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DLA Strategic Materials-ME

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U.S. Nuclear Regulatory Commission
Region 1, Nuclear Materials Safety Branch
Division of Nuclear Materials Safety
ATTN: Mr. Dennis Lawyer
475 Allendale Road
King of Prussia, PA 19406-1415

Re: License STC-133

SUBJECT: Investigation Radiological Survey and Sampling Results in Response To Request for Additional Information Concerning Application for Amendment to License STC-133 Dated March 3, 2010, Control No. 143447

04000341

Dear Mr. Lawyer:

In response to the subject request for additional information, Cabrera Services, Inc., on behalf of the Defense Logistics Agency, DLA Strategic Materials (formerly Defense National Stockpile Center) performed follow-up radiation surveys and sampling to investigate and resolve the areas of concern identified in the Oak Ridge Institute for Science and Education *Final Report - Confirmatory Survey of the Defense Logistics Agency, Defense National Stockpile Center New Haven Depot, New Haven, Indiana*, dated February 19, 2010. The follow-up Cabrera surveys and sampling were performed July 19 through July 27, 2010 in accordance with the planned activities stated in my letter of April 6, 2010.

The general approach, applicable requirements and release criteria were consistent with the *Final Status Survey Plan, New Haven Depot,* dated January 2008. The areas in question and the follow-up surveys and sampling results are detailed in the attachment to this letter. In summary, the attached survey and sampling results obtained demonstrate each of the areas in question meets the radiological criteria for unrestricted release of the New Haven Depot. We request your review and concurrence.

Should you have any questions or need additional information, please do not hesitate to contact Mike Lambert, of Cabrera Services, at (724) 980-2762.

Sincerely,

Michael J. Peculian
Radiation Safety Officer

Attachment

143447

NMSS/RGN1 MATERIALS-002

FOLLOW UP INVESTIGATION RADIATION SURVEYS AND SAMPLING RESULTS

NEW HAVEN DEPOT

DEFENSE NATIONAL STOCKPILE CENTER

NEW HAVEN, INDIANA

APPROVALS

Approval: _____ Date: 10/8/10

Mike Lambert, CHP
Principal Scientist

Approval: _____ Date: 10/8/10

John Eberlin, PMP
Project Manager
Cabrera Services, Inc.

Follow-Up Investigation Radiation Surveys and Sampling Results

In response to concerns identified in the *Independent Confirmatory Survey Report For the Confirmatory Survey of the Defense Logistics Agency Strategic Materials (formerly Defense National Stockpile Center) New Haven Depot New Haven, Indiana*, February, 2010, hereafter referred to as the Confirmatory Survey Report, prepared by the Oak Ridge Institute for Science and Education (ORISE), follow-up investigation surveys and soil sampling were performed July 19 through July 27, 2010. These activities were completed in accordance with the planned investigation specified in the April, 2010 letter from M. Pecullan, Radiation Safety Officer, to the U.S. Nuclear Regulatory Commission. The areas of concern identified in the Confirmatory Survey Report, investigation surveys and sampling performed, and conclusions are provided in the following sections.

I. Confirmatory Survey Report Areas of Concern

The Confirmatory Survey Report identified five areas of concern. These include:

1. Survey Unit (SU) 9; Class 1 Soil at Rail Scale
2. SU 210-2-3; Class 1 Floor in Building 210, Section 2
3. SU 210-2-F; Class 3 Floor in Building 210, Section 2
4. SU 145-F; Class 3 Outdoor Concrete Slab
5. SU 8; Class 2 Concrete Rail Scale

A summary of the confirmatory survey results and concern for each of the five areas is provided below.

1. SU 9

SU 9 is the Class 1 soil area surrounding the rail scale with an area of 241 square meters (m^2). The Confirmatory Survey Report indicates elevated U-238 concentration in soil was discovered in a biased (Judgmental) sample in excess of the area adjusted Derived Concentration Guideline Level ($DCGL_{EMC}$) when evaluated over 4 square meters (m^2). This Judgmental sample was collected on the north side of the rail scale.

2. SU 210-2-3

SU 210-2-3 is the Class 1 floor surface north of the location where the concrete slab was removed in Warehouse 210, Section 2 (SU 210-2-6). This Survey Unit has a surface area of 111 m^2. Although all but two of the six alpha surface activity measurements performed during the Confirmatory Survey were less than the Derived Concentration Guideline Level ($DCGL_W$) of 38 disintegrations per minute per 100 square centimeters (dpm/100 cm^2), and the two elevated surface activity results were less than the applied $DCGL_{EMC}$, the Confirmatory Survey Report indicates that elevated beta radioactivity was found at the location of a borehole in this Survey Unit. This is identified as Location 7 on the survey map in the Confirmatory Survey Report which is an additional Judgmental measurement location.

3. SU 210-2-F

SU 210-2-F in the Confirmatory Survey Report is the remaining Class 3 floor surface in Building 210, Section 2 outside the area of concrete remediation and the bounding Class 1 Survey Units (SU 210-2-1, 210-2-2 and 210-2-3). The Confirmatory Survey Report states the floor area associated with SU 210-2-F was incorrectly designated Class 3 based on one of six surface alpha radioactivity measurement results with a reported activity of 39 dpm/100 cm^2 when compared to the $DCGL_W$ of 38 dpm/100 cm^2.

4. SU 145-F

SU 145-F is the Class 3 outdoor concrete slab, where a structure once stood, with an area of 323 m^2. The Confirmatory Survey Report indicates that four of the six surface activity measurement results were greater than the $DCGL_W$ of 100 dpm/100 cm^2, with the conclusion that this Survey Unit was incorrectly designated as Class 3.

5. SU 8

SU 8 is the concrete rail scale, a Class 2 Survey Unit, with an area of 276 m^2. Although five of the six surface activity measurements obtained during the Confirmatory Survey were below the $DCGL_W$ of 100 dpm/100 cm^2, the Report states that elevated alpha surface activity in excess of the $DCGL_W$ was found on a crack in the concrete, resulting in incorrect designation of the Survey Unit as Class 2.

II. Follow-Up Surveys and Sampling to Address the Confirmatory Survey Report Areas of Concern

1. General Requirements

The following requirements applied to all investigation survey and sampling activities conducted.

A. Methods and Criteria

The general approach, applicable requirements, survey and sampling protocols, and release criteria (DCGL's) for follow-up investigation radiological surveys and sampling were consistent with the *Final Status Survey Plan, New Haven Depot dated January 2008.*

Follow-Up Investigation Radiation Surveys and Sampling Results

B. Survey Instrumentation

Survey detectors specified were similar to those used in the Final Status Survey and, for key measurements such as direct surface activity measurements, were the same used by ORISE during the Confirmatory Survey.

i. Structure Surfaces (Concrete)

Alpha surface activity scans over large areas were performed using a Ludlum Model 43-37 gas proportional detector with an active area of 542 cm^2. For smaller areas, alpha surface scans were performed using a Ludlum Model 43-37 or Model 43-68 gas proportional detector with an active area of 126 cm^2. Detectors were coupled to a Ludlum Model 2360 survey meter (ratemeter/scaler/data logger).

All direct surface activity measurements (systematic and biased) were performed using a Ludlum Model 43-68 detector coupled to a Ludlum Model 2360 survey meter.

Smears for the determination of loose surface activity were analyzed using a Ludlum Model 2929 scaler coupled to a Ludlum Model 43-10-1 zinc sulfide (ZnS) scintillation detector.

ii. Outdoor/Land Areas

Gamma walkover surveys (GWS) of land areas were performed with a Field Instrument for the Detection of Low Energy Radiation (FIDLER) coupled to a Ludlum Model 2221 survey meter. A Trimble Pro XRS global positioning system (GPS) was used to facilitate locating areas of elevated soil concentrations identified in the Confirmatory Survey Report.

C. Soil Sample Analysis

Soil samples collected during the investigation were submitted to an off-site laboratory (ALS Environmental) for analysis. All samples were analyzed for the radiological contaminants of concern (RCOC's), specifically thorium-232 (Th-232) and uranium-238 (U-238). RCOC background concentrations applied in the evaluation of soil samples are provided in Table 1.

Table 1: Soil RCOC Background Concentrations (pCi/g)

Radionuclide	Mean	Standard Deviation (SD)
Th-232	1.11	0.15
U-238	1.24	0.14

D. Portable Survey Instrument Efficiency Determination

Instrument efficiencies for direct alpha surface activity measurements were determined in accordance with ISO-7503-1, *Evaluation of surface contamination - Part 1: Beta-emitters (maximum beta energy greater than 0.15 MeV) and alpha-emitters.* Specifically, for alpha surface activity measurements, the total efficiency was determined by multiplying the 2 pi instrument efficiency by a source efficiency factor of 0.25. The 2 pi instrument efficiencies for the 2 Ludlum Model 43-68 detectors were 0.398 and 0.401. The total efficiencies for the 2 detectors considering the source efficiency factor were 0.0996 and 0.1003 (both rounded to 0.1). This compares very favorably with the ORISE alpha 2 pi instrument efficiencies of 0.40 to 0.42 and 0.1 total efficiency presented in the Confirmatory Survey Report using the same detectors and calibration source radionuclide.

E. Instrumentation Quality Control

Quality control (QC) parameters were established for each portable survey instrument (detector and meter combination) and the smear counter prior to first use during the investigation surveys. A QC measurement was performed daily prior to use. Only instrumentation that successfully passed the QC measurement could be used for performance of surveys or smear analyses. In addition to pre-use QC measurement, each portable survey instrument used to perform direct surface activity measurements were required to successfully pass a post use QC measurement at the end of each day or following use if less than a day. This provided continued assurance of the validity of the data collected each day.

F. Material Specific Background and Other Measurement Interference

All surfaces of interest during the investigation surveys were concrete. Prior to performance of surface activity measurements, each concrete surface to be surveyed was inspected visually. Concrete surfaces similar in appearance (age and condition) and known to be free of surface contamination were then identified for collection of material specific background count rates. This was performed for indoor and outdoor concrete surfaces. The selection of these locations was based solely on appearance and how closely the surface matched the concrete surfaces to be surveyed. A minimum of 5 material specific background measurements were then collected for each detector and survey meter combination to be used for the investigation surveys. The average of the measurements was then used to correct the investigation survey results for material background.

Radon and radon decay products can significantly influence surface activity alpha measurements. This is true for both indoor and outdoor measurements. To minimize this impact, outdoor measurements were typically performed no earlier than mid-morning and enclosed structures were opened (doorways on both sides of the structure opened to allow significant natural air circulation) for a minimum of several hours prior to performance of indoor surface activity measurements.

Follow-Up Investigation Radiation Surveys and Sampling Results

To evaluate the impact of possible daily variations in radon concentration and surface alpha activity due to radon, a background measurement was performed at the beginning of each work day for the material types or locations to be surveyed. If the background measurement was greater than or less than the material specific background plus 1 standard deviation of the background, a new material specific background was generated in the same manner as the initial. This value was then applied when evaluating survey results.

Finally, prior to performance of surface alpha activity measurements, each surface was inspected (daily as necessary) to verify the surface was dry and free of debris that could interfere with survey performance.

The minimum detectable concentrations (MDC) for each portable survey instrument (meter and detector combination) used for direct alpha surface activity measurements are provided in Table 2.

Table 2: Direct Surface Activity Minimum Detectable Concentration (dpm/100 cm^2)

Survey Meter and 43-68 Detector ID	Indoor Concrete (SU 210-2-3 and 210-2-F)	Outdoor Concrete (SU 145)	Outdoor Concrete (SU 8)	Outdoor Concrete (SU 8)
185779/PR190299	23.4[2]	54.4[3]	41.2[3]	47.5[3,4]
168043/PR190296[1]	20.2[2]	N/A	N/A	N/A

1. Designated as backup survey meter/detector – not used.
2. Background count time 20 minutes; sample count time 12 minutes.
3. Background count time 20 minutes; sample count time 5 minutes.
4. New material background established as a result of pre-survey background check and applied on the day of survey performance.

2. Investigation Survey and Sampling Results

A. SU 9

A GWS was initially performed to determine if the location of ORISE Judgmental S026 could be identified using the GPS coordinates provided in Table B-2 of the Confirmatory Survey Report. The GWS did not identify an area of elevated activity associated with the area of concern, therefore a series of soil samples were obtained. A single soil sample was obtained at the primary coordinate location; 4 soil samples were obtained at a distance of ½ meter from the primary location (each compass direction); and 4 soil samples were collected at a distance of 1 meter from the primary location (each compass direction). Additionally, a split soil sample was collected with the U.S. Nuclear Regulatory Commission (NRC) which is identified as SU9-NRC-1. The locations of the 9 investigation soil samples collected are shown in Figure 1 and the analytical results are provided in Table 3 which also includes the results for the NRC split soil sample.

Follow-Up Investigation Radiation Surveys and Sampling Results

Table 3: Survey Unit 9 (Class 1 Soil at Rail Scale)

General Information

Radionuclide	Background Concentration (pCi/g)	$DCGL_W$ (pCi/g)
Th-232	1.11	2.5
U-238	1.24	2.3

Soil Sample Results

Sample Identification	Th-232 Sample Concentration (pCi/g)	U-238 Sample Concentration (pCi/g)	Th-232 Net Concentration (pCi/g)	U-238 Net Concentration (pCi/g)
SU9-SS-01	0.16	1.24	-0.95	0.00
SU9-SS-02-HMN	0.16	0.45	-0.95	-0.79
SU9-SS-03-1MN	0.18	0.37	-0.93	-0.87
SU9-SS-04-HME	0.25	1.25	-0.86	0.01
SU9-SS-05-1ME	0.17	1.43	-0.94	0.19
SU9-SS-06-HMS	0.22	0.38	-0.89	-0.86
SU9-SS-07-1MS	0.08	0.41	-1.03	-0.83
SU9-SS-08-HMW	0.12	1.22	-0.99	-0.02
SU9-SS-09-1MW	0.06	0.67	-1.05	-0.57
SU9-NRC-1	0.08	1.01	-1.03	-0.23

HM = Half Meter; 1M = 1 Meter; N = North; E = East; S = South; W = West

As shown in Table 3 none of the analytical results are in excess of the $DCGL_W$.

B. SU 210-2-3

To investigate ORISE Confirmatory Survey Location 7, the concrete floor surface around the borehole location was removed and a sample obtained from the underlying soil. Additionally, surface alpha activity measurements were performed adjacent to the location of removed concrete. The soil analytical results are provided in Table 4 and the surface alpha activity measurement results are provided in Table 5. The locations of the removed concrete and surface activity measurements are provided in Figure 2.

Follow-Up Investigation Radiation Surveys and Sampling Results

Table 4: Survey Unit 210-2-3 Borehole Soil (Class 1 Floor in Building 210, Section 2)

General Information

Radionuclide	Background Concentration (pCi/g)	$DCGL_W$ (pCi/g)
Th-232	1.11	2.5
U-238	1.24	2.3

Soil Sample Results

Sample Identification	Th-232 Sample Concentration (pCi/g)	U-238 Sample Concentration (pCi/g)	Th-232 Net Concentration (pCi/g)	U-238 Net Concentration (pCi/g)
SU210-2-3-BH	0.77	3.00	-0.34	1.76

Table 5: Survey Unit 210-2-3 Borehole Surface Activity (Class 1 Floor in Building 210, Section 2)

General Information

Detector Type and Area (cm^2)	Alpha Total Efficiency	Sample Count Time (minutes)	Background Count Time (minutes)	$DCGL_W$ (dpm/100 cm^2)
43-68/126 cm^2	0.0996	12.0	10.0	38

Direct Surface Activity Measurement Results

Sample Identification	Background Alpha Count Rate (cpm)	Sample Alpha Count Rate (cpm)	Surface Alpha Activity (dpm/100 cm^2)
SU210-2-3 Borehole Location 1	3.6	4.0	2.9
SU210-2-3 Borehole Location 2	3.6	7.2	28.1
SU210-2-3 Borehole Location 3	3.6	3.3	-3.1

cpm = counts per minute

As shown in Table 4, the analytical results for the soil directly below the concrete floor borehole location do not identify RCOC concentrations in excess of the $DCGL_W$. Surface alpha activity results presented in Table 5 do not identify locations in excess of the surface activity $DCGL_W$.

C. SU 210-2-F

To investigate ORISE Confirmatory Survey Location 6 in SU 210-2-F an alpha surface activity scan was performed covering the area identified by the building coordinates noted in Confirmatory Survey Report Table B-3. The alpha surface activity scan did not identify areas of elevated surface activity. A single direct surface alpha activity measurement was performed at the primary location associated with the building coordinates provided and 4 additional direct surface alpha activity measurements were performed at a distance of 1 meter in each of the 4 compass directions from the primary location. The locations of surface activity measurements are provided in Figure 3 and the survey results are provided in Table 6.

Table 6: Survey Unit 210-2-F (Class 3 Floor in Building 210, Section 2)

General Information

Detector Type and Area (cm^2)	Alpha Total Efficiency	Sample Count Time (minutes)	Background Count Time (minutes)	$DCGL_W$ (dpm/100 cm^2)
43-68/126 cm^2	0.0996	12.0	10.0	38

Biased Direct Surface Activity Measurement Results

Sample Identification	Background Alpha Count Rate (cpm)	Sample Alpha Count Rate (cpm)	Surface Alpha Activity (dpm/100 cm^2)
SU210-2-Location 6	3.6	2.7	-7.8
SU210-2-Location 6 1 meter N	3.6	4.5	6.9
SU210-2-Location 6 1 meter S	3.6	3.5	-1.1
SU210-2-Location 6 1 meter E	3.6	2.9	-5.8
SU210-2-Location 5 1 meter W	3.6	4.7	8.2

Surface alpha activity results presented in Table 6 do not identify locations in excess of the surface activity $DCGL_W$.

Follow-Up Investigation Radiation Surveys and Sampling Results

D. SU 145-F

To investigate the potential elevated surface activity locations identified in the Confirmatory Survey Report, SU 145-F was divided into 3 Survey Units, each approximately 108 m^2 in size. These Survey Units are identified as SU 145-F-1, 145-F-2 and 145-F-3. A surface alpha scan was performed over all accessible surfaces in each Survey Unit. A total of 17 systematic direct alpha surface activity measurements were performed in each Survey Unit and additional biased surface activity measurements performed as indicated by the alpha surface activity scan. The locations of the systematic direct surface alpha activity measurements are provided in Figure 4 and the results provided in Tables 7, 8 and 9.

Follow-Up Investigation Radiation Surveys and Sampling Results

Table 7: Survey Unit 145-1 (Class 3 Outdoor Concrete Slab)

General Information

Detector Type and Area (cm^2)	Alpha Total Efficiency	Sample Count Time (minutes)	Background Count Time (minutes)	$DCGL_W$ (dpm/100 cm^2)
43-68/126 cm^2	0.0996	5.0	10.0	100

Systematic Direct Surface Activity Measurement Results

Sample Identification	Background Alpha Count Rate (cpm)	Sample Alpha Count Rate (cpm)	Surface Alpha Activity (dpm/100 cm^2)
SU145-1-1	12.0	6.8	-41.1
SU145-1-2	12.0	8.8	-25.2
SU145-1-3	12.0	9.0	-23.6
SU145-1-4	12.0	7.4	-36.3
SU145-1-5	12.0	9.0	-23.6
SU145-1-6	12.0	5.2	-53.9
SU145-1-7	12.0	9.2	-22.0
SU145-1-8	12.0	6.2	-45.9
SU145-1-9	12.0	9.4	-20.4
SU145-1-10	12.0	8.8	-25.2
SU145-1-11	12.0	10.6	-10.8
SU145-1-12	12.0	7.4	-36.3
SU145-1-13	12.0	8.8	-25.2
SU145-1-14	12.0	12.4	3.5
SU145-1-15	12.0	10.6	-10.8
SU145-1-16	12.0	10.8	-9.2
SU145-1-17	12.0	8.0	-31.6
		Average	**-25.7**
		Minimum	**-53.9**
		Maximum	**3.5**
		Standard Deviation	**14.4**

Follow-Up Investigation Radiation Surveys and Sampling Results

Table 8: Survey Unit 145-2 (Class 3 Outdoor Concrete Slab)

General Information

Detector Type and Area (cm^2)	Alpha Total Efficiency	Sample Count Time (minutes)	Background Count Time (minutes)	$DCGL_W$ (dpm/100 cm^2)
43-68/126 cm^2	0.0996	5.0	10.0	100

Systematic Direct Surface Activity Measurement Results

Sample Identification	Background Alpha Count Rate (cpm)	Sample Alpha Count Rate (cpm)	Surface Alpha Activity (dpm/100 cm^2)
SU145-2-1	12.0	10.8	-9.2
SU145-2-2	12.0	7.4	-36.3
SU145-2-3	12.0	11.2	-6.1
SU145-2-4	12.0	8.8	-25.2
SU145-2-5	12.0	10.6	-10.8
SU145-2-6	12.0	5.4	-52.3
SU145-2-7	12.0	14.2	17.8
SU145-2-8	12.0	8.8	-25.2
SU145-2-9	12.0	14.2	17.8
SU145-2-10	12.0	10.4	-12.4
SU145-2-11	12.0	11.0	-7.6
SU145-2-12	12.0	12.8	6.7
SU145-2-13	12.0	9.6	-18.8
SU145-2-14	12.0	8.4	-28.4
SU145-2-15	12.0	14.4	19.4
SU145-2-16	12.0	15.8	30.6
SU145-2-17	12.0	8.8	-25.2
		Average	**-9.7**
		Minimum	**-52.3**
		Maximum	**30.6**
		Standard Deviation	**22.3**

Follow-Up Investigation Radiation Surveys and Sampling Results

Table 9: Survey Unit 145-3 (Class 3 Outdoor Concrete Slab)

General Information

Detector Type and Area (cm^2)	Alpha Total Efficiency	Sample Count Time (minutes)	Background Count Time (minutes)	$DCGL_W$ (dpm/100 cm^2)
43-68/126 cm^2	0.0996	5.0	10.0	100

Systematic Direct Surface Activity Measurement Results

Sample Identification	Background Alpha Count Rate (cpm)	Sample Alpha Count Rate (cpm)	Surface Alpha Activity (dpm/100 cm^2)
SU145-3-1	12.0	10.4	-12.4
SU145-3-2	12.0	10.0	-15.6
SU145-3-3	12.0	10.4	-12.4
SU145-3-4	12.0	13.2	9.9
SU145-3-5	12.0	13.0	8.3
SU145-3-6	12.0	12.4	3.5
SU145-3-7	12.0	12.6	5.1
SU145-3-8	12.0	16.2	33.8
SU145-3-9	12.0	12.6	5.1
SU145-3-10	12.0	10.0	-15.6
SU145-3-11	12.0	15.2	25.8
SU145-3-12	12.0	11.6	-2.9
SU145-3-13	12.0	16.6	37.0
SU145-3-14	12.0	9.8	-17.2
SU145-3-15	12.0	16.6	37.0
SU145-3-16	12.0	11.0	-7.6
SU145-3-17	12.0	16.4	35.4
		Average	**6.9**
		Minimum	**-17.2**
		Maximum	**37.0**
		Standard Deviation	**20.0**

The locations of biased direct surface alpha activity measurements are provided in Figure 5 and the results provided in Table 10.

Table 10: Survey Unit 145-1, 2 and 3 (Class 3 Outdoor Concrete Slab)

General Information

Detector Type and Area (cm^2)	Alpha Total Efficiency	Sample Count Time (minutes)	Background Count Time (minutes)	$DCGL_W$ ($dpm/100\ cm^2$)
43-68/126 cm^2	0.0996	5.0	10.0	100

Biased Direct Surface Activity Measurement Results

Sample Identification	Background Alpha Count Rate (cpm)	Sample Alpha Count Rate (cpm)	Surface Alpha Activity ($dpm/100\ cm^2$)
SU145-1-18	12.0	14.4	19.4
SU145-1-19	12.0	15.0	24.2
SU145-1-20	12.0	13.6	13.1
SU145-2-18	12.0	9.2	-22.0
SU145-2-19	12.0	9.2	-22.0
SU145-2-20	12.0	16.4	35.4
SU145-2-21	12.0	17.2	41.8
SU145-3-18	12.0	12.2	1.9
SU145-3-19	12.0	15.6	29.0
SU145-3-20	12.0	17.4	43.3
SU145-3-21	12.0	15.4	27.4

Surface alpha activity results presented in Tables 7, 8, 9 and 10 do not identify locations in excess of the surface activity $DCGL_W$.

E. SU 8

To investigate the potential elevated surface activity location identified in the Confirmatory Survey Report, SU 8 was divided into 3 Survey Units, each approximately 92 m^2 in size. These Survey Units are identified as SU 8-1, 8-2 and 8-3. A surface alpha scan was performed over all accessible surfaces in each Survey Unit. A total of 17 systematic direct alpha surface activity measurements were performed in each Survey Unit and additional biased surface activity measurements performed as indicated by the alpha surface activity scan. The locations of the systematic direct surface alpha activity measurements are provided in Figure 6 and the results provided in Tables 11, 12 and 13.

Follow-Up Investigation Radiation Surveys and Sampling Results

Table 11: Survey Unit 8-1 (Class 2 Concrete Rail Scale)

General Information

Detector Type and Area (cm^2)	Alpha Total Efficiency	Sample Count Time (minutes)	Background Count Time (minutes)	$DCGL_W$ (dpm/100 cm^2)
43-68/126 cm^2	0.0996	5.0	10.0	100

Systematic Direct Surface Activity Measurement Results

Sample Identification	Background Alpha Count Rate (cpm)	Sample Alpha Count Rate (cpm)	Surface Alpha Activity (dpm/100 cm^2)
SU8-1-1	6.4	4.4	-16.1
SU8-1-2	6.4	6.2	-1.8
SU8-1-3	6.4	4.4	-16.1
SU8-1-4	6.4	4.0	-19.3
SU8-1-5	6.4	5.2	-9.7
SU8-1-6	6.4	5.2	-9.7
SU8-1-7	6.4	6.2	-1.8
SU8-1-8	6.4	7.0	4.6
SU8-1-9	6.4	4.8	-12.9
SU8-1-10	6.4	6.6	1.4
SU8-1-11	6.4	6.6	1.4
SU8-1-12	6.4	6.4	-0.2
SU8-1-13	6.4	6.2	-1.8
SU8-1-14	6.4	5.4	-8.1
SU8-1-15	6.4	7.6	9.4
SU8-1-16	6.4	5.8	-4.9
SU8-1-17	6.4	5.6	-6.5
		Average	**-5.4**
		Minimum	**-19.3**
		Maximum	**9.4**
		Standard Deviation	**7.9**

Table 12: Survey Unit 8-2 (Class 2 Concrete Rail Scale)

General Information

Detector Type and Area (cm^2)	Alpha Total Efficiency	Sample Count Time (minutes)	Background Count Time (minutes)	$DCGL_W$ (dpm/100 cm^2)
43-68/126 cm^2	0.0996	5.0	10.0	100

Systematic Direct Surface Activity Measurement Results

Sample Identification	Background Alpha Count Rate (cpm)	Sample Alpha Count Rate (cpm)	Surface Alpha Activity (dpm/100 cm^2)
SU8-2-1	6.4	4.4	-16.1
SU8-2-2	6.4	7.0	4.6
SU8-2-3	6.4	5.4	-8.1
SU8-2-4	6.4	6.2	-1.8
SU8-2-5	6.4	7.6	9.4
SU8-2-6	6.4	5.8	-4.9
SU8-2-7	6.4	5.8	-4.9
SU8-2-8	6.4	6.4	-0.2
SU8-2-9	6.4	6.6	1.4
SU8-2-10	6.4	7.2	6.2
SU8-2-11	6.4	6.8	3.0
SU8-2-12	6.4	8.0	12.6
SU8-2-13	6.4	5.8	-4.9
SU8-2-14	6.4	8.2	14.2
SU8-2-15	6.4	6.4	-0.2
SU8-2-16	6.4	7.4	7.8
SU8-2-17	6.4	6.4	-0.2
		Average	**1.1**
		Minimum	**-16.1**
		Maximum	**14.2**
		Standard Deviation	**7.8**

Table 13: Survey Unit 8-3 (Class 2 Concrete Rail Scale)

General Information

Detector Type and Area (cm^2)	Alpha Total Efficiency	Sample Count Time (minutes)	Background Count Time (minutes)	$DCGL_W$ (dpm/100 cm^2)
43-68/126 cm^2	0.0996	5.0	10.0	100

Systematic Direct Surface Activity Measurement Results

Sample Identification	Background Alpha Count Rate (cpm)	Sample Alpha Count Rate (cpm)	Surface Alpha Activity (dpm/100 cm^2)
SU8-3-1	6.4	4.6	-14.5
SU8-3-2	6.4	7.2	6.2
SU8-3-3	6.4	6.6	1.4
SU8-3-4	6.4	4.8	-12.9
SU8-3-5	6.4	7.0	4.6
SU8-3-6	6.4	5.6	-6.5
SU8-3-7	6.4	7.2	6.2
SU8-3-8	6.4	8.0	12.6
SU8-3-9	6.4	6.4	-0.2
SU8-3-10	6.4	6.0	-3.3
SU8-3-11	6.4	5.2	-9.7
SU8-3-12	6.4	8.0	12.6
SU8-3-13	6.4	5.8	-4.9
SU8-3-14	6.4	7.0	4.6
SU8-3-15	6.4	6.2	-1.8
SU8-3-16	6.4	6.2	-1.8
SU8-3-17	6.4	7.8	11.0
		Average	**0.2**
		Minimum	**-14.5**
		Maximum	**12.6**
		Standard Deviation	**8.3**

The locations of biased direct surface alpha activity measurements are provided in Figure 7 and the results provided in Table 14.

Follow-Up Investigation Radiation Surveys and Sampling Results

Table 14: Survey Unit 8 (Class 2 Concrete Rail Scale)

General Information

Detector Type and Area (cm^2)	Alpha Total Efficiency	Sample Count Time (minutes)	Background Count Time (minutes)	$DCGL_W$ (dpm/100 cm^2)
43-68/126 cm^2	0.0996	5.0	10.0	100

Biased Direct Surface Activity Measurement Results

Sample Identification	Background Alpha Count Rate (cpm)	Sample Alpha Count Rate (cpm)	Surface Alpha Activity (dpm/100 cm^2)
SU8-1-18	8.8[1]	6.6	-17.8
SU8-1-19	8.8	6.6	-17.8
SU8-1-20	8.8	5.2	-29.0
SU8-2-18	8.8	11.6	22.0
SU8-2-19	8.8	8.0	-6.7
SU8-2-20	8.8	14.6	45.9
SU8-2-21	8.8	7.8	-8.3
SU8-2-22	8.8	9.2	2.9
SU8-2-23	8.8	8.0	-6.7
SU8-3-18	8.8	4.8	-32.2
SU8-3-19	8.8	5.8	-24.2
SU8-3-20	8.8	8.6	-1.9

1. New material specific background established as a result of pre-survey background count rate measurement on the day of survey performance.

Surface alpha activity results presented in Tables 11, 12, 13 and 14 do not identify locations in excess of the surface activity $DCGL_W$.

F. Removable Surface Contamination

To evaluate removable surface alpha contamination a smear was obtained at each systematic and biased direct measurement location. A total of 133 smears were obtained, each counted for 5 minutes using a Ludlum Model 2929 with 43-10-1 ZnS detector. The range of removable alpha activity for all 133 smears was -1.4 to 4.2 dpm/100 cm^2 with an average of 0.5 dpm/100 cm^2.

III. Conclusions

Results of the investigation surveys and soil sampling did not identify locations in excess of the applicable $DCGL_W$ providing additional justification for the original assigned MARSSIM area classifications. These results further demonstrate each of the areas in question meet the radiological criteria for unrestricted release of the New Haven Depot.

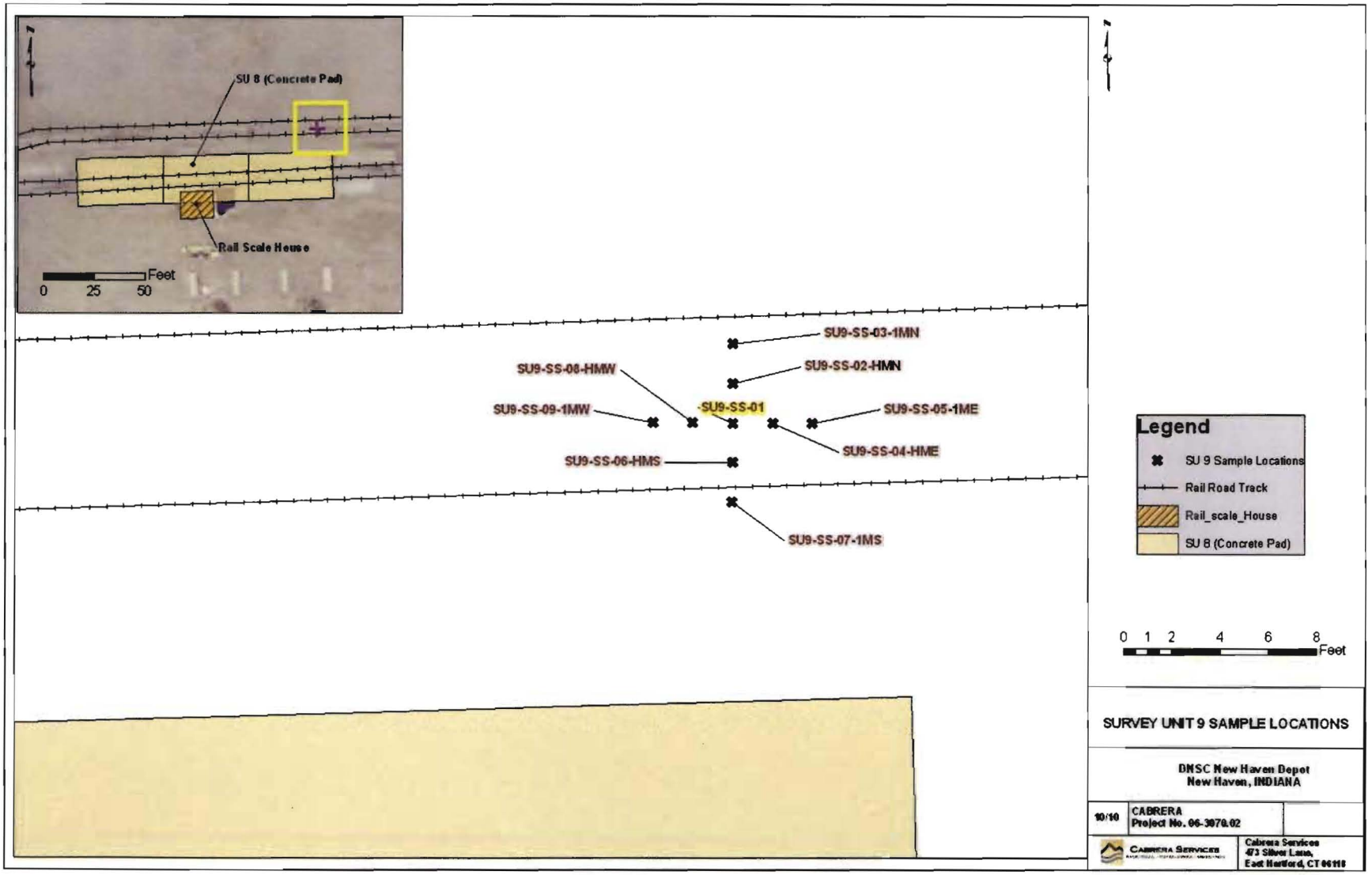

Figure 1: SU 9 Investigation Soil Sample Locations

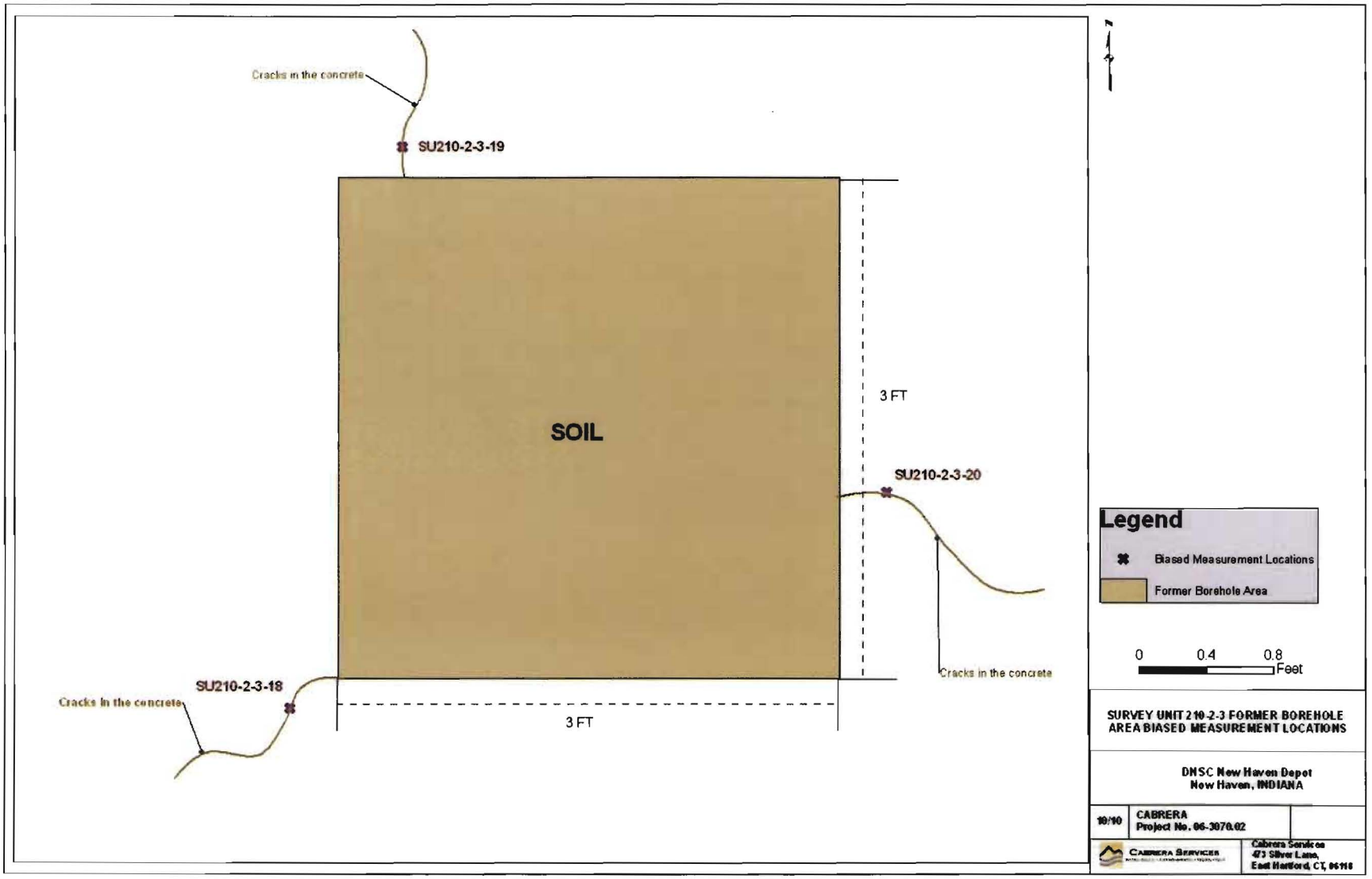

Figure 2: SU 210-2-3 Borehole Investigation Location and Surface Activity Measurement Locations

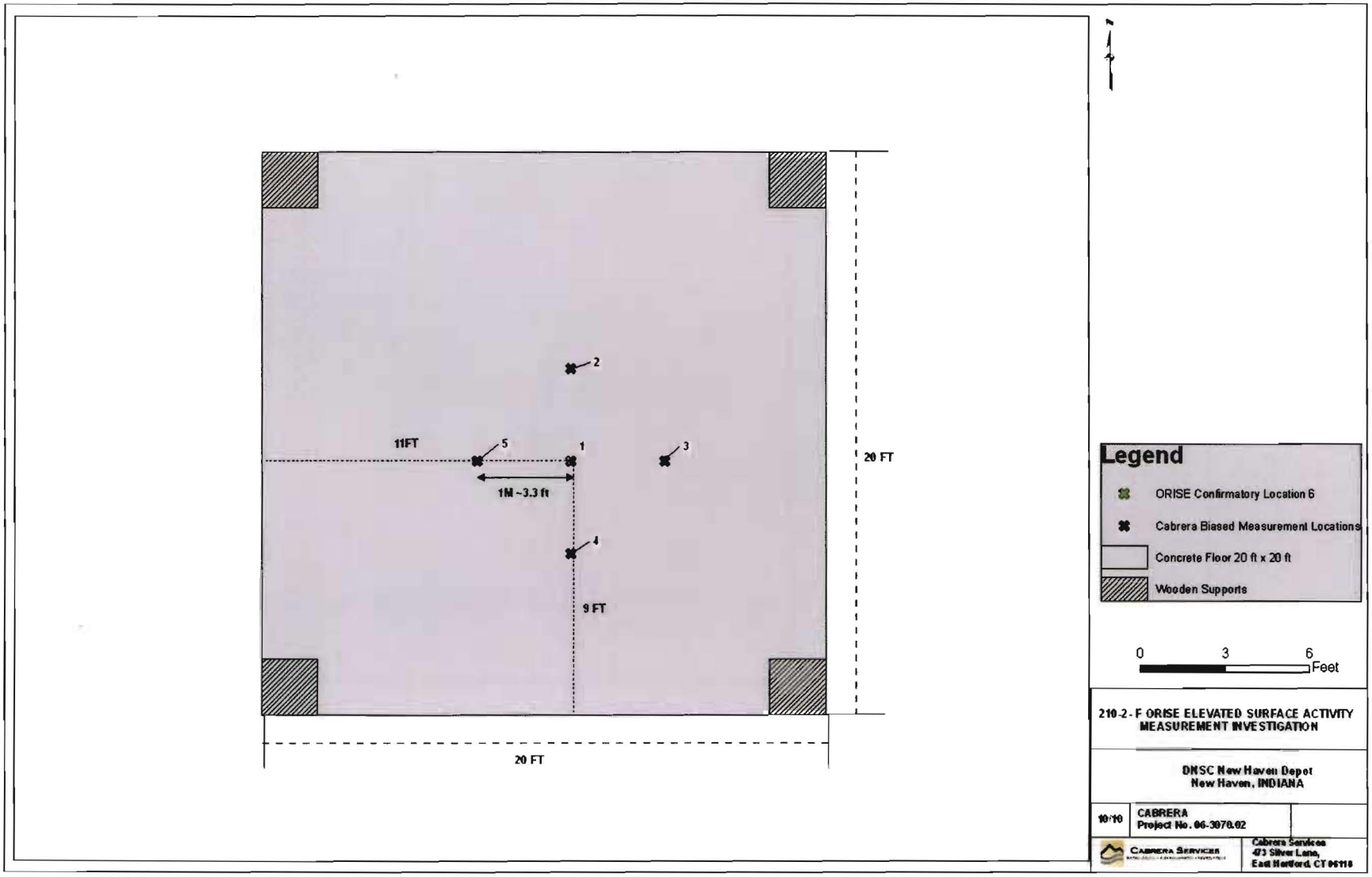

Figure 3: SU 210-2-F Surface Activity Measurement Locations

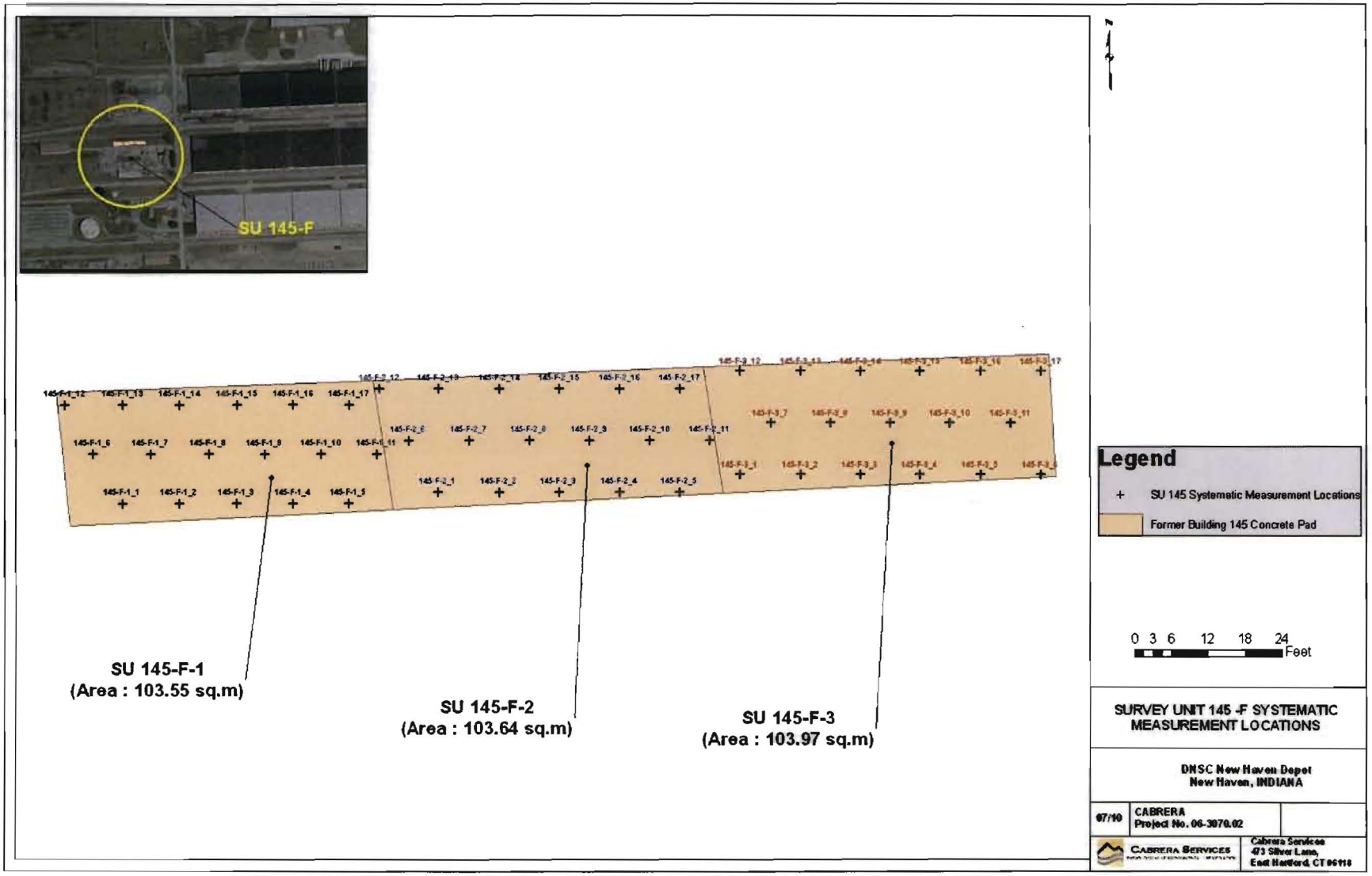

Figure 4: SU 145-F-1, 145-F-2 and 145-F-3 Systematic Surface Activity Measurement Locations

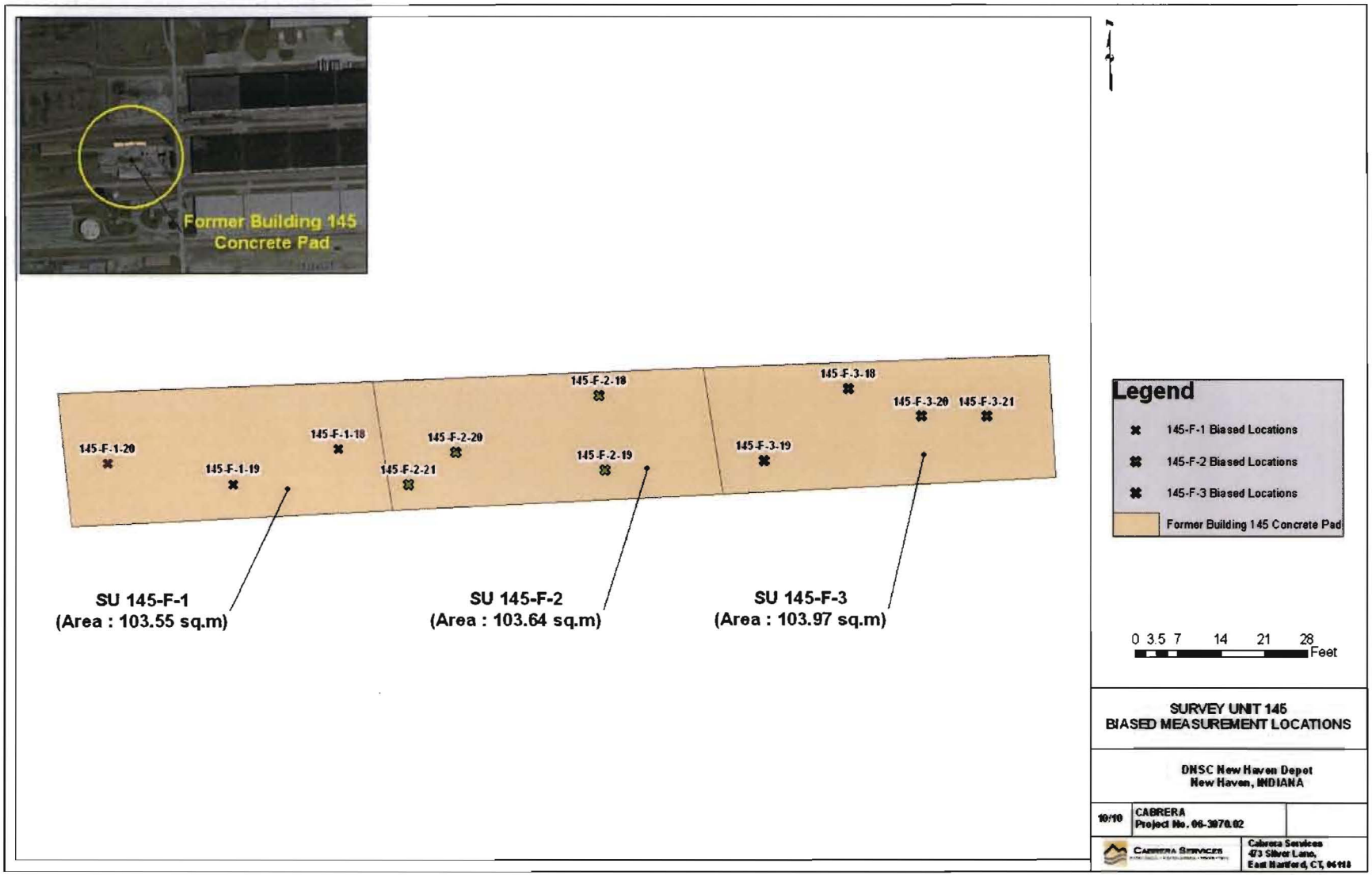

Figure 5: SU 145-F-1, 145-F-2 and 145-F-3 Biased Surface Activity Measurement Locations

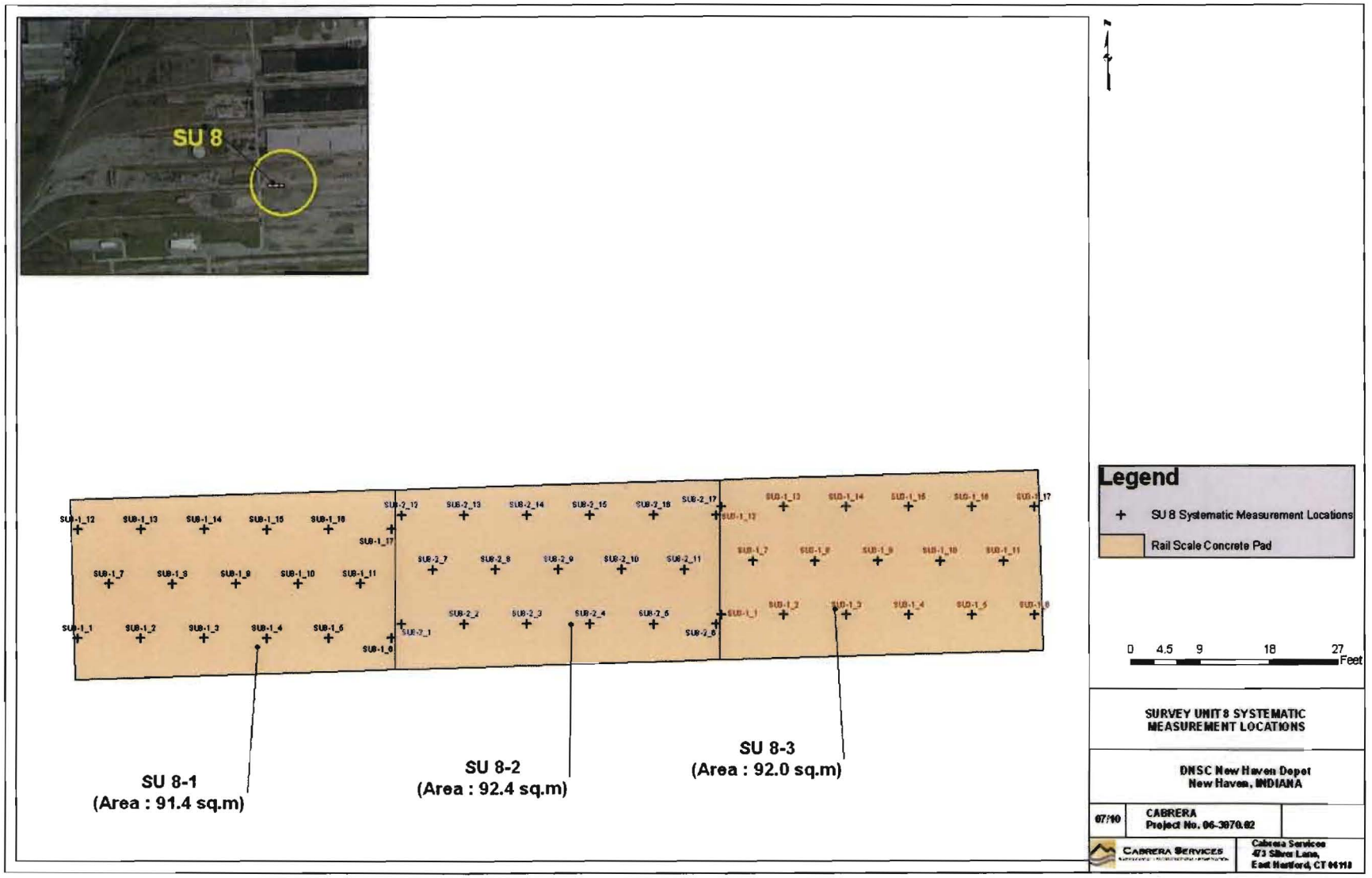

Figure 6: SU 8-1, 8-2 and 8-3 Systematic Surface Activity Measurement Locations

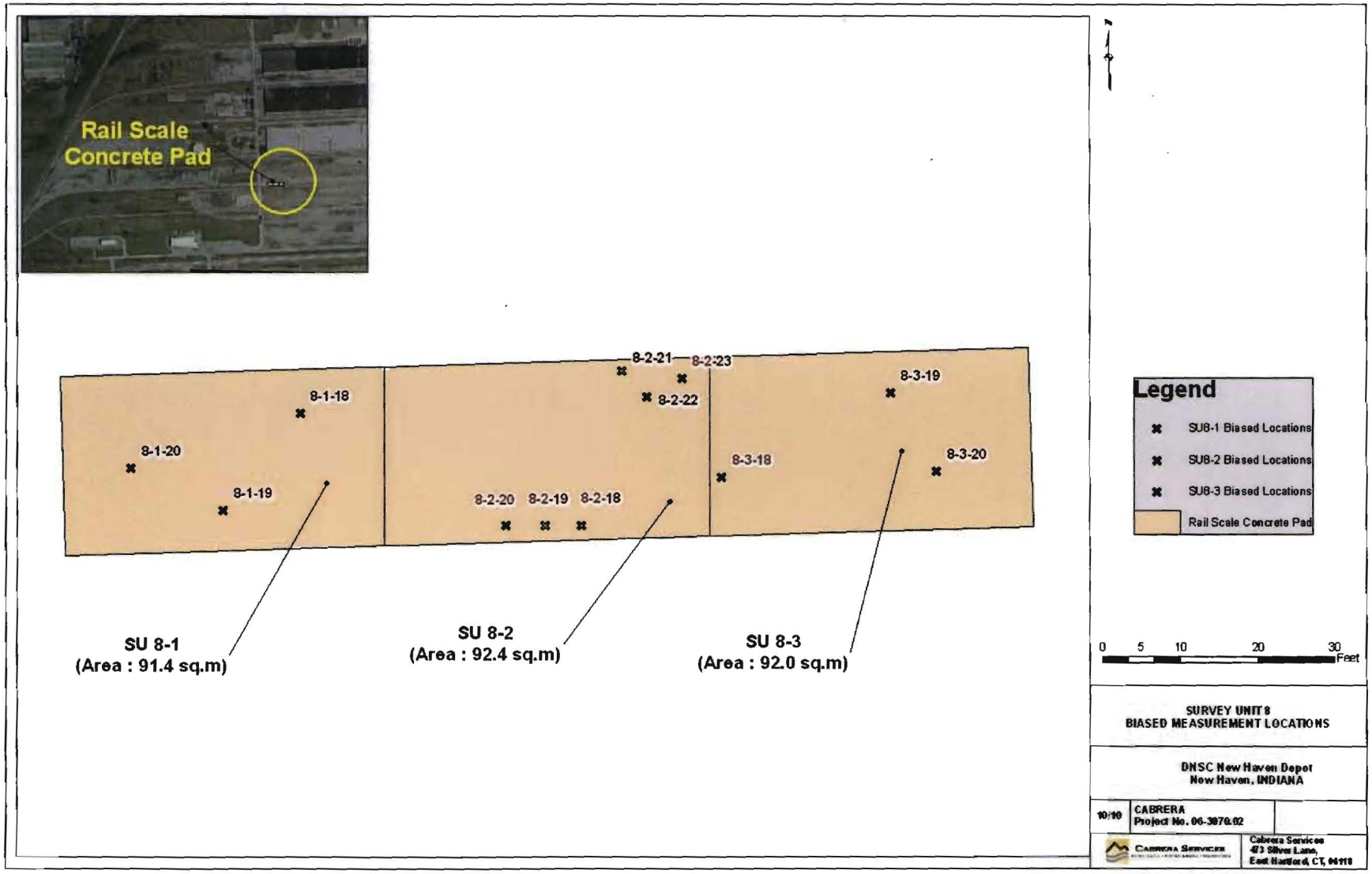

Figure 7: SU 8-1, 8-2 and 8-3 Biased Surface Activity Measurement Locations