FINAL REPORT
CACTUS PIPE AND SUPPLY
CLEANUP CODE CU-03-54012
USA PROJECT NO. 2159-NR-H033

Performed for: Railroad Commission of Texas
Site Remediation Section
1706 Seamist Drive, Ste. 501
Houston, Texas 77078-3135

Submitted By: USA Environment, LP
10234 Lucore Street
Houston, Texas 77017
(713) 425-6936
www.usaenviro.com

FALL 2009

A Full Service
Environmental Company

January 25, 2010

Railroad Commission of Texas
Mr. Pete Fisher
P.O. Box 12967
Austin, TX 78711

Subject: Final Report - Cactus Pipe and Supply Co, Inc. (122185) – Harris County
Railroad Commission Cleanup Code - CU-03-54012, (Req. No. 455-9-0654)
USA Environment Job number 2159-NR-H033

Dear Mr. Fisher,

Please find attached the final report for the above project. This was a fairly substantial project involving both lead and NORM impacted soil. Per the specifications, material was scanned for both lead and NORM content. Terracon provided the lead scanning and USA Environment, LP (USA) provided the radiation survey and radioactive waste profiling support.

The property had nine impacted areas to start with so records were kept by impacted area. Areas seven and eight merged as the impacts were defined so they are considered one area for reporting. These areas are listed on the attached map.

Individual maps were prepared for each of the impacted areas. A map was made for both pre and post remediation efforts. The pre remediation maps show typical surface gamma scans as well as laboratory results from that area. This set of maps is identified as "Initial Status" in the attachments.

Another set of maps was developed showing the post remediation status. They show the depth of soil removed and residual radium 226 concentrations for each area. All areas meet criteria except for area nine. These reports are shown as "Final Status" in the attachments.

Area nine had impacts that extended to the west to property boundary of the project area. They did not meet criteria at the edge of the remediation. This area was not considered

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part of the scope of the contract and was left in place. All remediated areas were backfilled as part of the project.

A summary of pre and post remediation soil concentration is shown in the attached Excel spreadsheet. The residual impacted area is shown as the elevated reading for area nine. All other areas except this boundary meet criteria.

All measurements were taken using a Ludlum Model 2241-2 with a 44-2 probe. The instrument was in current calibration and passed its daily performance checks as evidenced by the attached calibration certificate and daily source check logs.

For USA Environment, LP

Stephen V Prewett, PhD
Radiation Safety Officer

Attachments:

- Map for areas
- Pre remediation results (8 pages)
- Post remediation results (8 pages)
- Data summary table
- Instrument calibration and performance check logs

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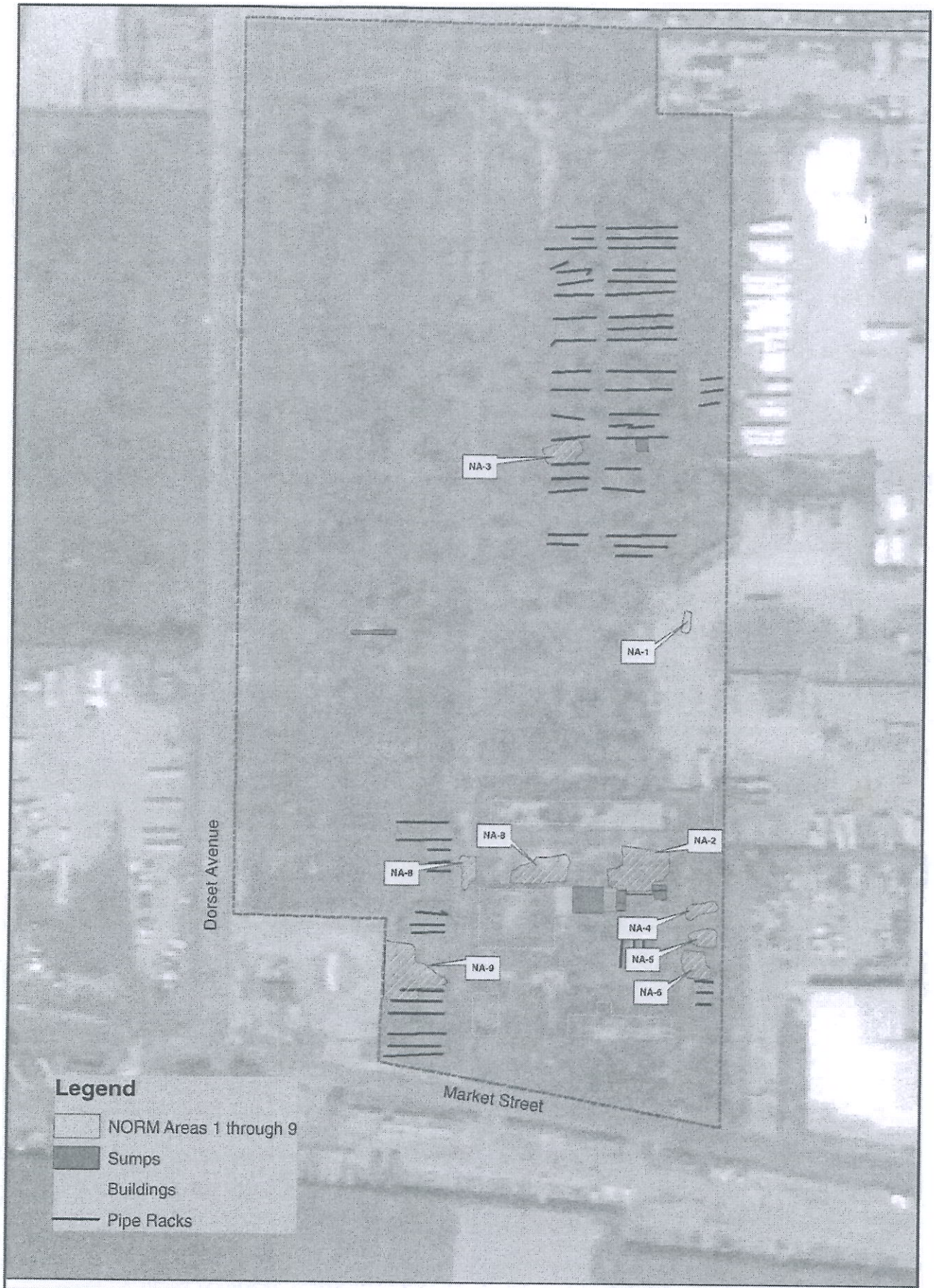
1. Map for Areas



0 50 100 Feet

1 inch = 100 feet

N

Drawn By: AN	
Checked By: AN	
Created In: ArcView 9.3	
Scale: 1"=100' (As Shown)	
Date:11/25/09	

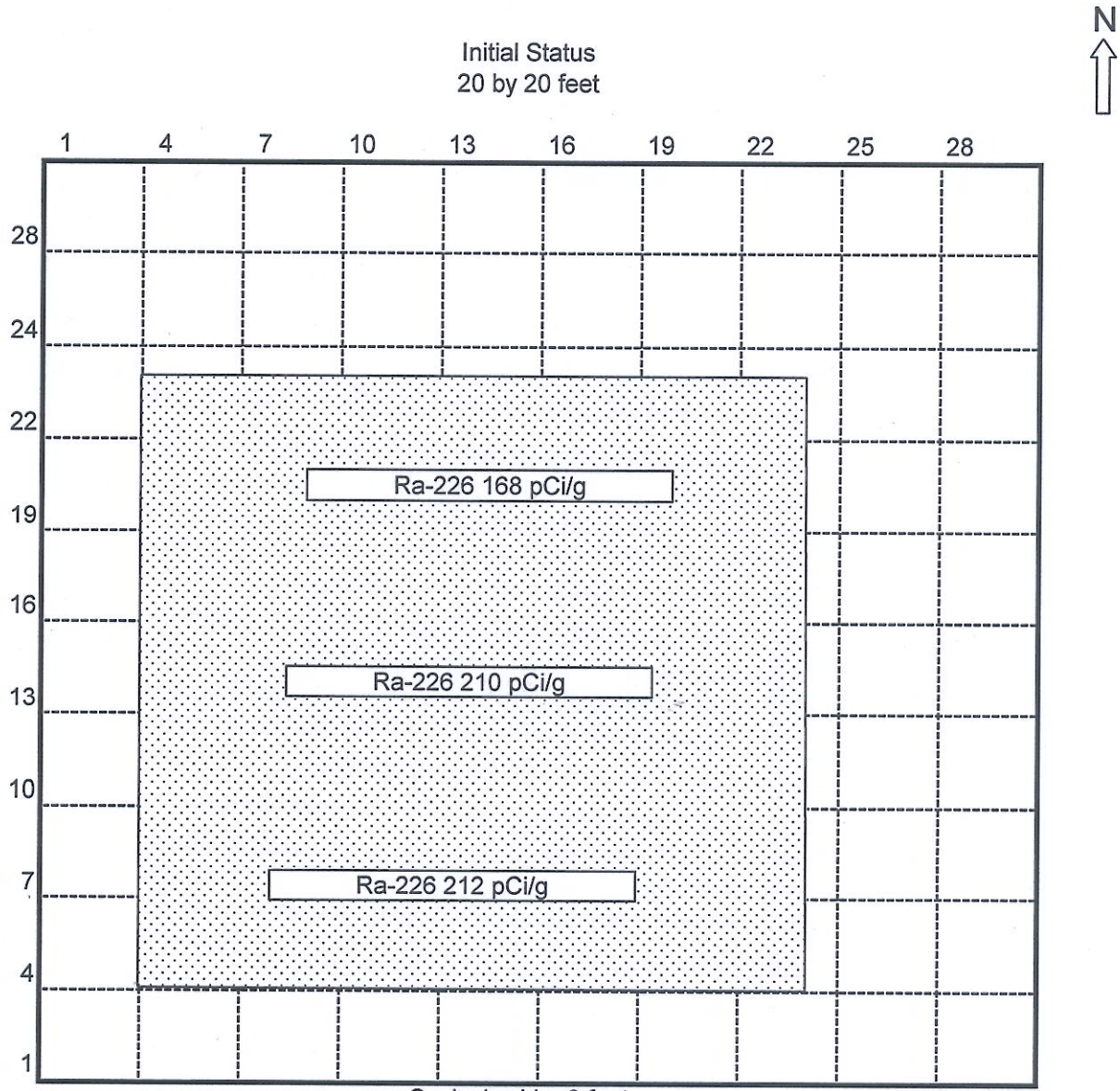
Figure 1

Limits of Final Excavation for NORM-affected soil

2. Initial Status Survey Results by Area

Cactus Pipe and Supply
2159-NR-H033
Houston, TX

Initial Status
20 by 20 feet



Scale 1 grid = 3 feet
Remediation Area Location 1

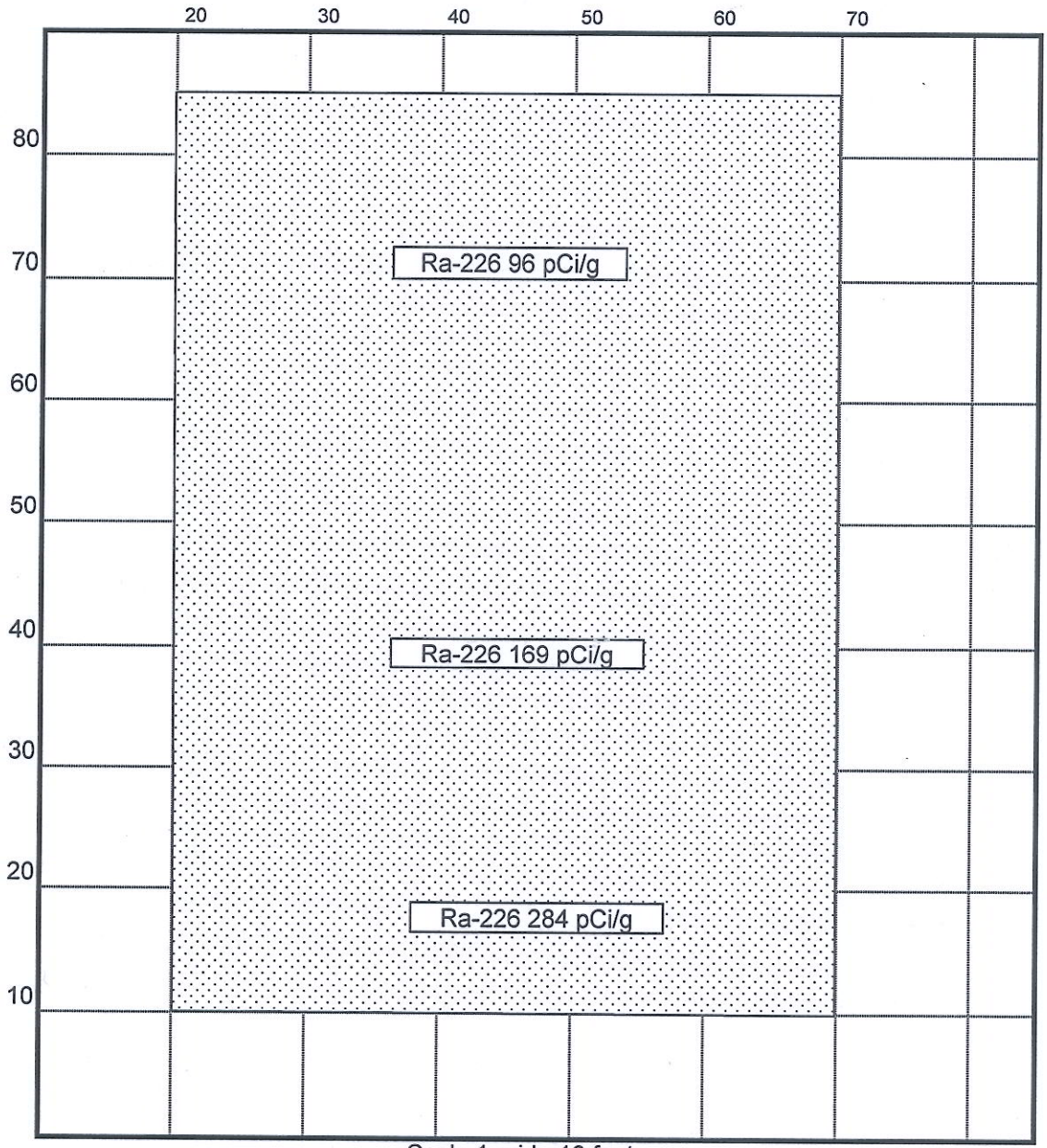
Ludlum 2241-2 SN 259335
Probe 44-2 PR276659
Calibration Due Date 3/10/10
169- 212 Eberline Ra-226 Range pCi/g Ra-226
40 to100 μR/hr at surface of area

Impact Location

Cactus Pipe and Supply
2159-NR-H033
Houston, TX

50 by 75 feet
Initial Status

N



Scale 1 grid =10 feet
Remediation Area Location 2

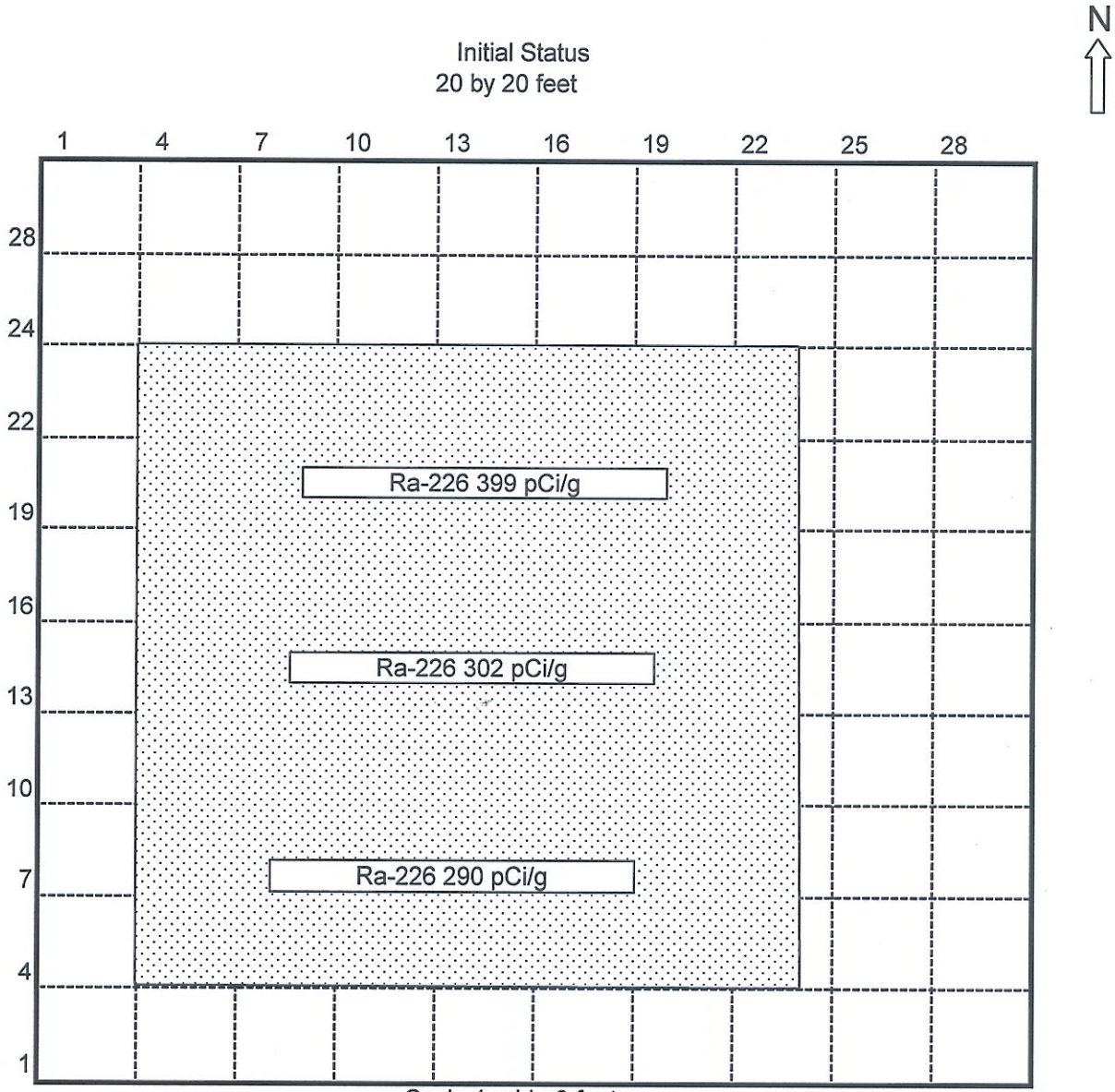
Ludlum 2241-2 SN 259335
Probe 44-2 PR276659
Calibration Due Date 3/10/10

96-285	Eberline Ra-226 Range pCi/g Ra-226
45 - 150	µR/hr at surface of area

Impact Location

Cactus Pipe and Supply
2159-NR-H033
Houston, TX

Initial Status
20 by 20 feet



Scale 1 grid =3 feet
Remediation Area Location 3

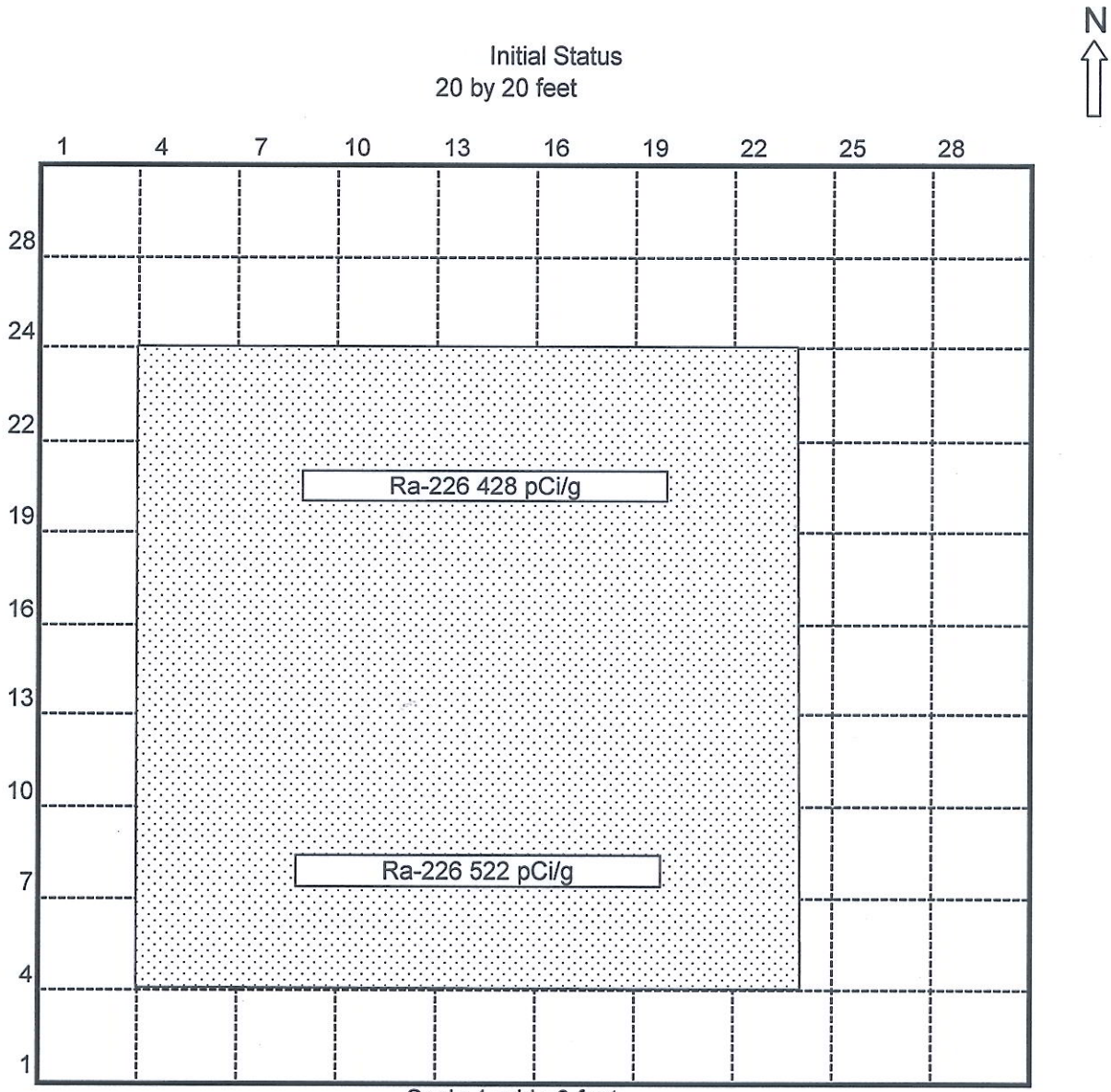
Ludlum 2241-2 SN 259335
Probe 44-2 PR276659
Calibration Due Date 3/10/10
85-399 Eberline Ra-226 Range pCi/g Ra-226
40 to150 μR/hr at surface of area

Impact Location

USA Environment, L.P.
Job# 3292-LA-005

Cactus Pipe and Supply
2159-NR-H033
Houston, TX

Initial Status
20 by 20 feet



Scale 1 grid =3 feet
Remediation Area Location 4

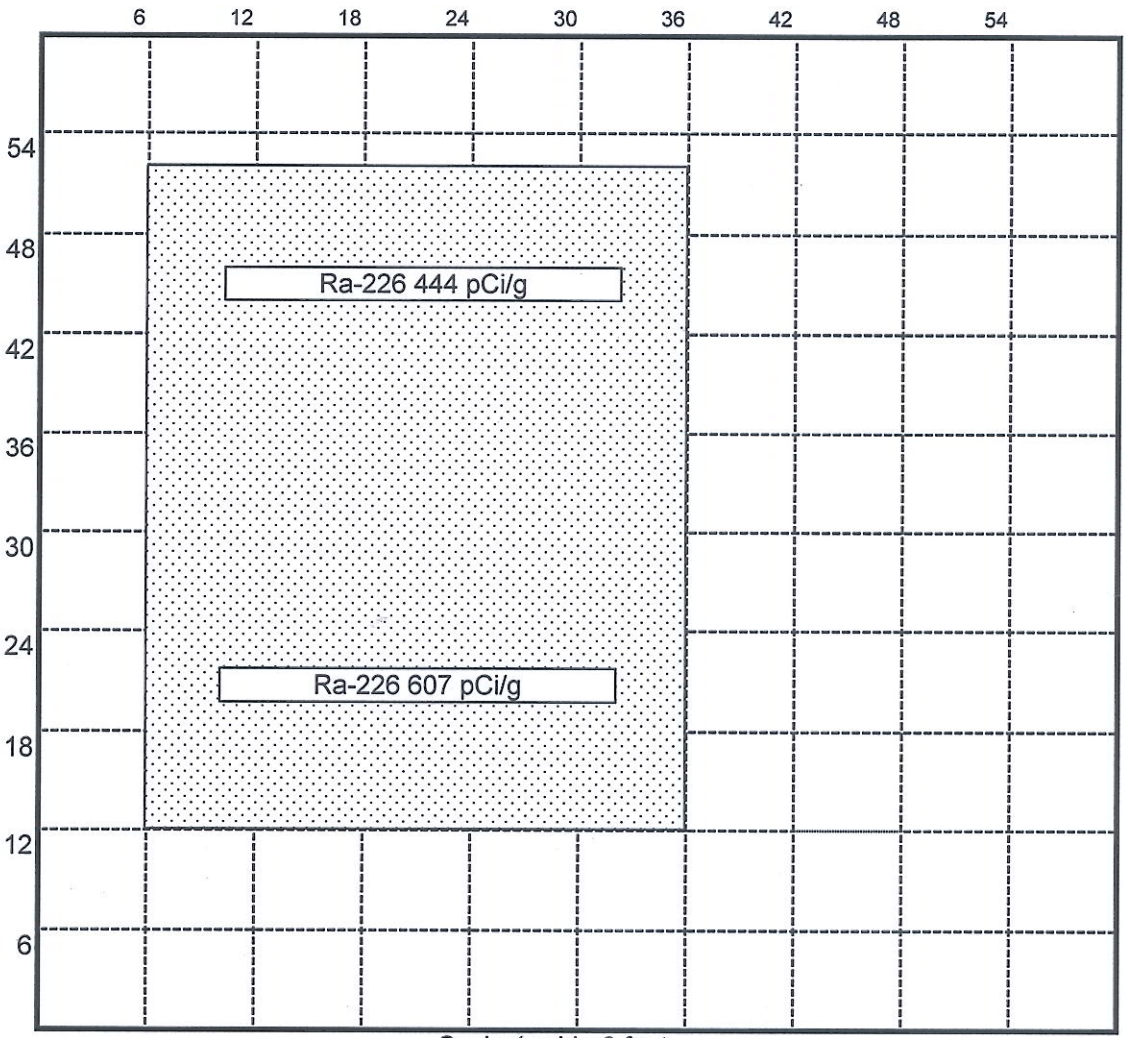
Ludlum 2241-2 SN 259335
Probe 44-2 PR276659
Calibration Due Date 3/10/10
428-522 Eberline Ra-226 Range pCi/g Ra-226
200-250 µR/hr at surface of area

Impact Location

Cactus Pipe and Supply
2159-NR-H033
Houston, TX

Initial Status
30 by 40 feet

N



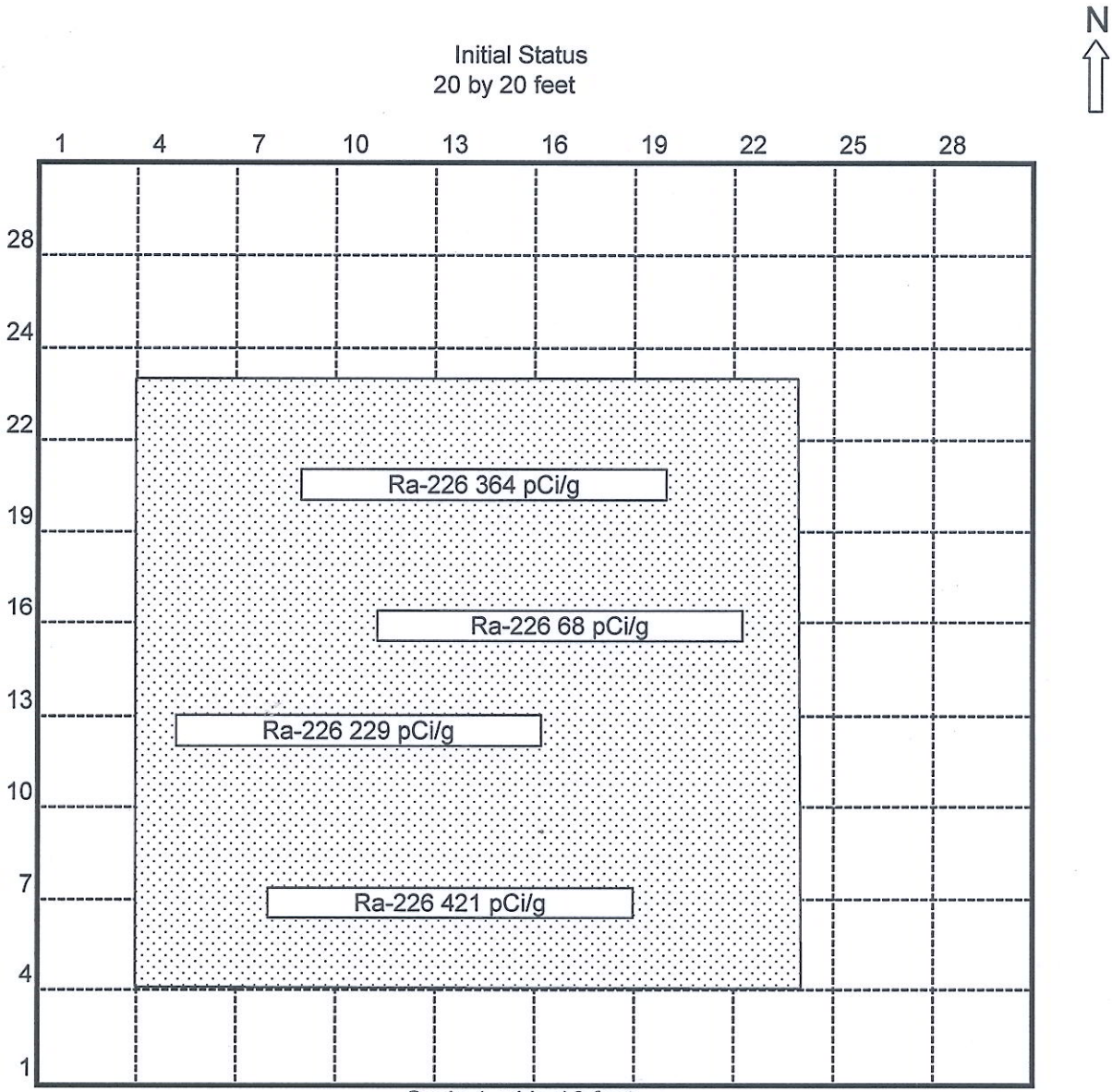
Scale 1 grid =6 feet
Remediation Area Location 5

Ludlum 2241-2 SN 259335
Probe 44-2 PR276659
Calibration Due Date 3/10/10
445-607 Eberline Ra-226 Range pci/g Ra-226
220-300 μR/hr at surface of area

Impact Location

Cactus Pipe and Supply
2159-NR-H033
Houston, TX

Initial Status
20 by 20 feet



Scale 1 grid =13 feet
Remediation Area Location 6

Ludlum 2241-2 SN 259335
Probe 44-2 PR276659
Calibration Due Date 3/10/10
68-421 Eberline Ra-226 Range pci/g Ra-226
30-220 μR/hr at surface of area

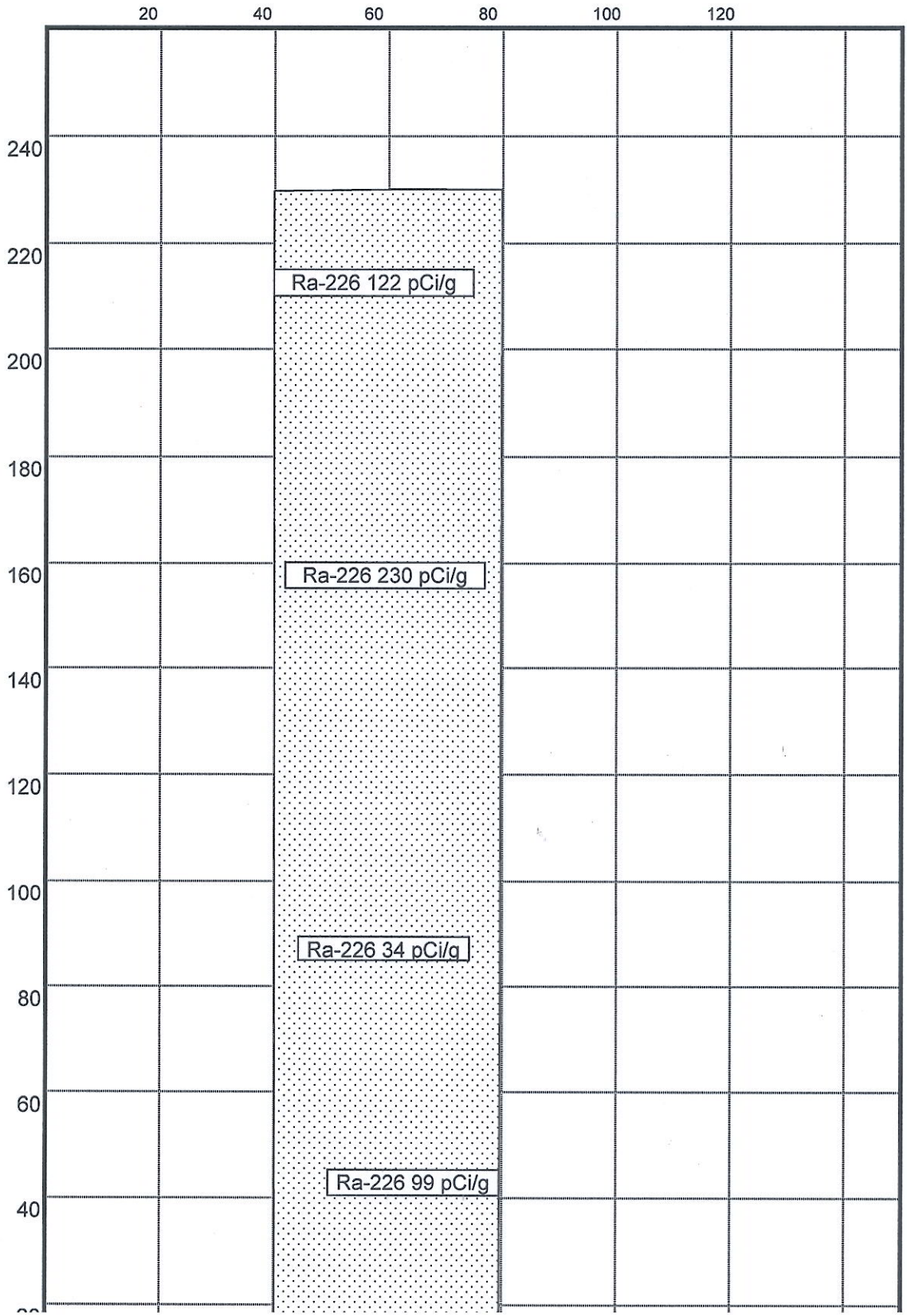
Impact Location

Cactus Pipe and Supply
2159-NR-H033
Houston, TX

Initial Status

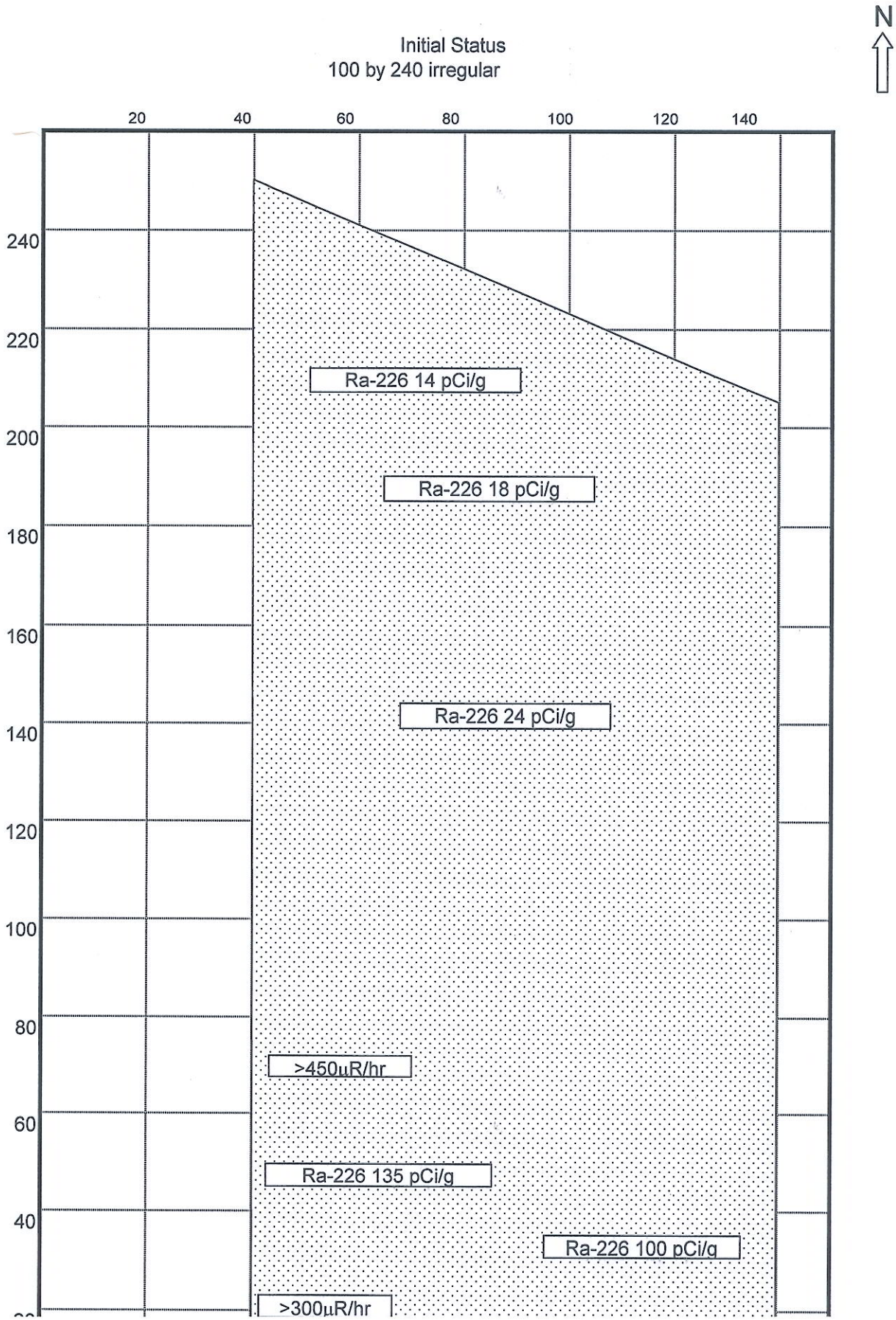
40 by 200

N



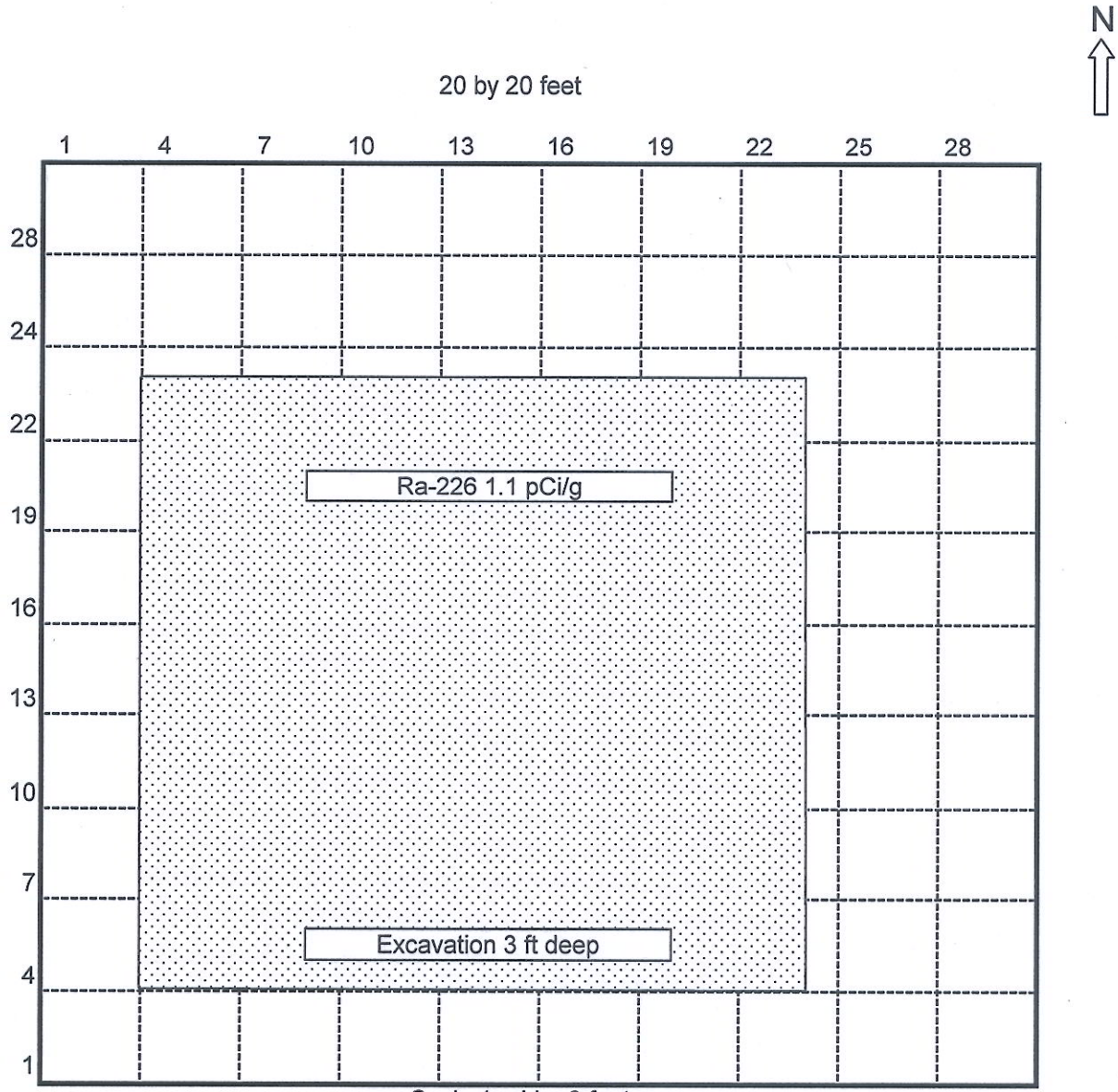
Cactus Pipe and Supply
2159-NR-H033
Houston, TX

Initial Status
100 by 240 irregular



3. Final Status Survey Results by Area

Cactus Pipe and Supply
2159-NR-H033
Houston, TX



Scale 1 grid = 3 feet
Remediation Area Location 1

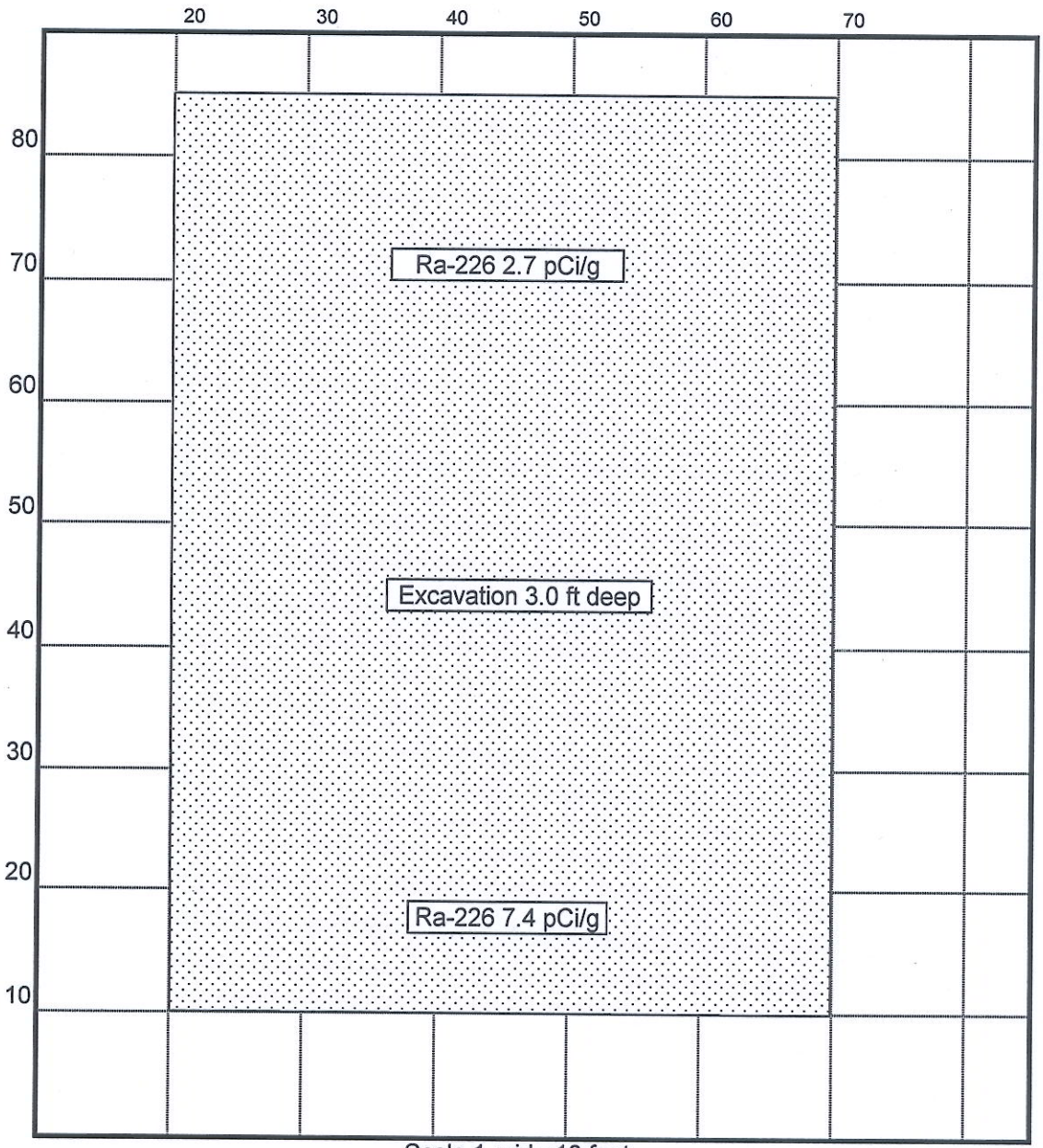
Ludlum 2241-2 SN 259335
Probe 44-2 PR276659
Calibration Due Date 3/10/10

1.1	ARS Ra-226 Result pCi/g
8-14	μR/hr at bottom of excavation

Excavation Location

Cactus Pipe and Supply
2159-NR-H033
Houston, TX
50 by 75 feet

N



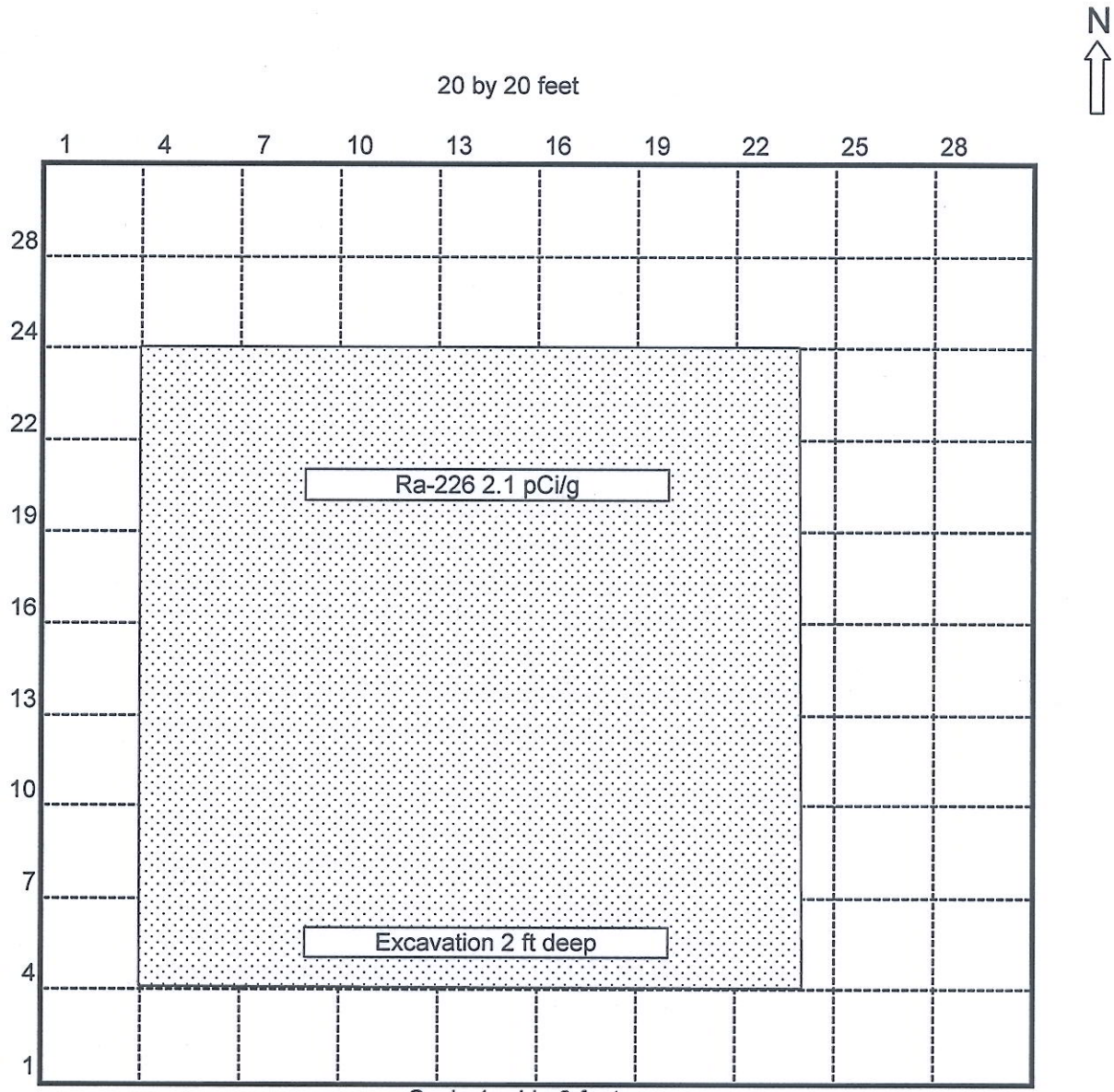
Scale 1 grid =10 feet
Remediation Area Location 2

Ludlum 2241-2 SN 259335
Probe 44-2 PR276659
Calibration Due Date 3/10/10

7.4	ARS Ra-226 Result pCi/g
9-14	µR/hr at bottom of excavation

Excavation Location

Cactus Pipe and Supply
2159-NR-H033
Houston, TX



Scale 1 grid =3 feet
Remediation Area Location 3

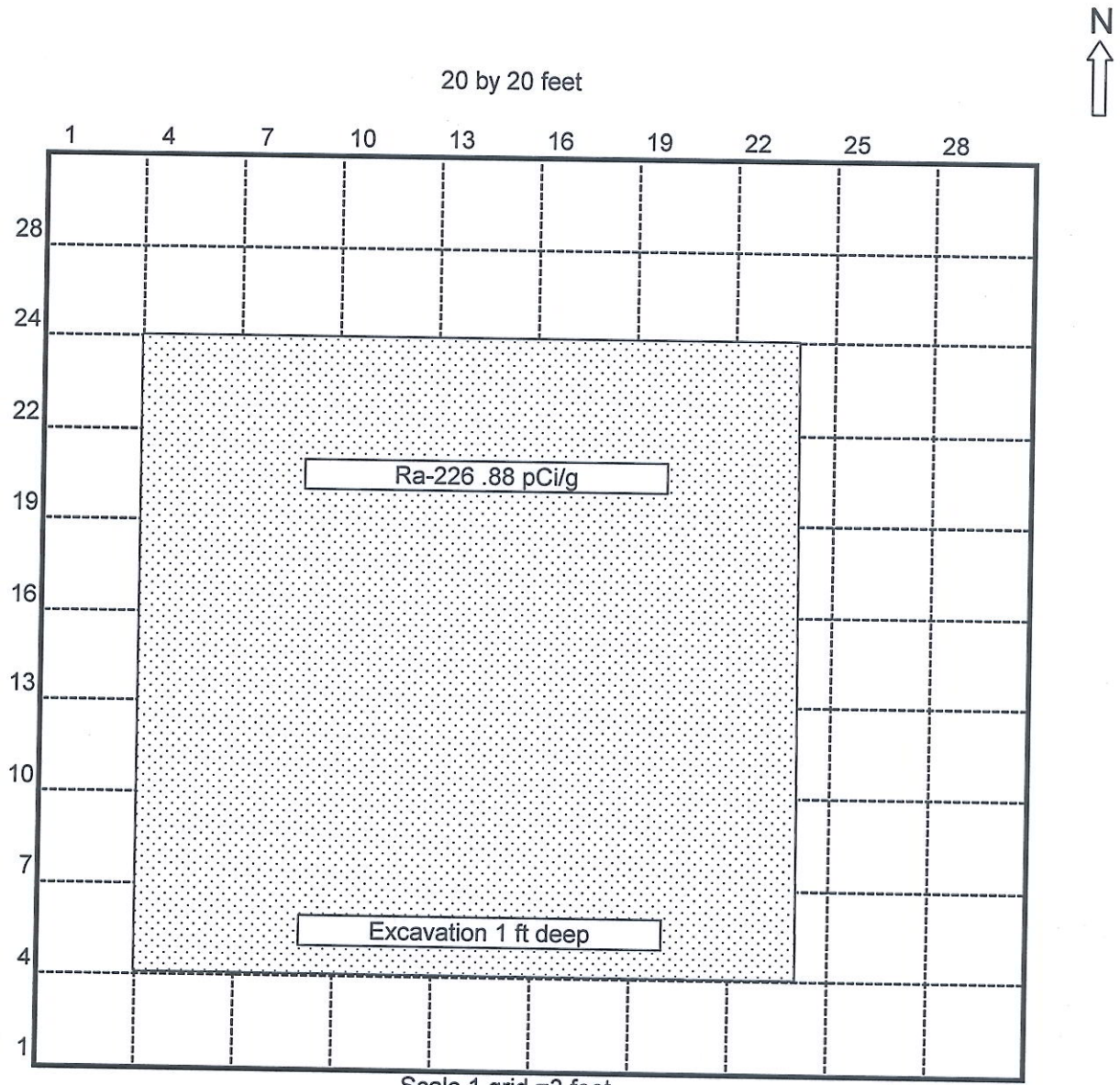
Ludlum 2241-2 SN 259335
Probe 44-2 PR276659
Calibration Due Date 3/10/10

2.1	ARS Ra-226 Result pCi/g
8-14	µR/hr at bottom of excavation

Excavation Location

USA Environment, L.P.
Job# 3292-LA-005

Cactus Pipe and Supply
2159-NR-H033
Houston, TX



Scale 1 grid =3 feet
Remediation Area Location 4

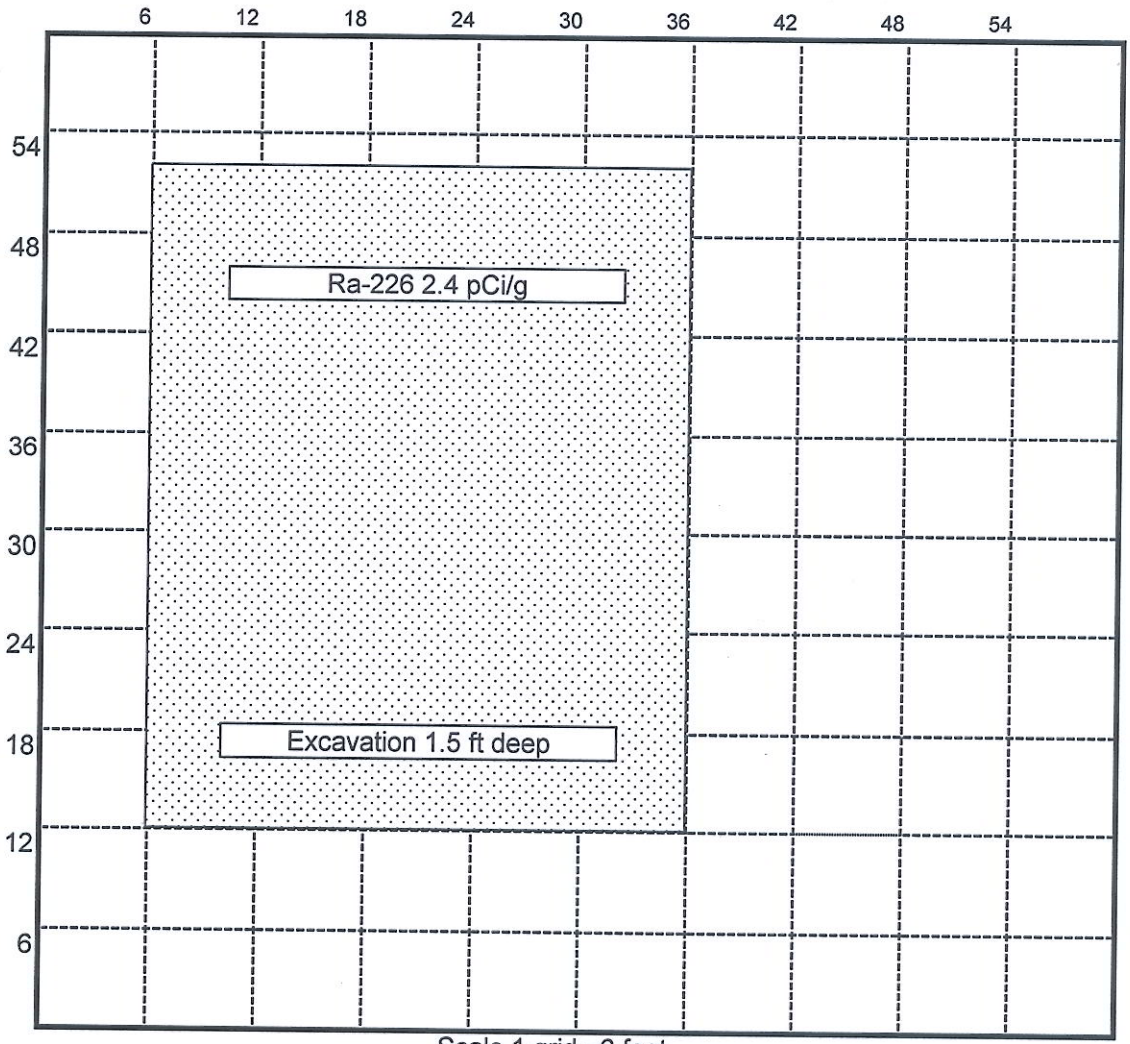
Ludlum 2241-2 SN 259335
Probe 44-2 PR276659
Calibration Due Date 3/10/10
0.88 ARS Ra-226 Result pCi/g
9-14 µR/hr at bottom of excavation

Excavation Location

Cactus Pipe and Supply
2159-NR-H033
Houston, TX

N

30 by 40 feet

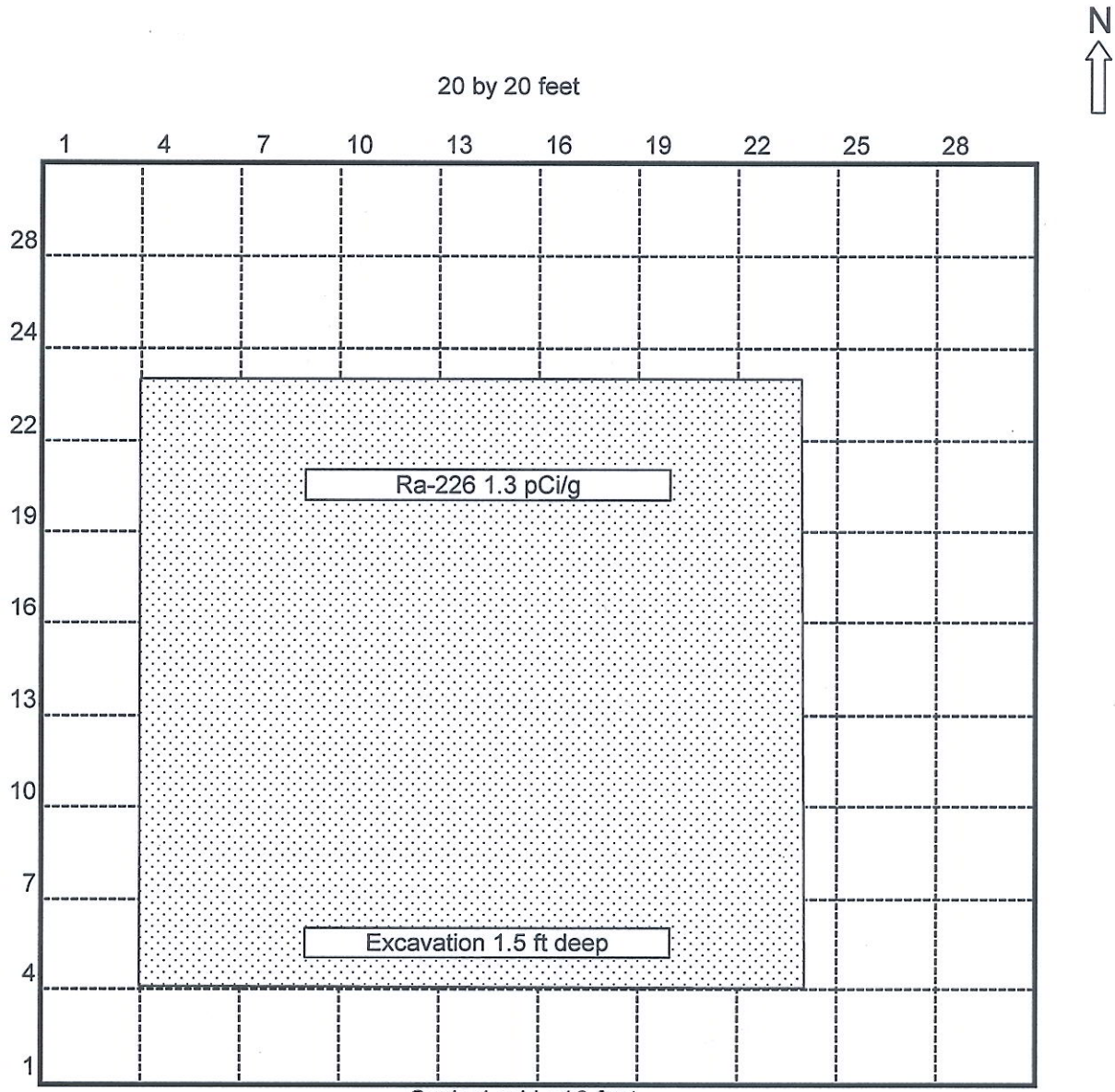


Scale 1 grid =6 feet
Remediation Area Location 5

Ludlum 2241-2 SN 259335
Probe 44-2 PR276659
Calibration Due Date 3/10/10
2.4 ARS Ra-226 Result pCi/g
9-14 µR/hr at bottom of excavation

Excavation Location

Cactus Pipe and Supply
2159-NR-H033
Houston, TX



Scale 1 grid =13 feet
Remediation Area Location 6

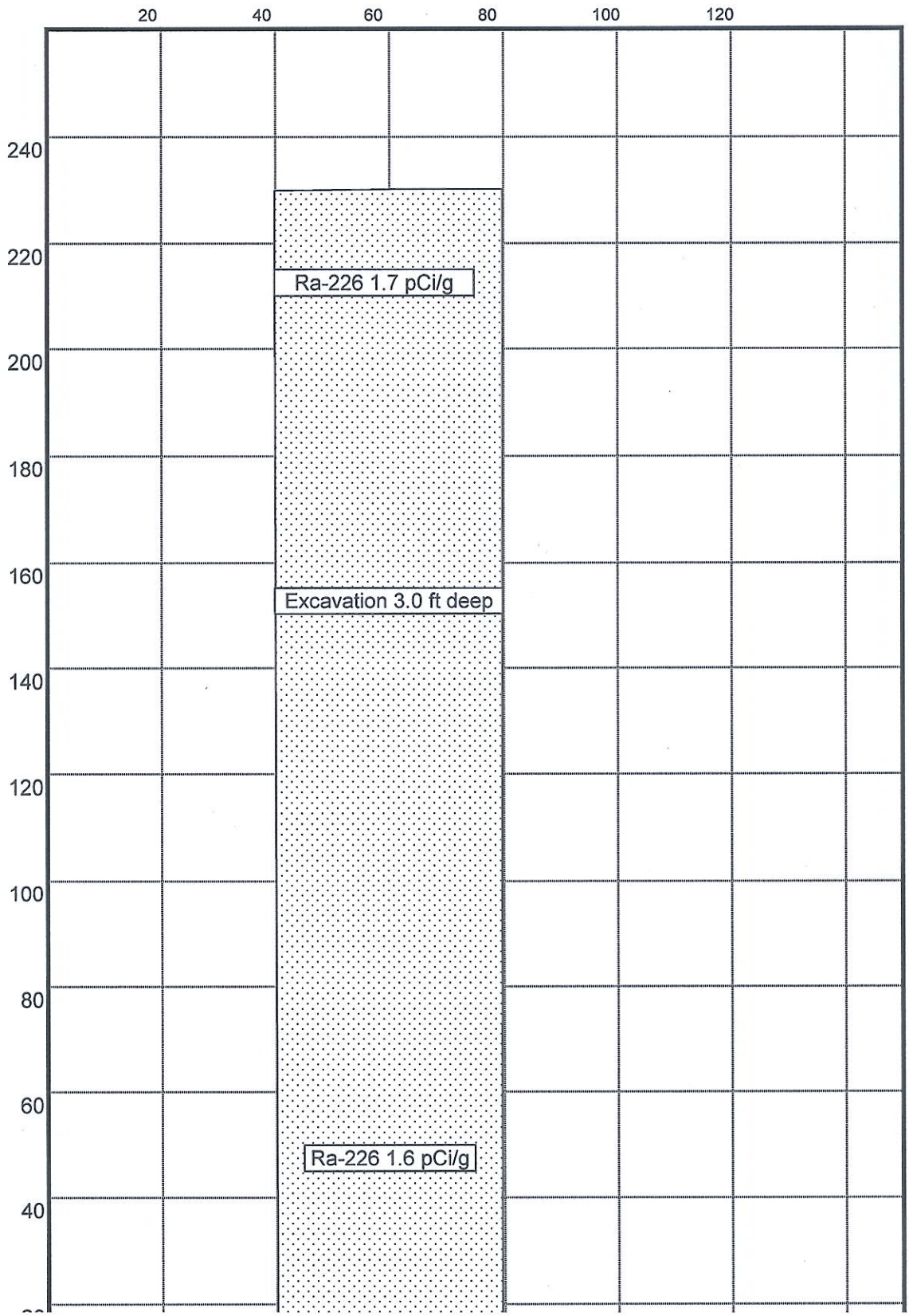
	Ludlum 2241-2	SN 259335
	Probe 44-2	PR276659
	Calibration Due Date 3/10/10	
1.3	ARS Ra-226 Result pCi/g	
9-14	µR/hr at bottom of excavation	

Excavation Location

Cactus Pipe and Supply
2159-NR-H033
Houston, TX

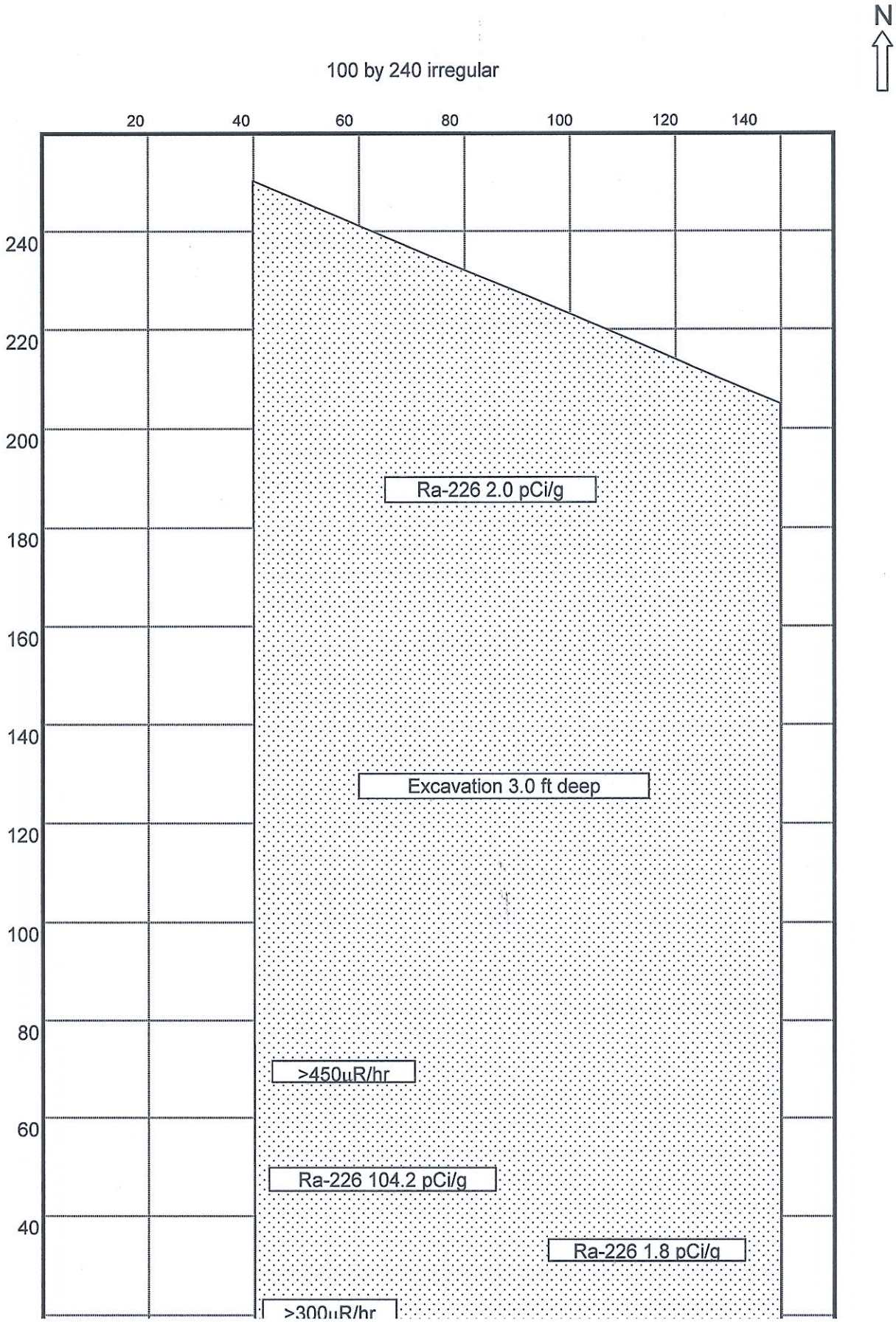
40 by 200

N



Cactus Pipe and Supply
2159-NR-H033
Houston, TX

100 by 240 irregular



4. Data Summary Table

Cactus Pipe and Supply

Area	Initial Ra-226 pCi/g max	Final Ra-226 pCi/g max	Other samples	
1	211.7	1.1	NC	NC
2	284.1	7.4	2.7	NC
3	399.1	2.1	NC	NC
4	521.5	0.88	NC	NC
5	607.1	2.4	NC	NC
6	421.6	1.3	NC	NC
7	230.6	1.7	NC	NC
8	212.5	1.6	NC	NC
9	135.5	104.2	2	1.8

NC indicates no other samples were collected

Area 9 had impacts that went to the property line that were not part of this contract. The high results are from the edge of the area.

5. Instrument Calibration and Performance Check Logs

USA ENVIRONMENT, L.P.

INSTRUMENT QUALITY CONTROL CHECK FORM

METER:	MODEL	2241-2
	S/N	259335
DETECTOR:	MODEL	44-9
	S/N	Pr275902
	UNITS	CPM
DETECTOR:	MODEL	44-2
	S/N	PR276659
	Units	µR/hr

METER CALIBRATION DUE DATE	03/18/10
Detector 1 calibration response	
Detector 2 calibration response	

CHECK SOURCES

RADIONUCLIDE		CS-137
ID		302
18,600	cpm	
635	µR/hr	

DATE of CHECK	Self Test	Detector	BACKGROUND	Units	Source Test	Net Source Check	Lower Limit	Upper Limit	Within Acceptable range Yes	No		Checked By
9-14-09	ok	44-9	37.8	CPM	19,400	19362	14880	22320	✓			[illegible]
9-14-09	✓	44-2	7.0	µR/hr	601	594	508	762	✓			[illegible]
9-15-09	✓	44-9	40.0	CPM	21,602	21562	14880	22320	✓			[illegible]
9-15-09	✓	44-2	7.3	µR/hr	647	639.7	508	762	✓			[illegible]
9-16-09	✓	44-9	37.1	CPM	19686	19,649	14880	22320	✓			[illegible]
9-16-09	✓	44-2	7.00	µR/hr	619	612	508	762	✓			[illegible]
9-17-09	✓	44-9	38.7	CPM	19,600	19561	14880	22320	✓			[illegible]
9-18-09	✓	44-2	7.4	µR/hr	632	624.6	508	762	✓			[illegible]
9-21-09	✓	44-9	37.2	CPM	20817	20780	14880	22320	✓			[illegible]
9-21-09	✓	44-2	7.5	µR/hr	630	622.5	508	762	✓			[illegible]
9-23-09	✓	44-9	40.1	CPM	19940	19539	14880	22320	✓			[illegible]
9-23-09	✓	44-2	7.3	µR/hr	652	644.7	508	762	✓			[illegible]

Data Reviewed by: _____

Data Reviewed by: [illegible]

Sheet 2

INSTRUMENT QUALITY CONTROL CHECK FORM

METER:	MODEL	2241-2	
	S/N	259335	
DETECTOR:	MODEL	44-9	
	S/N	Pr275902	
	UNITS	CPM	
DETECTOR:	MODEL	44-2	
	S/N	PR276659	
	Units	µR/hr	

METER CALIBRATION DUE DATE	03/18/10
Detector 1 calibration response	
Detector 2 calibration response	

CHECK SOURCES

RADIONUCLIDE	CS-137	
ID	302	
18,600	cpm	
635	µR/hr	

DATE of CHECK	Self Test	Detector	BACKGROUND	Units	Source Test	Net Source Check	Lower Limit	Upper Limit	Within Acceptable range Yes	No		Checked By
9-24	✓	44-9	37.8	CPM	19,400	19362	14880	22320	✓			CWB
9.24	✓	44-2	7.0	µR/hr	601	594	508	762	✓			CWB
9.28	✓	44-9	41.7	CPM	21,327	21285	14880	22320	✓			CWB
9.28	✓	44-2	7.5	µR/hr	701	693.5	508	762	✓			CWB
9.29	✓	44-9	39.0	CPM	20,987	20,952	14880	22320	✓			BB
9.29	✓	44-2	7.2	µR/hr	648	640.8	508	762	✓			CWB
10-1	✓	44-9	42.0	CPM	19790	19748	14880	22320	✓			CWB
10-1	✓	44-2	7.4	µR/hr	657	649.6	508	762	✓			CWB
10-2	✓	44-9	39.1	CPM	19128	19089	14880	22320	✓			Bill
10-2	✓	44-2	7.1	µR/hr	697.0	689.9	508	762	✓			CWB
10-5	✓	44-9	7.7	CPM	18737	18698.8	14880	22320	✓			Bill
10-5	✓	44-2	38.2	µR/hr	650	642.3	508	762	✓			CWB

Data Reviewed by:

Data Reviewed by: [signature]

~~[illegible]~~
(Rice Bagwell) [illegible]
– Darba

USA ENVIRONMENT, L.P.

INSTRUMENT QUALITY CONTROL CHECK FORM

METER:	MODEL	2241-2
	S/N	259335
DETECTOR:	MODEL	44-9
	S/N	Pr275902
	UNITS	CPM
DETECTOR:	MODEL	44-2
	S/N	PR276659
	Units	µR/hr

METER CALIBRATION DUE DATE	03/18/10
Detector 1 calibration response	
Detector 2 calibration response	

CHECK SOURCES

RADIONUCLIDE		CS-137
ID		302
18,600	cpm	
635	µR/hr	

DATE of CHECK	Self Test	Detector	BACKGROUND	Units	Source Test	Net Source Check	Lower Limit	Upper Limit	Within Acceptable range Yes	No		Checked By
10-6	✓	44-9	37.8	CPM	19410	19372	14880	22320	✓			Bee
10-6	✓	44-2	7.2	µR/hr	648.0	640.8	508	762	✓			CWB
10-7	✓	44-9	37.2	CPM	20817	20780	14880	22320	✓			[illegible]
10-7	✓	44-2	7.4	µR/hr	632	624.6	508	762	✓			CWB
10-8	✓	44-9	400	CPM	19940	19540	14880	22320	✓			Bell
10-8	✓	44-2	7.0	µR/hr	648	641	508	762	✓			Bell
10-9	✓	44-9	39	CPM	19139	19100	14880	22320	✓			Bee
10-9	✓	44-2	7.7	µR/hr	[illegible]	642.3	508	762	✓			CWB
10-12	✓	44-9	38.7	CPM	19638	19593	14880	22320	✓			CWB
10-12	✓	44-2	7.1	µR/hr	638	630.9	508	762				CWB
10-13	✓	44-9	40	CPM	19790	19750	14880	22320				CWB
10-13	✓	44-2	7.0	µR/hr	652	645	508	762				CWB

Data Reviewed by: CWB

Data Reviewed by: [signature]

USA ENVIRONMENT, L.P.

INSTRUMENT QUALITY CONTROL CHECK FORM

METER:	MODEL	2241-2
	S/N	259335
DETECTOR:	MODEL	44-9
	S/N	Pr275902
	UNITS	CPM
DETECTOR:	MODEL	44-2
	S/N	PR276659
	Units	µR/hr

METER CALIBRATION DUE DATE	03/18/10
Detector 1 calibration response	
Detector 2 calibration response	

CHECK SOURCES

RADIONUCLIDE		CS-137
ID		302
18,600	cpm	
635	µR/hr	

DATE of CHECK	Self Test	Detector	BACKGROUND	Units	Source Test	Net Source Check	Lower Limit	Upper Limit	Within Acceptable range Yes	No		Checked By
10-14-09	ok	44-9	37.1	CPM	21107	21070	14880	22320	✓			[illegible]
10-14	ok	44-2	7.2	µR/hr	687.	679.8	508	762	✓			[illegible]
10-15	ok	44-9	38.0	CPM	22105	22067	14880	22320	✓			[illegible]
10-15	✓	44-2	7.5	µR/hr	701	639.5	508	762	✓			[illegible]
10-16	ok	44-9	39.2	CPM	22008		14880	22320	✓			[illegible]
10-16	✓	44-2	7.1	µR/hr	659		508	762	✓			[illegible]
10-19	✓	44-9	36.4	CPM	19870		14880	22320	✓			[illegible]
10-19	✓	44-2	7.6	µR/hr	672		508	762	✓			[illegible]
10-20	ok	44-9	37.8	CPM	20760		14880	22320	✓			[illegible]
10-20	✓	44-2	7.5	µR/hr	654		508	762	✓			[illegible]
10-21	ok	44-9	36.5	CPM	21,030		14880	22320	✓			[illegible]
10-21	✓	44-2	7.3	µR/hr	682		508	762	✓			[illegible]

Data Reviewed by:

Data Reviewed by: [illegible]

Designer and Manufacturer
of
Scientific and Industrial
Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Detector

Detector 44-2 Serial No. PR 276659

Customer USA ENVIRONMENT INC

Order #. 20129789

Counter 2241-2 Serial No. 259335

Counter Input Sensitivity 35 mV

Count Time 6 seconds

Distance Source to Detector Surface

Other

High Voltage	Background	Isotope Am241 Size ≈0.9 μCi	Isotope Size	Isotope Size	Isotope Size
600	90	6986			
650	91	8311			
700	84	8500			
750	82	8639			
800	105	8607			
850	118	8576			
900	171	9205			
950	514	13405			

Signature Lemon Ortega

Date 18-Mar-09

FORM C4A 04/09/2003

• Serving The Nuclear Industry Since 1962 •

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER USA ENVIRONMENT INC ORDER NO. 20129789

Mfg. Ludlum Measurements, Inc. Model 2241-2 Serial No. 259335

Mfg. Ludlum Measurements, Inc. Model 44-2 Serial No. PR 296059

Cal. Date 18-Mar-09 Cal Due Date 18-Mar-10 Cal. Interval 1 Year Meterface 44-2

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 77 °F RH 26 % Alt 702.8 mm Hg

☑ New Instrument Instrument Received ☐ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☐ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation
☑ Audio ck. ☑ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC
☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☑ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set See below V Input Sens. See below mV Det. Oper. See below V at See below mV Threshold Dial Ratio = mV

	Det. (1) cpm	Det. (2) R/hr
Deadtime correction:	73 µSec	9 µSec
Calibration constant:	100c-2	109 ct8
Ratemeter alarm setting:	50.0 Kcpm	50 µR/hr
Ratemeter alert setting:	20.0 Kcpm	20 µR/hr
High voltage setting:	900 V	800 V
Millivoltage setting:	35 mV	35 mV
Probe model number:	44-9	44-2
Color:	Red	Yellow

Overload set at 1 R/hr w/44-9 and Det. (1)

Cs137 check source s/n 802 ≈ 1µCi reads as follows:
≈ 18.6 k cpm w/protective screen of 44-9 placed against check source holder w/holder door open and 2241-2 set to Det. (1) and ratemeter position.
≈ 685 µR/hr w/detector end (crystal end) of 44-2 probe placed against check source holder w/holder door open and 2241-2 set to Det. (2) and ratemeter position.

Firmware Version: P.09-10

"INSTRUMENT METER READING" reflect Det. (2) 44-2

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
Dig.rate	50 mR/hr		49.1 µR/hr
Dig.rate	20 mR/hr		20.0 mR/hr
	15 mR/hr		14.9 µR/hr
	10mR/hr		9.75 mR/hr
	4mR/hr		3.84 mR/hr
	2mR/hr		1.96 mR/hr
	1mR/hr		1.06 µR/hr
	500µR/hr		521 µR/hr
	200µR/hr		212 µR/hr 104 µR/hr

*Uncertainty within ± 10% C.F. within ± 20% 103 µR/hr Range(s) Calibrated Electronically

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*		REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Ratemeter Readout	800K cpm		799 kcpm	Scaler Readout	800K cpm		79918 (0)
	200K cpm		199 kcpm		200K cpm		19971 (0)
	80K cpm		79.9 kcpm		80K cpm		7991 (0)
	20K cpm		19.9 kcpm		20K cpm		1997 (0)
	8K cpm		7.99 kcpm		8K cpm		799 (0)
	2K cpm		1.99 kcpm		2K cpm		199 (0)
	800 cpm		800 cpm		800 cpm		80 (0)
	200 cpm		199 cpm		200 cpm		20 (0)

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: ☐ S-394/1122 ☐ 1131 ☐ 781 ☐ 059 ☐ 280 ☐ 60646

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☑ 720 ☑ 734 ☑ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ☐ Beta S/N ☑ Other Am241-0.87µCi

☑ m 500 S/N 38120 ☐ Oscilloscope S/N ☑ Multimeter S/N 84260131

Calibrated By: [signature] Date 18-Mar-09

Reviewed By: Diana DiSara Date 18 Mar 09

FORM C22E-ERK 10/15/2008

This certificate shall not be reproduced except in full, without the written approval of Ludlum Measurements, Inc.

Designer and Manufacturer
of
Scientific and Industrial
Instruments

LUDLUM MEASUREMENTS, INC.
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CONVERSION CHART

Customer USA ENVIRONMENT INC Date 18-Mar-09 Order #. 20129789

Model 2241-2 Serial No. 259335 Detector Model 44-9 Serial No. PR 275902

Source Cs-137 42.4 mCi High Voltage 900 V

Count time Ratemeter Input Sensitivity 35 mV

Reference Point	"As Found" Readings (CPM): with Deadtime	"As Found" Readings (CPM): w/o Deadtime	After Adjustment Readings (CPM): with Deadtime	After Adjustment Readings (CPM): w/o Deadtime
150 mR/hr			495 k	NA
50 mR/hr			159 k	
15 mR/hr			51.7 k	
5 mR/hr			17.3 k	
1.5 mR/hr			4.91 k	
1.0 mR/hr			3.41 k	

Signature: [signature] Date 18-Mar-09

FORM C17-1C 04/09/2003