DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

National Institutes of Health
Bethesda, Maryland 20892

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Br. 1

February 23, 2015

License 19-00296-10/ 030-01786

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U.S. Nuclear Regulatory Commission
Division of Nuclear Materials Safety
Region 1
2100 Renaissance Blvd.
King of Prussia, PA 19406

Dear Sir or Madam:

This is a request to amend the subject NIH broad scope license to remove the satellite facility at 5516 Nicholson Lane in Rockville, MD 20895. All radioactive materials have been removed from this facility and either disposed of as radioactive waste or transferred to another NRC licensee. The attached MARSSIM-based final status survey documents demonstrate that there is no residual radiological contamination at the Nicholson Lane facility.

Please contact me if you have questions or need additional information. I may be reached at 301-594-0922 or nnewman@nih.gov.

Sincerely,

Nancy E Newman

Nancy E. Newman

Attachments

586165

NMSS/RGN1 MATERIALS-002

REPORT OF
FINAL STATUS SURVEY

For:

The National Institutes of Health
Nicholson Lane Research Center
5516 Nicholson Lane
Rockville, MD 20895

United States Nuclear Regulatory Commission
Radioactive Materials License
Number: 19-00296-10
Docket Nr: 030-01786

Prepared by:

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Abbreviations

Clym	Clym Environmental Services, LLC
CPM	Counts per minute
DCGL	Derived concentration guideline level
DPM	Disintegrations per minute
DRS	Division of Radiation Safety
GCPM	Gross counts per minute
HSA	Historical Site Assessment
LBGR	Lower bound of the gray region
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDCR	Minimum detectable count rate
NIH	National Institutes of Health
NCPM	Net counts per minute
NL	Nicholson Lane Research Center
NRC	United States Nuclear Regulatory Commission

References

1. NUREG-1507, "Minimum Detectable Concentrations With Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", NRC-Washington, DC, June 1998
2. NUREG-1575, "Multi-Agency Radiological Survey and Site Investigation Manual, Revision 1", August 2000
3. NUREG – 1757, Vol.1, "Consolidated NMSS Decommissioning Guidance, Decommissioning Process for Materials Licenses", Final report, NRC-Washington, DC, September 2002
4. NUREG – 1757, Vol.2, "Consolidated NMSS Decommissioning Guidance, Decommissioning Process for Materials Licenses", Final report, NRC- Washington, DC, September 2003
5. NUREG-CR-5512, Vol. 2, SAND2001-0822P, "Residual Radioactive Contamination from Decommissioning, User's Manual DandD, Version 2.1", NRC-Washington, DC, April 2001
6. DandD, Version 2.1 software
7. Title 10, Code of Federal Regulations, Part 20

1.0 Background

The National Institutes of Health is part of the Executive Branch of the United States Government, within the Department of Health and Human Services. The National Institutes of Health (NIH) is a Nuclear Regulatory Commission (NRC) radioactive materials licensee.

NIH has occupied laboratory and office space in the Nicholson Research Center, located at 5516 Nicholson Lane, Rockville, MD 20895. This facility is known to the NIH Division of Radiation Safety (DRS) as Nicholson Lane (NL). Laboratory and office space was leased in two buildings at the NL facility. They are identified as building A (NL-A) and building B (NL-B). These buildings are connected and form part of the Nicholson Research Center. The sole occupant using material under the NIH materials license was the Food and Drug Administration's Center for Biologics Evaluation and Research (FDA/CBER).

The facility was occupied by the FDA/CBER from 1991 through September 2014. The property manager is Promark Real Estate Services, LLC located at 1390 Piccard Drive, Suite 120 in Rockville, Maryland 20850. The point of contact is Robert Eisinger, (301) 208-6700.

Buildings A and B have two floors. Laboratory and office space on the first floor of NL-A. The second floor of NL-A was built out as office space. A vivarium, laboratory and office space are located on the first and second floor of NL-B. A floor plan has been provided as Attachment 1.

There were research protocols that involved the use of radioactive materials in unsealed form. Unsealed form usage involved the benchtop manipulation of radioactive materials in life science research. These materials were procured and used at NL under the NIH's broad scope radioactive materials license (number 19-00296-10, docket number: 030-01786, expiration date: 30 April 2024). However, Uranium and Thorium were procured and used under a general license. Sealed sources were also in use at the Nicholson Lane facility. The types of sources were commonly small reference standards, check sources and electron capture devices. There have been no leaking sources used in the facility. The FDA/CBER is currently in the process of relocating research operations to other facilities outside the NIH. All use of radioactive materials has been discontinued. NIH has decided to decommission the Nicholson Lane facility and has engaged Clym Environmental Services, LLC (Clym) to assist in this process.

If any, the radionuclide(s) likely to exist at the site as potential contaminants would be those having relatively long half-lives given the usage history. The radionuclides with

long half-lives known to have been possessed and used at NL in unsealed form are as follows: Tritium, 14-Carbon, Uranium and Thorium. Records indicate usage of alpha emitting nuclides was limited to the following laboratories; NL-A room A113 and A113A. In NL-B, rooms B106 and B106A were added to the list as it served as the Chemical Waste marshalling and processing room. Uranium and Thorium compounds were sometimes mistakenly given to Chemical Waste for disposal. The following areas were established as reference areas; NL-A, room A166, NL-B, rooms B172 and B170A.

2.0 Survey Plan

Area classification was based on the information obtained as a result of the Historical Site Assessment. All occupied space where open form radioactive materials were used and/or stored has been classified as impacted. Additionally, hallway areas adjacent to these usage/storage areas have been classified as impacted. It should be noted that some laboratories have undergone renovations over the time NIH has occupied the building. These renovations have occurred to meet the research and administrative space allocation requirements of the NIH. Several laboratories and adjacent hallways identified in the HSA as usage areas no longer physically exist. The floor plans denoting original space as utilized by the NIH in NL-A and NL-B have been provided as Attachment 2. The impacted areas have been highlighted in the current floor plans provided in Attachment 1. The impacted areas are identified using alpha numeric designation as provided in current floor plans.

The NIH elected to use the derived concentration guideline levels (DCGL) and Final Status Survey method to demonstrate compliance with the provisions specified in Title 10: Code of Federal Regulation (CFR), Part 20, Subpart E, for releasing the previously occupied laboratory space for unrestricted use.

Surface contamination screening levels were obtained using the values provided in NUREG-1757, Volume 1, revision 2, Appendix B, Table B.1 (^{3}H, ^{14}C) and DandD software, Version 2.1, Building Occupancy Scenario for uranium-238, with progeny in equilibrium (^{238}U+C), as well as thorium-232, with progeny in equilibrium (^{232}Th+C). A copy of the reports for ^{238}U+C and ^{232}Th+C are provided as Attachment 3. A listing of the adopted screening values for building/surface contamination is provided in Table 1.

The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) assigns a greater level of effort on surveys conducted in areas that have or have had the highest potential for contamination. Based on information obtained from the Historical Site Assessment, all laboratory space where radioactive materials might have been used and/or stored, as well as adjacent hallways, has been classified as impacted.

The initial radiological evaluation would designate each survey unit for surface scans and swipe samples. Surface scans were designated to cover 100% of accessible floor and lower wall areas, 50% upper wall areas and 10% of ceilings. Additionally, all sinks and traps, elementary neutralization tanks and house vacuum pump were designated for evaluation.

Scoping surveys were designed to evaluate levels of 1) total surface activity using surface scans as well as static measurements, and 2) removable surface contamination using swipe samples. Swipe sample locations were determined using the surveyor's professional judgment. Any area found to have residual surface contamination was designated for further evaluation as outlined below. An evaluation would be made using static measurements and swipe samples to quantify the level of the contamination and better define the area.

Table 1: Surface Contamination Screening Values

Radionuclide	Symbol	Acceptable Screening Levels (dpm/100cm^2)
3-Hydrogen	^{3}H	1.2E+08
14-Carbon	^{14}C	3.7E+06
238Uranium+C	^{238}U+C	250
232Thoriun+C	^{232}Th+C	55

Surface Scans –any surface area found to be greater than minimum detectable count rate for the matrices being evaluated.

Swipe Samples – any activity detected above the minimum detectable.

Survey instruments were selected based on the detection sensitivities to the radiations of concern, to ensure levels are within acceptable parameters (10%-50% of the applicable screening level). A strategy for evaluating residual tritium surface contamination was developed using swipe samples.

The performance of decommissioning activities was managed within a framework of policies and procedures, to assure the validity and quality of data. Procedures were established for activities requiring the application of standard and approved methods to ensure regulatory requirements were met. These procedures document the technical competence of the survey approach thus ensuring the use of effective processes. Procedures utilized by Clym are documented using program-specific applications.

The Sign Test was selected to compare levels of contaminants not present in background (3H and 14C) with the DCGL value. The Wilcoxon Rank Sum (WRS) test was selected to evaluate contaminants present in background, ^{238}U+C and ^{232}Th+C. The objective of the Final Status Survey is to demonstrate that residual radioactivity levels meet the release criterion. Scenario A has been selected to demonstrate this objective for residual contamination on building/structure surfaces. In demonstrating that this objective is met, the null hypothesis (H_o) is tested, namely is the median concentration of residual radioactivity in the survey unit greater than the DCGL?

H_o: The median concentration of residual radioactivity in the survey unit is greater than the DCGL.

The Type I error (α) was specified as 0.05 and a Type II decision error (β) was set at 0.05.

The value for the lower bound of the gray region (LBGR) was selected at one half the DCGL, as a starting point. The number of data points for each survey unit was determined by selecting the designated values using Table 5.5 as found in NUREG-1575 (Revision 1, August 2000).

2.1 Field Measurements, Methods and Instrumentation

Surface scans and static measurements were made using scaler/rate meters equipped with large area gas proportional detectors (Ludlum models 43-37 and 43-68). Copies of calibration certificates are on file at Clym Environmental Services, LLC and are available upon request.

The Scan MDC for surface structures was calculated using formula (6-10) from NUREG-1575, revision 1, August 2000. The Scan MDC for the 43-37 detectors was determined using the following variables: established background for concrete block, painted, as this surface was abundant and provided one of the highest "natural" backgrounds of the various matrices encountered, the instrument efficiency for 14C, and a 2 second observation interval, the instrument efficiency, a source efficiency of 0.25, a value of 0.5 for the "ideal" surveyor, value for d' of 1.51 was selected and probe surface area of 582cm^2. The Scan MDC for the 43-68 detectors was determined using the same variables with a change in probe surface area to 126cm^2. One half the acceptable value for 14C is 1.85E+06dpm/100cm^2. The Scan MDC for each detector has been provided in Table 2.

The Scan MDC for each detector is much less than 50% of the acceptable value.

The efficiency for ^{238}U+C was determined using a gas proportional detector in the "alpha only" mode, by using a solution of uranium natural traceable to NIST,

deposited on an aluminum surface. The solution had the following atom percent composition:

234U = 0.0055 atom%

235U = 0.720 atom%

238U = 99.2745 atom%

Table 2: Detector 14C Scan MDC

Scaler/rate meter Serial nr	Detector Type	Detector Serial Nr	Reference Bkg (cpm)	14C Eff (2pi)	Scan MDC (dpm/100cm2)
147494	43-37	216994	1,584	40	800
147494	43-68	149769	387	38	1,922
144866	43-37	148745	1,452	37	828
144866	43-68	178072	395	38	1,942
149987	43-37	149714	1,259	36	792
149987	43-68	147408	380	37	1,956
183988	43-37	216662	1,573	39	818
183988	43-68	147956	405	39	1,916

The solution of ^{238}U+C additionally contained in equilibrium 234Th and 234mPa.

An aliquot was first weighted to determine the total activity of uranium. The solution was allowed to dry in a chemical fume hood for 24 hours. The efficiency for uranium using gas proportional detectors in "alpha mode" has been provided in Table 3.

The probability of detecting two or more counts when passing over one half the DCGL, 125 dpm/100cm^2 was determined (NUREG-1575, 6.7.2.2 (6-14)) and is provided in Table 3. An example of the variables used in solving equation (6-14) is provided in Table 4.

The detectors were employed on the scanned surface at no greater than the prescribed speeds as indicated below:

43-68, alpha/beta mode: ½ a probe width per second (2inches/sec)

43-68, alpha mode: ¼ a probe width per second (1inch/sec)

Table 3: Probability of Detecting 2 or More Counts When Passing over 125DPM/100cm²

Scaler/rate meter Serial nr	Detector	Reference Bkg (cpm)	^{238}U+C Eff (4pi)	P ($n \geq 2$)
147494	43-37	5	8	.26
147494	43-68	4	7	.21
144866	43-37	4	7	.21
144866	43-68	3	8	.22
149987	43-37	9	8	.36
149987	43-68	2	7	.16
183988	43-37	4	7	.21
183988	43-68	2	8	.19

Table 4: Variables in Equation (6-14) for ^{238}U+C

Variables		Detector Type	
		43-37	43-68
0.5 x DCGL	G	125	125
Efficiency (4pi)	E	.08	.07
Window width (cm)	D	15.9	11.7
Scan speed (cm/s)	V	3.97	2.9
Bkg	B	5	4
T (sec)	t	4.0	4.0
P($n \geq 2$)		.26	.21

43-37, alpha/beta mode: ½ a probe width per second (3inches/sec)

43-37, alpha mode: ¼ a probe width per second (1.5inches/sec)

The thorium collected at the site was a single bottle received at the time FDA/CBER were relocating. The reference date of the material placed the age of the thorium at well over 40 years. An effort was undertaken to obtain a reference standard and/or solution of thorium-232, having progeny in equilibrium. No such standard was found to be commercially available. An acidic aqueous solution was prepared and a weighed amount of thorium added. The activity was calculated using the manufacturer's formula weight and found to be 15.19 nanocuries. A sample of the prepared solution was sent to a commercial NELAP laboratory for analysis. The results of this analysis confirmed the progeny were in equilibrium and the total activity was found to be 15.95 nanocuries.

An efficiency for ^{232}Th+C was next determined using a gas proportional detector in the "alpha only" mode. A sample of the thorium solution was weighed, deposited on an aluminum surface and allowed to dry in a chemical fume hood for 24 hours.

The efficiency for ^{232}Th+C using gas proportional detectors in "alpha mode" has been provided in Table 5. The probability of detecting two or more counts when passing over one half the DCGL, 27 dpm/100cm^2 was determined (NUREG-1575, 6.7.2.2 (6-14)) and is also provided in Table 5. An example of the variables used in solving equation (6-14) is provided in Table 6.

The detectors were employed on the scanned surface at no greater than the prescribed speeds as previously indicated.

Table 5: Probability of Detecting 2 or More Counts When Passing over 27DPM/100cm^2

Scaler/rate meter Serial nr	Detector	Reference Bkg (cpm)	^{232}Th+C Eff (4pi)	P (n≥2)
147494	43-37	5	9	.09
147494	43-68	4	9	.07
144866	43-37	4	8	.07
144866	43-68	3	9	.05
149987	43-37	9	9	.18
149987	43-68	2	9	.04
183988	43-37	4	9	.07
183988	43-68	2	10	.04

`

Table 6: Variables in Equation (6-14) for ^{232}Th+C

Variables		Detector Type	
		43-37	43-68
0.5 x DCGL	G	27.5	27.5
Efficiency (4pi)	E	.09	.09
Window width (cm)	D	15.9	11.7
Scan speed (cm/s)	V	3.97	2.9
Bkg	B	5	4
T (sec)	t	4.0	4.0
P(n≥2)		.09	.07

2.2 Laboratory Analysis of Smear Samples

The evaluation of removable surface activity was conducted using a dry paper wipe, covering an area of 100cm^2 while applying moderate pressure. Swipe

samples were analyzed using liquid scintillation counting techniques. A swipe efficiency of 10% was applied to the acceptable value for Tritium, 1.2E+07dpm/100cm^2.

Smear samples were analyzed by Clym Environmental Services, LLC (license nr. MD-21-035-01) for gross beta. For the analysis of swipe samples collected for Final Status, a minimum count time of one minute was utilized using a channel setting of 0-400 for Tritium using a Beckman LS6500. The background count rate for this region of interest was found to be 13cpm. The typical minimum detectable activity was found to be 26dpm for a two minute count.

2.3 Daily Operational Checks for Portable Survey Instruments

The purpose of these procedures was to ensure portable scaler/rate meters equipped with gas proportional detectors were in proper working condition prior to placement into service. Should an instrument have failed an operational check, both the instrument and detector would be removed from service until the discrepancy could be resolved. Both source and background measurements must fall within the acceptable range established for the site. Daily operation checks were performed as follows: prior to beginning the performance of data measurements and/or scanning for the day, after the lunch or noon break, any time the detector is suspected of being contaminated, and/or any time an instrument's operation is in question.

Daily instrument checks included: a determination of operational readiness, ambient background, and check source reproducibility. The check source reproducibility determination involved obtaining the data necessary to calculate the average source count and verifying that each section of the detector face was reading within ± 10%. Additionally, the 2σ and 3σ values for the background and check source counts were calculated. A copy of the daily checks conducted during Final Status Survey measurements has been provided as Attachment 4.

2.4 Activity Detected At or Above Investigative Levels

An area of alpha contamination was identified in NL-A, room A113 in excess of the DCGL. This area was located within the laboratory sink, on the interior base, far right of the drain. The area was found to be 789 ± 118 dpm/100cm2, using a 43-68 in "alpha" mode, with an efficiency for ^{232}Th+C. The trap was removed. Both the trap and drain line were evaluated to determine if contamination was present. No activity was detected in either the trap or drain line in excess of the minimum detectable for static measurements and removable surface contamination. Efforts to collect a sample having enough activity to identify the nuclide proved unsuccessful.

2.5 Decontamination and Re-evaluation

In keeping with ALARA principles and goals, the area of residual contamination identified as a result of scoping surveys was successfully remediated. This was accomplished using wet method decontamination techniques. All disposable wipers and spent personal protective equipment were disposed as radioactive waste.

The survey unit A113, includes both laboratories A113 and A113A, was designated as a Class 1 survey unit. Surface scans in Class 1 survey units were designated for 100% coverage on all surface areas. The results of surface scans, static measurements and swipe samples collected post remediation of the entire sink and surrounding area identified no detectable activity in excess of action levels. The survey unit A113 was reclassified as a Class 2 survey unit.

2.6 Mechanical Systems

No activity was detected as a result of scoping surveys in building systems in excess of the action level.

3.0 Final Status Survey

The areas identified as impacted in the Historical Site Assessment were divided into survey units. Survey Unit A113 included all areas in NL-A where ^{238}U+C and ^{232}Th+C were used or stored, in addition to Tritium and 14-Carbon, rooms A113 and A113A. All remaining areas from NL-A combined to form Survey Unit NL-A1 and are listed below;

A111, A112, A112A, A115, A116, A1.2, A1.3, A001, A151, A152, A153, A156, A158, A159, A160, A161, A162, Corridor A110 and A167, including adjacent hallways/areas.

Survey Unit B106 included areas in NL-B where ^{238}U+C and ^{232}Th+C had been stored , including Tritium and 14-Carbon, rooms B106 and B106A. In keeping with ALARA goals and principles Tritium and 14-Carbon were also added as possible contaminants. The areas combined to form Survey Unit NL-B1 are identified as follows;

B101, Lobby B1.1, Vest B1.1, B109, B112, B114, B115, B116, B118, B124, B125, B136, B138, B140, B142, B149, B150, B155, B156, B157, B158, B159, B175, Corridor B1.1, Corridor B1.6, Corridor B1.7, including adjacent hallways/areas.

The areas combined to form Survey Unit NL-B2 are identified as follows;

B200, B200B, B210, B211, B217, B219, B234, B237, B258, B267, B268, B269, B270, B271, B272, B273, B274, B275, B276, B277, B279, B280, Corridor B2.1, Corridor B2.2, Corridor B237, Corridor B2.3, Elevator, including adjacent hallways/areas.

Please reference Attachment 1 for the building floor plans. The designation for each surface in a survey unit was identified using an alpha- numeric system. From the entrance to the area of interest, the left wall was designated as the "A" wall, the rear wall was designated as the "B" wall, the right hand wall was designated as the "C" wall and the wall in which the entrance resides was the "D" wall. The individual grids were sequentially numbered from top left to top right while facing each individual surface.

The surveyor used the following methodology to acquire the appropriate sample location in the grid system. Floor Area- locate the designated sample grid coordinate in the floor area with your back to the entrance way. Wall Area - Facing the wall surface, locate the designated sample grid.

The Final Status Survey required the collection of swipe samples, surface scans and static measurements. A one-minute count time was designated for contaminants not present in background and/or a two-minute count time for contaminants present in background using a Ludlum model 43-37 gas proportional detector. Surface scans were completed in each survey unit during scoping surveys to the required specifications as detailed in Section 2. Sample points were designated using a random number generator after having assigned each grid coordinate a numerical value.

3.1 NL Building A

There were two survey units in building A: "113", a Class 2 and "NL-A", a Class 3. A listing of laboratories/areas by survey unit is provided below:

Survey unit	Class	Laboratory/areas						
113	2	113	113A	Adjacent hallway				
NL-A1	3	A111	A112	A112A	A115	A116	A1.2	A1.3
		A001	A151	A152	A153	A156	A158	A159
		A160	A161	A162	Adjacent hallways/areas			
		Corridor A110		Corridor A167				

Survey unit 113 included the laboratory 113, laboratory 113A as well as the hallway adjacent to laboratory 113 to include floor and lower wall to a distance of ten feet from the entrance to the laboratory.

The instrument selected to conduct static measurements was a Ludlum model 2221, scaler/rate meter (sn: 147494), equipped with a Ludlum model 43-37, gas proportional detector. The instrument efficiency was found to be 14C – 40% (2pi), ^{238}U+C – 8% (4pi) and ^{232}Th+C – 9% (4pi).

The WRS test was designated to evaluate the levels of residual contamination for ^{238}U+C and ^{232}Th+C. The one sample Sign test was selected to evaluate 3H and 14C.

3.1.1 Survey Unit – 113

Based on knowledge obtained from scoping surveys a total of eighteen random sample points was designated to evaluate each analyte. The results of measurements made in 113 have been provided as Attachment 5. The evaluation of sample data collected from Survey unit 113 is as follows:

WRS Test

Evaluation of ^{238}U+C

The average cpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average 1.7 ± 2.9 cpm
Reference area measurements average -0.4 ± 1.7 cpm

The DCGL for ^{238}U+C was converted to cpm by first determining the total efficiency: 4pi instrument efficiency, .08 x 5.82, probe surface area correction, = .4656 or 0.47. The DCGL is converted to cpm/100cm^2: 250dpm/100cm^2 x .47 = 117.5cpm/100cm^2. The relative shift was calculated:

$$(DCGL-LBGR)/\sigma = \Delta/\sigma$$
Or
$$(117.5 - 58.75) / 3.362 = 17.47$$

The relative shift was adjusted to 4 and the number of required sample points was determined to be 9.

All sample points were found to be less than the DCGL. The largest of the survey unit measurements was found to be 13dpm/100cm^2. The smallest of the reference area measurements was -4dpm/100cm^2. The summary of the WRS test is the difference between the largest measurement in the survey unit and smallest reference area measurement or 17dpm/100cm^2. This is less than the DCGL (250dpm/100cm^2). The difference between the survey unit average (4) and the reference area average (-1) was found to be 5, less than the DCGL. The survey unit meets the release criterion: the WRS test did not need to be conducted.

Evaluation of ^{232}Th+C

The average cpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average 1.7 ± 2.9 cpm
Reference area measurements average -0.4 ± 1.7 cpm

The DCGL for ^{232}Th+C was converted to cpm by first determining the total efficiency: 4pi instrument efficiency, .09 x 5.82, probe surface area correction, = 0.5238 or 0.52. The DCGL is converted to cpm/100cm^2: 55dpm/100cm^2 x .52 = 28.6cpm/100cm^2. The relative shift was calculated:

(DCGL-LBGR)/σ = Δ/σ
Or
(28.6 – 14.3) / 3.362 = 4.25

The relative shift was adjusted to 4 and the number of required sample points was determined to be 9.

All sample points were found to be less than the DCGL. The largest of the survey unit measurements was found to be 12dpm/100cm^2. The smallest of the reference area measurements was -4dpm/100cm^2. The summary of the WRS test is the difference between the largest measurement in the survey unit and smallest reference area measurement or 16dpm/100cm^2. This is less than the DCGL (55dpm/100cm^2). The difference between the survey unit average (3) and the reference area average (-1) was found to be 4, less than the DCGL. The survey unit meets the release criterion: the WRS test did not need to be conducted.

Sign Test

Evaluation of 14-Carbon

The average cpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average 890 ± 83 cpm
Reference area measurements average 920 ± 91 cpm

The total efficiency was first determined: 2pi instrument efficiency, .40 x source efficiency, 0.25 x probe surface area correction, 5.82 = .582 or 0.58. The DCGL for 14C was converted to cpm: 3.7E+06dpm/100cm^2 x .58 = 2.146E+06cpm/100cm^2. The relative shift was next determined:

(DCGL-LBGR)/σ = Δ/σ
Or
(2.146E+06 – 1.07E+06) / 123 = 8.7E+03

The relative shift was adjusted to 3 and the number of required sample points was determined to be 14.

All measurements were found to be less than the DCGL. The survey unit meets the release criterion: the Sign test did not need to be conducted.

Evaluation of Tritium
The average dpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average -1.2 ± 1.4 dpm
Reference area measurements average 1.0 ± 3 dpm

The relative shift was calculated:
(1.2E+07 – 6.0E+06) / 3.3 = 1.81E+06

The relative shift was adjusted to 3 and the number of required sample points was determined to be 14.

All measurements were found to be less than the DCGL. The survey unit meets the release criterion: the Sign test did not need to be conducted.

The average concentration (dpm/100cm^2) for each contaminant evaluated in Survey Unit 113 is provided below:

3H = -1.2 14C = -52 ^{238}U+C = 4 ^{232}Th+C = 3

3.1.2 Survey Unit – NL-A1
Based on knowledge obtained from scoping surveys a total of sixteen random sample points was designated to evaluate each analyte. The results of measurements made in NL-A1 have been provided as Attachment 6. The evaluation of sample data collected from Survey unit NL-A1 is as follows:

Sign Test
Evaluation of 14-Carbon
The average cpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average 911 ± 85 cpm
Reference area measurements average 992 ± 94 cpm

The total efficiency was first determined: 2pi instrument efficiency, .40 x source efficiency, 0.25 x probe surface area correction, 5.82 = .582 or 0.58. The DCGL for 14C was converted to cpm: 3.7E+06dpm/100cm^2 x .58 = 2.146E+06cpm/100cm^2. The relative shift was next determined:

(DCGL-LBGR)/σ = Δ/σ
Or
(2.146E+06 – 1.07E+06) / 126.7 = 8.4E+03

The relative shift was adjusted to 3 and the number of required sample points was determined to be 14.

All measurements were found to be less than the DCGL. The survey unit meets the release criterion: the Sign test did not need to be conducted.

Evaluation of Tritium
The average dpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average -1.68 ± 1.4 dpm
Reference area measurements average 1 ± 3 dpm

The relative shift was calculated:
(1.2E+07 – 6.0E+06) / 3.23 = 1.85E+06

The relative shift was adjusted to 3 and the number of required sample points was determined to be 14.

All measurements were found to be less than the DCGL. The survey unit meets the release criterion: the Sign test did not need to be conducted.

The average concentration (dpm/100cm^2) for each contaminant evaluated in Survey Unit 113 is provided below:

3H = -1.57 14C = -140

3.2 NL Building – B

There were three survey units in the B building: "106" – a Class 3, "NL-B1", a Class 3, "NL-B2", a Class 3. A listing of laboratories/areas by survey unit is provided below:

Survey unit	Class	Laboratory/areas
106	3	106 106A Adjacent Hallway
NL-B1	3	B101 B109 B112 B114 B115 B116 B118 B124 B125 B136 B138 B140 B142 B149 B150 B155 B156 B157 B158 B159 B175 Lobby B1.1 Corridor B1.6 Corridor B1.7 Corridor B1.1 Vest B1.1 Adjacent hallways/areas
NL-B2	3	B200 B200B B210 B211 B217 B219 B234

B237 B258 B267 B268 B269 B270 B271
B272 B273 B274 B275 B276 B277 B279
B280 Corridor B2.2 Corridor B237 Corridor B2.3
Corridor B1.1 Elevator Adjacent hallways/areas

Survey unit 106 included the adjacent cold box 106A as well as the hallway, directly adjacent to room 106, including floor and lower walls, to the main corridor B1.1.

The instrument selected to conduct static measurements was a Ludlum model 2221, scaler/rate meter (sn: 147494), equipped with a Ludlum model 43-37, gas proportional detector. The instrument efficiency was found to be 14C – 40% (2pi), ^{238}U+C – 8% (4pi) and ^{232}Th+C – 9% (4pi).

The WRS test was designated to evaluate the levels of residual contamination for ^{238}U+C and ^{232}Th+C. The one sample Sign test was selected to evaluate 3H and 14C.

3.2.1 Survey Unit – 106
Based on knowledge obtained from scoping surveys a total of eighteen random sample points was designated to evaluate each analyte. The results of measurements made in 106 have been provided as Attachment 7. The evaluation of sample data collected from Survey unit 106 is as follows:

WRS Test

Evaluation of ^{238}U+C

The average cpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average	-2.1 ± 1 cpm
Reference area measurements average	-1.8 ± 0.8 cpm

The DCGL for ^{238}U+C was converted to cpm by first determining the total efficiency: 4pi instrument efficiency, .08 x 5.82, probe surface area correction, = 0.4656 or 0.47. The DCGL is converted to cpm/100cm^2: 250dpm/100cm^2 x .47 = 117.5cpm/100cm^2. The relative shift was calculated:

$$(DCGL-LBGR)/\sigma = \Delta/\sigma$$

Or

$$(117.5 - 58.75) / 1.28 = 45.9$$

The relative shift was adjusted to 4 and the number of required sample points was determined to be 9.

All sample points were found to be less than the DCGL. The largest of the survey unit measurements was found to be 0dpm/100cm^2. The smallest of

the reference area measurements was -5dpm/100cm^2. The summary of the WRS test is the difference between the largest measurement in the survey unit and smallest reference area measurement or 5dpm/100cm^2. The difference between the survey unit average (-5) and the reference area average (-4) was found to be -1, less than the DCGL. This is less than the DCGL (250dpm/100cm^2). The survey unit meets the release criterion: the WRS test did not need to be conducted.

Evaluation of ^{232}Th+C

The average cpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average	-2.1 ± 1 cpm
Reference area measurements average	-1.8 ± 0.8 cpm

The DCGL for ^{232}Th+C was converted to cpm by first determining the total efficiency: 4pi instrument efficiency, .09 x 5.82, probe surface area correction, = 0.5238 or 0.52. The DCGL is converted to cpm/100cm^2: 55dpm/100cm^2 x .52 = 28.6cpm/100cm^2. The relative shift was calculated:

$(DCGL\text{-}LBGR)/\sigma = \Delta/\sigma$

Or

$(28.6 - 14.3) / 1.28 = 11$

The relative shift was adjusted to 4 and the number of required sample points was determined to be 9.

All sample points were found to be less than the DCGL. The largest of the survey unit measurements was found to be 0dpm/100cm^2. The smallest of the reference area measurements was -5dpm/100cm^2. The summary of the WRS test is the difference between the largest measurement in the survey unit and smallest reference area measurement or 5dpm/100cm^2. This is less than the DCGL (55dpm/100cm^2). The difference between the survey unit average (-4) and the reference area average (-3) was found to be -1, less than the DCGL. The survey unit meets the release criterion: the WRS test did not need to be conducted.

Sign Test

Evaluation of 14-Carbon

The average cpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average	841 ± 93 cpm
Reference area measurements average	910 ± 91 cpm

The total efficiency was first determined: 2pi instrument efficiency, .40 x source efficiency, 0.25 x probe surface area correction, 5.82 = .582 or 0.58. The DCGL for 14C was converted to cpm: 3.7E+06dpm/100cm^2 x .58 = 2.146E+06cpm/100cm^2. The relative shift was next determined:

(DCGL-LBGR)/σ = Δ/σ

Or

(2.146E+06 – 1.07E+06) / 130 = 8.2E+03

The relative shift was adjusted to 3 and the number of required sample points was determined to be 14.

All measurements were found to be less than the DCGL. The survey unit meets the release criterion: the Sign test did not need to be conducted.

Evaluation of Tritium

The average dpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average	-1.7 ± 1.7 dpm
Reference area measurements average	1.0 ± 3 dpm

The relative shift was calculated:

(1.2E+07 – 6.0E+06) / 3.45 = 1.74E+06

The relative shift was adjusted to 3 and the number of required sample points was determined to be 14.

All measurements were found to be less than the DCGL. The survey unit meets the release criterion: the Sign test did not need to be conducted.

The average concentration (dpm/100cm^2) for each contaminant evaluated in Survey Unit 106 is provided below:

3H = -1.7 14C = -120 ^{238}U+C = -4.6 ^{232}Th+C = -4.1

3.2.2 Survey Unit – NL-B1

Based on knowledge obtained from scoping surveys a total of sixteen random sample points was designated to evaluate each analyte. The results of measurements made in NL-B1 have been provided as Attachment 8. The evaluation of sample data collected from Survey unit NL-B1 is as follows:

Sign Test

Evaluation of 14-Carbon

The average cpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average 1015 ± 112 cpm
Reference area measurements average 958 ± 93 cpm

The total efficiency was first determined: 2pi instrument efficiency, .40 x source efficiency, 0.25 x probe surface area correction, 5.82 = .582 or 0.58. The DCGL for 14C was converted to cpm: 3.7E+06dpm/100cm^2 x .58 = 2.146E+06cpm/100cm^2. The relative shift was next determined:

$(DCGL\text{-}LBGR)/\sigma = \Delta/\sigma$

Or

(2.146E+06 – 1.07E+06) / 146 = 7.3E+03

The relative shift was adjusted to 3 and the number of required sample points was determined to be 14.

All measurements were found to be less than the DCGL. The survey unit meets the release criterion: the Sign test did not need to be conducted.

Evaluation of Tritium
The average dpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average -1.68 ± 1.4 dpm
Reference area measurements average 1 ± 3 dpm

The relative shift was calculated:
(1.2E+07 – 6.0E+06) / 3.31 = 1.81E+06

The relative shift was adjusted to 3 and the number of required sample points was determined to be 14.

All measurements were found to be less than the DCGL. The survey unit meets the release criterion: the Sign test did not need to be conducted.

The average concentration (dpm/100cm^2) for each contaminant evaluated in Survey Unit NL-B1 is provided below:

3H = -1.68 14C = 99

3.2.3 Survey Unit – NL-B2
Based on knowledge obtained from scoping surveys a total of sixteen random sample points was designated to evaluate each analyte. The results of

measurements made in NL-B2 have been provided as Attachment 9. The evaluation of sample data collected from Survey unit NL-B2 is as follows:

Sign Test

Evaluation of 14-Carbon

The average cpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average 960 ± 157 cpm
Reference area measurements average 921 ± 91 cpm

The total efficiency was first determined: 2pi instrument efficiency, .40 x source efficiency, 0.25 x probe surface area correction, 5.82 = .582 or 0.58. The DCGL for 14C was converted to cpm: 3.7E+06dpm/100cm^2 x .58 = 2.146E+06cpm/100cm^2. The relative shift was next determined:

$(DCGL-LBGR)/\sigma = \Delta/\sigma$

Or

(2.146E+06 – 1.07E+06) / 182 = 5.9E+03

The relative shift was adjusted to 3 and the number of required sample points was determined to be 14.

All measurements were found to be less than the DCGL. The survey unit meets the release criterion: the Sign test did not need to be conducted.

Evaluation of Tritium

The average dpm and standard deviation for the survey unit and reference area are provided below:

Survey Unit measurements average -2.11 ± 2.6 dpm
Reference area measurements average 1 ± 3 dpm

The relative shift was calculated:
(1.2E+07 – 6.0E+06) / 3.97 = 1.51E+06

The relative shift was adjusted to 3 and the number of required sample points was determined to be 14.

All measurements were found to be less than the DCGL. The survey unit meets the release criterion: the Sign test did not need to be conducted.

The average concentration (dpm/100cm^2) for each contaminant evaluated in Survey Unit NL-B2 is provided below:

3H = -2.11 14C = 66

4.0 Conclusion

The average concentration (dpm/100cm^2) for each contaminant evaluated was determined for the site. The unity rule is satisfied when the contaminant mixtures yield a combined fractional concentration limit that is less than or equal to 1. Unity was determined for the entire site and is provided as Attachment 10.

The Final Status Survey conducted by the NIH demonstrates compliance with the provisions specified in Title 10 CFR Part 20 for releasing the Nicholson Lane Research Center, located in Rockville, MD for unrestricted use.

This is to acknowledge the receipt of your letter/application dated

02/23/2015, and to inform you that the initial processing which includes an administrative review has been performed.

19-00296-10 (Amendment)

[X] There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

[ ] Please provide to this office within 30 days of your receipt of this card

____.

A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 586165.
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

NRC FORM 532 (RI)
(6-96)

Sincerely,
Licensing Assistance Team Leader.