six showed readings exceeding 15,000 dpm/100cm<sup>2</sup> fixed beta/gamma, the maximum reading being 24,000 dpm/100cm<sup>2</sup>. Also, concrete located in the east side of Reservoir #2 spillway was surveyed. Forty-nine large pieces of concrete were surveyed, with eleven readings exceeding the 15,000 dpm/100cm<sup>2</sup> fixed beta/gamma limit. The maximum reading was being 40,000 dpm/100cm<sup>2</sup>. The concrete located in Reservoir #1 was released with both alpha and beta surveys in 1994.

The following areas on site contain concrete rubble that may exceed the free release limit for beta/gamma. Averaging of survey results for each of these areas in accordance with NUREG/CR-5849 will be performed during the final release survey of these areas.

- Concrete in Drainage Area next to the Uranium Emergency Pond:
- Concrete in Drainage Area between Waste Ponds #1 & #2:
- Concrete in the spillway from Reservoir #3:
- Concrete northeast of Burial Ground #1:
- Concrete in the Spillway North of Reservoir #2:



- Concrete in Drainage Area between the New Lined Sanitary Lagoon and the Incinerator / Burial Area #3:



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**CIMARRON FACILITY  
OVERALL SITE MAP  
SHOWING RESERVOIRS LOCATIONS**

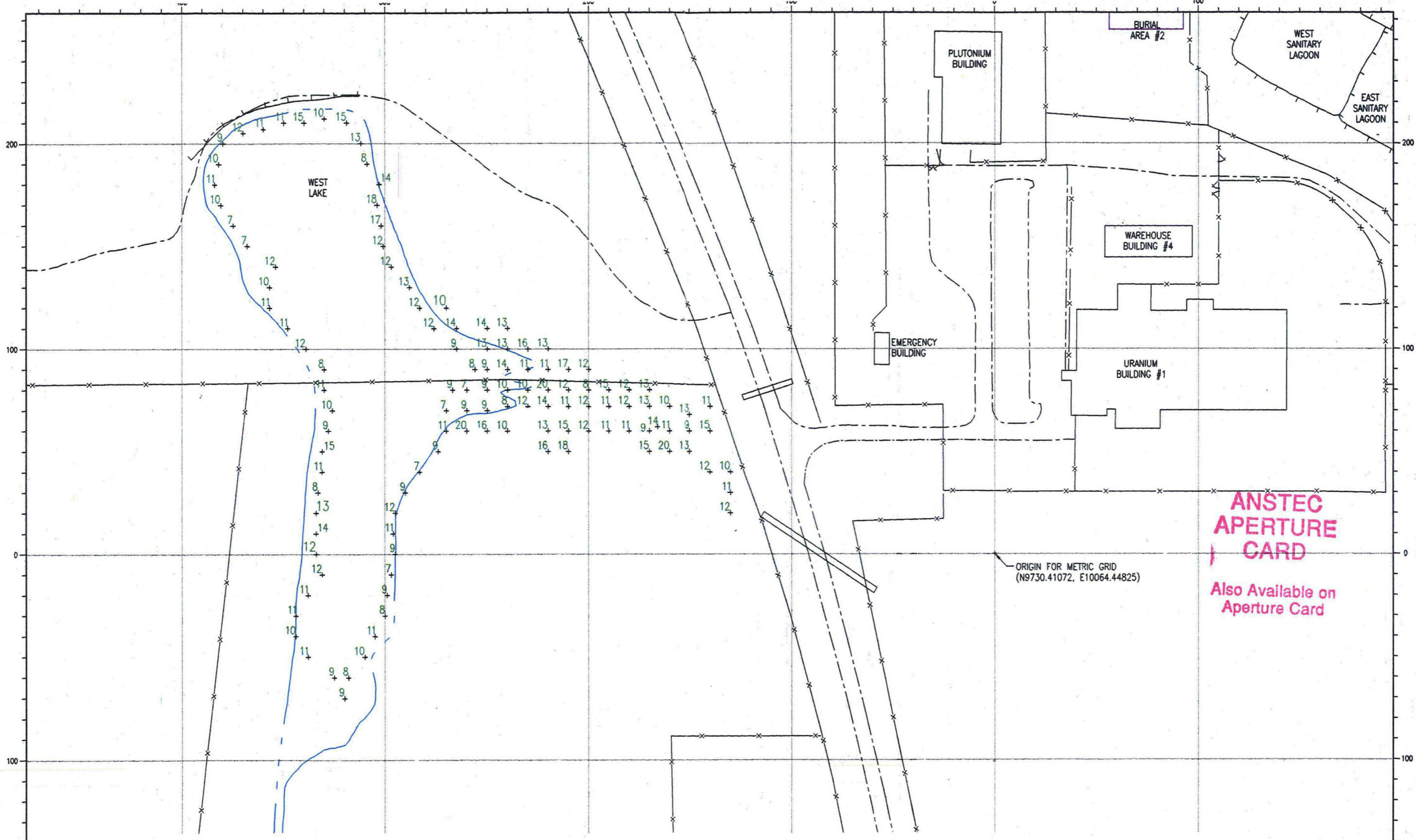
CLIENT DRAWING NO. \_\_\_\_\_

DRAWN BY: JE	DATE: 9/30/94	CHKD BY: JA	DATE: 10/1/94	APP'D BY: KM	SCALE: AS SHOWN
JOB NO. _____	DRAWING NO. 94MOST_RF4	REV. 0			



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179



READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U).  
 CIMARRON GAMMA SPEC SOIL COUNTER.  
 SITE SOIL BACKGROUND OF APPROXIMATELY 6 pCi/g U, NOT SUBTRACTED.  
 SAMPLES TAKEN ON 10 METER X 10 METER GRID.  
 SAMPLES WERE TAKEN AT THE EDGE OF THE WATER WHEN THE LAKE WAS AT ITS LOWEST LEVEL IN 10 YEARS (MARCH 1991).  
 SAMPLES WERE TAKEN AFTER REMEDIATION.

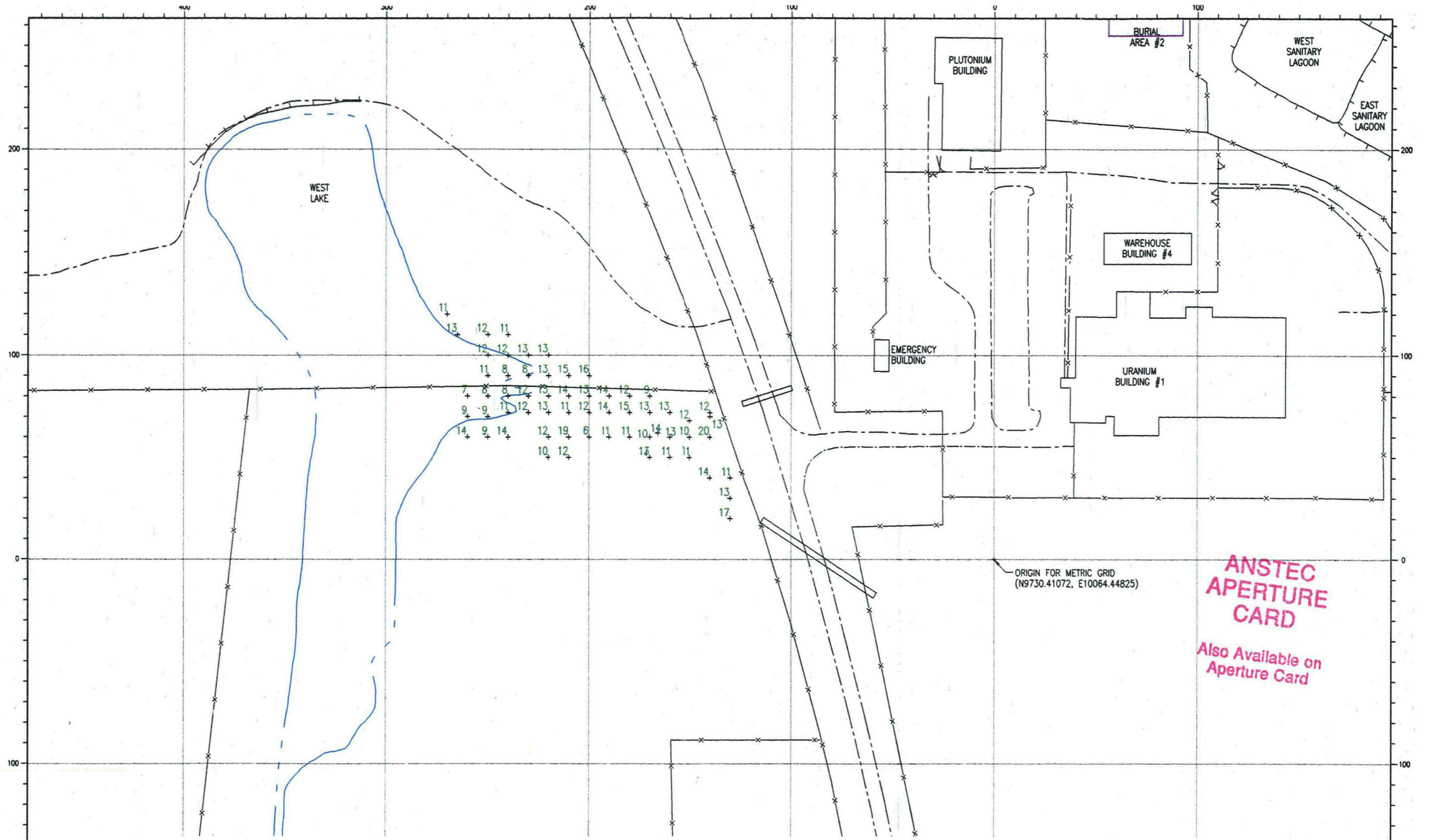
**CIMARRON CORPORATION**  
 CIMARRON FACILITY  
 WEST LAKE AREA  
 POST REMEDIATION SOIL SAMPLE RESULTS (1991)  
 SOIL SAMPLE ALIQUOT: 0-6" DEEP  
 CLIENT DRAWING NO.

JOB NO.	DRAWING NO.	REV.
	91POR1SS-0	0



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180



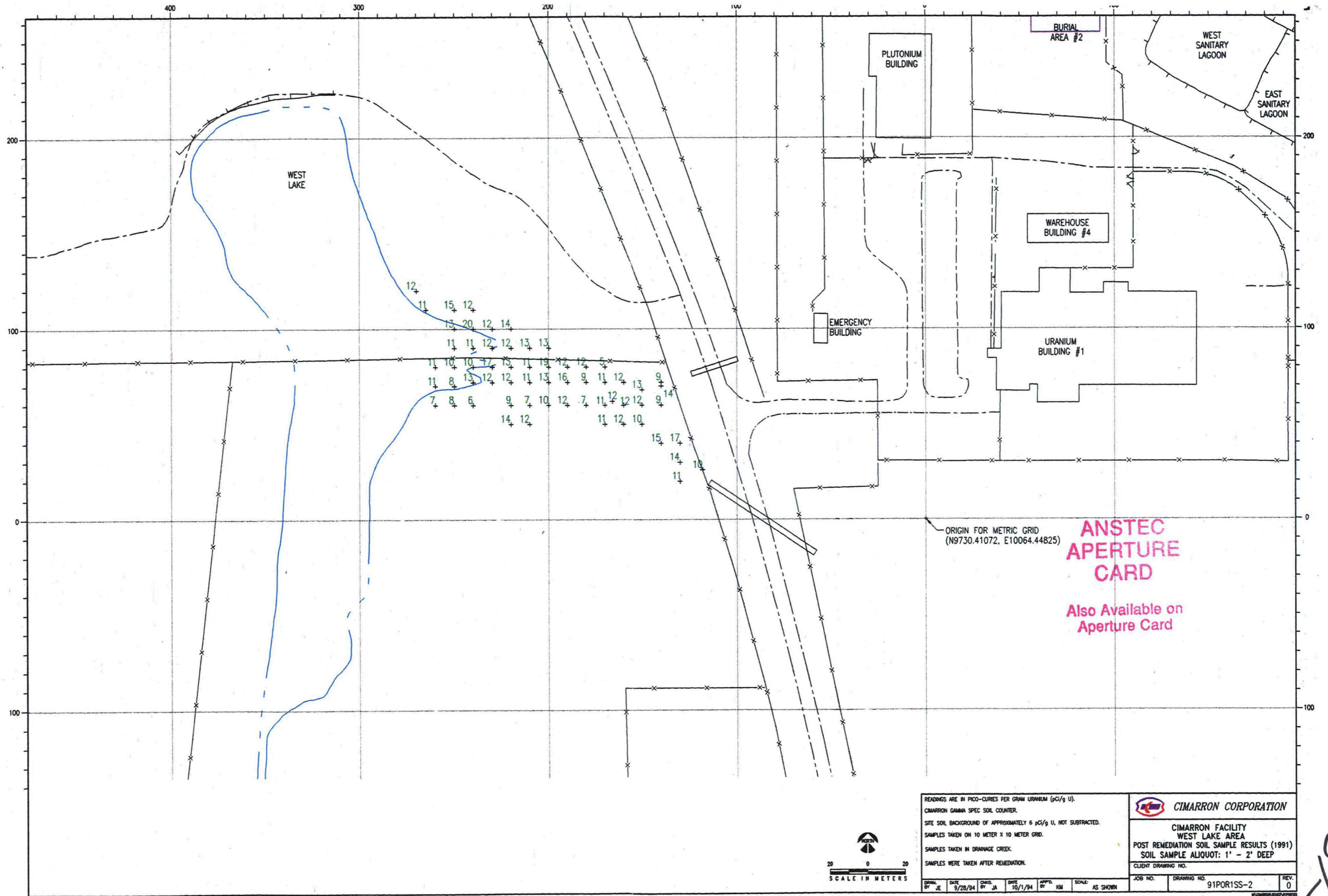
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READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U). CIMARRON GAMMA SPEC SOIL COUNTER. SITE SOIL BACKGROUND OF APPROXIMATELY 6 pCi/g U, NOT SUBTRACTED. SAMPLES TAKEN ON 10 METER X 10 METER GRID. SAMPLES TAKEN IN DRAINAGE CREEK. SAMPLES WERE TAKEN AFTER REMEDIATION.			
DRWN: JE DATE: 9/28/94 CHDL: JA DATE: 10/1/94 APP'D: KM SCALE: AS SHOWN		CIMARRON CORPORATION CIMARRON FACILITY WEST LAKE AREA POST REMEDIATION SOIL SAMPLE RESULTS (1991) SOIL SAMPLE ALIQUOT: 6" - 1' DEEP CLIENT DRAWING NO.	
JOB NO.		DRAWING NO. 91POR1SS-1	
REV. 0		9412080115	

181



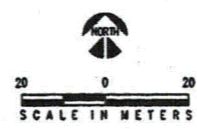
READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U).  
 CIMARRON GAMMA SPEC SOIL COUNTER.  
 SITE SOIL BACKGROUND OF APPROXIMATELY 6 pCi/g U, NOT SUBTRACTED.  
 SAMPLES TAKEN ON 10 METER X 10 METER GRID.  
 SAMPLES TAKEN IN DRAINAGE CREEK.  
 SAMPLES WERE TAKEN AFTER REMEDIATION.

**CIMARRON CORPORATION**

CIMARRON FACILITY  
 WEST LAKE AREA  
 POST REMEDIATION SOIL SAMPLE RESULTS (1991)  
 SOIL SAMPLE ALIQUOT: 1' - 2' DEEP

CLIENT DRAWING NO. 91POR1SS-2

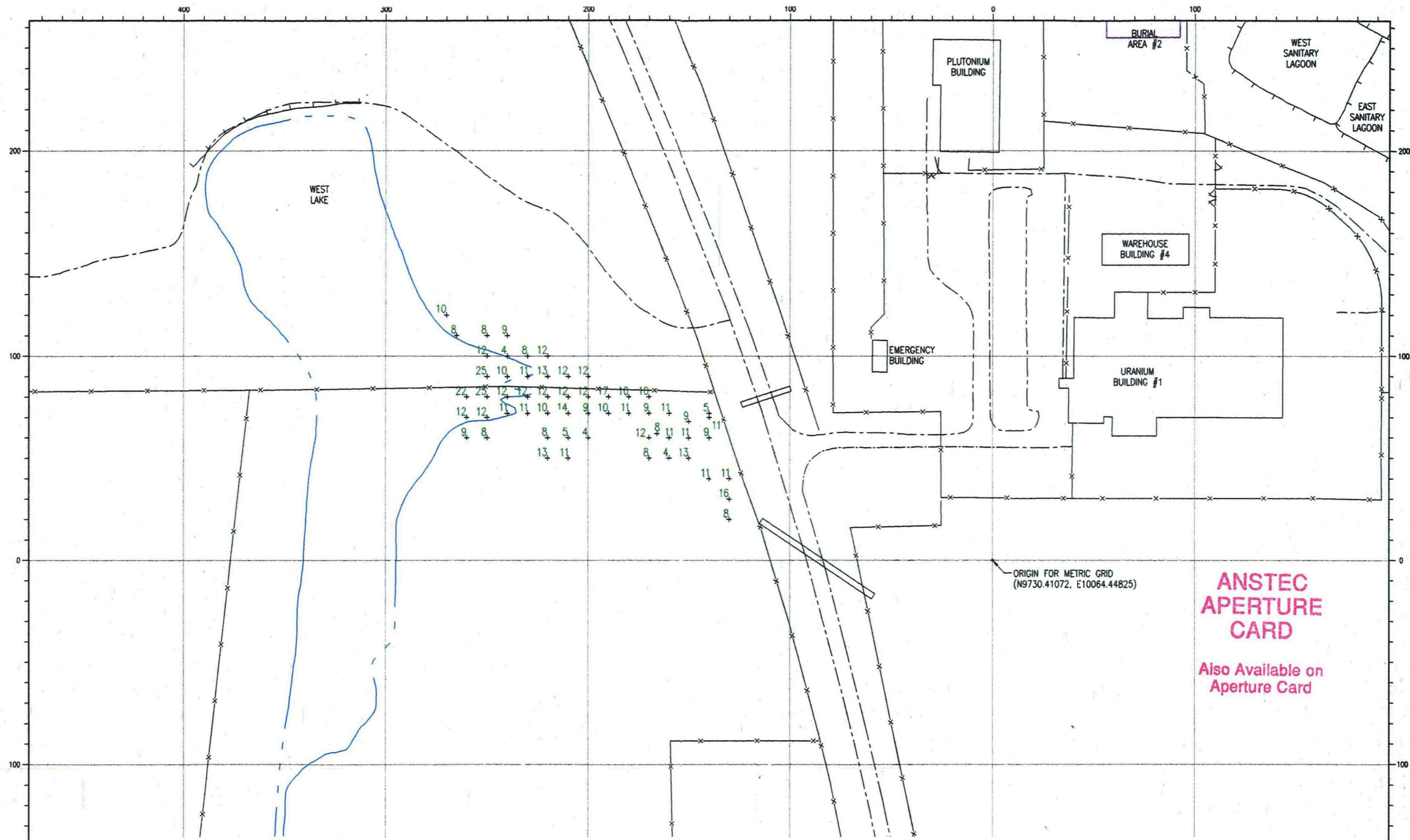
JOB NO. DRAWING NO. 91POR1SS-2 REV. 0



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182





READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U).  
 CIMARRON GAMMA SPEC SOIL COUNTER.  
 SITE SOIL BACKGROUND OF APPROXIMATELY 6 pCi/g U, NOT SUBTRACTED.  
 SAMPLES TAKEN ON 10 METER X 10 METER GRID.  
 SAMPLES TAKEN IN DRAINAGE CREEK.  
 SAMPLES WERE TAKEN AFTER REMEDIATION.

**CIMARRON CORPORATION**

CIMARRON FACILITY  
 WEST LAKE AREA  
 POST REMEDIATION SOIL SAMPLE RESULTS (1991)  
 SOIL SAMPLE ALIQUOT: 3" - 4" DEEP

CLIENT DRAWING NO. 91POR1SS-4

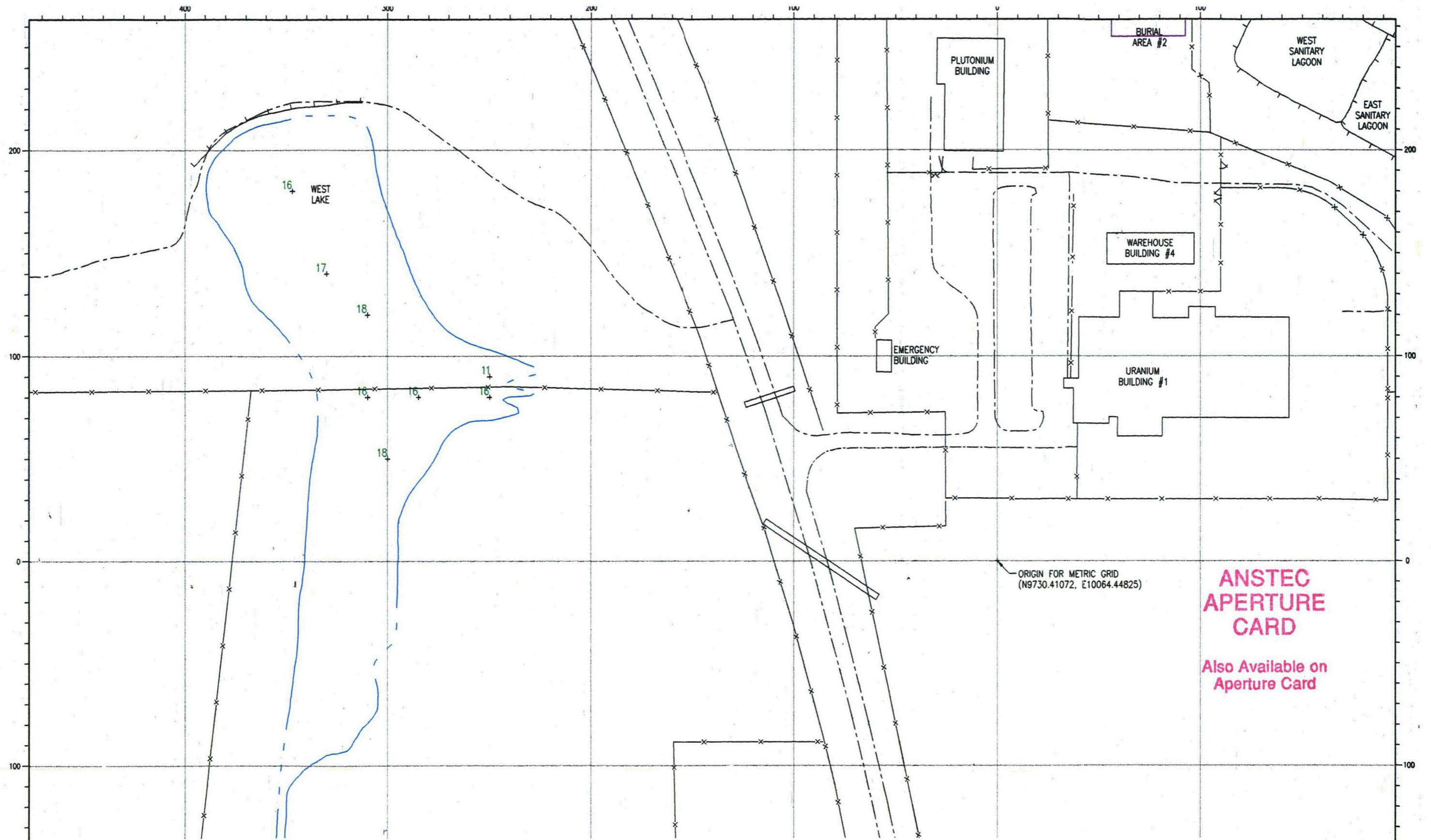
JOB NO. DRAWING NO. 91POR1SS-4 REV. 0

DATE 9/28/94 CHD. BY JA DATE 10/1/94 APPD. BY KM SCALE: AS SHOWN



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184

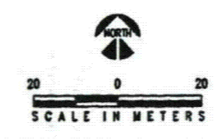


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READINGS ARE IN PICO-CURIES PER GRAM URANIUM (pCi/g U).  
 CIMARRON GAMMA SPEC SOIL COUNTER.  
 SITE SOIL BACKGROUND OF APPROXIMATELY 6 pCi/g U. NOT SUBTRACTED.  
 SAMPLES TAKEN ON RANDOM PATTERN IN BOTTOM OF DRAINAGE CREEK.  
 NO REMEDIATION OF LAKE BOTTOM.

CIMARRON CORPORATION	
CIMARRON FACILITY WEST LAKE AREA POST REMEDIATION SLUDGE SAMPLE RESULTS (1991) SLUDGE SAMPLE	
CLIENT DRAWING NO.	
JOB NO.	DRAWING NO. 91POR1SS-5
REV. 0	



9412080115

185



## 17.0 Plutonium Building and Plant Yard

Cimarron submitted a license termination request to the NRC to terminate the MOFF Plant License SNM-1174 on August 20, 1990. The MOFF Plant license covers the facility itself, the fenced area (security fence) which surrounds the facility, the drain line to the evaporation ponds, the former plutonium evaporation and emergency ponds, the east and west sanitary lagoons, the septic tank, and some underground tanks). The NRC terminated License SNM-1174 by letter dated February 5, 1993<sup>3</sup>. In this letter, the NRC stated the following:

"The staff has determined that (1) all special nuclear material relating to this license has been properly disposed, (2) reasonable effort has been made to eliminate residual radioactive contamination, and (3) a radiation survey has been performed, and confirmed by the NRC, which demonstrates that the premises are suitable for release for unrestricted use."

However, the MOFF Plant was not released from the Uranium Facility License SNM-928. The Uranium Facility License SNM-928 covers the entire 1,100-acre site (which includes the area licensed under SNM-1174). The NRC stated the following in the same letter of February 5, 1993:

"The termination of License No. SNM-1174 does not alter your Special Nuclear Materials License No. SNM-928 (Docket No. 70-925) in any way. Because the land formerly licensed under License No. SNM-1174 is contained within the bounds of License No. SNM-928, a second confirmatory survey of the former Mixed-Oxide Facility and associated grounds may be made at the time of termination of the Uranium Facility license. Any cross-contamination will be required to be remediated before the Uranium Facility license will be terminated."

As discussed above, Cimarron submitted a license termination request to the NRC for License SNM-1174. This request included a complete characterization and final survey for the MOFF Plant. A Final Confirmatory Survey of the MOFF Plant was conducted by ORAU at the request of the NRC<sup>20</sup>. The survey report was submitted to the NRC in 1991 and was titled "Confirmatory Survey of the Cimarron Corporation Mixed Oxide Fuel Fabrication Plant, Crescent, Oklahoma". In this report, ORAU stated:

"The documentation developed by the licensee was thorough and adequately described the post decontamination status of the

facility. Radiological data demonstrated that the residual activity levels satisfied the established decommissioning guidelines".

The ORAU Confirmatory Survey Report also was referenced in the "Environmental Assessment For License Termination At The Cimarron Corporation Mixed Oxide Fuel Fabrication Plant" which was issued by the NRC (NMSS) in February of 1993<sup>21</sup>. In this Environmental Assessment, the NRC stated that "...Cimarron Corporation has decontaminated and decommissioned the Mixed Oxide Facility and associated grounds to below guidelines required for unrestricted use by the NRC. It is NRC's judgement that the applied guidelines adequately protect the public health and safety, and the environment. Therefore, the NRC finds that termination of the Mixed Oxide Facility Licenses (License No. SNM-1174) and conversion of the related facility to unrestricted use will pose no significant impact to the environment or the health and safety of the public."

During the conduct of the final confirmatory survey of the Cimarron facility, ORAU investigated the sources of all contamination at the Plutonium Facility and yard area. During this investigation, ORAU discovered uranium contamination on the exterior surface of the Plutonium Building and also in several soil samples from the yard area. However, the concentrations of uranium in the soil samples and the surface contamination levels were all within NRC guideline values. The following excerpt from the 1991 ORAU Final Confirmatory Survey Report explains these issues in more detail:

"Because the activity was suspected to be windblown uranium from the adjacent Uranium Plant, several samples of surfaces with elevated direct measurements were analyzed for uranium and plutonium content... .

Plutonium has been identified as the major potential contaminant on building interior surfaces, the guidelines applicable to plutonium are:

100 alpha dpm/100 cm<sup>2</sup>, averaged over 1 m<sup>2</sup> area  
300 alpha dpm/100 cm<sup>2</sup>, maximum in a 100 cm<sup>2</sup> area  
20 alpha dpm/100 cm<sup>2</sup>, removable

All individual final measurements were below the 300 dpm/100 cm<sup>2</sup> maximum level and there was no removable activity in excess of 20 dpm/100cm<sup>2</sup>. Several single measurements were noted to have activity levels between 100 and 300 dpm/100 cm<sup>2</sup>; however, the surface areas of these locations were small and averaging

throughout the contiguous 1 m<sup>2</sup> results in activity levels below the 100 dpm/100cm<sup>2</sup> guideline.

Contamination levels on some exterior surfaces exceeded the plutonium guideline levels. Further analyses indicated that the contaminant was predominantly uranium - likely windblown from the adjacent Uranium Plant. The NRC guidelines for uranium are:

5,000 dpm/100 cm<sup>2</sup>, averaged over 1 m<sup>2</sup> area  
15,000 dpm/100 cm<sup>2</sup>, maximum in a 100 cm<sup>2</sup> area  
1,000 dpm/100 cm<sup>2</sup>, removable

Activity levels on exterior surfaces satisfied these guidelines.

Exposure rates throughout the site were typically in the range of background levels. The highest exposure rate measured at one meter above the surface was 13 μR/h, which is 3 μR/h above the range (9 to 10 μR/h) in background rates. Exposure rates are therefore well within the guideline value of 10 μR/h above background (see Appendix C).

Residual soil activity guidelines for this site are:

Total uranium	30 pCi/g
Total plutonium	25 pCi/g
Total Americium-241	30 pCi/g

One drum of excavated soil (#124-5) contained total plutonium and Am-241 concentrations in excess of these guideline values; however, samples of residual subfloor soil were well below the guideline values. Outside the building, one sample from the piping excavation contained residual total plutonium activity of approximately 110 pCi/g. A nearby sample from that same excavation and samples from 10 m grid intersections and random boreholes were well within the guideline plutonium value, thus averaging would result in meeting the guideline. Assuming an activity ratio for U-234/U-235 of 21 (typical for low enrichment uranium) a U-235 concentration above 1.36 pCi/g would indicate that the total uranium exceeds the 30 pCi/g guideline. Samples from grid locations 20E, 212N (2) and 30E, 220N (1) contained U-235 concentrations above 1.0 pCi/g (1.5 pCi/g and 1.3 pCi/g, respectively). Using the activity ratio of 21, the total uranium (U-234, U-235, and U-238) in samples from these locations is estimated as:

20E, 212N (surface)	37.3 pCi/g
" " (30-45 cm)	37.6 pCi/g
30E, 220N	36.3 pCi/g

Although these levels are slightly above the guideline value, other samples from the adjacent areas contain much lower concentrations, and the average levels are therefore expected to be well within the guideline”.

This report summarized the authors findings as follows:

“At the request of the U.S. Nuclear Regulatory Commission, Region III, Environmental Survey and Site Assessment Program of Oak Ridge Associated Universities conducted an independent radiological survey of the Mixed Oxide Facility at the Cimarron Corporation Plant. The survey included surface alpha, beta-gamma, and gamma scans, measurement of direct and removable contamination levels, exposure rate measurements, and determination of radionuclide concentrations in soil, concrete, and paint samples.

Initial measurements identified several areas of residual surface activity exceeding guideline levels. These areas were addressed by the licensee, and resurveys indicated that the additional cleanup was effective in meeting the established limits. Based on the results of the confirmatory survey it is ORAU's opinion that the decontamination efforts have been successful in satisfying the guideline levels and that the licensee's documentation adequately and accurately describes the final radiological status of the site”.

This area has not been released from Uranium License SNM-928. In this letter, the NRC also stated that "The termination of License SNM-1174 does not alter your Special Nuclear Material License SNM-928 in any way. Because the land formerly licensed under License SNM-1174 is contained within the bounds of License SNM-928, a second confirmatory survey of the former Mixed-Oxide Facility and associated grounds may be made at the termination of the Uranium Facility License”.

Also included with the decommissioning of the MOFF Plant and termination of the SNM License were the plutonium evaporation and emergency ponds. These ponds were sampled by Cimarron and the NRC prior to closure. As stated in the NRC's February 1993 Environmental Assessment for License Termination, “NRC and the

Oklahoma State Department of Health verified Kerr-McGee's soil sample data by independently sampling the pond bottoms... . The NRC results were generally less conservative than the Kerr-McGee results... .

Because of the close proximity to the Uranium plant, Cimarron performed a release survey on the exterior of the MOFF plant building and yard. The purpose of the survey was to detect the presence of enriched uranium. The building survey indicated no elevated levels of contamination on the south, west or north walls, but contamination was found on the east wall in the vicinity of the air supply fanroom stairs. A previously installed addition to the stair landing, a deck plate, was found to be reading approximately 100,000 dpm/100 cm<sup>2</sup>. An alpha pulse height analysis on a smear taken from this plate indicated enriched uranium. The deck plate was removed for disposal as LSA material. The area beneath the deck plate on the east wall of the building was decontaminated to meet release limits and resurveyed.

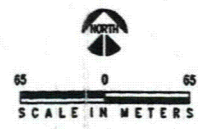
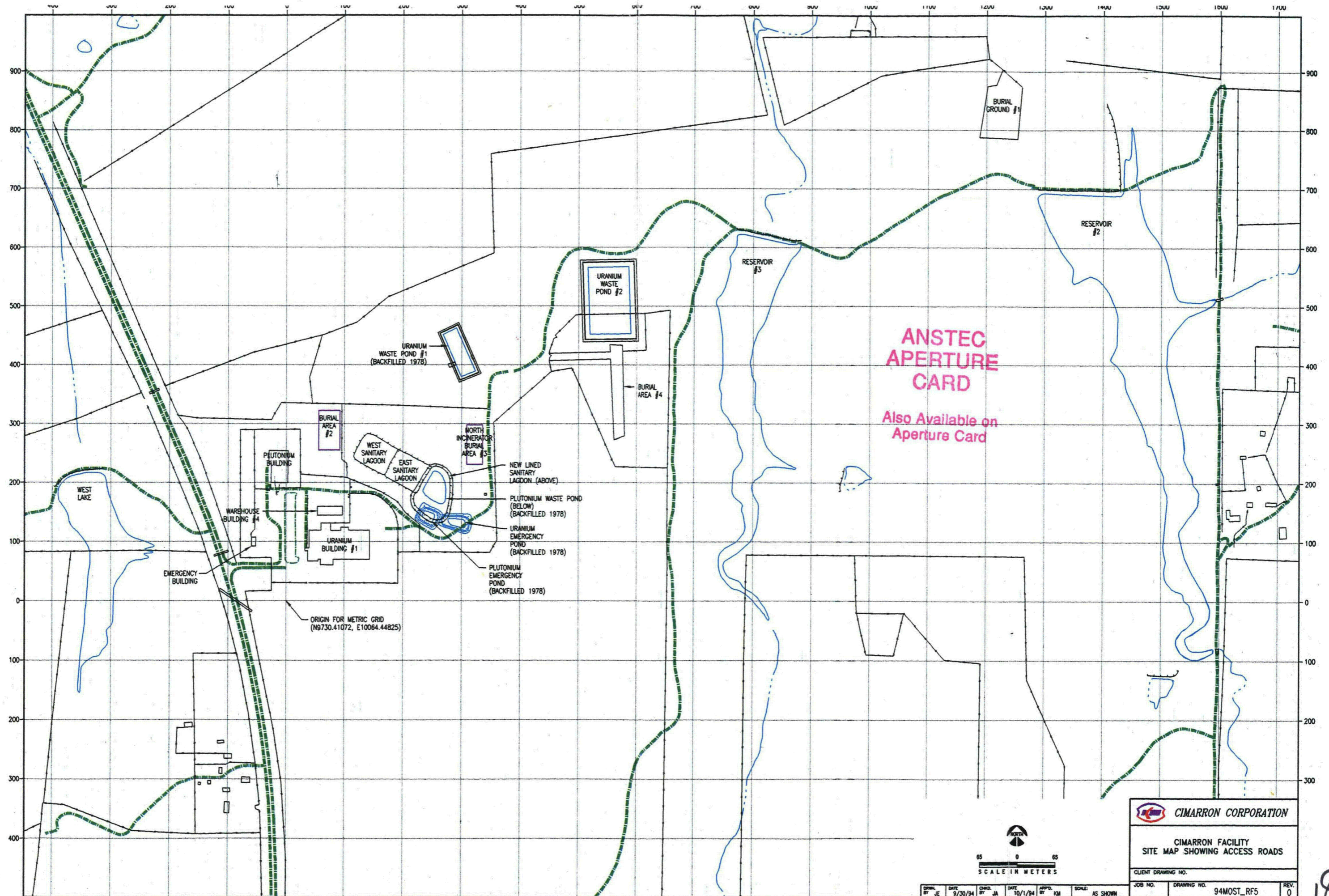
The restricted area surrounding the Plutonium Building, which was part of the Plutonium License was released by the NRC with the release of SNM License 1174. Uranium contamination discovered in the Plutonium Plant Yard during the confirmatory survey is below the release limits for the Cimarron facility License SNM-928.

## **18.0 Septic Tank, Lines and Drain Field**

As part of the overall site decommissioning effort, the sanitary sewer and laundry drains were diverted from the New Sanitary Lagoon to the old MOFF Plant uncontaminated septic tank in 1992. New drain lines have been installed from the Uranium plant to the septic tank that had previously served the plutonium building, and a new drain field (laterals) has been installed for this septic tank. This new drain line is a 4-inch PVC pipe which runs from the Uranium plant change rooms to the septic tank. This will be used as the septic tank for the Uranium plant during the remaining site decommissioning activities. The laundry water for the Uranium plant drains into 55-gallon drums where it is sampled and analyzed prior to being released. The sample analysis results for the laundry water and the volume of water are logged by Health Physics personnel prior to being released to track the amount of uranium discharged to the septic tank and drain field. If laundry water samples are above the effluent concentration limit, the water is recycled through a filter to remove the radioactivity before it is discharged to the septic tank.

## **19.0 All On-site Roads outside Restricted Area**

The roads outside of the restricted area are shown on Drawing No. 94MOST-RF5. The road from the restricted area to Reservoir #2 will require final surveys be performed once all on-site remediation and on-site disposal has been completed.



**CIMARRON CORPORATION**

CIMARRON FACILITY  
SITE MAP SHOWING ACCESS ROADS

CLIENT DRAWING NO.

JOB NO.	DRAWING NO.	REV.
	94MOST_RF5	0

DRWN BY: JE	DATE: 9/30/94	CHKD BY: JA	DATE: 10/1/94	APP'D BY: KCM	SCALE: AS SHOWN
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186