

Pratt & Whitney
400 Main Street
East Hartford, CT 06118
Mail Stop 101-29



Pratt & Whitney
A United Technologies Company

January 15, 2015

Br. 2

Ms. Elizabeth Ullrich
U.S. NRC Region I
2100 Renaissance Blvd
King of Prussia, PA 19406

REC RG 101 21 15 AM 07:25

Subject: Pratt & Whitney Final Status Survey Reports and SMB-151 License Termination Request

Dear Ms. Ullrich,

Please find the attached Final Status Survey Reports for the SMB-151 license termination surveys at the Pratt & Whitney Middletown and East Hartford, CT facilities.

Final Status Surveys were performed in accordance with Revision 2 of the Middletown, CT Final Status Survey Plan and Revision 1 of the East Hartford, CT Final Status Survey Plan.

A review of all the direct measurements for both sites shows that no direct measurement was greater than 50% of the site-specific Derived Concentration Guideline Level (DCGL). A review of all the removable surface contamination measurements for both sites shows that no result was greater than the Minimum Detectable Concentration (MDC). Therefore, both sites meet the unrestricted release criteria.

Based upon the results of the final status surveys for both sites, Pratt & Whitney requests termination of the SMB-151 license.

If you have any questions, please contact Dave Alberghini at 860-565-4977 or via email at david.alberghini@pw.utc.com.

Sincerely,

Renee Welsh

Docket No.: 04000791
License No.: SMB-151

Enclosures:

1. Final Status Survey Report; Termination of License SMB-151 at the Middletown, CT Facility, Revision 0
2. Final Status Survey Report; Termination of License SMB-151 at the East Hartford, CT Facility, Revision 0

585804
NMSS/RGMI MATERIALS-002

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EAR Export Classification: ECCN EAR99

Final Status Survey Report

Revision 0

Pratt & Whitney
A United Technologies Company
400 Main Street
East Hartford, Connecticut

**Termination of License SMB-151
at the East Hartford, CT Facility**

Prepared by:

Radiation Safety & Control Services
91 Portsmouth Avenue
Stratham, NH 03885-2468



Pratt & Whitney East Hartford Site Final Status Survey Report

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Pratt & Whitney East Hartford Site Final Status Survey Report

1.0 EXECUTIVE SUMMARY

This report presents the methodology and results of Final Status Surveys performed at the Pratt & Whitney facility in East Hartford, CT. The results of these surveys provide the justification to terminate the Nuclear Regulatory Commission (NRC) SMB-151 license (1) (2) at that location. (3) (4) (5) A Final Status Survey Plan (6) (7) using a site-specific Derived Concentration Guideline Level (DCGL) (8) (9) (10) was reviewed (11) and approved by the NRC. Procedures and survey packages were prepared in accordance with the plan. Final Status Surveys were performed from December 8, 2014 to December 11, 2014. Nine survey units were surveyed. A total of one hundred ninety (190) direct measurements and 190 smears were collected and evaluated. All the direct measurement results were less than one-half (50%) of the DCGL. All smear results were less than the alpha MDC of 11.0 dpm/100 cm². Evaluation of these data shows that all nine survey units meet the unrestricted release criteria.

2.0 HISTORICAL SITE ASSESSMENT

The P&W East Hartford, Connecticut site is located on approximately 1,000 acres of land in Hartford County. It contains approximately 4 million square feet of combined office and factory space. Figure 2-1 presents an aerial view of the East Hartford site. United Technologies' Pratt & Whitney (P&W) is licensed by the U.S. Nuclear Regulatory Commission (NRC) to possess and use radioactive material at the 400 Main Street, East Hartford, Connecticut facility under NRC License SMB-151. (7) The SMB-151 license allows possession and use of 910 kilograms of solid Thorium oxide (natural Th-232) source material not exceeding 4% (by mass) dispersed in Nickel. This was commonly referred to as TD-Nickel or TD-Ni. This material was not alloyed by P&W but was provided as sheet metal stock by a vendor.

The SMB-151 license was obtained on March 31, 1961. Licensed material was initially used in Middletown. Building 10 in Middletown, CT was constructed in 1968 and was used for the manufacture of jet engine heat shields and burn cups from TD-Ni. Licensed activities in Building 10 ceased in 2000 when the TD-Ni sheet metal stock manufacturing equipment and production operations were moved to the L building in the East Hartford Facility. Jet engine heat shields and burn cups from engines being overhauled were disassembled and assembled in both the L and M buildings. Manufacturing of TD-Ni parts in East Hartford ceased in 2012.

As in the Middletown Building 10 processes, no smelting or alloying of the metal was done in the L or M Buildings. Also, no other kind of high temperature work was done on this metal, so no radioactive fumes or other finely divided particulate contamination was ever produced. Any fine particulate produced was generally associated with tumbling and polishing operations which remained wet, entailing very low airborne radioactivity release fractions (ARFs). Any contamination present was the result of stamping, forming, de-burring, tumbling, polishing or some other low velocity production operation. Standard housekeeping practices were employed at that time which included cleaning up each work station at the end of each shift.

Over the years, small areas in various buildings were used for temporary storage of stock, parts and scrap waste. These areas were located within the North Production Test Building, South Production Test Building, the B, D, F, H, J and K buildings and a waste storage trailer. By the mid 2000s, several buildings were deemed no longer necessary. The North Production, South Production and F buildings were surveyed, free released, and then demolished in whole. A major portion of the H building was also demolished.

Figure 2-1 Aerial View of the East Hartford Site



Based upon the Historical Site Assessment, (7) Table 2-1 presents the survey units that were established for the Final Status Survey.

Table 2-1 Final Status Survey Units

Survey Unit	Description	Survey Scope
1	L Bldg - East Half	Floor only
2	L Bldg - West Half	Floor only
3	J Building	Floor only
4	M Building	Floor only
5	K Building	Floor only
6	D Building – East Half	Floor only
7	D Building – West Half (with B Bldg included)	Floor only
8	Waste Storage Trailer	Floor only
9	E Building	Floor only

3.0 SURVEY PLANNING

Survey packages were prepared for each survey unit in accordance with RSCS Standard Operating Procedures (SOPs). (12) The Data Quality Objective (DQO) process was used to develop each package. Packages included instructions for planning, performance, documentation, review and approval of the Final Status Survey for the survey unit.

3.1 Classification and Surface Area Limits of Survey Units

Based upon the Historical Site Assessment, (7) all nine survey units in the P&W East Hartford facility are designated as Class 3. Based upon the guidance in MARSSIM, there are no surface area limits for Class 3 survey units. (5)

3.2 Determination of DCGLs

Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs were presented to the Nuclear Regulatory Commission for review and approval. (9) (8) Using a conservative methodology that included the radon pathway, a site-specific total surface activity TD-Ni concentration DCGL_W of 354 dpm/100 cm² was calculated for use at P&W. This DCGL_W corresponds to the state of Connecticut release criterion of 19 mrem/year. (13) (14)

The removable contamination activity concentration was set at 10% of the total activity DCGL_W which is equal to 35 dpm/100 cm². (7)

3.3 Number of Fixed Measurements

Using the relative shift value of 1.5, and the α and β decision error rate values of 0.05, the minimum number of measurements for each survey unit from Table 5-5 of MARSSIM (5) is equal to eighteen (18). Three additional measurements at biased locations were added to each survey unit.

3.4 Determining Measurement Locations

All survey units at the East Hartford site are designated as Class 3; therefore, all measurement locations were selected at random. The random measurement locations were determined by Visual Sample Plan Version 6.0. (15) In addition to randomly selected locations, three additional biased sample locations were added (e.g. near floor drains, TD-Ni historical storage and use areas). The biased measurement locations were determined by the survey team lead. If the exact location of a randomly selected measurement location was inaccessible due to an obstruction, the nearest accessible location was surveyed.

3.5 Data Investigations

Because all survey units at East Hartford are designated as Class 3, a fixed measurement that is greater than 0.5 x DCGL_W will be investigated. Any scan measurement that shows a positive indication over background will also be investigated.

Pratt & Whitney East Hartford Site Final Status Survey Report

4.0 SURVEY IMPLEMENTATION

The requirements and objectives outlined in the East Hartford Final Status Survey plan were incorporated into a final status survey package for each survey unit. Each plan contained:

- Responses to the 7 DQO steps;
- maps of the survey unit with measurement/wipe sample locations;
- applicable DCGLs;
- instrumentation to be used;
- investigation criteria;
- QA/QC requirements (e.g., instrument response checks);
- applicable health and safety precautions; and
- applicable procedures.

A copy of each final status survey package is presented in Attachments 2 through 10.

4.1 Scanning

Because all survey units at East Hartford are Class 3, only judgmental scanning was performed in each survey unit. A minimum of a 1 meter radius was scanned around each direct measurement location. (7) The detector was passed over the surface at a rate of approximately 1 to 2 inches per second. All technicians were using ear-phones while scanning. Survey packages instructed personnel performing scans that if any detectable positive indication is observed (e.g. audible and/or visual) to stop and hold the position for 2 seconds, backup and re-scan the spot. If the positive indication is observed again, stop and perform a direct measurement and obtain a smear at that location. Only 1 location in 1 survey unit; location 8 in K-BLDG-001, had a positive indication observed. The result of the direct measurement at that location is less than 50% of the DCGL and is presented in Attachment 6.

4.2 Direct Measurements

The count time for all direct measurements was 3 minutes. Eighteen (18) direct measurements were collected in each survey unit at the East Hartford site. An additional 3 biased fixed measurements were also collected in each survey unit. The results of the direct measurements are presented in Attachments 2 through 10. All direct measurements are less than 50% of the DCGL.

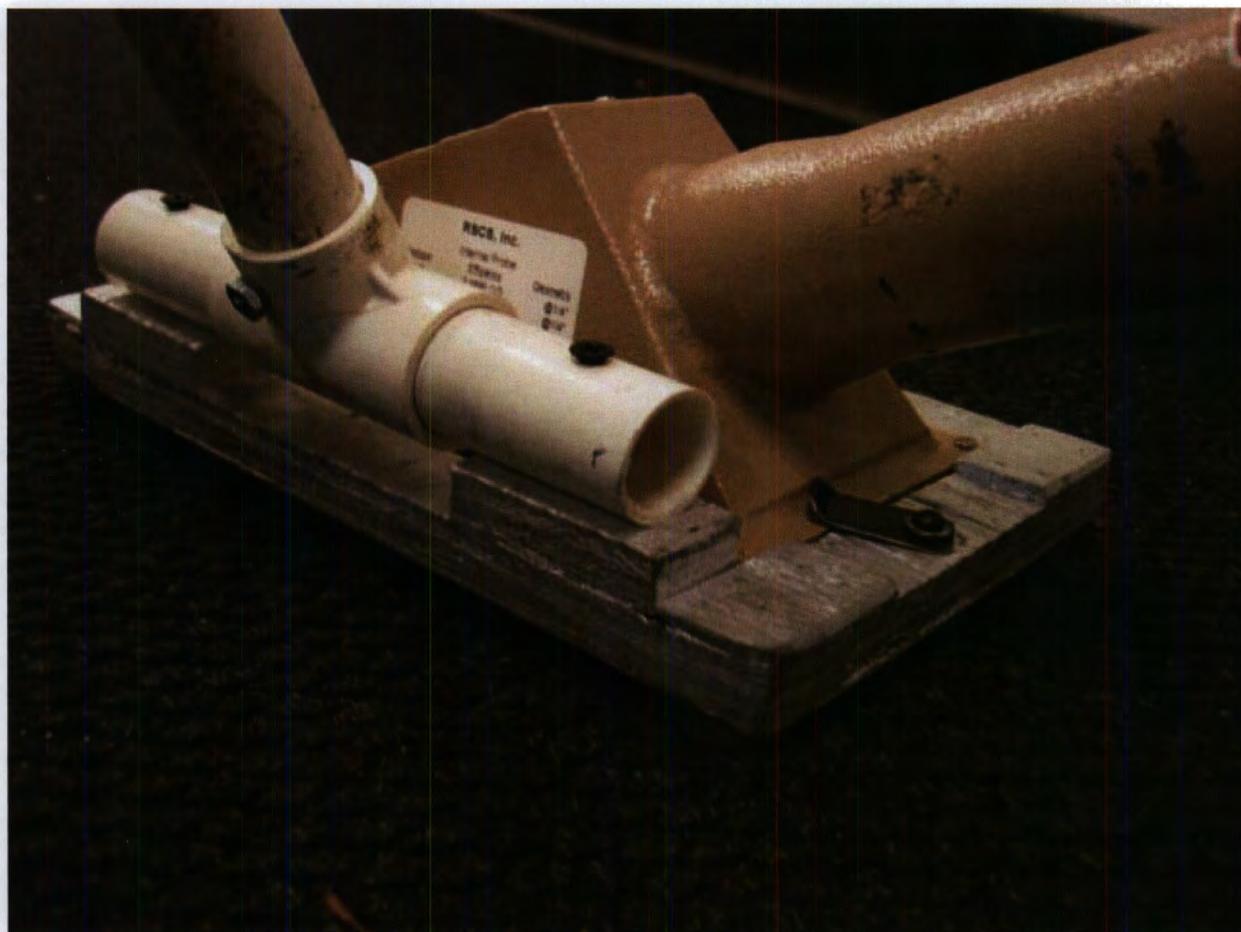
4.3 Survey Instrumentation

All scanning and direct measurements were performed with Ludlum Model 43-89 detectors connected to Eberline Model E-600 (16) meters with SmartPAC connectors. SmartPAC connectors include a memory device which contains all pertinent calibration and operating criteria. Instruments were calibrated and source checked in accordance with RSCS SOPs. (17) The detectors were placed into a holder to allow the technicians to stand while scanning and taking direct measurements and keeping the distance between the detector face and the surface at a constant $\frac{1}{4}$ inch (0.64 cm). Figure 4-1 is a picture of the detector holder and Figure 4-2 is a close-up of the holder and stand-offs.

Figure 4-1 Ludlum 43-89 Holder



Figure 4-2 Ludlum 43-89 Holder and Spacers



4.4 Calibration

The source used for the instrument calibrations is a 5 cm diameter Th-230 source. The calibration standard is traceable to the National Institute of Standards and Technology (NIST). The detector efficiencies were determined at a distance of $\frac{1}{4}$ inch (0.64 cm) to match the distance from the detector face to the surface. The detector efficiencies ranged from 0.0922 c/d to 0.1106 c/d. Copies of the instrument calibration certificates are presented in Attachment 1.

4.5 Response Checks

All survey instrumentation was response checked prior to and after each survey. All pre and post survey response checks were satisfactory.

4.6 MDCs for Fixed Measurements

Before any measurements were made in a survey unit, the average background and Minimum Detectable Concentration (MDC) were calculated. Five 3-minute counts, with the detector held at waist height, were obtained in the survey unit. The average background was used in the equation shown below to calculate the MDC. The MDCs ranged from 36.9 dpm/100 cm² to 70.2

Pratt & Whitney East Hartford Site Final Status Survey Report

dpm/100 cm² or 10.4% to 19.8% of the 354 dpm/100 cm² DCGL. The calculated MDCs for each instrument used in each survey unit are presented in Attachments 2 through 10.

Per NUREG-1507 (18), MDCs for fixed measurements are computed as

$$MDC_{fixed} = \frac{3 + 4.65\sqrt{C_B}}{Kt}$$

Where:

- 3 and 4.65 = constants as described in NUREG-1507;
- C_B = background counts during the measurement time interval (t);
- t = measurement time; and
- K = a proportionality constant that relates the detector response to the activity level in the sample being measured.

The proportionality constant K typically encompasses the detector efficiency, self-absorption factors and probe area corrections, as required.

4.7 MDCs for Alpha Scan Surveys for Structure Surfaces

Five random count rate readings over a minute were recorded and resulting background range (mean +/- 3 standard deviations) was established. This range was only used for information purposes. No calculations or evaluations were made using this data.

The alpha scans were performed at a very slow speed; between 1 and 2 inches per second with the Ludlum 43-89 moving in the 4 inch (10 cm) width direction. All technicians were using ear-phones while scanning and made decisions based upon a detectable audible increase in count rate. Using Figure J.4 in MARSSIM, we have estimated the probability of detecting 2 or more counts over a 100 cm² source equal to the site-specific DCGL to be between 70 and 90 percent.

4.8 MDCs for Wipe Samples

Wipe samples were collected and controlled using chain of custody procedures. (19) The wipes were counted on a Tennelec Model LB5100 low background alpha/beta automatic proportional counter. (20) This counter has internal software to calculate the MDA and Critical Level. The smear efficiency was determined with the same NIST traceable Th-230 source used for the Ludlum 43-89 calibrations. The MDA for all smear analyses was 11.0 dpm. This corresponds to an MDC of 11 dpm/100 cm².

5.0 DATA ASSESSMENT

5.1 Initial Evaluation

The first step in evaluating the data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion. The result of these comparisons will be one of three conclusions: 1) the unit meets the release criterion; 2) the unit does not meet the release criterion; or 3) no conclusion can be drawn from simple comparisons and thus one of the non-parametric statistical tests must be applied.

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For final status survey data collected at the East Hartford site, the initial data evaluation was as described in Table 5-1. (7)

Table 5-1 Initial Evaluation of Survey Results

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

All measured concentrations in all survey units are less than 50% of the DCGL; therefore, all survey units meet the release criterion.

5.2 Data Assessment Summary

A summary of the direct measurements has been compiled and is presented in Table 5-2.

Table 5-2 Summary of Direct Measurements

Survey Unit	Number collected	Direct Measurements (dpm/100 cm ²)			Dose Estimate (mrem/y)
		Average	Max	Min	
J-BLDG	21	2.9	17.9	-13.2	0.2
K-BLDG	22	3.2	53.5	-21.2	0.2
D-BLDG-EH	21	0.1	17.4	-14.5	0.0
D-BLDG-WH	21	11.1	44.2	-28.5	0.6
L-BLDG-EH	21	-13.0	25.1	-40.0	0.0
L-BLDG-WH	21	-0.4	30.2	-25.8	0.0
M-BLDG	21	-7.9	6.3	-25.1	0.0
E-BLDG	21	-4.8	15.1	-24.4	0.0
Waste Trailer	21	21.6	54.8	-10.2	1.2

5.3 ALARA Evaluations

The average residual radioactivity in all survey units is less than 50% of the DCGL; therefore, an ALARA evaluation does not need to be performed.

6.0 CONCLUSIONS

The DQO process was used in developing the Final Status Survey packages. As part of that process, the Null Hypothesis assumed that the survey unit exceeds the release criterion. Based upon all the direct measurements being less than 50% of the DCGL, the null hypothesis is rejected and all survey units meet the release criterion.

Pratt & Whitney East Hartford Site Final Status Survey Report

7.0 REFERENCES

1. *NRC Materials License SMB-151, United Technologies Corporation Pratt and Whitney, NRC Form 374 Amendment No. 18, August 9, 2010 Issued by NRC January 11, 2011.*
2. *United Technologies Corporation, Acceptance of Notification of Cessation of Activities at a Site, Control No. 580065, U.S. Nuclear Regulatory Commission, April 24, 2013.*
3. *10 CFR 20 Standards for Protection Against Radiation, Subpart E—Radiological Criteria for License Termination.*
4. *10 CFR 40.42 Expiration and termination of licenses and decommissioning of sites and separate buildings or outdoor areas.*
5. *NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," dated December 1997.*
6. *United Technologies Corporation, License Amendment No. 23 Control No 585186 East Hartford FSS Plan, Oct 24, 2014 ML14309A493.*
7. *Final Status Survey Plan Revision 1 A United Technologies Company Pratt & Whitney 400 Main Street East Hartford, Connecticut Termination of License SMB-151 at the Middletown, CT Facility, August 2014.*
8. *RSCS TSD No. 14-003, "Site-Specific Pratt & Whitney Building Surface DCGL Using RESRAD-BUILD.*
9. *Email Pratt & Whitney East Hartford and Middletown Facilities Site Specific Building Surface DCGL Submittal for SMB-151 License Termination, Timothy Noonan, April 29, 2014 Ascension No. ML14134A096.*
10. *United Technologies Corporation, Acceptance of Site Specific Derived Concentration Guideline Level (DCGL) Value Concerning Application for Amendment to License, Control No. 583820, U.S. Nuclear Regulatory Commission, August 13, 2014.*
11. *Pratt and Whitney East Hartford FSSP, a United Technologies Company; E-mail dtd November 10, 2014, RE: Deficiency Request; Control No. 585186.*
12. *RSCS SOP 4.1.6, Preparation and Implementation of Final Status Survey Packages for Pratt & Whitney, Revision 00, September 26, 2014.*
13. *Adoption of the 19 mrem per year total dose equivalent standard for remediation of sources of ionizing radiation within the State of Connecticut, Connecticut, State of, Office of the Attorney General Letter, From Robert D. Snook (Assistant Attorney Genera.*
14. *Remediation Standard Regulations, § 22a-133k, Hartford, CT, January 30, 1996.*
15. *PNNL-19915, Visual Sample Plan Version 6.0 User's Guide, Pacific Northwest National Laboratory, June 2010.*
16. *RSCS SOP 2.7.1, Setup And Operation Of The E-600 Digital Survey Instrument For Multiple Modes Of Operation and With Various Probes, Revision 00, September 2010.*
17. *RSCS SOP 2.7.4, Operation of Radiological Instrumentation, Revision 00, September 2010.*
18. *NUREG-1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions, June 1998.*
19. *RSCS SOP 2.1.15, Chain Of Custody For Samples to be Analyzed In RSCS Laboratory, Revision 00, March 2014.*
20. *RSCS SOP 2.9.2, Tennelec Series 5 LB5100 Operation, Revision 01, June 2013.*

Attachment 1 Calibration Certificates



Pratt & Whitney East Hartford Site Final Status Survey Report

ID Number: 22394583190-0

Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

Instrument Ludlum Model 43-89
Serial Number 223945

Probe Model & SN	Isotope	Efficiency	NIST Source ID	Geometry
Internal Probe	Tc-99	0.0408 C/D	Tc-99 (SN: 63963 (Beta))	@1/4"
Internal Probe	Th-230	0.0922 C/D	Th-230 (SN: S-963)	@1/4"
Internal Probe	Th-230	0.1828 C/D	Th-230 (SN: S-963)	On Flat Surface

Outer Physical Check: *Pass*
 Tap Test: *Pass*

Electronics Checks	As Found	As Left
High Voltage	742 Volts	742 Volts

Comments: All As Left readings taken subsequent to repair. Calibrated with E-600 SN 01033 (Calibration Due Date = 9/19/2015)

Check Source Acceptance Range (With RSCS Projects Alpha/Beta Source 001) = 2.916 to 4.374 kcpm on the alpha plus beta channel

Calibrated by:

QA Review:

Date: 10/21/2014
 Expires: 10/21/2015

Atmospheric Conditions - Temperature: 74° F Humidity: 23% Barometric Pressure: 29.88 in/hg
 This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
 Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
 J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
 RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%.
 Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
 Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994
 This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc.



Pratt & Whitney East Hartford Site Final Status Survey Report

ID Number: 22394683187-0

Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

Instrument
 Ludlum Model 43-89

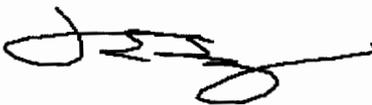
Serial Number
 223946

Probe Model & SN	Isotope	Efficiency	NIST Source ID	Geometry
Internal Probe	Tc-99	0.0672 C/D	Tc-99 (SN: 63963 (Beta))	@1/4"
Internal Probe	Th-230	0.0954 C/D	Th-230 (SN: S-963)	@1/4"
Internal Probe	Th-230	0.1673 C/D	Th-230 (SN: S-963)	On Flat Surface

Outer Physical Check: *Pass*
 Tap Test: *Pass*

Electronics Checks	As Found	As Left
High Voltage	674 Volts	645 Volts

Comments: Calibrated with E-600 SN 01018 (Calibration Due Date = 10/21/2015)
 Check Source Acceptance Range (With RSCS Projects Alpha/Beta Source 001) = 4.444 to 6.666 kcpm on the alpha plus beta channel

Calibrated by:  QA Review: 

Date: 10/22/2014
 Expires: 10/22/2015

Atmospheric Conditions - Temperature: 70° F Humidity: 43% Barometric Pressure: 29.98 in/hg
 This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
 Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
 J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
 RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%.
 Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
 Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994
 This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc.



Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

Instrument
 Ludlum Model 43-89

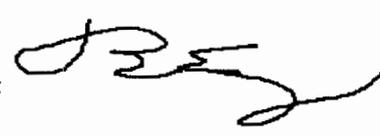
Serial Number
 311683

Probe Model & SN	Isotope	Efficiency	NIST Source ID	Geometry
Internal Probe	Tc-99	0.0695 C/D	Tc-99 (SN: 63963 (Beta))	@1/4"
Internal Probe	Th-230	0.1106 C/D	Th-230 (SN: S-963)	@1/4"
Internal Probe	Th-230	0.1629 C/D	Th-230 (SN: S-963)	On Flat Surface

Outer Physical Check: *Pass*
 Tap Test: *Pass*

Electronics Checks	As Found	As Left
High Voltage	762 Volts	762 Volts

Comments: Calibrated with E-600 SN 3689 (Calibration Due Date = 10/21/2015)
 Check Source Acceptance Range (With RSCS Projects Alpha/Beta Source 001) = 4.148 to 6.223 kcpm on the alpha plus beta channel

Calibrated by:  QA Review: 

Date: 10/22/2014
 Expires: 10/22/2015

Atmospheric Conditions - Temperature: 70° F Humidity: 43% Barometric Pressure: 29.98 in/hg
 This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
 Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
 J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 91411), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
 RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%.
 Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
 Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994
 This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc.



Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

Instrument
 Ludlum Model 43-89

Serial Number
 312071

Probe Model & SN	Isotope	Efficiency	NIST Source ID	Geometry
Internal Probe	C-14	0.0091 C/D	C-14 (SN: 488-10-9)	On Contact
Internal Probe	Cs-137	0.2162 C/D	Cs-137(Beta) (SN: 98CS5004751)	@1cm
Internal Probe	Cs-137	0.2536 C/D	Cs-137(Beta) (SN: 98CS5004751)	On Contact
Internal Probe	Sr/Y-90	0.1989 C/D	Sr/Y-90 (SN: 63962 (Beta))	On Contact
Internal Probe	Tc-99	0.0793 C/D	Tc-99 (SN: 63963 (Beta))	@1cm
Internal Probe	Tc-99	0.0853 C/D	Tc-99 (SN: 63963 (Beta))	On Contact
Internal Probe	Co-60	0.0934 C/D	Tc-99 (SN: 63963 (Beta))	On Contact
Internal Probe	Th-230	0.1095 C/D	Th-230 (SN: S-963)	@1/4"
Internal Probe	Th-230	0.0966 C/D	Th-230 (SN: S-963)	@1cm
Internal Probe	Th-230	0.2012 C/D	Th-230 (SN: S-963)	On Contact

Outer Physical Check: *Pass*
 Tap Test: *Pass*

Electronics Checks	As Found	As Left
High Voltage	771 Volts	771 Volts

Comments: Calibrated with E-600 SN 3689 (Calibration Due Date = 12/02/2014) Added Cs-137 efficiencies 7/29/14 dsc.
 Added C-14, Sr-90 and Co-60 9/12/14 dsc.
 Updated 10/21/14 to add Th-230 efficiency at 1/4" and check source reading
 Check Source Acceptance Range (With RSCS Projects Alpha/Beta Source 001 on the alpha + beta channel) = 4.336 to 6.504 kcpm

Calibrated by:

QA Review:

Date: 06/17/2014
 Expires: 06/17/2015

Atmospheric Conditions - Temperature: 72° F Humidity: 29% Barometric Pressure: 29.94 in/hg
 This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
 Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
 J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
 RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%.
 Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
 Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994
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Pratt & Whitney East Hartford Site Final Calibration Certificate
Status Survey Report
 ID Number: 0101883208-0

Customer: Joan Ervey
 Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

Instrument
 Eberline Model E-600

Serial Number
 01018

Precision Check				
Test 1	Test 2	Test 3	Mean	Results
7.98 Kcpm	7.97 Kcpm	7.99 Kcpm	7.98 Kcpm	Satisfactory

Accuracy Check			
Range	Target Value	As Found	As Left
100K	80 Kcpm	79.9 Kcpm #	79.9 Kcpm #
100K	20 Kcpm	19.93 Kcpm #	19.93 Kcpm #
10K	8 Kcpm	7.98 Kcpm #	7.98 Kcpm #
10K	2 Kcpm	1.99 Kcpm #	1.99 Kcpm #
1K	800 cpm	797 cpm #	797 cpm #
1K	200 cpm	200 cpm #	200 cpm #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10.00% of Target value
 Readings with # indicate ranges where pulser was used.

MTE Instrument Type	Model	CalDueDate
Pulser	Eberline MP-2 SN: 886	10/29/2014

Outer Physical Check: *Pass*
 Tap Test: *Pass*

Comments: High Voltage Accuracy Check: Set at 898 V, Measured = 897 V

Calibrated by:

QA Review:

Calibration Date: 10/21/2014
 Expires: 10/21/2015

Atmospheric Conditions - Temperature: 74°F Humidity: 23% Barometric Pressure: 29.88"hg
 This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
 Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
 J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
 RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%.
 Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
 Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994
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Pratt & Whitney East Hartford Site Final Calibration Certificate
Survey Report
 ID Number: 0103382009-0

Customer: Joan Ervey
 Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

Instrument
 Eberline Model E-600

Serial Number
 01033

Precision Check				
Test 1	Test 2	Test 3	Mean	Results
7.99 Kcpm	7.98 Kcpm	7.99 Kcpm	7.99 Kcpm	Satisfactory

Accuracy Check			
Range	Target Value	As Found	As Left
100K	80 Kcpm	79.8 Kcpm #	79.8 Kcpm #
100K	20 Kcpm	19.98 Kcpm #	19.98 Kcpm #
10K	8 Kcpm	7.99 Kcpm #	7.99 Kcpm #
10K	2 Kcpm	2.00 Kcpm #	2.00 Kcpm #
1K	800 cpm	801 cpm #	801 cpm #
1K	200 cpm	201 cpm #	201 cpm #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10.00% of Target value
 Readings with # indicate ranges where pulser was used.

MTE Instrument Type	Model	CalDueDate
Pulser	Ludlum 500-4 SN: 66151	10/30/2014

Outer Physical Check: Pass
 Tap Test: Pass

Comments: High Voltage Accuracy Check: Set at 1201 V, As-Found, Measured = 1217 V, As-Left = 1201

Calibrated by:

QA Review:

Calibration Date: 09/19/2014
 Expires: 09/19/2015

Atmospheric Conditions - Temperature: 73°F Humidity: 25% Barometric Pressure: 30.23"hg
 This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
 Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
 J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
 RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%.
 Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
 Calibration Laboratory is operated in accordance with ANSI/NCCL Z540-1-1994
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Pratt & Whitney East Hartford Site Final Status Survey Report

Calibration Certificate
ID Number: 00368577615-1

Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
91 Portsmouth Avenue
Stratham, NH 03885

Instrument
Eberline Model E-600

Serial Number
003685

Precision Check				
Test 1	Test 2	Test 3	Mean	Results
11.53 mrem/hr	10.98 mrem/hr	10.29 mrem/hr	10.93 mrem/hr	Satisfactory

Accuracy Check			
Range	Target Value	As Found	As Left
AUTO	20 mrem/hr	19.79 mrem/hr	19.79 mrem/hr
AUTO	12 mrem/hr	11.53 mrem/hr	11.53 mrem/hr
AUTO	8 mrem/hr	6.996 mrem/hr	6.996 mrem/hr
AUTO	2 mrem/hr	1.892 mrem/hr	1.892 mrem/hr

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10.00% of Target value

Outer Physical Check: Pass
Tap Test: Pass

Electronics Checks	As Found	As Left
High Voltage	set @ 2334 V	set @ 2334 V

Calibrated by: *MD MA*

QA Review: *JEG*

Calibration Date: 03/26/2014
Expires: 03/26/2015

Atmospheric Conditions - Temperature: 73°F Humidity: 16% Barometric Pressure: 29.75"hg

This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:

Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.

J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.

RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%

Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.

Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994

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Pratt & Whitney East Hartford Site Final Status Survey Report

Calibration Certificate
ID Number: 368983210-0

Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
91 Portsmouth Avenue
Stratham, NH 03885

Instrument
Eberline Model E-600

Serial Number
3689

Precision Check				
Test 1	Test 2	Test 3	Mean	Results
7.98 Kcpm	7.99 Kcpm	7.99 Kcpm	7.99 Kcpm	Satisfactory

Accuracy Check			
Range	Target Value	As Found	As Left
100K	80 Kcpm	79.9 Kcpm #	79.9 Kcpm #
100K	20 Kcpm	19.92 Kcpm #	19.92 Kcpm #
10K	8 Kcpm	7.98 Kcpm #	7.98 Kcpm #
10K	2 Kcpm	2.0 Kcpm #	2.0 Kcpm #
1K	800 cpm	800 cpm #	800 cpm #
1K	200 cpm	201 cpm #	201 cpm #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10.00% of Target value
Readings with # indicate ranges where pulser was used.

MTE Instrument Type	Model	CalDueDate
Pulser	Eberline MP-2 SN: 886	10/29/2014

Outer Physical Check: *Pass* Tap Test: *Pass*

Comments: High Voltage Accuracy Check: Set at 898 V, Measured = 898 V

Calibrated by:

QA Review:

Calibration Date: 10/21/2014
Expires: 10/21/2015

Atmospheric Conditions - Temperature: 74°F Humidity: 23% Barometric Pressure: 29.88"hg
This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%.
Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994
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Pratt & Whitney East Hartford Site Final Status Survey Report

Calibration Certificate
ID Number: 00369082008-0

Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

Instrument
 Eberline Model E-600

Serial Number
 003690

Precision Check				
Test 1	Test 2	Test 3	Mean	Results
7.96 Kcpm	7.96 Kcpm	7.95 Kcpm	7.96 Kcpm	Satisfactory

Accuracy Check			
Range	Target Value	As Found	As Left
100K	80 Kcpm	79.8 Kcpm #	79.8 Kcpm #
100K	20 Kcpm	19.90 Kcpm #	19.90 Kcpm #
10K	8 Kcpm	7.96 Kcpm #	7.96 Kcpm #
10K	2 Kcpm	1.989 Kcpm #	1.989 Kcpm #
1K	800 cpm	796 cpm #	796 cpm #
1K	200 cpm	201 cpm #	201 cpm #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10.00% of Target value
 Readings with # indicate ranges where pulser was used.

MTE Instrument Type	Model	CalDueDate
Pulser	Eberline MP-2 SN: 678	03/19/2015

Outer Physical Check: *Pass*
 Tap Test: *Pass*

Comments: High Voltage Accuracy Check: Set at 1200 V, Measured = 1200 V

Calibrated by:

QA Review:

Calibration Date: 09/19/2014
 Expires: 09/19/2015

Atmospheric Conditions - Temperature: 73°F Humidity: 25% Barometric Pressure: 30.23"hg

This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:

Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.

J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.

RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%

Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.

Calibration Laboratory is operated in accordance with ANSI/NCCL Z540-1-1994

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Attachment 2 Survey Unit L BLDG – East Half

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: L-BLDG-EH	FSSP #: L-BLDG-EH-001
Survey unit name: L Building East Half	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit L-BLDG-EH, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the East Hartford Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the East Hartford Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the East Hartford Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_W). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

Basis for Determining the Operational DCGL: The East Hartford Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_W equal to 354 dpm/100 cm². This DCGL_W corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The East Hartford Final Status Survey Plan, Revision 1, has specified that an approximately one meter radius around each direct measurement location will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The East Hartford Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

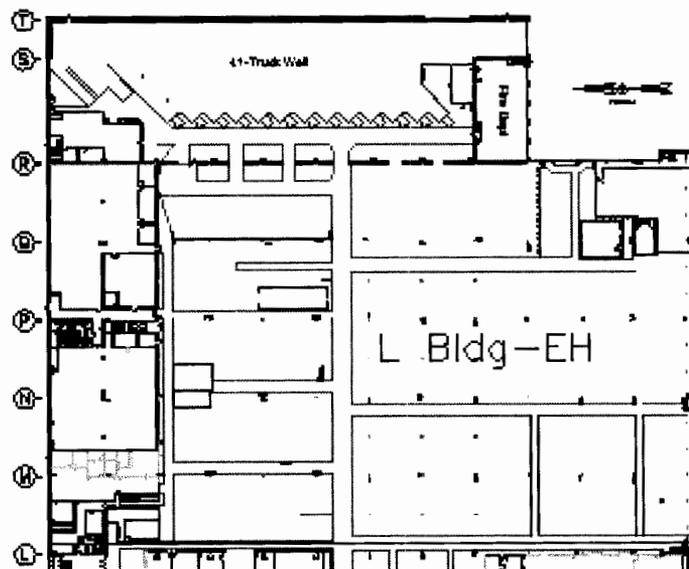
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is the east half of the L Building. The survey unit surface area is approximately 17,003 square meters (17,003 m^2) or 183,018 square feet (183,018 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit L-BLDG-EH



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The East Hartford Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The East Hartford Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in the East Hartford Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible at areas requiring investigations.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.
10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than $177 \text{ dpm}/100 \text{ cm}^2$, increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.
 - 3) Obtain a 100 cm^2 smear at the location of the direct measurement

- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shiftDocument the investigation on the attached Data Investigation form. Record actions taken on the form such as:
 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

Pratt & Whitney East Hartford Site Final Status Survey Report

FSSP #: L-BLDG-EH-001

14. The Health Physicist will complete the package review in accordance with the East Hartford Final Status Survey Plan, Termination of License SMB-151 at the East Hartford, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

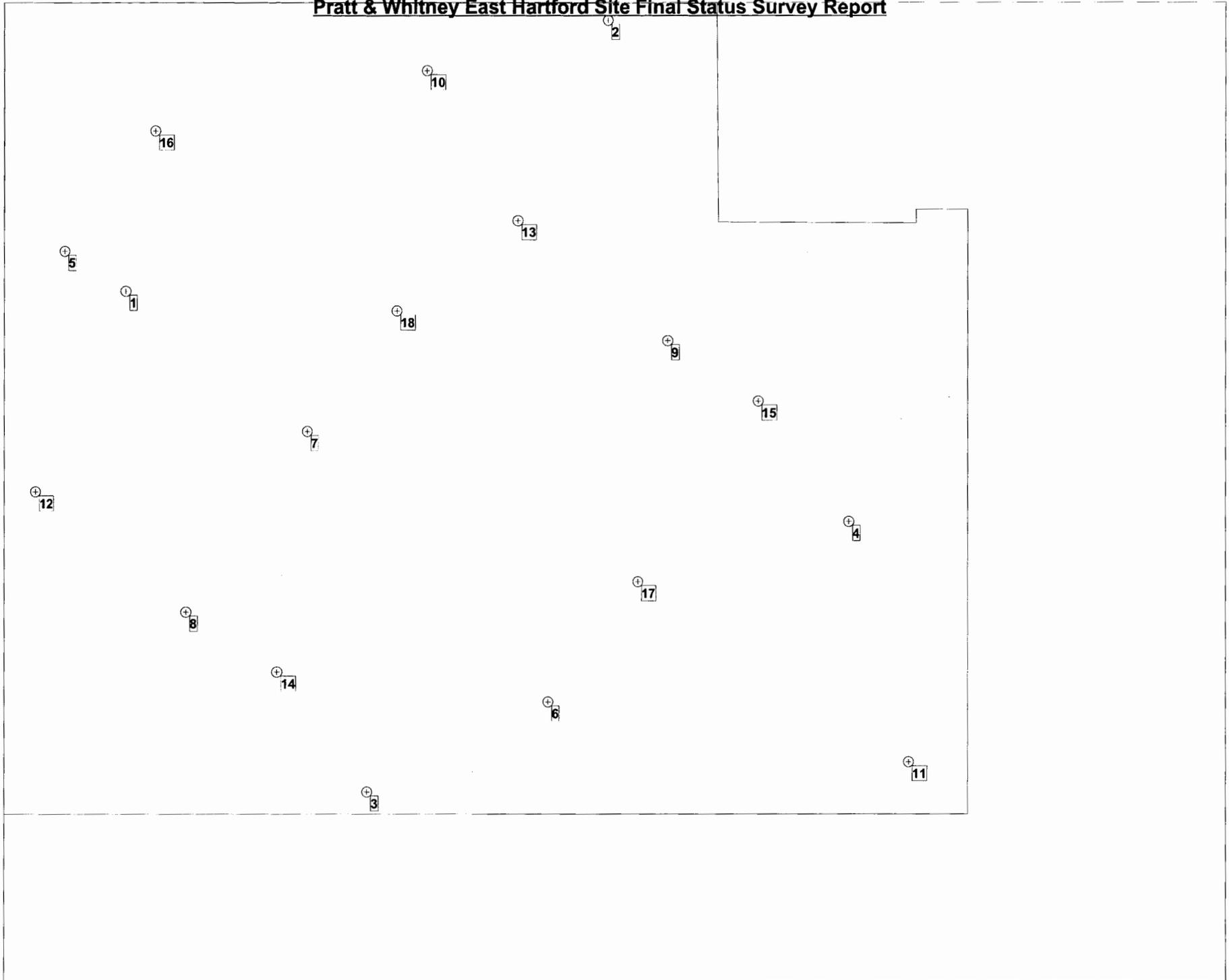
Prepared by: P Hollenbeck

Date: 3-Dec-14

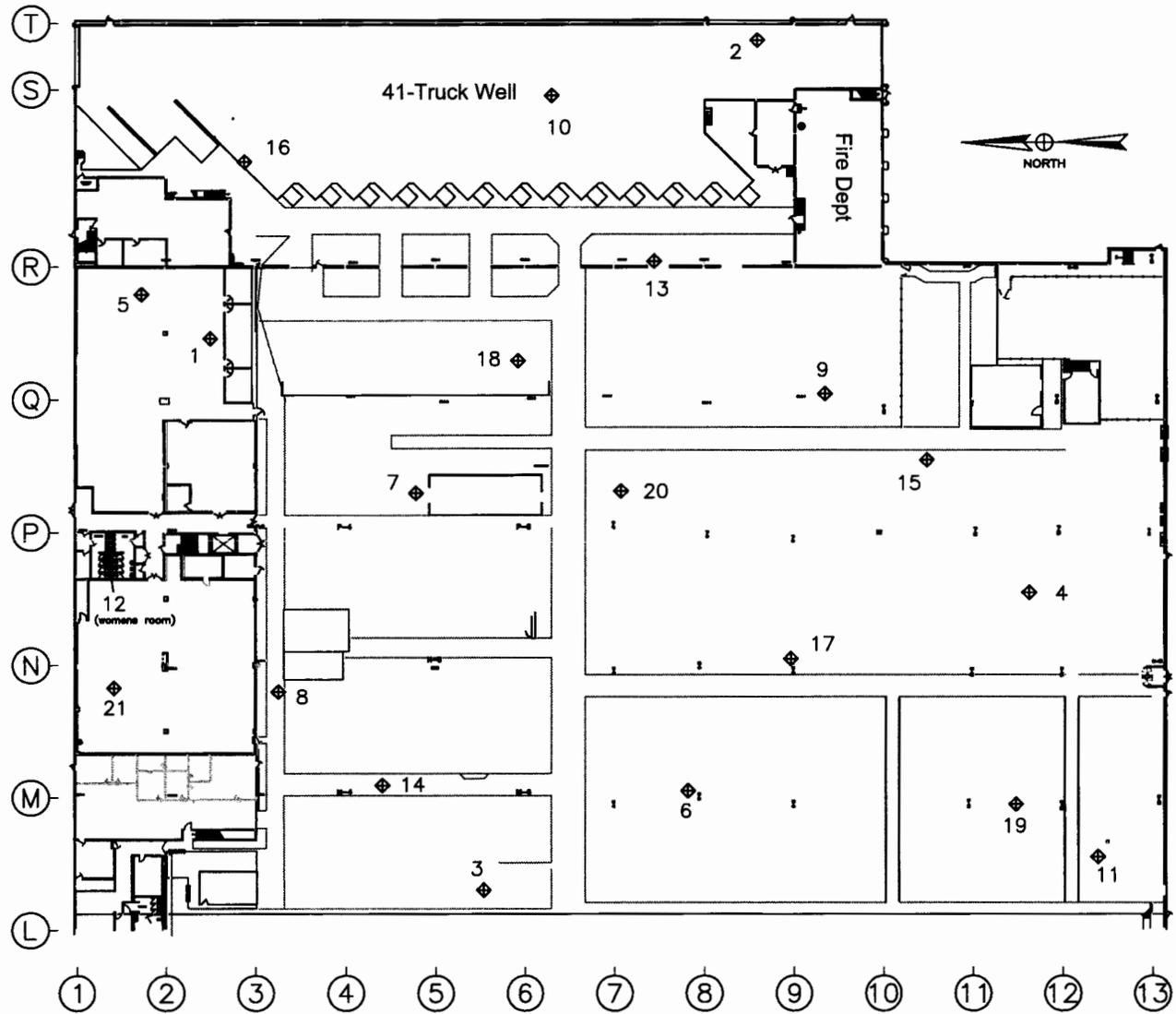
Approved by: [Signature]

Date: 5-Dec-14

Final Building List Survey, Location Map (BP)
Pratt & Whitney East Hartford Site Final Status Survey Report



As Surveyed L Building East Half Survey Location Map
Pratt & Whitney East Hartford Site Final Status Survey Report



Pratt & Whitney East Hartford Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: L-BLDG-EH-001

Survey Date: 12/10/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #3689/43-89 # 311683			
Survey meter (2):		E-600 #3690/43-89 # 223945			
Meter (1) Details			Meter (2) Details		
Count time (min):		3	Count time (min):		3
Meter (1) background (counts):		25.6	Meter (2) background (counts):		8.6
Meter (1) Efficiency (c/d):		0.1106	Meter (2) Efficiency (c/d):		0.0922
Meter (1) MDC (dpm/100 cm ²):		64.0	Meter (2) MDC (dpm/100 cm ²):		48.1
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	1	16	-9.6	-23.1	N
2	1	14	-11.6	-28.0	N
3	1	14	-11.6	-28.0	N
4	2	9	0.4	1.2	N
5	1	12	-13.6	-32.8	N
6	2	5	-3.6	-10.4	N
7	1	10	-15.6	-37.6	N
8	1	24	-1.6	-3.9	N
9	2	11	2.4	6.9	N
10	1	25	-0.6	-1.4	N
11	2	6	-2.6	-7.5	N
12	1	36	10.4	25.1	N
13	2	6	-2.6	-7.5	N
14	1	17	-8.6	-20.7	N
15	2	9	0.4	1.2	N
16	1	9	-16.6	-40.0	N
17	2	7	-1.6	-4.6	N
18	1	13	-12.6	-30.4	N
19	2	5	-3.6	-10.4	N
20	2	8	-0.6	-1.7	N
21	1	18	-7.6	-18.3	N

survey unit average => -13.0 dpm/100 cm²
dose estimate => -0.7 mrem/y

**Pratt & Whitney East Hartford Site Final Status Survey Report
Sample Report**

Batch ID: LT Th-230 - 201412170846
 Group: A
 Device: LB5100
 Batch Key: 27,229
 Selected Geometry: 1/4" Stainless Steel

Count Date: 12/17/2014
 Count Minutes: 2.0
 Count Mode: Alpha Only
 Operating Volts: 840

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	1.46			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	11.00			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	34.00			Beta Bkgd (CPH)	0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
20141217084700-A1	1			0.00	-0.23	0.50	
20141217084940-A2	2			0.00	-0.23	0.50	
20141217085151-A3	3			0.00	-1.99	0.00	
20141217085311-A4	4			0.00	-1.99	0.00	
20141217085621-A5	5			0.00	-0.23	0.50	
20141217085881-A6	6			0.00	-0.23	0.50	
20141217090051-A7	7			0.00	-1.99	0.00	
20141217090311-A8	8			0.00	-0.23	0.50	
20141217090521-A9	9			0.00	-1.99	0.00	
20141217090781-A10	10			0.00	-1.99	0.00	
20141217091001-A11	11			0.00	1.52	1.00	
20141217091261-A12	12			0.00	-1.99	0.00	
20141217091431-A13	13			0.00	-1.99	0.00	
20141217091691-A14	14			0.00	-1.99	0.00	
20141217091901-A15	15			0.00	-1.99	0.00	
20141217092161-A16	16			0.00	-0.23	0.50	
20141217092331-A17	17			0.00	-1.99	0.00	
20141217092591-A18	18			0.00	-1.99	0.00	
20141217092801-A21	Smears 19			0.00	-1.99	0.00	
20141217093061-A20	20			0.00	-1.99	0.00	
20141217093232-A23	21			0.00	-1.99	0.00	

P+W L-BLDG -EH -001



Reviewed by: _____
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Attachment 3 Survey Unit L BLDG – West Half

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: L-BLDG-WH	FSSP #: L-BLDG-WH-001
Survey unit name: L Building West Half	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit L-BLDG-WH, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the East Hartford Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the East Hartford Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the East Hartford Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_W). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

Basis for Determining the Operational DCGL: The East Hartford Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_W equal to 354 dpm/100 cm². This DCGL_W corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The East Hartford Final Status Survey Plan, Revision 1, has specified that an approximately one meter radius around each direct measurement location will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The East Hartford Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

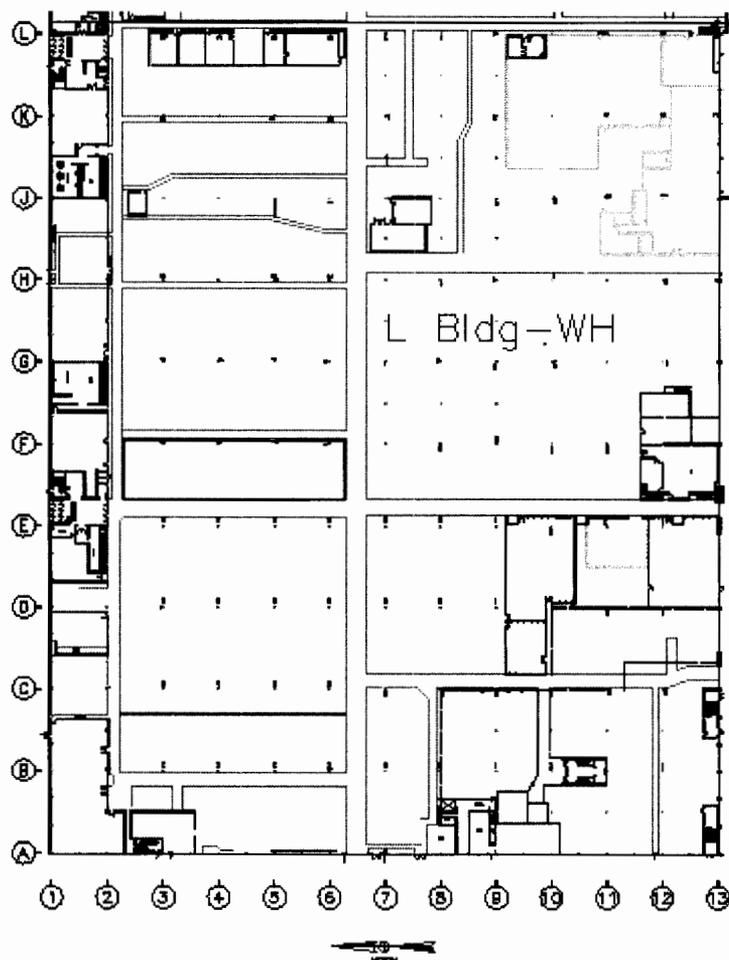
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is the west half of the L Building. The survey unit surface area is approximately 27,264 square meters (27,264 m^2) or 293,466 square feet (293,466 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit L-BLDG-WH



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The East Hartford Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The East Hartford Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in the East Hartford Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible at areas requiring investigations.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.
10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.
 - 3) Obtain a 100 cm² smear at the location of the direct measurement

- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

Pratt & Whitney East Hartford Site Final Status Survey Report

FSSP #: L-BLDG-WH-001

14. The Health Physicist will complete the package review in accordance with the East Hartford Final Status Survey Plan, Termination of License SMB-151 at the East Hartford, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

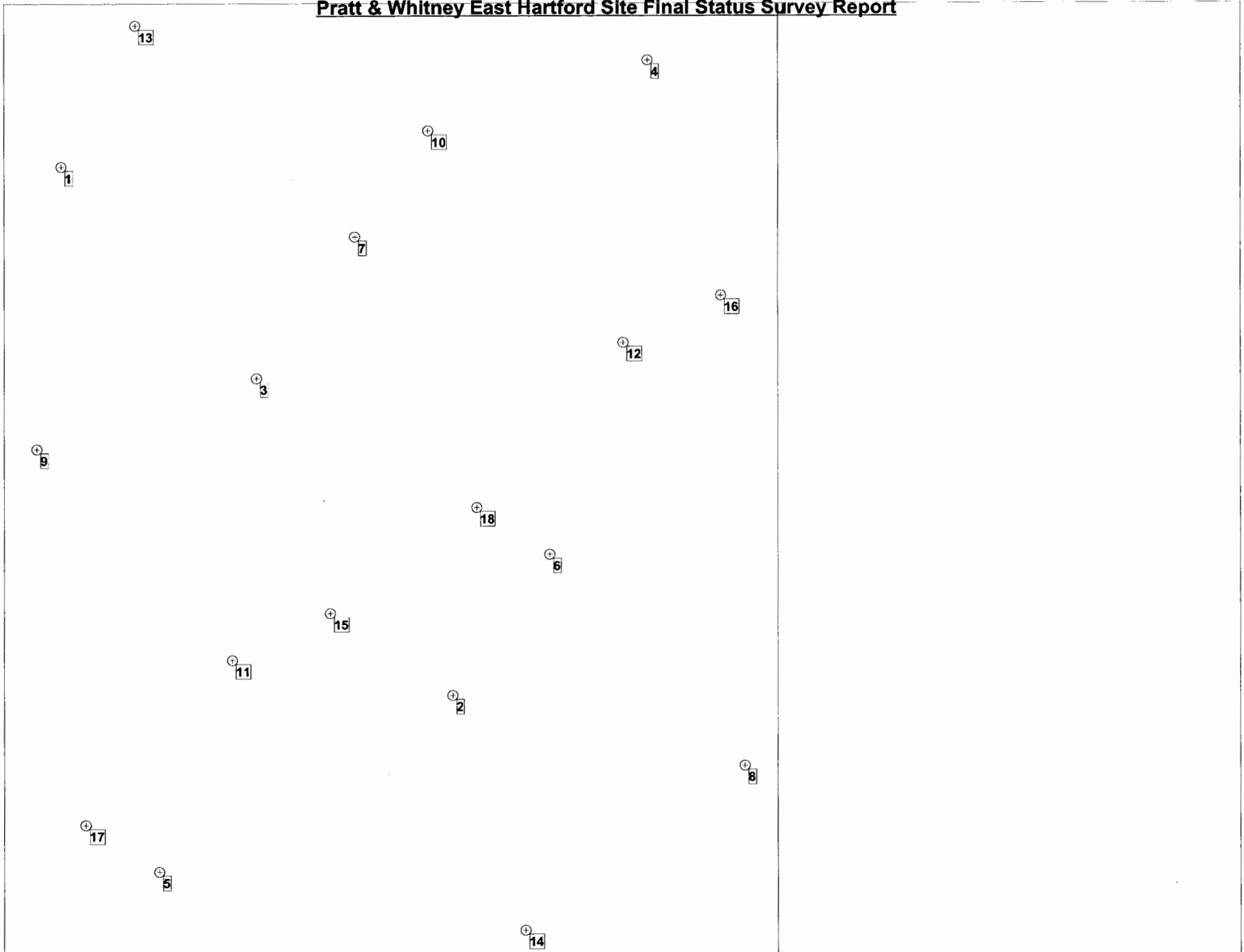
Prepared by: P Hollenbeck

Date: 3-Dec-14

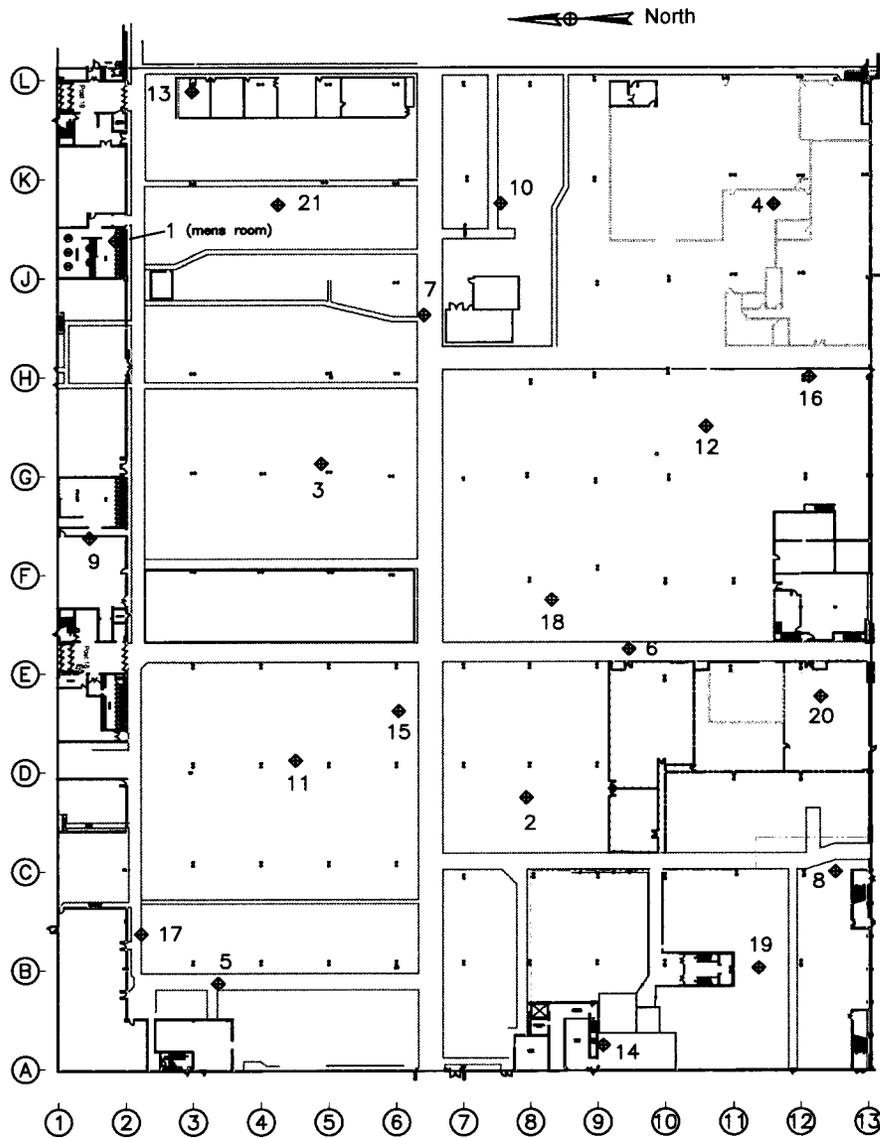
Approved by: [Signature]

Date: 5-Dec-14

Planned L Building West Half Survey Location Map - (VSP)
Pratt & Whitney East Hartford Site Final Status Survey Report



As Surveyed L Building West Half Survey Location Map
Pratt & Whitney East Hartford Site Final Status Survey Report



Pratt & Whitney East Hartford Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: L-BLDG-WH-001

Survey Date: 12/10/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #1018/43-89 # 223946			
Survey meter (2):		E-600 #3685/43-89 # 312071			
Meter (1) Details			Meter (2) Details		
Count time (min):	3	Count time (min):	3		
Meter (1) background (counts):	17.0	Meter (2) background (counts):	17.6		
Meter (1) Efficiency (c/d):	0.0954	Meter (2) Efficiency (c/d):	0.1095		
Meter (1) MDC (dpm/100 cm²):	62.0	Meter (2) MDC (dpm/100 cm²):	54.8		
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm²)	>Inv Level (Y/N)
1	2	30	12.4	30.2	N
2	1	17	0.0	0.0	N
3	2	13	-4.6	-11.2	N
4	1	15	-2.0	-5.6	N
5	2	19	1.4	3.4	N
6	1	19	2.0	5.6	N
7	2	10	-7.6	-18.5	N
8	1	23	6.0	16.8	N
9	2	15	-2.6	-6.3	N
10	1	25	8.0	22.4	N
11	2	11	-6.6	-16.1	N
12	1	21	4.0	11.2	N
13	2	16	-1.6	-3.9	N
14	1	18	1.0	2.8	N
15	2	10	-7.6	-18.5	N
16	1	23	6.0	16.8	N
17	2	13	-4.6	-11.2	N
18	1	19	2.0	5.6	N
19	2	8	-9.6	-23.4	N
20	1	23	6.0	16.8	N
21	2	7	-10.6	-25.8	N

survey unit average => -0.4 dpm/100 cm²
dose estimate => 0.0 mrem/y

**Pratt & Whitney East Hartford Site Final Status Survey Report
Sample Report**

Batch ID:	LT Th-230 - 201412161511	Count Date:	12/16/2014
Group:	A	Count Minutes:	2.0
Device:	LB5100	Count Mode:	Alpha Only
Batch Key:	27,219	Operating Volts:	840
Selected Geometry: 1/4" Stainless Steel			

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)		±
Alpha Action Level (cpm)	1.46			Beta Action Level (cpm)	0.00	
Alpha MDA (dpm)	11.00			Beta MDA (dpm)	0.00	
Alpha Bkgd (CPH)	34.00			Beta Bkgd (CPH)	0.00	

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
20141216151151-A1	1			0.00	-1.99	0.00	
20141216151152-A2	2			0.00	-0.23	0.50	
20141216151642-A3	3			0.00	1.52	1.00	
20141216152112-A5	5			0.00	-0.23	0.50	
20141216152542-A7	7			0.00	-1.99	0.00	
20141216153012-A9	9			0.00	-0.23	0.50	
20141216153452-A11	11			0.00	-1.99	0.00	
20141216153922-A13	13			0.00	-1.99	0.00	
20141216154353-A15	15			0.00	1.52	1.00	
20141216154823-A17	17			0.00	-1.99	0.00	
20141216155253-A21	Smears 19			0.00	-1.99	0.00	
20141216155733-A23	21			0.00	-0.23	0.50	

P+W L-BLDG-WH-001



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Attachment 4 Survey Unit J BLDG

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: J-BLDG	FSSP #: J-BLDG-001
Survey unit name: J Building	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit J-BLDG, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the East Hartford Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the East Hartford Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the East Hartford Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_W). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

Basis for Determining the Operational DCGL: The East Hartford Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_W equal to 354 dpm/100 cm². This DCGL_W corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The East Hartford Final Status Survey Plan, Revision 1, has specified that an approximately one meter radius around each direct measurement location will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The East Hartford Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

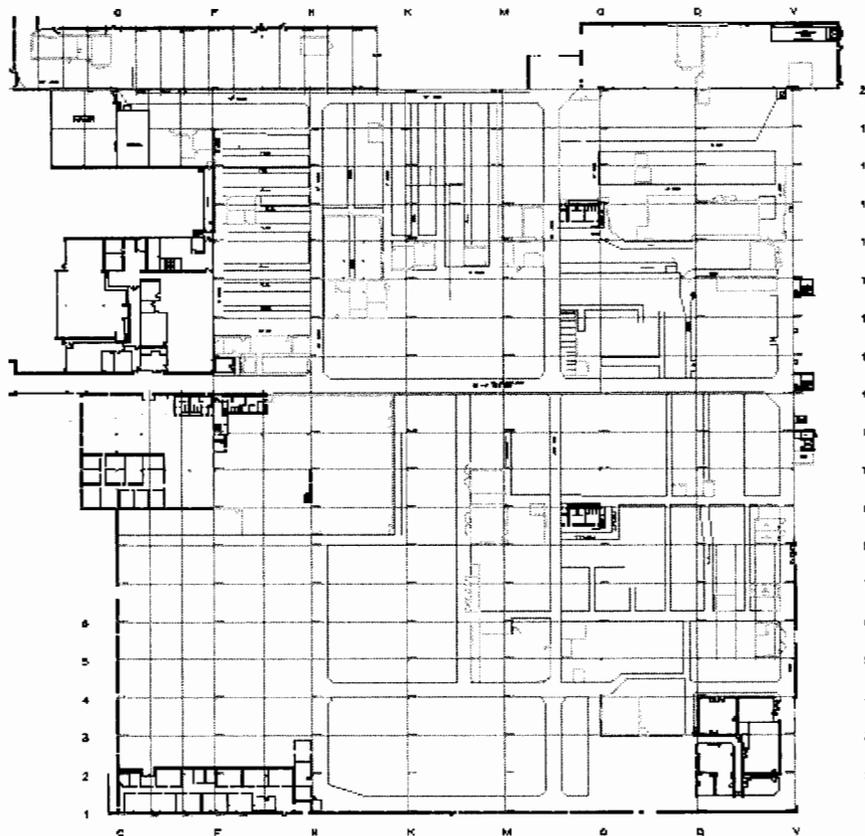
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is the J Building. The survey unit surface area is approximately 32,482 square meters (32,482 m^2) or 349,635 square feet (349,635 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit J-BLDG



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The East Hartford Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The East Hartford Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in the East Hartford Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible at areas requiring investigations.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.
10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.
 - 3) Obtain a 100 cm² smear at the location of the direct measurement

- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

14. The Health Physicist will complete the package review in accordance with the East Hartford Final Status Survey Plan, Termination of License SMB-151 at the East Hartford, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

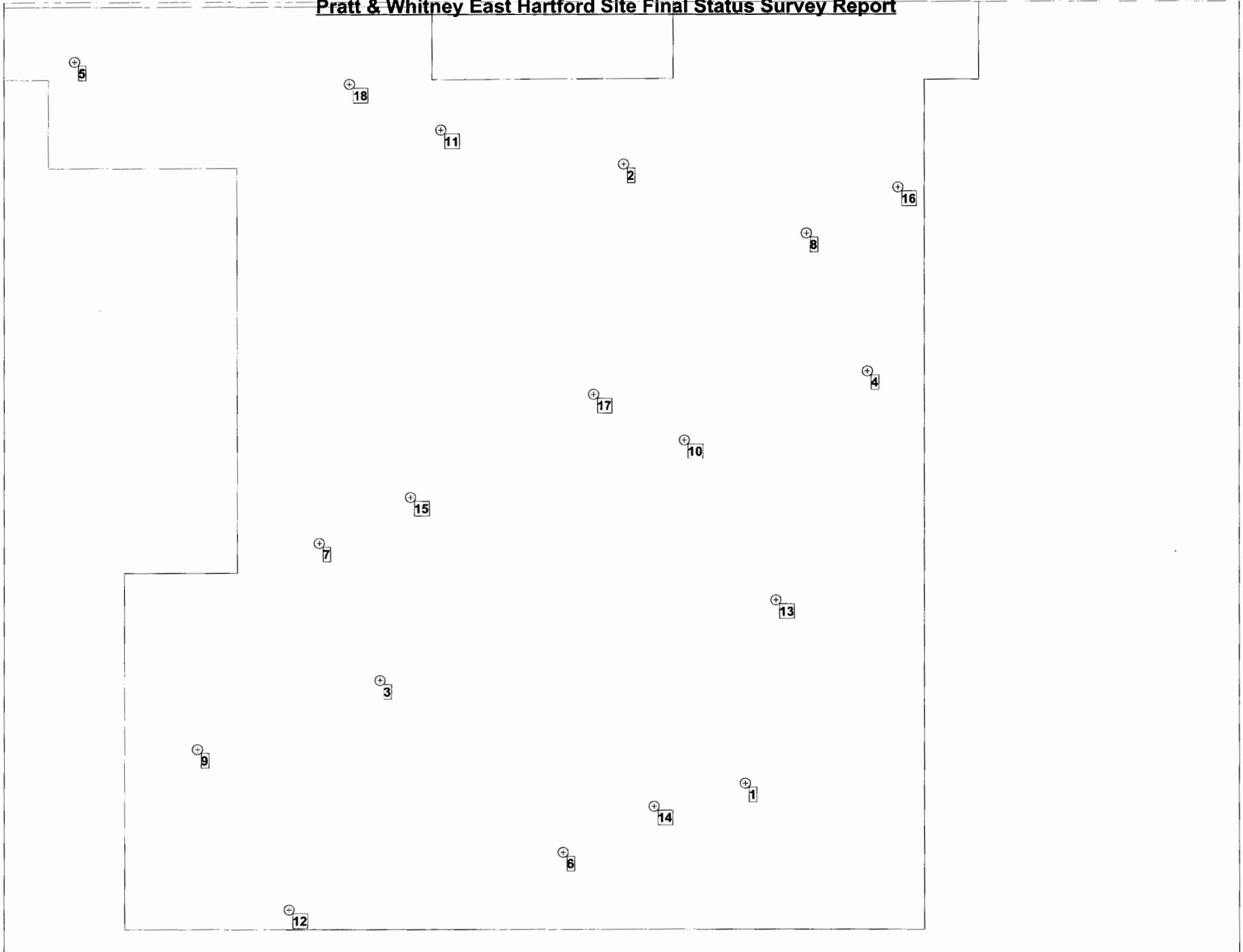
Prepared by: P Hollenbeck

Date: 2-Dec-14

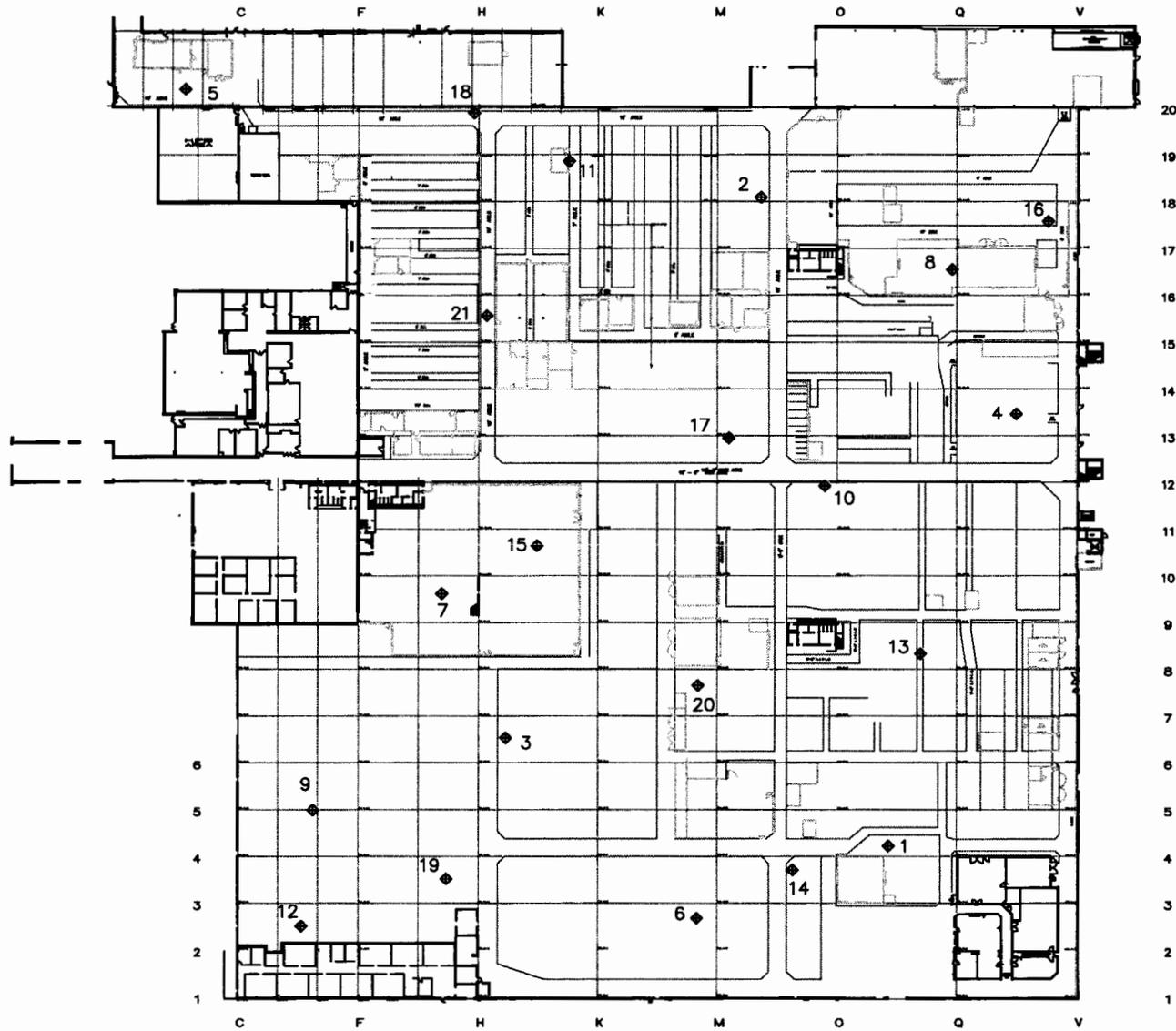
Approved by: [Signature]

Date: 2-Dec-14

Pratt & Whitney East Hartford Site Final Status Survey Report



As Surveyed J Building Survey Location Map
Pratt & Whitney East Hartford Site Final Status Survey Report



← North

Pratt & Whitney East Hartford Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: J-BLDG-001

Survey Date: 12/8/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #1018/43-89 # 223946			
Survey meter (2):		E-600 #3685/43-89 # 312071			
Meter (1) Details			Meter (2) Details		
Count time (min):	3	Count time (min):	3		
Meter (1) background (counts):	17.6	Meter (2) background (counts):	11.4		
Meter (1) Efficiency (c/d):	0.0954	Meter (2) Efficiency (c/d):	0.1095		
Meter (1) MDC (dpm/100 cm²):	62.9	Meter (2) MDC (dpm/100 cm²):	45.5		
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm²)	>Inv Level (Y/N)
1	2	14	2.6	6.3	N
2	1	21	3.4	9.5	N
3	2	15	3.6	8.8	N
4	1	24	6.4	17.9	N
5	2	8	-3.4	-8.3	N
6	1	19	1.4	3.9	N
7	2	8	-3.4	-8.3	N
8	1	18	0.4	1.1	N
9	2	6	-5.4	-13.2	N
10	1	20	2.4	6.7	N
11	2	10	-1.4	-3.4	N
12	1	21	3.4	9.5	N
13	2	17	5.6	13.6	N
14	1	20	2.4	6.7	N
15	2	8	-3.4	-8.3	N
16	1	18	0.4	1.1	N
17	2	12	0.6	1.5	N
18	1	20	2.4	6.7	N
19	2	12	0.6	1.5	N
20	1	18	0.4	1.1	N
21	2	14	2.6	6.3	N

survey unit average => 2.9 dpm/100 cm²
dose estimate => 0.2 mrem/y

**Pratt & Whitney East Hartford Site Final Status Survey Report
Sample Report**

Batch ID:	LT Th-230 - 201412151435	Count Date:	12/15/2014
Group:	A	Count Minutes:	2.0
Device:	LB5100	Count Mode:	Alpha Only
Batch Key:	27,187	Operating Volts:	840
Selected Geometry: 1/4" Stainless Steel			

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	1.46			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	11.00			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	34.00			Beta Bkgd (CPH)	0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
20141215143518-A1	1			0.00	1.52	1.00	
20141215143519-A2	2			0.00	1.52	1.00	
20141215144009-A3	3			0.00	-1.99	0.00	
20141215144229-A4	4			0.00	-1.99	0.00	
20141215144439-A5	5			0.00	-1.99	0.00	
20141215144659-A6	6			0.00	-0.23	0.50	
20141215144919-A7	7			0.00	-1.99	0.00	
20141215145129-A8	8			0.00	-0.23	0.50	
20141215145349-A9	9			0.00	-1.99	0.00	
20141215145559-A10	10			0.00	-1.99	0.00	
20141215145819-A11	11			0.00	-1.99	0.00	
20141215150029-A12	12			0.00	-1.99	0.00	
20141215150249-A13	13			0.00	-1.99	0.00	
20141215150469-A14	14			0.00	-1.99	0.00	
20141215150720-A15	15			0.00	-0.23	0.50	
20141215150940-A16	16			0.00	-0.23	0.50	
20141215151150-A17	17			0.00	-1.99	0.00	
20141215151370-A18	18			0.00	-0.23	0.50	
20141215151620-A21	Smears 14			0.00	-0.23	0.50	
20141215151840-A20	19			0.00	-1.99	0.00	
20141215152100-A23	21			0.00	-0.23	0.50	

P+W J-BLDG-001



Reviewed by: _____

Attachment 5 Survey Unit M BLDG

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: M-BLDG	FSSP #: M-BLDG-001
Survey unit name: M Building	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit M-BLDG, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the East Hartford Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the East Hartford Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the East Hartford Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_w). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _w	Survey unit meets the release criterion
Average concentration exceeds the DCGL _w	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _w and the average concentration is less than the DCGL _w	Conduct the Sign test

Basis for Determining the Operational DCGL: The East Hartford Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_w equal to 354 dpm/100 cm². This DCGL_w corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The East Hartford Final Status Survey Plan, Revision 1, has specified that an approximately one meter radius around each direct measurement location will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The East Hartford Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

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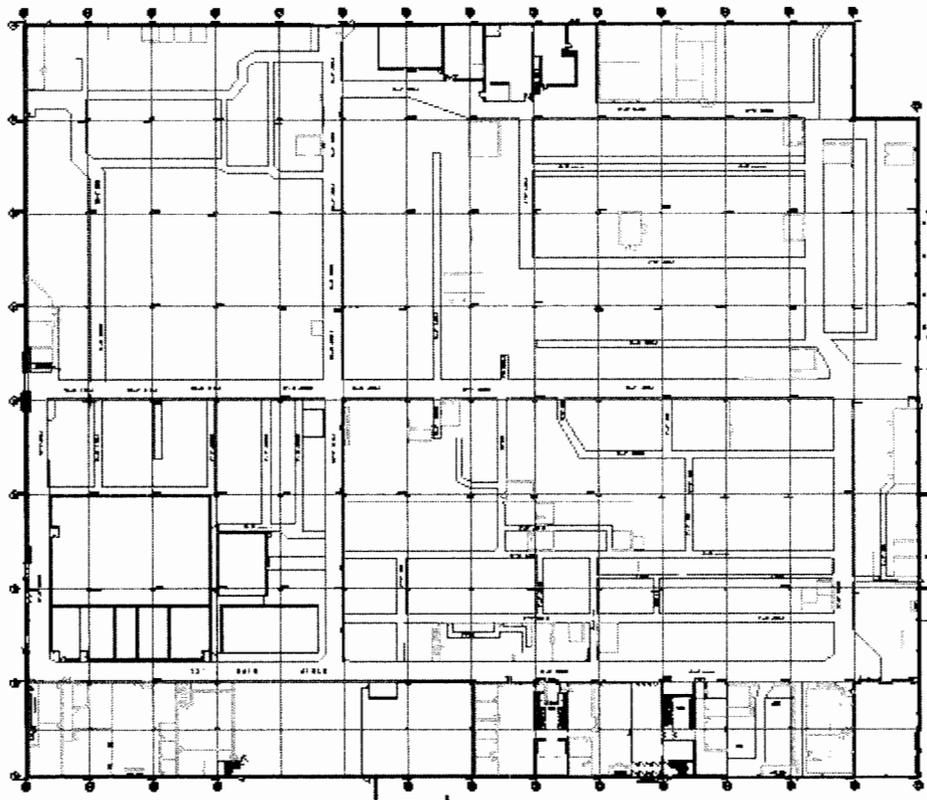
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is the M Building. The survey unit surface area is approximately 24,774 square meters (24,774 m^2) or 266,660 square feet (266,660 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit M-BLDG



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The East Hartford Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The East Hartford Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in the East Hartford Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
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SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
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 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than $177 \text{ dpm}/100 \text{ cm}^2$, increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.
 - 3) Obtain a 100 cm^2 smear at the location of the direct measurement

- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
 7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
 8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
 9. Forward all paperwork to the Survey Supervisor for review.
 10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
 11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
 12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
 13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

Pratt & Whitney East Hartford Site Final Status Survey Report

FSSP #: M-BLDG-001

14. The Health Physicist will complete the package review in accordance with the East Hartford Final Status Survey Plan, Termination of License SMB-151 at the East Hartford, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

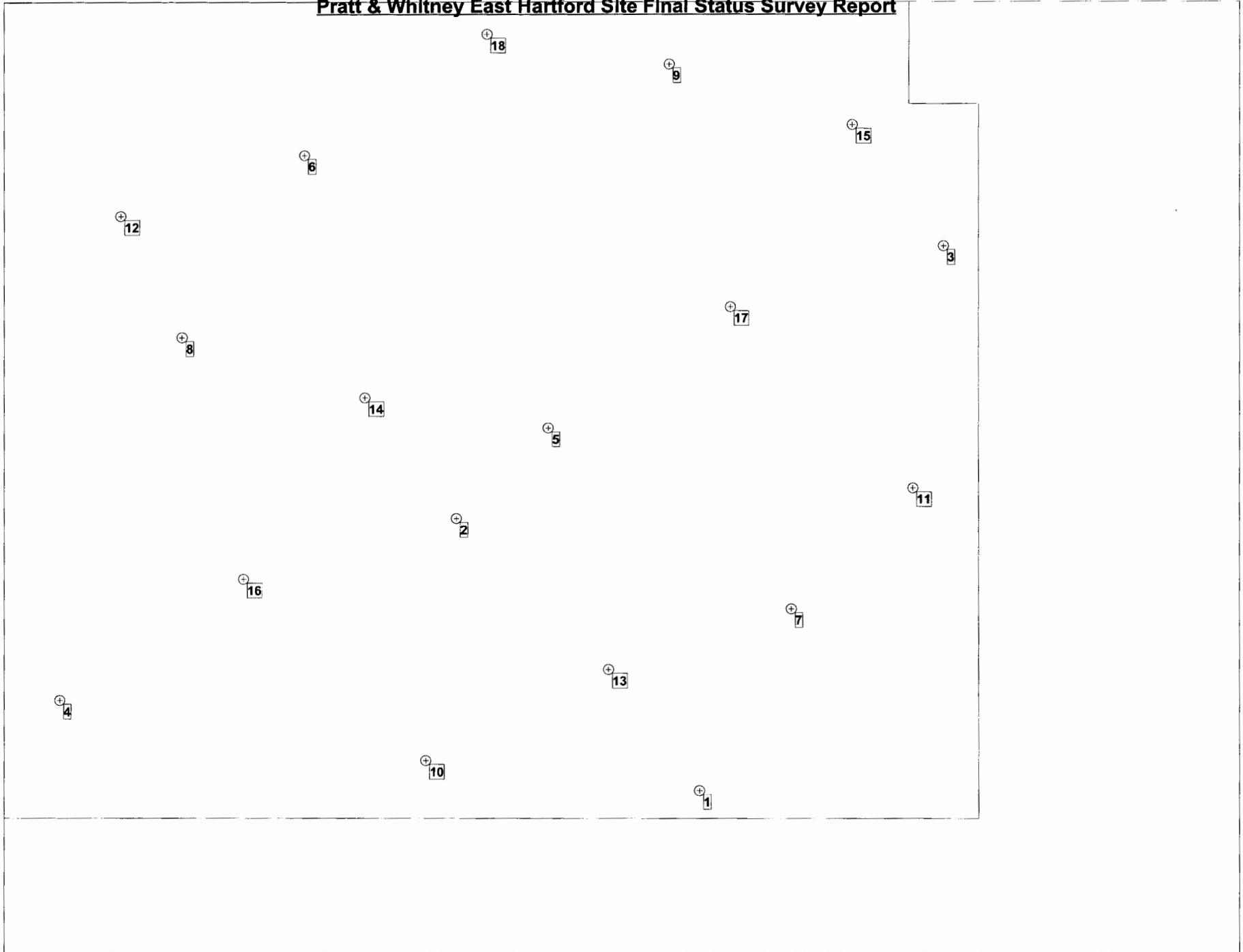
Prepared by: P Hollenbeck

Date: 2-Dec-14

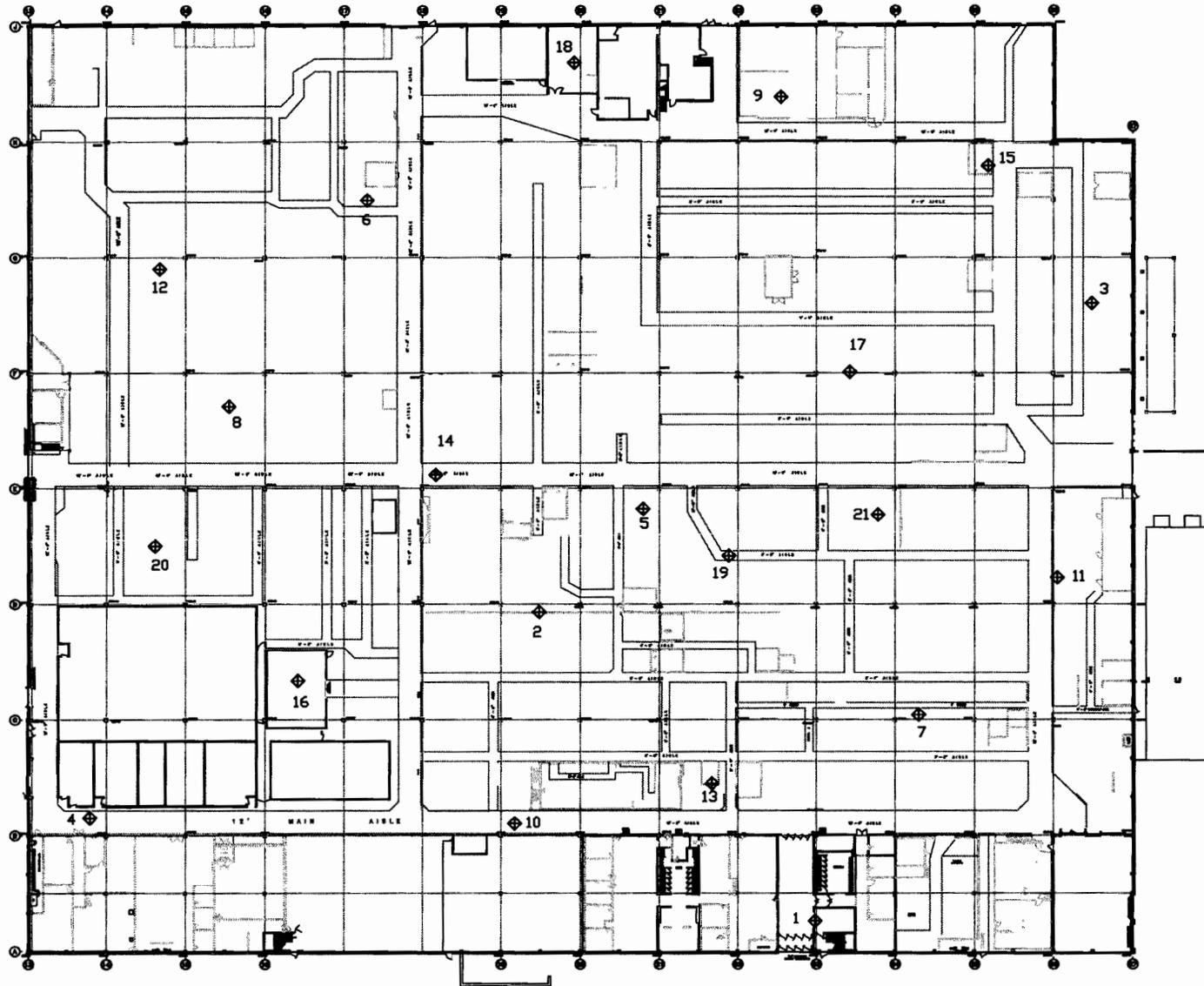
Approved by: [Signature]

Date: 2-Dec-14

Pratt & Whitney East Hartford Site Final Status Survey Report



As Surveyed M Building Survey Location Map
Pratt & Whitney East Hartford Site Final Status Survey Report



← North

Pratt & Whitney East Hartford Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: M-BLDG-001

Survey Date: 12/11/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #3689/43-89 # 311683			
Survey meter (2):		E-600 #3690/43-89 # 223945			
Meter (1) Details			Meter (2) Details		
Count time (min):		3	Count time (min):		3
Meter (1) background (counts):		21.4	Meter (2) background (counts):		8.2
Meter (1) Efficiency (c/d):		0.1106	Meter (2) Efficiency (c/d):		0.0922
Meter (1) MDC (dpm/100 cm ²):		59.1	Meter (2) MDC (dpm/100 cm ²):		47.2
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	2	3	-5.2	-15.0	N
2	2	2	-6.2	-17.9	N
3	1	11	-10.4	-25.1	N
4	2	6	-2.2	-6.4	N
5	2	6	-2.2	-6.4	N
6	1	16	-5.4	-13.0	N
7	2	7	-1.2	-3.5	N
8	1	24	2.6	6.3	N
9	1	24	2.6	6.3	N
10	2	4	-4.2	-12.1	N
11	2	7	-1.2	-3.5	N
12	1	20	-1.4	-3.4	N
13	2	6	-2.2	-6.4	N
14	1	23	1.6	3.9	N
15	1	22	0.6	1.4	N
16	2	7	-1.2	-3.5	N
17	1	12	-9.4	-22.7	N
18	1	11	-10.4	-25.1	N
19	2	6	-2.2	-6.4	N
20	2	8	-0.2	-0.6	N
21	2	4	-4.2	-12.1	N

survey unit average => -7.9 dpm/100 cm²
dose estimate => -0.4 mrem/y

**Pratt & Whitney East Hartford Site Final Status Survey Report
Sample Report**

Batch ID: LT Th-230 - 201412171012
Group: A
Device: LB5100
Batch Key: 27,232
Selected Geometry: 1/4" Stainless Steel

Count Date: 12/17/2014
Count Minutes: 2.0
Count Mode: Alpha Only
Operating Volts: 840

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	1.46			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	11.00			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	34.00			Beta Bkgd (CPH)	0.00

<u>Carrier ID</u>	<u>Sample ID</u>	<u>Source ID</u>	<u>Net Beta DPM</u>	<u>Beta Gross Cpm</u>	<u>Net Alpha DPM</u>	<u>Alpha Gross Cpm</u>	<u>> Action Level?</u>
20141217101237-A1	1			0.00	3.28	1.50	*
20141217101518-A2	2			0.00	-1.99	0.00	
20141217101728-A3	3			0.00	-1.99	0.00	
20141217101948-A4	4			0.00	-0.23	0.50	
20141217102158-A5	5			0.00	-1.99	0.00	
20141217102418-A6	6			0.00	-0.23	0.50	
20141217102628-A7	7			0.00	-1.99	0.00	
20141217102848-A8	8			0.00	1.52	1.00	
20141217103058-A9	9			0.00	-0.23	0.50	
20141217103278-A10	10			0.00	-0.23	0.50	
20141217103538-A11	11			0.00	-1.99	0.00	
20141217103758-A12	12			0.00	-1.99	0.00	
20141217104008-A13	13			0.00	-0.23	0.50	
20141217104218-A14	14			0.00	-1.99	0.00	
20141217104438-A15	15			0.00	-1.99	0.00	
20141217104658-A16	16			0.00	-1.99	0.00	
20141217104909-A17	17			0.00	-1.99	0.00	
20141217105119-A18	18			0.00	-0.23	0.50	
20141217105339-A21	Smears 14			0.00	-1.99	0.00	
20141217105559-A22	19			0.00	-1.99	0.00	
20141217105809-A23	21			0.00	-1.99	0.00	

P+W M-BLDG -001



Reviewed by:

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Rev. 0

S/N L11263 Cal due 06/06/2014
 9/23/2015
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C:\Program Files (x86)\Tennelec Systems\Eclipse\activity report_dpm_a_b.rpt

Print Date 12/17/2014
 Print Time 11:00:25AM

**Pratt & Whitney East Hartford Site Final Status Survey Report
Sample Report**

Batch ID: LT Th-230 - 201412171553
Group: A
Device: LB5100
Batch Key: 27,243
Selected Geometry: 1/4" Stainless Steel

Count Date: 12/17/2014
Count Minutes: 2.0
Count Mode: Alpha Only
Operating Volts: 840

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	1.46			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	11.00			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	34.00			Beta Bkgd (CPH)	0.00

<u>Carrier ID</u>	<u>Sample ID</u>	<u>Source ID</u>	<u>Net Beta DPM</u>	<u>Beta Gross Cpm</u>	<u>Net Alpha DPM</u>	<u>Alpha Gross Cpm</u>	<u>> Action Level?</u>
20141217155346-A1	1			0.00	-1.99	0.00	

P+W M-BLDG-001



Reviewed by: _____
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Subject to the export control restrictions on the

title page of this document

C:\Program Files (x86)\Tennelec Systems\Eclipse\activity report_dpm_a_b.rpt

Rev. 0

Print Date 12/17/2014

Print Time 3:56:22PM

Attachment 6 Survey Unit K BLDG

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: K-BLDG	FSSP #: K-BLDG-001
Survey unit name: K Building	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit K-BLDG, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the East Hartford Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the East Hartford Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the East Hartford Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_W). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

Basis for Determining the Operational DCGL: The East Hartford Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_W equal to 354 dpm/100 cm². This DCGL_W corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The East Hartford Final Status Survey Plan, Revision 1, has specified that an approximately one meter radius around each direct measurement location will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The East Hartford Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

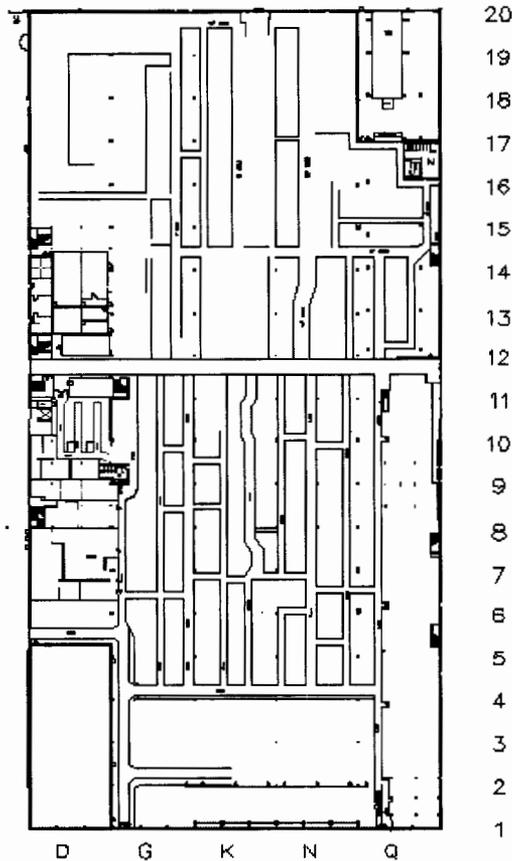
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is the K Building. The survey unit surface area is approximately 17,051 square meters (17,051 m^2) or 183,538 square feet (183,538 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit K-BLDG



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The East Hartford Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The East Hartford Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in the East Hartford Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible at areas requiring investigations.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.
10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.
 - 3) Obtain a 100 cm² smear at the location of the direct measurement

- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

Pratt & Whitney East Hartford Site Final Status Survey Report

FSSP #: K-BLDG-001

14. The Health Physicist will complete the package review in accordance with the East Hartford Final Status Survey Plan, Termination of License SMB-151 at the East Hartford, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

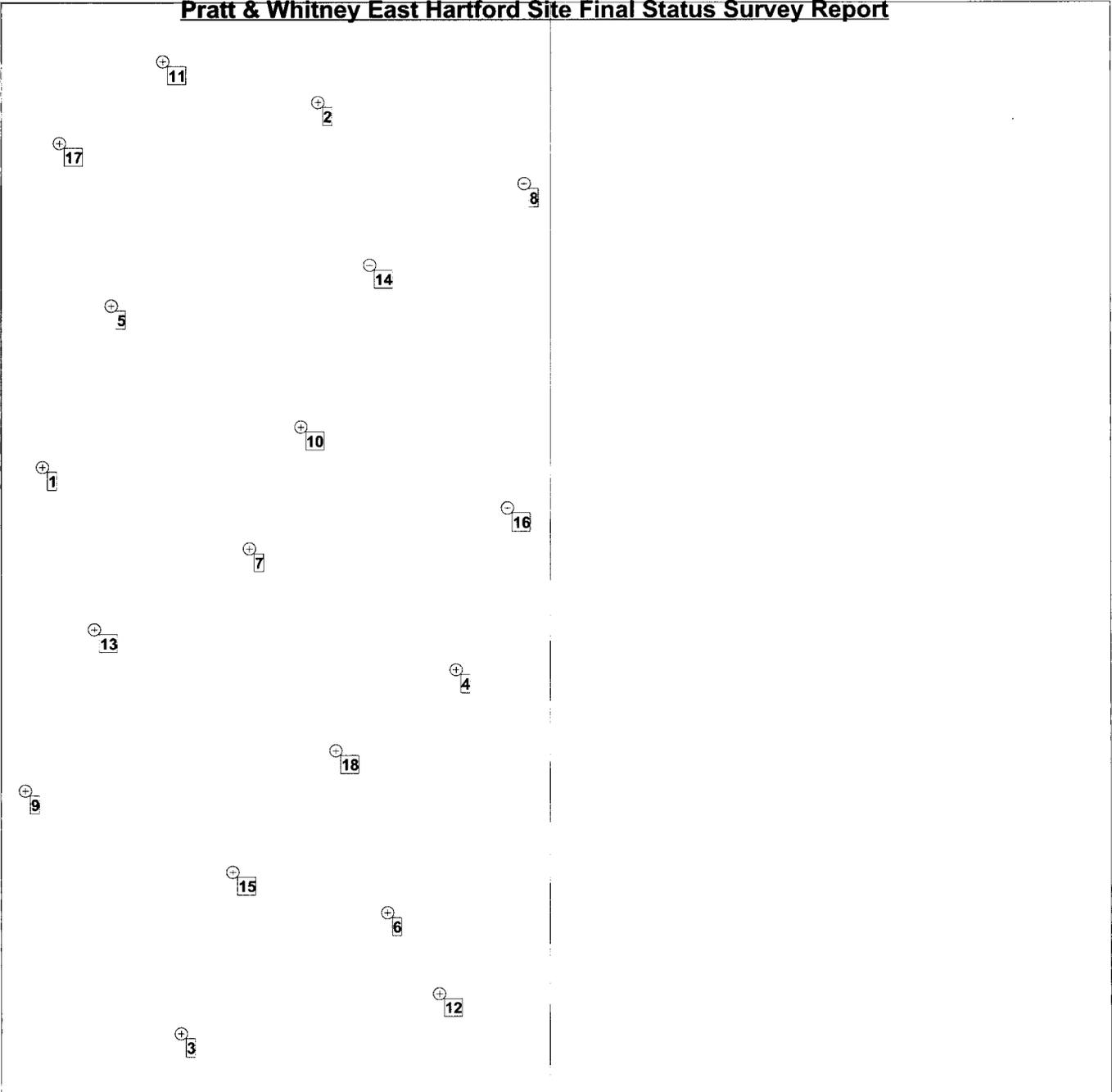
Prepared by: P Hollenbeck

Date: 2-Dec-14

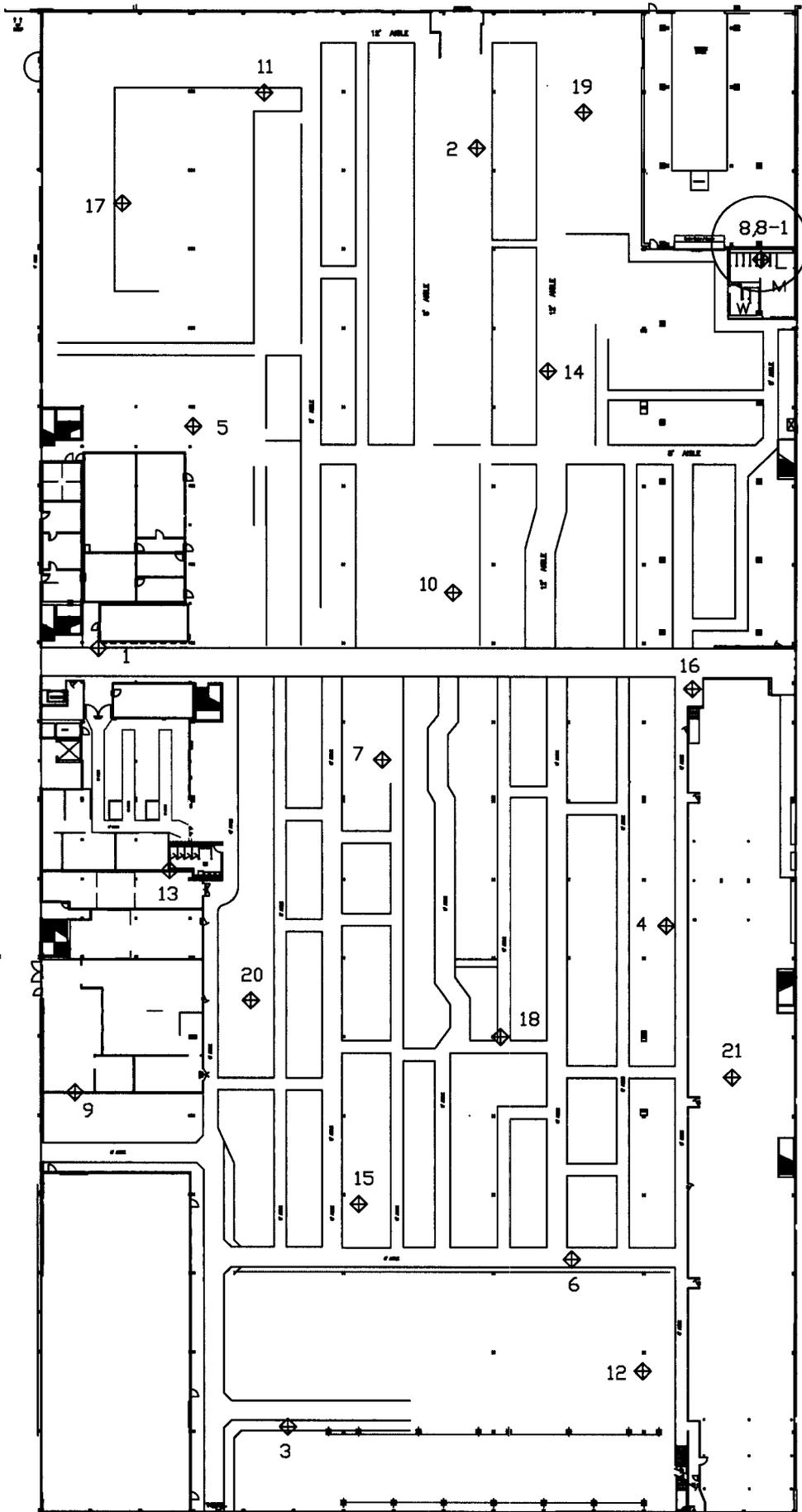
Approved by: [Signature]

Date: 2-Dec-14

Pratt & Whitney East Hartford Site Final Status Survey Report



As Surveyed K Building Survey Location Map
Pratt & Whitney East Hartford Site Final Status Survey Report



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Pratt & Whitney East Hartford Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: K-BLDG-001

Survey Date: 12/8/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #3689/43-89 # 311683			
Survey meter (2):		E-600 #3690/43-89 # 223945			
Meter (1) Details			Meter (2) Details		
Count time (min):	3	Count time (min):	3		
Meter (1) background (counts):	10.8	Meter (2) background (counts):	4.4		
Meter (1) Efficiency (c/d):	0.1106	Meter (2) Efficiency (c/d):	0.0922		
Meter (1) MDC (dpm/100 cm ²):	44.1	Meter (2) MDC (dpm/100 cm ²):	36.9		
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	1	9	-1.8	-4.3	N
2	1	2	-8.8	-21.2	N
3	2	7	2.6	7.5	N
4	2	4	-0.4	-1.2	N
5	1	13	2.2	5.3	N
6	2	5	0.6	1.7	N
7	1	15	4.2	10.1	N
8	1	18	7.2	17.4	N
9	2	2	-2.4	-6.9	N
10	1	9	-1.8	-4.3	N
11	1	12	1.2	2.9	N
12	2	5	0.6	1.7	N
13	2	0	-4.4	-12.7	N
14	1	8	-2.8	-6.8	N
15	2	4	-0.4	-1.2	N
16	1	14	3.2	7.7	N
17	1	10	-0.8	-1.9	N
18	2	4.1	-0.3	-0.9	N
19	1	7	-3.8	-9.2	N
20	2	7	2.6	7.5	N
21	1	21	10.2	24.6	N
8-1	1	33	22.2	53.5	N

survey unit average => 3.2 dpm/100 cm²
dose estimate => 0.2 mrem/y

**Pratt & Whitney East Hartford Site Final Status Survey Report
Sample Report**

Batch ID: LT Th-230 - 201412171358
Group: A
Device: LB5100
Batch Key: 27,241
Selected Geometry: 1/4" Stainless Steel

Count Date: 12/17/2014
Count Minutes: 2.0
Count Mode: Alpha Only
Operating Volts: 840

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	1.46			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	11.00			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	34.00			Beta Bkgd (CPH)	0.00

<u>Carrier ID</u>	<u>Sample ID</u>	<u>Source ID</u>	<u>Net Beta DPM</u>	<u>Beta Gross Cpm</u>	<u>Net Alpha DPM</u>	<u>Alpha Gross Cpm</u>	<u>> Action Level?</u>
20141217135831-A1	1			0.00	-0.23	0.50	
20141217140322-A2	2			0.00	-1.99	0.00	
20141217140322-A3	3			0.00	-1.99	0.00	
20141217140322-A4	4			0.00	-1.99	0.00	
20141217140752-A5	5			0.00	-1.99	0.00	
20141217141012-A6	6			0.00	-1.99	0.00	
20141217141222-A7	7			0.00	-1.99	0.00	
20141217141433-A8	8			0.00	-1.99	0.00	
20141217141653-A9	9			0.00	-1.99	0.00	
20141217141864-A10	10			0.00	-0.23	0.50	
20141217142133-A11	11			0.00	-1.99	0.00	
20141217142343-A12	12			0.00	-1.99	0.00	
20141217142603-A13	13			0.00	-1.99	0.00	
20141217142813-A14	14			0.00	-0.23	0.50	
20141217143033-A15	15			0.00	-0.23	0.50	
20141217143243-A16	16			0.00	-1.99	0.00	
20141217143503-A17	17			0.00	-1.99	0.00	
20141217143713-A18	18			0.00	-1.99	0.00	
20141217143933-A21	Smears 19			0.00	-1.99	0.00	
20141217144143-A20	20			0.00	-1.99	0.00	
20141217144404-A23	21			0.00	-1.99	0.00	
20141217144614-A24	22			0.00	-1.99	0.00	

P+W K-BLDG -001



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Attachment 7 Survey Unit D BLDG – East Half

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: D-BLDG-EH	FSSP #: D-BLDG-EH-001
Survey unit name: D Building East Half	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit D-BLDG-EH, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the East Hartford Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the East Hartford Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the East Hartford Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_W). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

Basis for Determining the Operational DCGL: The East Hartford Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_W equal to 354 dpm/100 cm². This DCGL_W corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The East Hartford Final Status Survey Plan, Revision 1, has specified that an approximately one meter radius around each direct measurement location will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The East Hartford Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

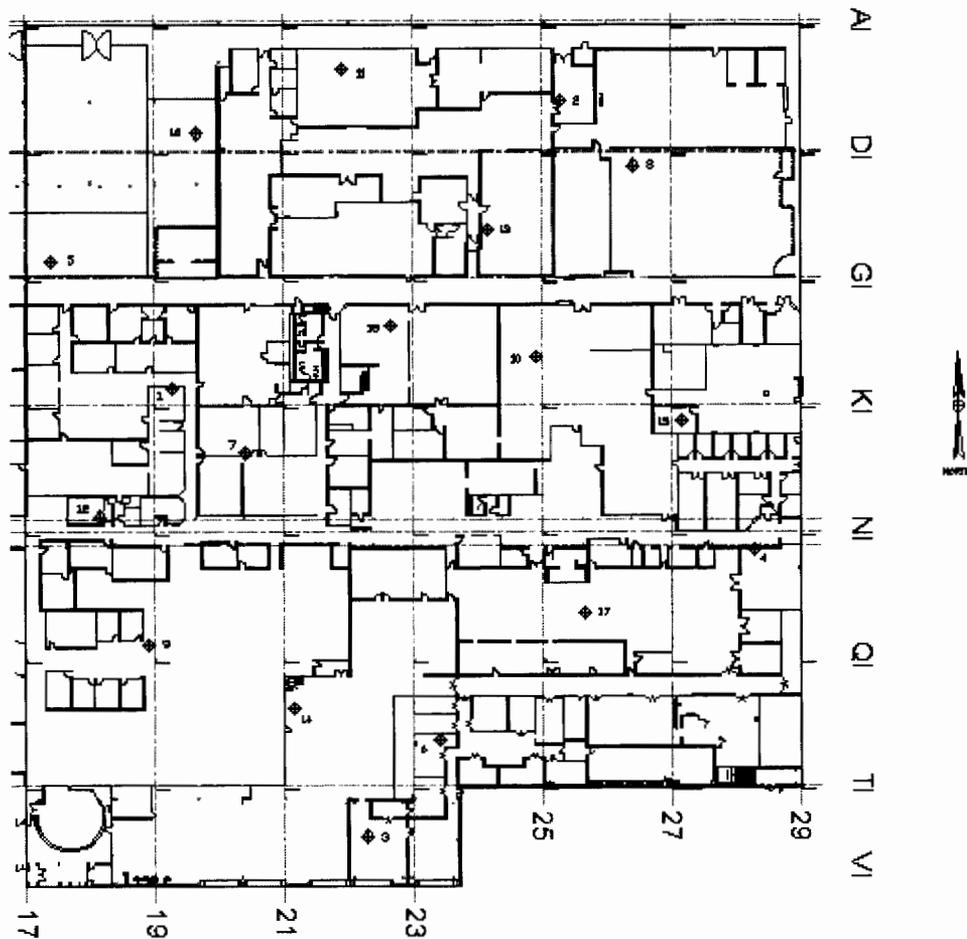
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is the east half of the D Building. The survey unit surface area is approximately 14,732 square meters (14,732 m^2) or 158,577 square feet (158,577 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit D-BLDG-EH



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

- 6.0 Specify tolerable limits on decision errors
- The Null Hypothesis:* Residual radioactivity in the survey unit exceeds the release criterion.
- Type I Error:* This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The East Hartford Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.
- Type II Error:* This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The East Hartford Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.
- 7.0 Optimize the design
- Type of statistical test:* The Sign Test will be the statistical test as specified in the East Hartford Final Status Survey Plan, Revision 1.
- Number of measurements:* There are eighteen (18) random measurement locations as specified in the East Hartford Final Status Survey Plan, Revision 1.
- Number of judgmental measurements and locations:* A minimum of three (3) judgmental measurements as specified in the East Hartford Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible at areas requiring investigations.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.
10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.
 - 3) Obtain a 100 cm² smear at the location of the direct measurement

- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

14. The Health Physicist will complete the package review in accordance with the East Hartford Final Status Survey Plan, Termination of License SMB-151 at the East Hartford, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

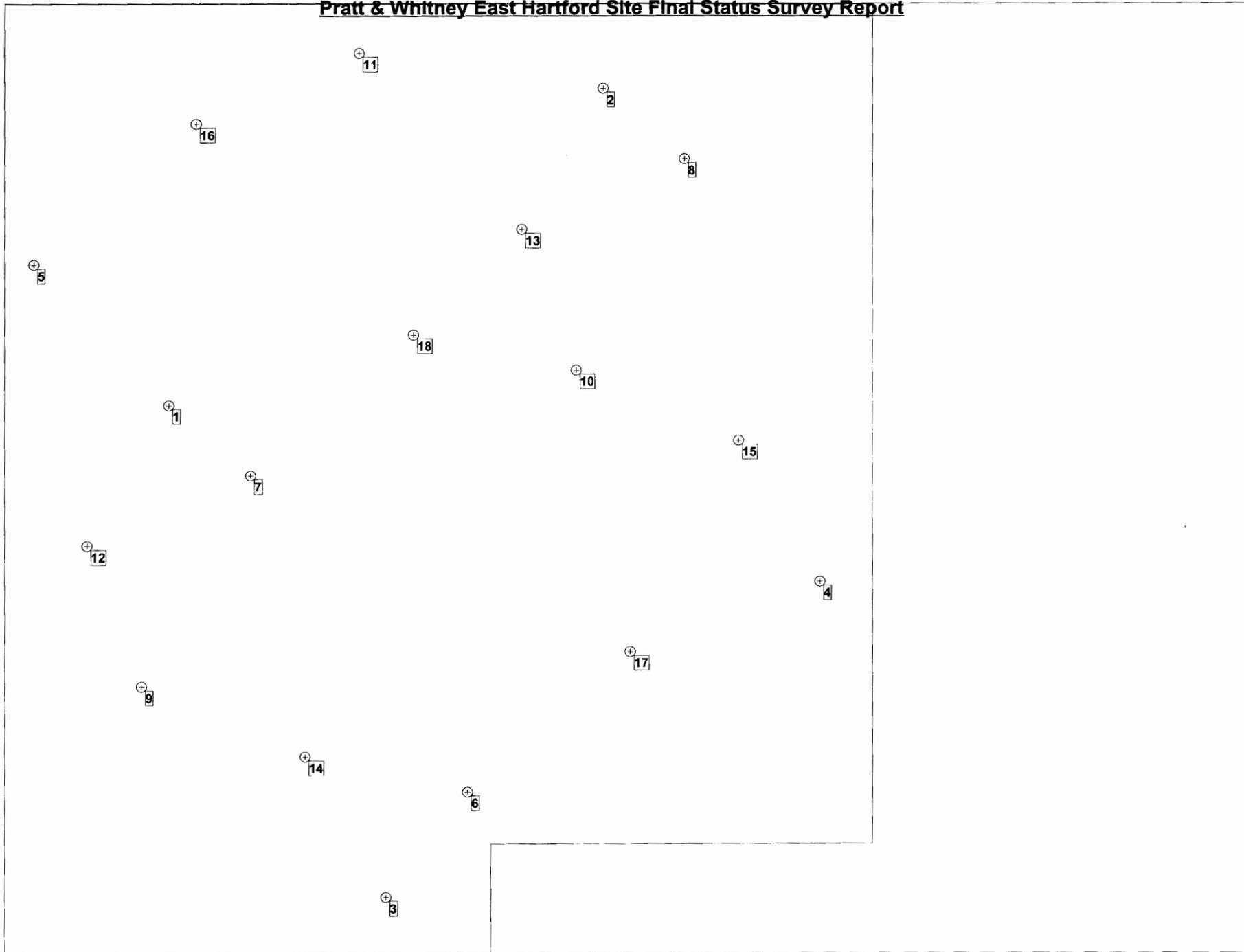
Prepared by: P Hollenbeck

Date: 1-Dec-14

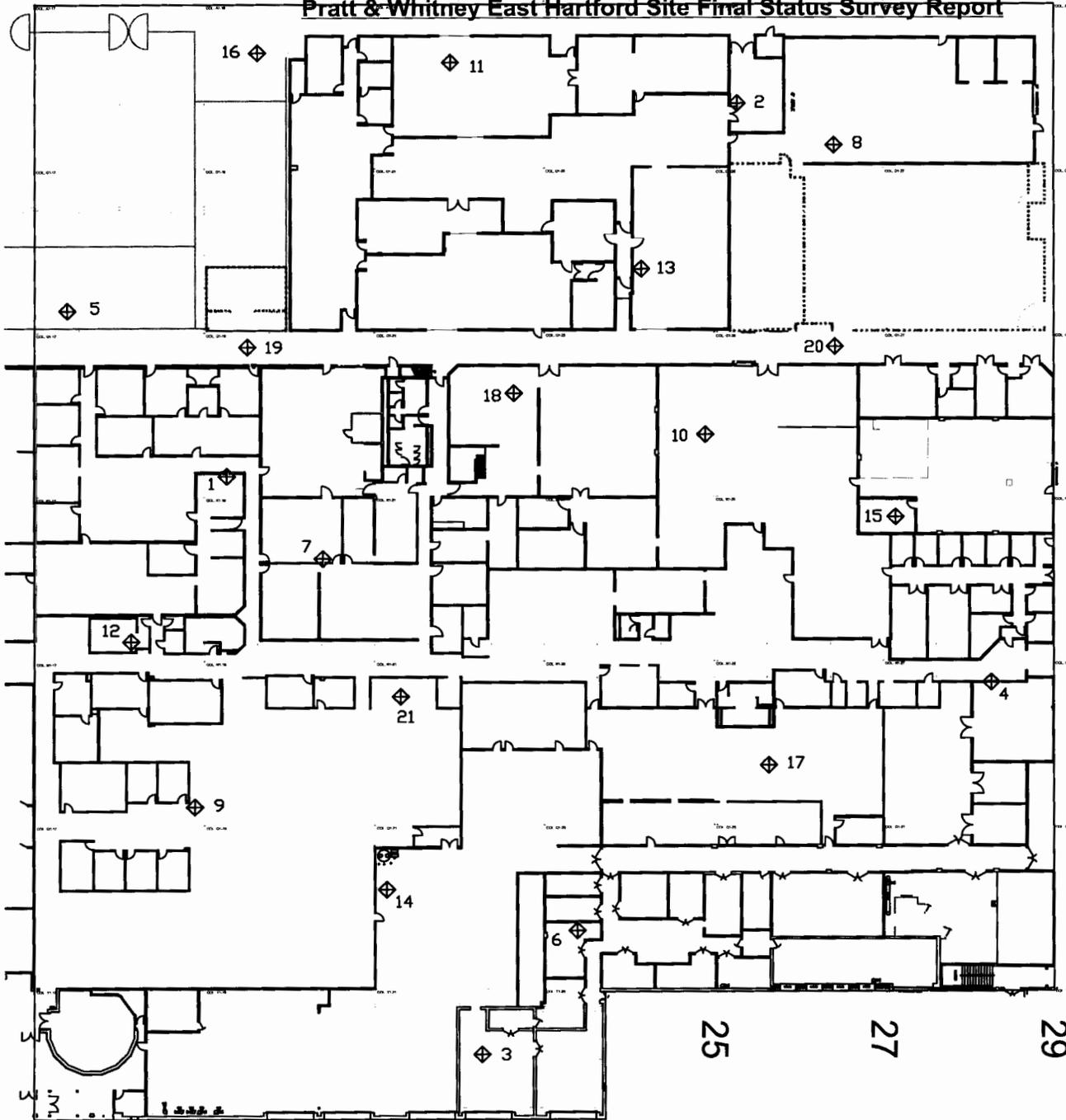
Approved by: [Signature]

Date: 2-Dec-14

Planned D Building East Half Survey Location Map - (VSP)
Pratt & Whitney East Hartford Site Final Status Survey Report



As Surveyed D Building East Half Survey Location Map
Pratt & Whitney East Hartford Site Final Status Survey Report



Pratt & Whitney East Hartford Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: D-BLDG-EH-001

Survey Date: 12/9/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #3689/43-89 # 311683			
Survey meter (2):		E-600 #3690/43-89 # 223945			
Meter (1) Details			Meter (2) Details		
Count time (min):		3	Count time (min):		3
Meter (1) background (counts):		14.2	Meter (2) background (counts):		6.0
Meter (1) Efficiency (c/d):		0.1106	Meter (2) Efficiency (c/d):		0.0922
Meter (1) MDC (dpm/100 cm²):		49.5	Meter (2) MDC (dpm/100 cm²):		41.6
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	1	10	-4.2	-10.1	N
2	2	5	-1.0	-2.9	N
3	1	12	-2.2	-5.3	N
4	2	1	-5.0	-14.5	N
5	1	19	4.8	11.6	N
6	2	11	5.0	14.5	N
7	1	11	-3.2	-7.7	N
8	2	12	6.0	17.4	N
9	1	12	-2.2	-5.3	N
10	2	5	-1.0	-2.9	N
11	1	17	2.8	6.8	N
12	1	20	5.8	14.0	N
13	2	5	-1.0	-2.9	N
14	2	8	2.0	5.8	N
15	2	6	0.0	0.0	N
16	1	14	-0.2	-0.5	N
17	2	3	-3.0	-8.7	N
18	1	18	3.8	9.2	N
19	1	10	-4.2	-10.1	N
20	2	6	0.0	0.0	N
21	1	12	-2.2	-5.3	N

survey unit average => 0.1 dpm/100 cm²
dose estimate => 0.0 mrem/y

Pratt & Whitney East Hartford Site Final Status Survey Report Sample Report

Batch ID:	LT Th-230 - 201412161221	Count Date:	12/16/2014
Group:	A	Count Minutes:	2.0
Device:	LB5100	Count Mode:	Alpha Only
Batch Key:	27,213	Operating Volts:	840
Selected Geometry:	1/4" Stainless Steel		

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	1.46			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	11.00			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	34.00			Beta Bkgd (CPH)	0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
20141216122120-A1	1			0.00	-1.99	0.00	
20141216122401-A2	2			0.00	-1.99	0.00	
20141216122611-A3	3			0.00	-0.23	0.50	
20141216122831-A4	4			0.00	-1.99	0.00	
20141216123041-A5	5			0.00	-1.99	0.00	
20141216123251-A6	6			0.00	-0.23	0.50	
20141216123511-A7	7			0.00	-0.23	0.50	
20141216123731-A8	8			0.00	-1.99	0.00	
20141216123952-A9	9			0.00	-1.99	0.00	
20141216124171-A10	10			0.00	-1.99	0.00	
20141216124422-A11	11			0.00	-1.99	0.00	
20141216124641-A12	12			0.00	-1.99	0.00	
20141216124852-A13	13			0.00	-1.99	0.00	
20141216125071-A14	14			0.00	-1.99	0.00	
20141216125322-A15	15			0.00	-1.99	0.00	
20141216125541-A16	16			0.00	-1.99	0.00	
20141216125752-A17	17			0.00	-1.99	0.00	
20141216130001-A18	18			0.00	-1.99	0.00	
20141216130222-A21	snears 19			0.00	-0.23	0.50	
20141216130441-A20	20			0.00	-0.23	0.50	
20141216130702-A23	21			0.00	-1.99	0.00	

P+W D-BLDG-EH



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Print Date 12/16/2014

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Pratt & Whitney East Hartford Site Final Status Survey Report

Attachment 8 Survey Unit D BLDG – West Half

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: D-BLDG-WH	FSSP #: D-BLDG-WH-001
Survey unit name: D Building West Half	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit D-BLDG-WH, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the East Hartford Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the East Hartford Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the East Hartford Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_w). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _w	Survey unit meets the release criterion
Average concentration exceeds the DCGL _w	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _w and the average concentration is less than the DCGL _w	Conduct the Sign test

Basis for Determining the Operational DCGL: The East Hartford Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_w equal to 354 dpm/100 cm². This DCGL_w corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The East Hartford Final Status Survey Plan, Revision 1, has specified that an approximately one meter radius around each direct measurement location will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The East Hartford Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

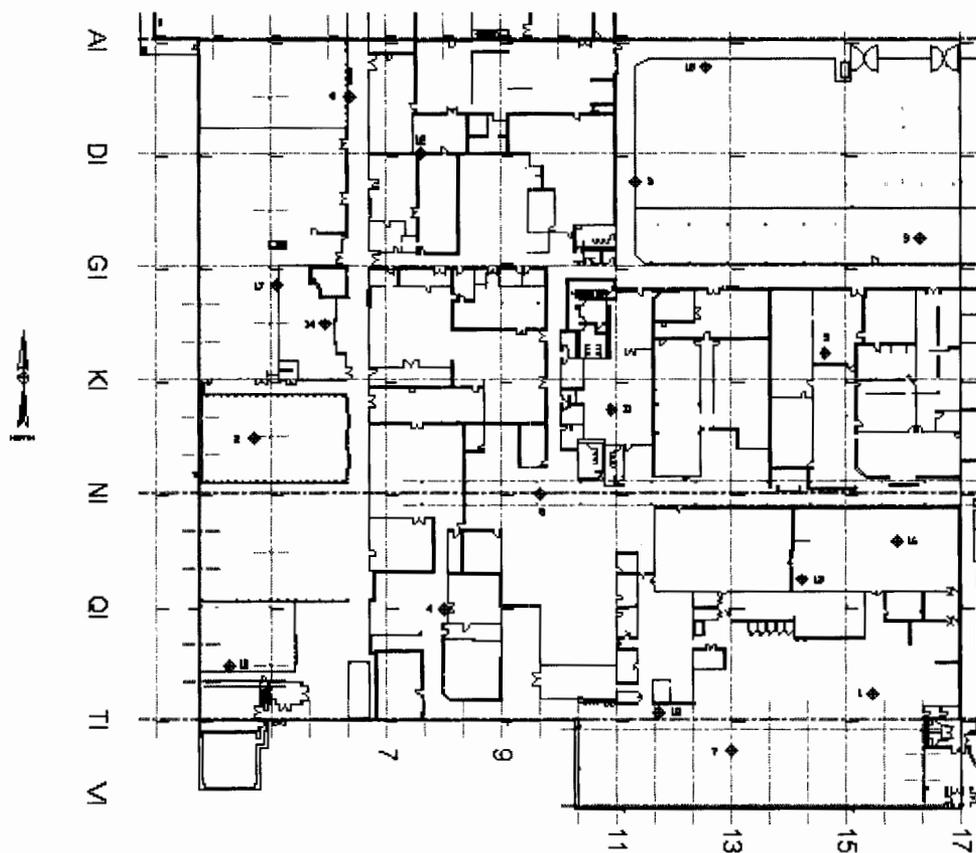
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is the west half of the D Building. The survey unit surface area is approximately 16,158 square meters (16,158 m^2) or 173,925 square feet (173,925 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit D-BLDG-WH



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The East Hartford Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The East Hartford Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in the East Hartford Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible at areas requiring investigations.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.
10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than $177 \text{ dpm}/100 \text{ cm}^2$, increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.
 - 3) Obtain a 100 cm^2 smear at the location of the direct measurement

- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

Pratt & Whitney East Hartford Site Final Status Survey Report

FSSP #: D-BLDG-WH-001

14. The Health Physicist will complete the package review in accordance with the East Hartford Final Status Survey Plan, Termination of License SMB-151 at the East Hartford, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

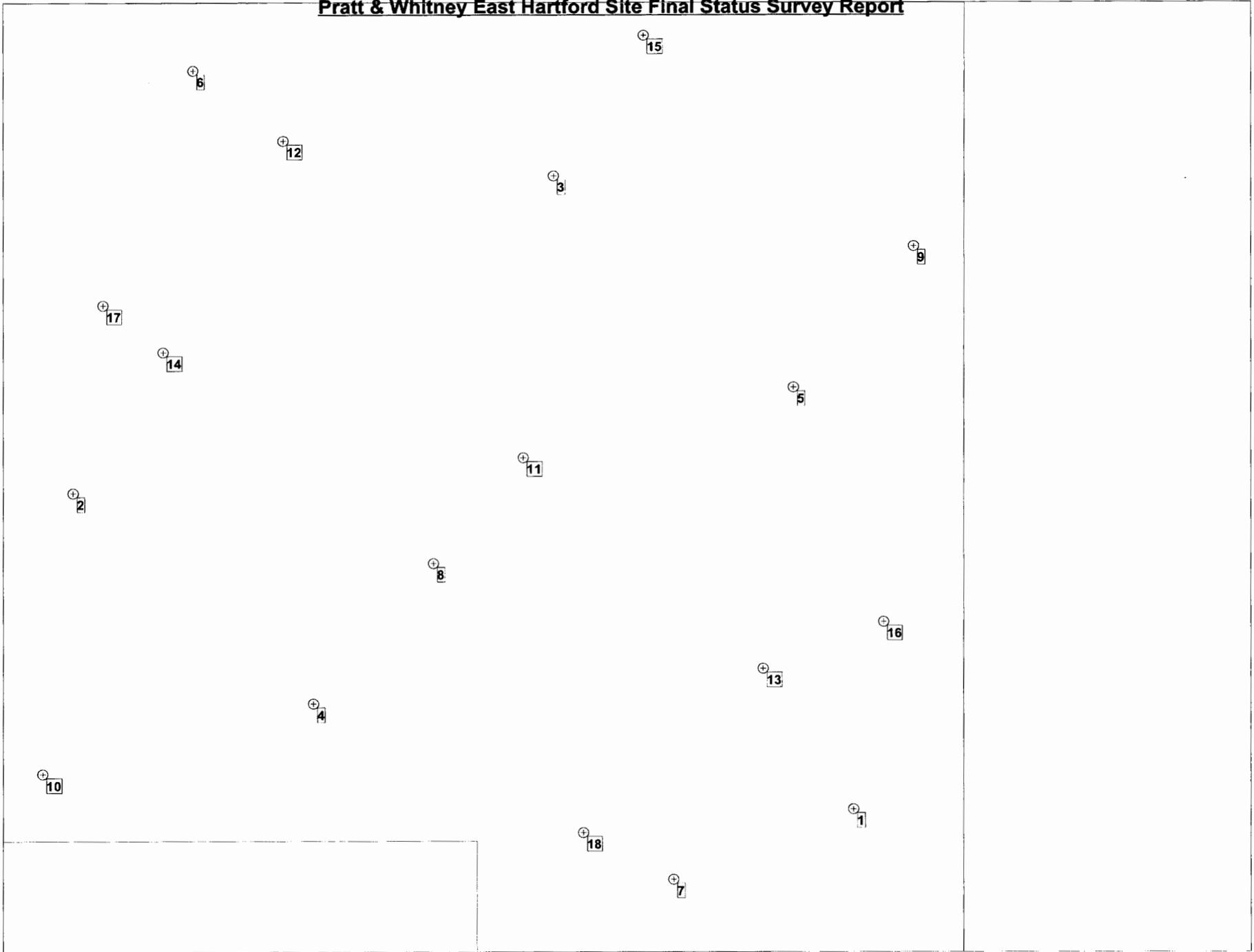
Prepared by: P Hollenbeck

Date: 1-Dec-14

Approved by: [Signature]

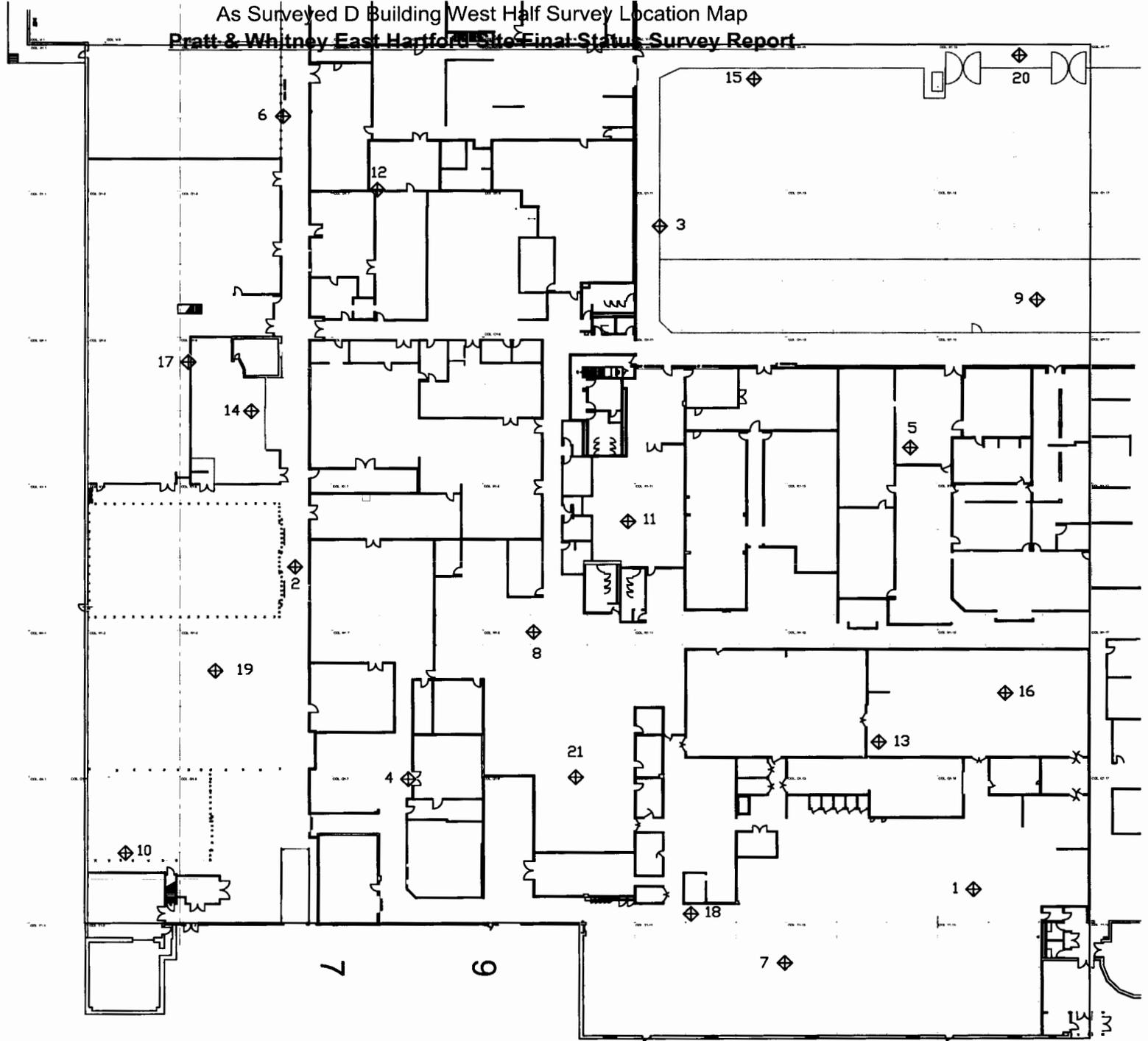
Date: 2-Dec-14

Planned D Building West Half Survey Location Map - (VSP)
Pratt & Whitney East Hartford Site Final Status Survey Report



As Surveyed D Building West Half Survey Location Map
Pratt & Whitney East Hartford Site Final Status Survey Report

AI
DI
GI
KI
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VI



Pratt & Whitney East Hartford Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: D-BLDG-WH-001

Survey Date: 12/9/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #1018/43-89 # 223946			
Survey meter (2):		E-600 #3685/43-89 # 312071			
Meter (1) Details			Meter (2) Details		
Count time (min):	3	Count time (min):	3		
Meter (1) background (counts):	21.2	Meter (2) background (counts):	10.8		
Meter (1) Efficiency (c/d):	0.0954	Meter (2) Efficiency (c/d):	0.1095		
Meter (1) MDC (dpm/100 cm²):	68.2	Meter (2) MDC (dpm/100 cm²):	44.5		
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm²)	>Inv Level (Y/N)
1	1	31	9.8	27.4	N
2	2	22	11.2	27.3	N
3	1	26	4.8	13.4	N
4	2	20	9.2	22.4	N
5	1	37	15.8	44.2	N
6	2	15	4.2	10.2	N
7	1	36	14.8	41.4	N
8	2	10	-0.8	-1.9	N
9	1	19	-2.2	-6.1	N
10	2	19	8.2	20.0	N
11	1	11	-10.2	-28.5	N
12	2	16	5.2	12.7	N
13	1	16	-5.2	-14.5	N
14	2	10	-0.8	-1.9	N
15	1	28	6.8	19.0	N
16	2	14	3.2	7.8	N
17	1	20	-1.2	-3.4	N
18	2	17	6.2	15.1	N
19	1	28	6.8	19.0	N
20	2	22	11.2	27.3	N
21	1	15	-6.2	-17.3	N

survey unit average => 11.1 dpm/100 cm²
dose estimate => 0.6 mrem/y

**Pratt & Whitney East Hartford Site Final Status Survey Report
Sample Report**

Batch ID: LT Th-230 - 201412171253
 Group: A
 Device: LB5100
 Batch Key: 27,240
 Selected Geometry: 1/4" Stainless Steel

Count Date: 12/17/2014
 Count Minutes: 2.0
 Count Mode: Alpha Only
 Operating Volts: 840

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	1.46			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	11.00			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	34.00			Beta Bkgd (CPH)	0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
20141217125336-A1	1			0.00	1.52	1.00	
20141217125617-A2	2			0.00	-1.99	0.00	
20141217125827-A3	3			0.00	-1.99	0.00	
20141217130257-A5	5			0.00	-0.23	0.50	
20141217130727-A7	7			0.00	-1.99	0.00	
20141217131157-A9	9			0.00	-1.99	0.00	
20141217131637-A11	11			0.00	-1.99	0.00	
20141217132108-A13	13			0.00	-1.99	0.00	
20141217132538-A15	15			0.00	-1.99	0.00	
20141217133008-A17	17			0.00	-0.23	0.50	
20141217133438-A21	19			0.00	-1.99	0.00	
20141217133908-A23	21			0.00	-1.99	0.00	

P+W D-BLDG-WH-001



Reviewed by: _____

9/13/2015 IC

Attachment 9 Survey Unit Waste Storage Trailer

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: Waste Trailer	FSSP #: Waste Trailer-001
Survey unit name: Waste Storage Trailer	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit Waste Trailer, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the East Hartford Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the East Hartford Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the East Hartford Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_W). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

Basis for Determining the Operational DCGL: The East Hartford Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_W equal to 354 dpm/100 cm². This DCGL_W corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The East Hartford Final Status Survey Plan, Revision 1, has specified that an approximately one meter radius around each direct measurement location will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The East Hartford Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

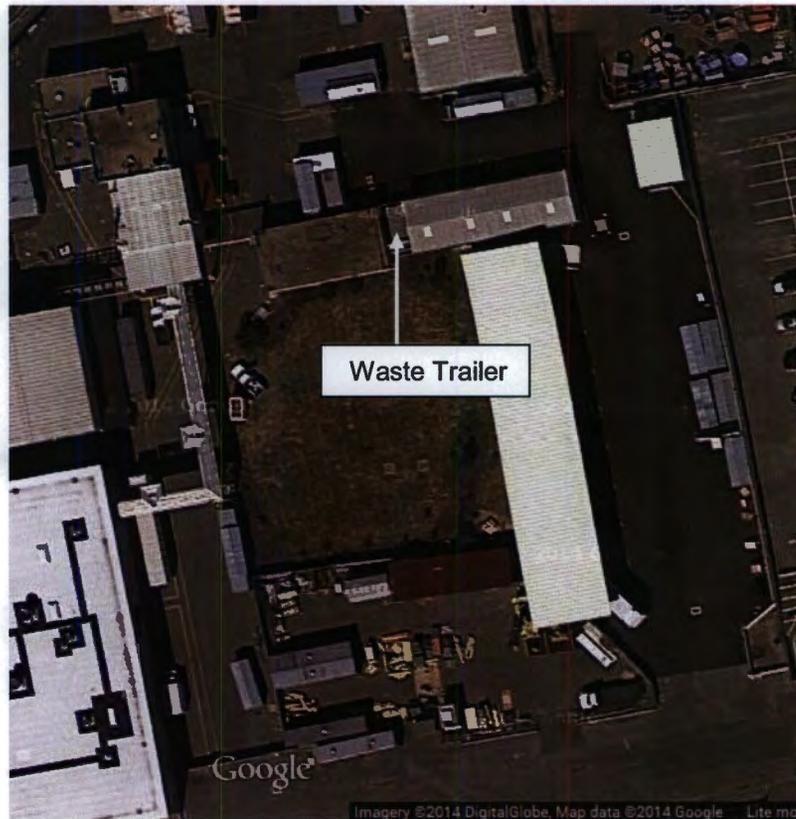
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is the Waste Storage Trailer. The survey unit floor surface area is approximately 14.9 square meters (14.9 m^2) or 160 square feet (160 ft^2), based upon physical measurements. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit Waste Trailer



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The East Hartford Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a

value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The East Hartford Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in the East Hartford Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible at areas requiring investigations.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.
10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.
 - 3) Obtain a 100 cm² smear at the location of the direct measurement

- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

Pratt & Whitney East Hartford Site Final Status Survey Report

FSSP #: Waste Trailer-001

14. The Health Physicist will complete the package review in accordance with the East Hartford Final Status Survey Plan, Termination of License SMB-151 at the East Hartford, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

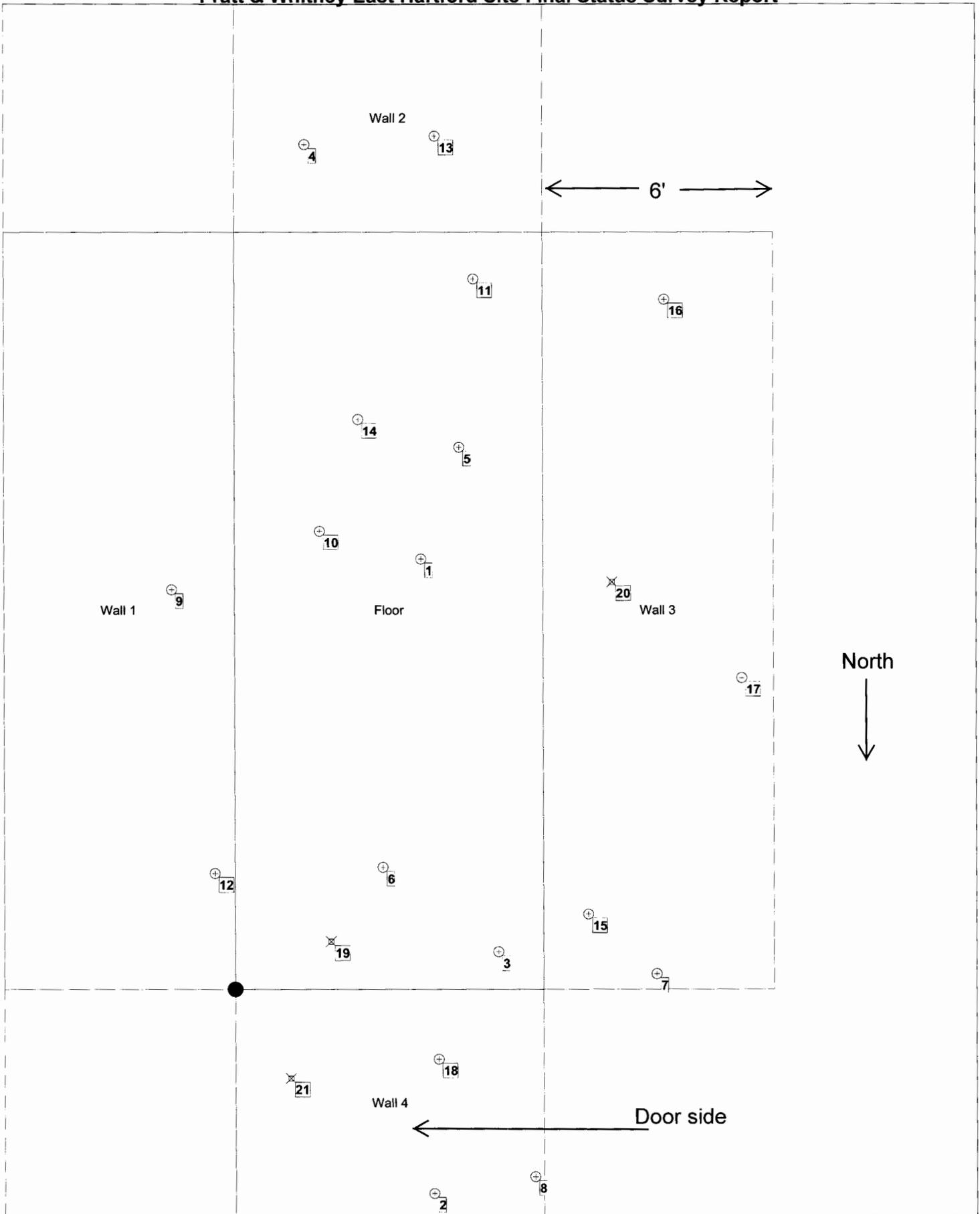
Prepared by: P Hollenbeck

Date: 3-Dec-14

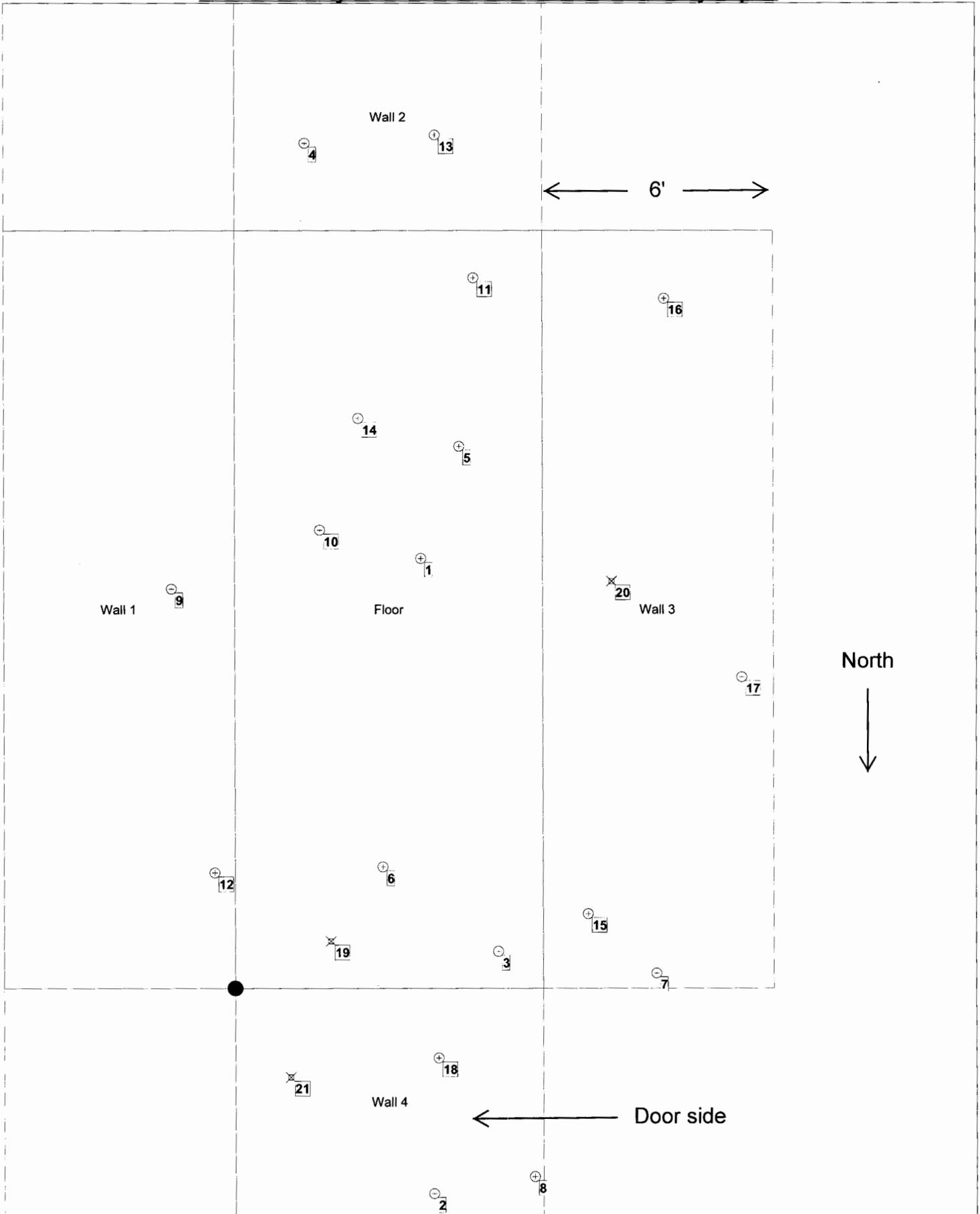
Approved by: [Signature]

Date: 5-Dec-14

As Surveyed Waste Storage Trailer Survey Location Map
Pratt & Whitney East Hartford Site Final Status Survey Report



As Surveyed Waste Storage Trailer Survey Location Map
Pratt & Whitney East Hartford Site Final Status Survey Report



Pratt & Whitney East Hartford Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: Waste Trailer-001

Survey Date: 12/11/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #1018/43-89 # 223946			
Survey meter (2):		E-600 #3685/43-89 # 312071			
Meter (1) Details			Meter (2) Details		
Count time (min):		3	Count time (min):		3
Meter (1) background (counts):		22.4	Meter (2) background (counts):		17.2
Meter (1) Efficiency (c/d):		0.0954	Meter (2) Efficiency (c/d):		0.1095
Meter (1) MDC (dpm/100 cm ²):		69.9	Meter (2) MDC (dpm/100 cm ²):		54.3
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	1	27	4.6	12.9	N
2	2	21	3.8	9.3	N
3	1	21	-1.4	-3.9	N
4	2	27	9.8	23.9	N
5	1	30	7.6	21.2	N
6	2	13	-4.2	-10.2	N
7	1	39	16.6	46.4	N
8	2	22	4.8	11.7	N
9	1	35	12.6	35.2	N
10	2	28	10.8	26.3	N
11	1	26	3.6	10.1	N
12	2	17	-0.2	-0.5	N
13	1	34	11.6	32.4	N
14	2	18	0.8	1.9	N
15	1	40	17.6	49.2	N
16	2	21	3.8	9.3	N
17	1	42	19.6	54.8	N
18	2	31	13.8	33.6	N
19	1	36	13.6	38.0	N
20	2	21	3.8	9.3	N
21	1	38	15.6	43.6	N

survey unit average => 21.6 dpm/100 cm²
dose estimate => 1.2 mrem/y

**Pratt & Whitney East Hartford Site Final Status Survey Report
Sample Report**

Batch ID:	LT Th-230 - 201412151329	Count Date:	12/15/2014
Group:	A	Count Minutes:	2.0
Device:	LB5100	Count Mode:	Alpha Only
Batch Key:	27,186	Operating Volts:	840
Selected Geometry:	1/4" Stainless Steel		

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	1.46			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	11.00			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	34.00			Beta Bkgd (CPH)	0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
20141215132931-A1	1			0.00	-1.99	0.00	
20141215133022-A2	2			0.00	-1.99	0.00	
20141215133422-A3	3			0.00	-0.23	0.50	
20141215133679-A4	4			0.00	-0.23	0.50	
20141215133852-A5	5			0.00	-1.99	0.00	
20141215134026-A6	6			0.00	-1.99	0.00	
20141215134332-A7	7			0.00	-0.23	0.50	
20141215134507-A8	8			0.00	-0.23	0.50	
20141215134802-A9	9			0.00	-0.23	0.50	
20141215135012-A10	10			0.00	-0.23	0.50	
20141215135232-A11	11			0.00	-0.23	0.50	
20141215135442-A12	12			0.00	-1.99	0.00	
20141215135702-A13	13			0.00	-1.99	0.00	
20141215135922-A14	14			0.00	-1.99	0.00	
20141215140132-A15	15			0.00	1.52	1.00	
20141215140352-A16	16			0.00	-0.23	0.50	
20141215140603-A17	17			0.00	-1.99	0.00	
20141215140822-A18	18			0.00	-6.79	2.50	*
20141215141043-A21	Smears 19			0.00	-1.99	0.00	
20141215141262-A22	20			0.00	-1.99	0.00	
20141215141513-A23	21			0.00	-1.99	0.00	

P+W Waste Trailer - 001



Reviewed by:

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S/N L11263 Cal due 06/06/2014

9/23/2015

title page of this document

Print Date 12/15/2014

C:\Program Files (x86)\Tennelec Systems\Eclipse\activity report_dpm_a_b.rpt

Print Time 2:17:29PM

**Pratt & Whitney East Hartford Site Final Status Survey Report
Sample Report**

Batch ID:	LT Th-230 - 201412171551	Count Date:	12/17/2014
Group:	A	Count Minutes:	2.0
Device:	LB5100	Count Mode:	Alpha Only
Batch Key:	27,242	Operating Volts:	840
Selected Geometry:	1/4" Stainless Steel		

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	1.46			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	11.00			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	34.00			Beta Bkgd (CPH)	0.00

<u>Carrier ID</u>	<u>Sample ID</u>	<u>Source ID</u>	<u>Net Beta DPM</u>	<u>Beta Gross Cpm</u>	<u>Net Alpha DPM</u>	<u>Alpha Gross Cpm</u>	<u>> Action Level?</u>
20141217155100-A18	18			0.00	-1.99	0.00	

P+W Waste Trailer -001



Reviewed by:

RC

Attachment 10 Survey Unit E BLDG

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: E-BLDG	FSSP #: E-BLDG-001
Survey unit name: E Building	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit E-BLDG, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the East Hartford Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the East Hartford Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the East Hartford Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_W). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

Basis for Determining the Operational DCGL: The East Hartford Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_W equal to 354 dpm/100 cm². This DCGL_W corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The East Hartford Final Status Survey Plan, Revision 1, has specified that an approximately one meter radius around each direct measurement location will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The East Hartford Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

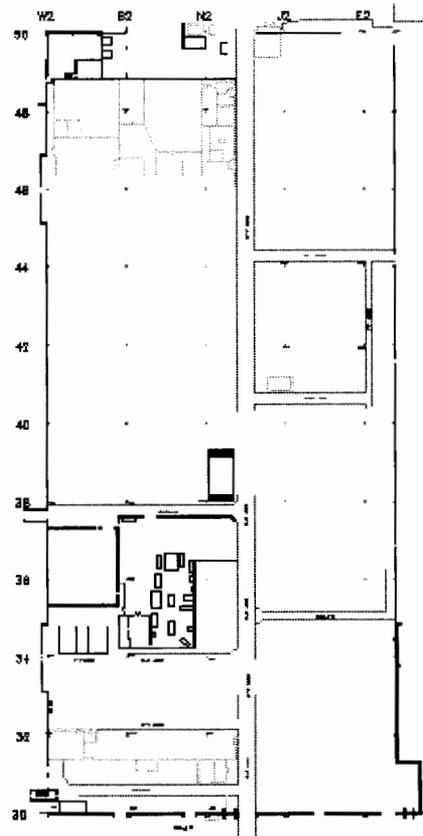
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is the E Building. The survey unit surface area is approximately 16,812 square meters (16,812 m^2) or 180,967 square feet (180,967 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit E-BLDG



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The East Hartford Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The East Hartford Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in the East Hartford Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in the East Hartford Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible at areas requiring investigations.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.
10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.
 - 3) Obtain a 100 cm² smear at the location of the direct measurement

- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

Pratt & Whitney East Hartford Site Final Status Survey Report

FSSP #: E-BLDG-001

14. The Health Physicist will complete the package review in accordance with the East Hartford Final Status Survey Plan, Termination of License SMB-151 at the East Hartford, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

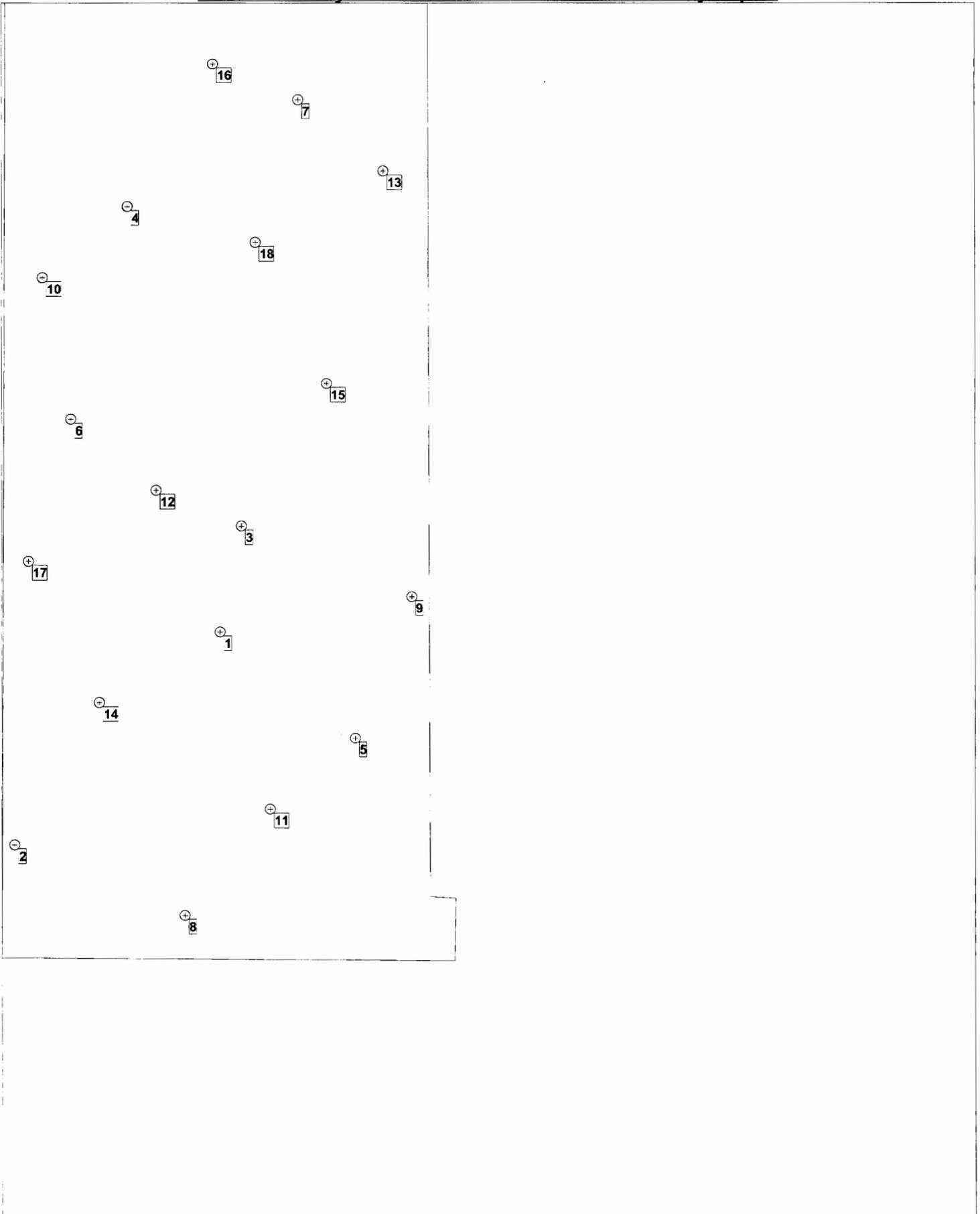
Prepared by: P Hollenbeck

Date: 1-Dec-14

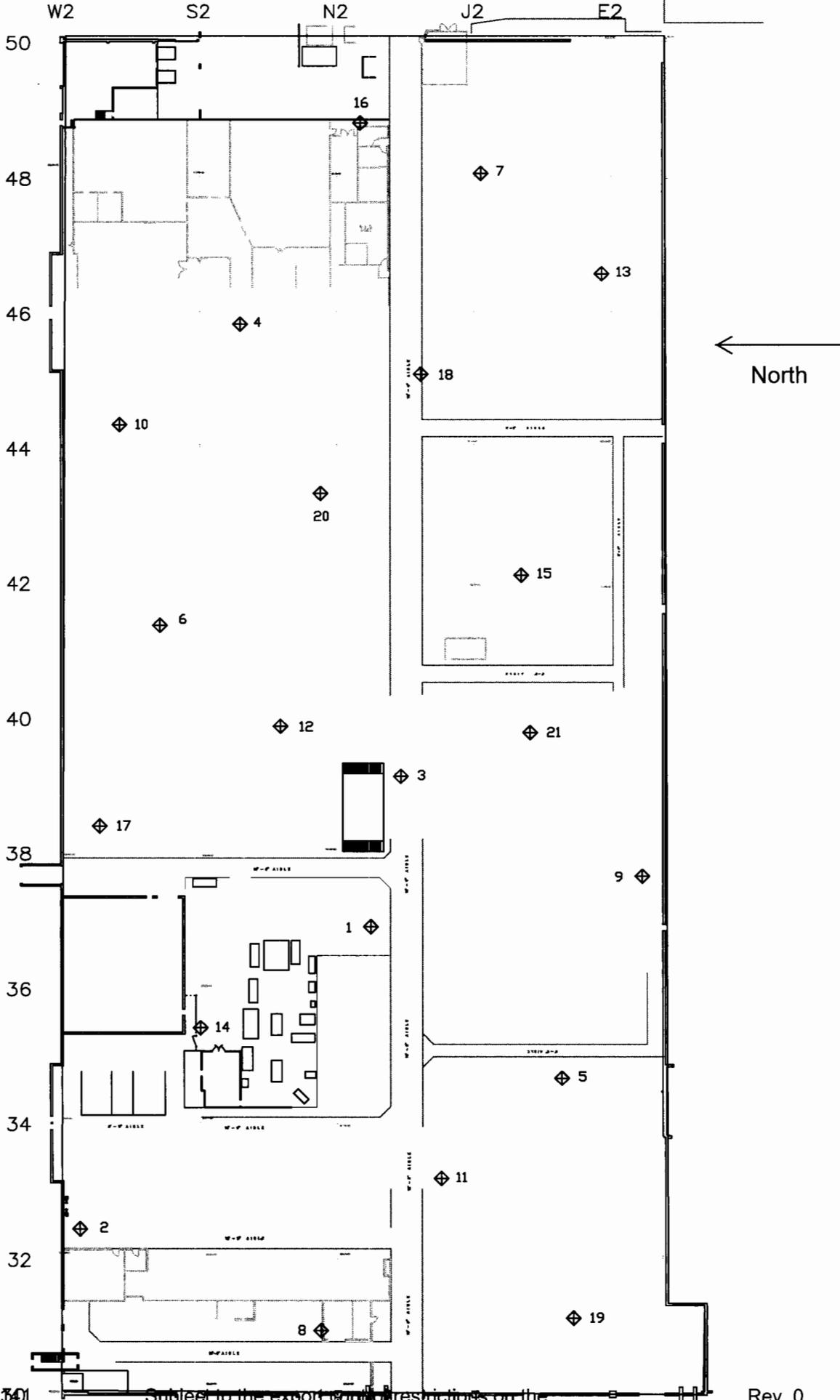
Approved by: [Signature]

Date: 2-Dec-14

Planned E Building Survey Location Map - (VSP)
Pratt & Whitney East Hartford Site Final Status Survey Report



As Surveyed E Building Survey Location Map
Pratt & Whitney East Hartford Site Final Status Survey Report



Pratt & Whitney East Hartford Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: E-BLDG-001

Survey Date: 12/11/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #1018/43-89 # 223946			
Survey meter (2):		E-600 #3685/43-89 # 312071			
Meter (1) Details			Meter (2) Details		
Count time (min):		3	Count time (min):		3
Meter (1) background (counts):		22.6	Meter (2) background (counts):		19.0
Meter (1) Efficiency (c/d):		0.0954	Meter (2) Efficiency (c/d):		0.1095
Meter (1) MDC (dpm/100 cm²):		70.2	Meter (2) MDC (dpm/100 cm²):		56.7
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	2	11	-8.0	-19.5	N
2	1	28	5.4	15.1	N
3	2	15	-4.0	-9.7	N
4	1	26	3.4	9.5	N
5	2	9	-10.0	-24.4	N
6	1	18	-4.6	-12.9	N
7	2	10	-9.0	-21.9	N
8	1	24	1.4	3.9	N
9	2	14	-5.0	-12.2	N
10	1	21	-1.6	-4.5	N
11	2	16	-3.0	-7.3	N
12	1	22	-0.6	-1.7	N
13	2	12	-7.0	-17.0	N
14	1	19	-3.6	-10.1	N
15	2	15	-4.0	-9.7	N
16	1	26	3.4	9.5	N
17	2	17	-2.0	-4.9	N
18	1	28	5.4	15.1	N
19	2	19	0.0	0.0	N
20	1	19	-3.6	-10.1	N
21	2	24	5.0	12.2	N

survey unit average => -4.8 dpm/100 cm²
dose estimate => -0.3 mrem/y

Pratt & Whitney East Hartford Site Final Status Survey Report Sample Report

Batch ID: LT Th-230 - 201412151540
Group: A
Device: LB5100
Batch Key: 27,189
Selected Geometry: 1/4" Stainless Steel

Count Date: 12/15/2014
Count Minutes: 2.0
Count Mode: Alpha Only
Operating Volts: 840

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	1.46			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	11.00			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	34.00			Beta Bkgd (CPH)	0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
20141215154028-A1	1			0.00	-0.23	0.50	
20141215154189-A2	2			0.00	-0.23	0.50	
20141215154519-A3	3			0.00	-0.23	0.50	
20141215154849-A4	4			0.00	-1.99	0.00	
20141215154949-A5	5			0.00	-1.99	0.00	
20141215155209-A6	6			0.00	-0.23	0.50	
20141215155419-A7	7			0.00	-1.99	0.00	
20141215155639-A8	8			0.00	-1.99	0.00	
20141215155900-A9	9			0.00	-1.99	0.00	
20141215160110-A10	10			0.00	-1.99	0.00	
20141215160330-A11	11			0.00	-1.99	0.00	
20141215160549-A12	12			0.00	-1.99	0.00	
20141215160800-A13	13			0.00	-0.23	0.50	
20141215161020-A14	14			0.00	-1.99	0.00	
20141215161230-A15	15			0.00	-1.99	0.00	
20141215161450-A16	16			0.00	-1.99	0.00	
20141215161700-A17	17			0.00	-1.99	0.00	
20141215161920-A18	18			0.00	-0.23	0.50	
20141215162130-A21	Smears 19			0.00	-1.99	0.00	
20141215162350-A22	20			0.00	-1.99	0.00	
20141215162610-A23	21			0.00	-1.99	0.00	

P+W E-BLDG



Reviewed by: _____

9/23/2015 JL

FOR RETURN ADDRESS: FOLD AT DOTTED LINE

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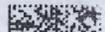
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\$13.33⁰⁰



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Pratt & Whitney

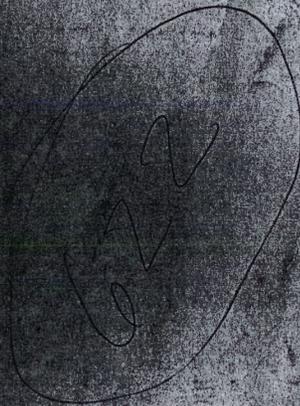
A United Technologies Company

Matt Gustafson 102-21

400 Main Street
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Final Status Survey Report

Revision 0

Pratt & Whitney
A United Technologies Company
400 Main Street
East Hartford, Connecticut

**Termination of License SMB-151
at the Middletown, CT Facility**

Prepared by:

Radiation Safety & Control Services
91 Portsmouth Avenue
Stratham, NH 03885-2468



Pratt & Whitney Middletown Site Final Status Survey Report

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Pratt & Whitney Middletown Site Final Status Survey Report

1.0 EXECUTIVE SUMMARY

This report presents the methodology and results of Final Status Surveys performed at the Pratt & Whitney facility in Middletown, CT. The results of these surveys provide the justification to terminate the Nuclear Regulatory Commission (NRC) SMB-151 license (1) (2) at that location. (3) (4) A Final Status Survey Plan (5) (6) using a site-specific Derived Concentration Guideline Level (DCGL) (7) (8) (9) was reviewed (10) and approved by the NRC. Procedures and survey packages were prepared in accordance with the plan. Final Status Surveys were performed from November 3, 2014 to November 7, 2014. Ten survey units were surveyed. A total of two hundred nineteen (219) direct measurements and 219 smears were collected and evaluated. All the direct measurement results were less than one-half (50%) of the DCGL. All smear results were less than the alpha MDC of 5.64 dpm/100 cm². Evaluation of these data shows that all ten survey units meet the unrestricted release criteria.

2.0 HISTORICAL SITE ASSESSMENT

The P&W Middletown, Connecticut site is located on 1,100 acres of land in Middlesex County on the west bank of the Connecticut River. Figure 2-1 presents an aerial view of the Middletown site. United Technologies' Pratt & Whitney (P&W) is licensed by the U.S. Nuclear Regulatory Commission (NRC) to possess and use radioactive material at the 400 Aircraft Road, Middletown, Connecticut facility under NRC License SMB-151. (1) The SMB-151 license allows possession and use of 910 kilograms of solid Thorium oxide (natural Th-232) source material not exceeding 4% (by mass) dispersed in Nickel. This was commonly referred to as TD-Nickel or TD-Ni. This material was not alloyed by P&W but was provided as sheet metal stock by a vendor.

The SMB-151 license was obtained on March 31, 1961. Building 10 was constructed in 1968 and was used for the manufacture of jet engine heat shields and burn cups from TD-Ni. No smelting or alloying of the metal was done in Building 10. Also, no other kind of high temperature work was done on this metal, so no radioactive fumes or other finely divided particulate contamination was ever produced. Any fine particulate produced was generally associated with lapping compounds which remained wet, entailing very low airborne radioactivity release fractions (ARFs). Any contamination present was the result of stamping, forming, de-burring, tumbling, polishing or some other low velocity, low temperature operation. Standard housekeeping practices were employed at that time which included cleaning up each work station at the end of each shift. This fabrication work did not occur in any other building at the Middletown facility.

Licensed activities in Building 10 ceased in 2000 when the TD-Ni sheet metal stock and manufacturing equipment were moved to the East Hartford Facility. Building 10 was surveyed on June 20, June 26, and July 28 of 2000 (11) and was demolished between August 2004 and December 2004. The remaining concrete pad was surveyed for termination from the license in 2012. The concrete pad surveys took place over a two-week period at the end of July through the beginning of August in 2012. (12) The final report of the decommissioning surveys of the Building 10 concrete pad was submitted in February 2013 (13) with a letter requesting release of the Building 10 concrete pad for unrestricted use and removal of the Middletown site from the license. The NRC responded that other buildings had radioactive materials used in them as well at the Middletown campus in a letter dated May 23, 2013 and denied the application to remove the Middletown campus from the license. (14) In a letter to the NRC on June 19, 2013 (15) Pratt & Whitney amended this request to limit the termination from the license of just the Building 10

Pratt & Whitney Middletown Site Final Status Survey Report

concrete pad. The remaining concrete pad from Building 10 was released for unrestricted use by the NRC. (16)

Figure 2-1 Aerial View of the Middletown Site



Based upon the Historical Site Assessment, (6) Table 2-1 presents the survey units that were established for the Final Status Survey.

Table 2-1 Final Status Survey Units

Survey Unit	Description	Survey Scope
1	220M East Half	Floor only
2	220M West Half	Floor only
3	220A Building Northeast Quadrant	Floor only
4	220A Building Northwest Quadrant	Floor only
5	220A Building Southeast Quadrant	Floor only
6	220A Building Southwest Quadrant	Floor only
7	Building 410 Engine Test Cells (8)	Walls and Exhaust Pipe only
8	Building 140	Floor only
9	Building 440	Floor only
10	Building 150	Floor only

3.0 SURVEY PLANNING

Survey packages were prepared for each survey unit in accordance with RSCS Standard Operating Procedures (SOPs). (17) The Data Quality Objective (DQO) process was used to develop each package. Packages included instructions for planning, performance, documentation, review and approval of the Final Status Survey for the survey unit.

3.1 Classification and Surface Area Limits of Survey Units

Based upon the Historical Site Assessment, (6) all ten survey units in the P&W Middletown facility are designated as Class 3. Based upon the guidance in MARSSIM, there are no surface area limits for Class 3 survey units. (18)

3.2 Determination of DCGLs

Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs were presented to the Nuclear Regulatory Commission for review and approval. (8) (7) Using a conservative methodology that included the radon pathway, a site-specific total surface activity TD-Ni concentration $DCGL_W$ of 354 dpm/100 cm² was calculated for use at P&W. This $DCGL_W$ corresponds to the state of Connecticut release criterion of 19 mrem/year. (19) (20)

The removable contamination activity concentration was set at 10% of the total activity $DCGL_W$ which is equal to 35 dpm/100 cm². (6)

One modification was made to the site-specific $DCGL_W$. One survey unit, Building 140, was previously used to support CANEL operations. At the time of the previous license termination surveys, beta/gamma residual radioactivity was detected in the floor from those operations. (21) If 5000 dpm/100 cm² of Cs-137 and 5000 dpm/100 cm² of Co-60 (e.g., twice the license termination limit) was left in Building 140 in 1994, the decayed Cs-137 and Co-60 activities divided by the current NRC screening DCGLs is 21.4% of the site-specific 19 mrem limit of 354 dpm/100 cm². Therefore, for the final status survey in Building 140, the site-specific DCGL was reduced to 278 dpm/100 cm² to account for any residual beta/gamma radioactivity from the CANEL operations. (6)

3.3 Number of Fixed Measurements

Using the relative shift value of 1.5, and the α and β decision error rate values of 0.05, the minimum number of measurements for each survey unit from Table 5-5 of MARSSIM (18) is equal to eighteen (18). Three additional measurements at biased locations were added to each survey unit.

3.4 Determining Measurement Locations

All survey units at the Middletown site are designated as Class 3; therefore, all measurement locations were selected at random. The random measurement locations were determined by Visual Sample Plan Version 6.0. (22) In addition to randomly selected locations, three additional biased sample locations were added (e.g. near floor drains, TD-Ni historical storage and use areas). The biased measurement locations were determined by the survey team lead. If the exact location of a randomly selected measurement location was inaccessible due to an obstruction, the nearest accessible location was surveyed.

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3.5 Data Investigations

Because all survey units at Middletown are designated as Class 3, a fixed measurement that is greater than $0.5 \times \text{DCGL}_W$ will be investigated. Any scan measurement that shows a positive indication over background will also be investigated.

4.0 SURVEY IMPLEMENTATION

The requirements and objectives outlined in the Middletown Final Status Survey plan were incorporated into a final status survey package for each survey unit. Each plan contained:

- Responses to the 7 DQO steps;
- maps of the survey unit with measurement/wipe sample locations;
- applicable DCGLs;
- instrumentation to be used;
- investigation criteria;
- QA/QC requirements (e.g., instrument response checks);
- applicable health and safety precautions; and
- applicable procedures.

A copy of each final status survey package is presented in Attachments 2 through 11.

4.1 Scanning

Because all survey units at Middletown are Class 3, only judgmental scanning was performed in each survey unit. A minimum of a 1 meter radius was scanned around each direct measurement location. (6) The detector was passed over the surface at a rate of approximately 1 to 2 inches per second. All technicians were using ear-phones while scanning. Survey packages instructed personnel performing scans that if any detectable positive indication is observed (e.g. audible and/or visual) to stop and hold the position for 2 seconds, backup and re-scan the spot. If the positive indication is observed again, stop and perform a direct measurement and obtain a smear at that location. Only 1 location in 1 survey unit; location 9 in B220A-SE-001, had a positive indication observed. A total of 3 positive indications in the 1 meter radius were observed. The results of the direct measurements at those locations are all less than 50% of the DCGL and are presented in Attachment 5.

4.2 Direct Measurements

The count time for all direct measurements was 3 minutes. Eighteen (18) direct measurements were collected in each survey unit at the Middletown site, with the exception of Survey Unit B-410-001. Because of the uniqueness of that survey unit; test cell exhaust ducts, a total of 24 direct measurements were collected; 3 per exhaust duct with 8 exhaust ducts. An additional 3 biased fixed measurements were also collected in each survey unit. The results of the direct measurements are presented in Attachments 2 through 11. All direct measurements are less than 50% of the DCGL.

4.3 Survey Instrumentation

All scanning and direct measurements were performed with Ludlum Model 43-89 detectors connected to Eberline Model E-600 (23) meters with SmartPAC connectors. SmartPAC

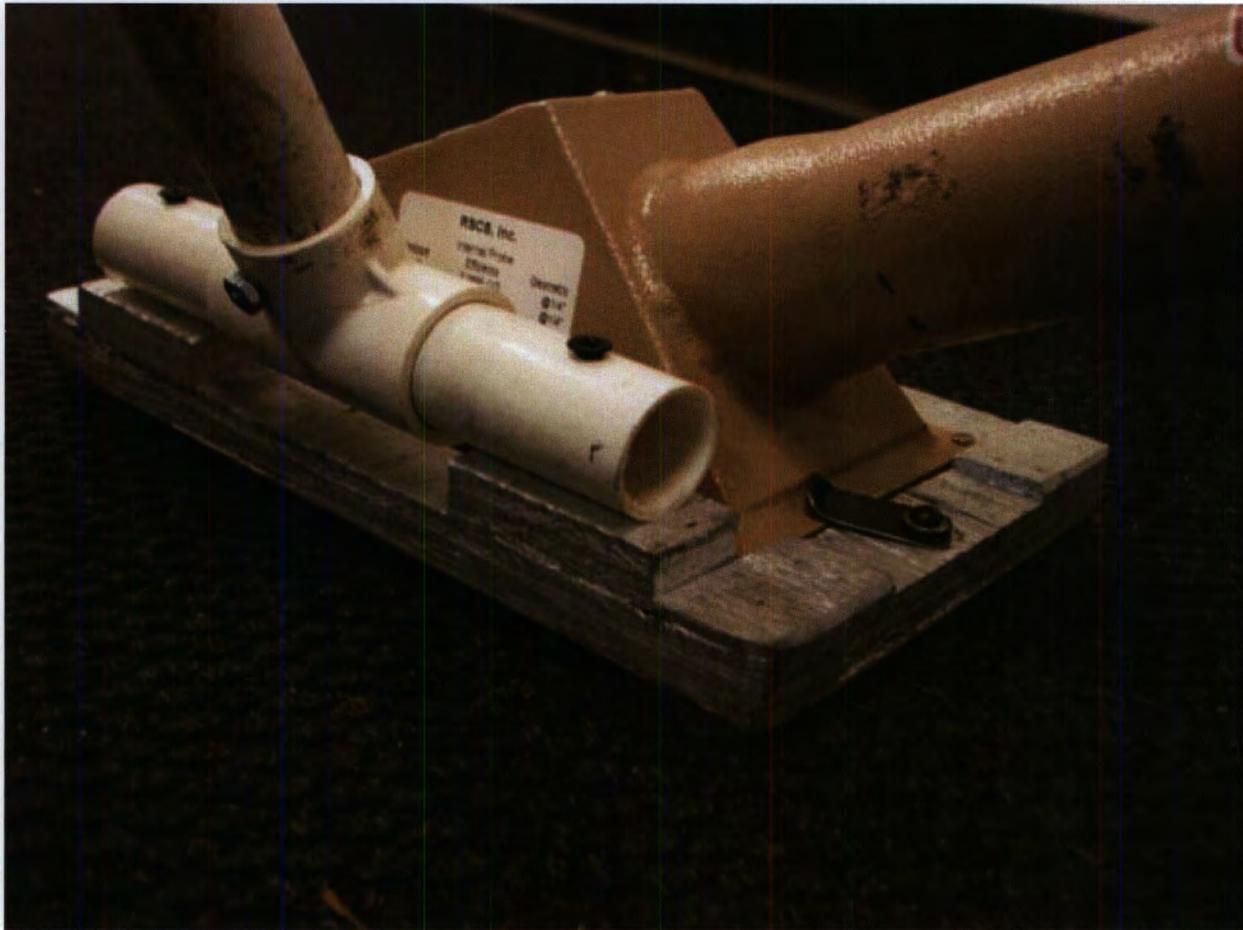
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connectors include a memory device which contains all pertinent calibration and operating criteria. Instruments were calibrated and source checked in accordance with RSCS SOPs. (24) The detectors were placed into a holder to allow the technicians to stand while scanning and taking direct measurements and keeping the distance between the detector face and the surface at a constant $\frac{1}{4}$ inch (0.64 cm). Figure 4-1 is a picture of the detector holder and Figure 4-2 is a close-up of the holder and stand-offs.

Figure 4-1 Ludlum 43-89 Holder



Figure 4-2 Ludlum 43-89 Holder and Spacers



4.4 Calibration

The source used for the instrument calibrations is a 5 cm diameter Th-230 source. The calibration standard is traceable to the National Institute of Standards and Technology (NIST). The detector efficiencies were determined at a distance of $\frac{1}{4}$ inch (0.64 cm) to match the distance from the detector face to the surface. The detector efficiencies ranged from 0.0922 c/d to 0.1106 c/d. Copies of the instrument calibration certificates are presented in Attachment 1.

4.5 Response Checks

All survey instrumentation was response checked prior to and after each survey. Only one survey meter malfunctioned during a survey. All the data collected from that meter were re-collected with a new meter. All pre and post survey response checks were satisfactory.

4.6 MDCs for Fixed Measurements

Before any measurements were made in a survey unit, the average background and Minimum Detectable Concentration (MDC) were calculated. Five 3-minute counts, with the detector held at waist height, were obtained in the survey unit. The average background was used in the

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equation shown below to calculate the MDC. The MDCs ranged from 31.8 dpm/100 cm² to 73.4 dpm/100 cm² or 9% to 20.7% of the 354 dpm/100 cm² DCGL. The calculated MDCs for each instrument used in each survey unit are presented in Attachments 2 through 11.

Per NUREG-1507 (25), MDCs for fixed measurements are computed as

$$MDC_{fixed} = \frac{3 + 4.65\sqrt{C_B}}{Kt}$$

Where:

- 3 and 4.65 = constants as described in NUREG-1507;
- C_B = background counts during the measurement time interval (t);
- t = measurement time; and
- K = a proportionality constant that relates the detector response to the activity level in the sample being measured.

The proportionality constant K typically encompasses the detector efficiency, self-absorption factors and probe area corrections, as required.

4.7 MDCs for Alpha Scan Surveys for Structure Surfaces

Five random count rate readings over a minute were recorded and resulting background range (mean +/- 3 standard deviations) was established. This range was only used for information purposes. No calculations or evaluations were made using this data.

The alpha scans were performed at a very slow speed; between 1 and 2 inches per second with the Ludlum 43-89 moving in the 4 inch (10 cm) width direction. All technicians were using ear-phones while scanning and made decisions based upon a detectable audible increase in count rate. Using Figure J.4 in MARSSIM, we have estimated the probability of detecting 2 or more counts over a 100 cm² source equal to the site-specific DCGL to be between 70 and 90 percent.

4.8 MDCs for Wipe Samples

Wipe samples were collected and controlled using chain of custody procedures. (26) The wipes were counted on a Tennelec Model LB5100 low background alpha/beta automatic proportional counter. (27) This counter has internal software to calculate the MDA and Critical Level. The smear efficiency was determined with the same NIST traceable Th-230 source used for the Ludlum 43-89 calibrations. The MDA for all smear analyses was 5.64 dpm. This corresponds to an MDC of 5.64 dpm/100 cm².

5.0 DATA ASSESSMENT

5.1 Initial Evaluation

The first step in evaluating the data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion. The result of these comparisons will be one of three conclusions: 1) the unit meets the release criterion; 2) the unit does not meet the release criterion; or 3) no conclusion can be drawn from simple comparisons and thus one of the non-parametric statistical tests must be applied.

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For final status survey data collected at the Middletown site, the initial data evaluation was as described in Table 5-1. (6)

Table 5-1 Initial Evaluation of Survey Results

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

All measured concentrations in all survey units are less than 50% of the DCGL; therefore, all survey units meet the release criterion.

5.2 Data Assessment Summary

A summary of the direct measurements has been compiled and is presented in Table 5-2.

Table 5-2 Summary of Direct Measurements

Survey Unit	Number collected	Direct Measurements (dpm/100 cm ²)			Dose Estimate (mrem/y)
		Average	Max	Min	
B-140	21	7.2	36.9	-10.6	0.5
B-150	21	1.7	20.7	-13.9	0.1
B220A-NE	21	-1.8	20.7	-17.9	0.0
B220A-NW	21	4.3	40.9	-15.1	0.2
B220A-SE	21	2.7	33.5	-29.7	0.1
B220A-SW	24	3.2	118.0	-26.6	0.2
B220M-EH	21	9.7	39.7	-11.7	0.5
B220M-WH	21	-11.7	-1.7	-19.1	0.0
B-410	27	4.3	32.4	-13.9	0.2
B-440	21	-17.9	38.5	-46.8	0.0

5.3 ALARA Evaluations

The average residual radioactivity in all survey units is less than 50% of the DCGL; therefore, an ALARA evaluation does not need to be performed.

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6.0 CONCLUSIONS

The DQO process was used in developing the Final Status Survey packages. As part of that process, the Null Hypothesis assumed that the survey unit exceeds the release criterion. Based upon all the direct measurements being less than 50% of the DCGL, the null hypothesis is rejected and all survey units meet the release criterion.

7.0 REFERENCES

1. *NRC Materials License SMB-151, United Technologies Corporation Pratt and Whitney, NRC Form 374 Amendment No. 18, August 9, 2010 Issued by NRC January 11, 2011.*
2. *United Technologies Corporation, Acceptance of Notification of Cessation of Activities at a Site, Control No. 580065, U.S. Nuclear Regulatory Commission, April 24, 2013.*
3. *10 CFR 40.42 Expiration and termination of licenses and decommissioning of sites and separate buildings or outdoor areas.*
4. *10 CFR 20 Standards for Protection Against Radiation, Subpart E—Radiological Criteria for License Termination.*
5. *Pratt & Whitney Middletown CT SMB-151 Final Status Survey Plan Submittal to NRC, June 6, 2014 ML14164A554.*
6. *Final Status Survey Plan Revision 2, United Technologies Company Pratt & Whitney 400 Main Street East Hartford, Connecticut Termination of License SMB-151 at the Middletown, CT Facility, November 2014.*
7. *RSCS TSD No. 14-003, "Site-Specific Pratt & Whitney Building Surface DCGL Using REARAD-BUILD.*
8. *Email Pratt & Whitney East Hartford and Middletown Facilities Site Specific Building Surface DCGL Submittal for SMB-151 License Termination, Timothy Noonan, April 29, 2014 Ascension No. ML14134A096.*
9. *United Technologies Corporation, Acceptance of Site Specific Derived Concentration Guideline Level (DCGL) Value Concerning Application for Amendment to License, Control No. 583820, U.S. Nuclear Regulatory Commission, August 13, 2014.*
10. *United Technologies Corporation, Pratt & Whitney, Request for Additional Information Concerning Application for Amendment to License, Control No. 583820, U.S. Nuclear Regulatory Commission, July 14, 2014.*
11. *Final Radiological Status Report Pratt & Whitney Middletown Facilities Building 10, August 9, 2000.*
12. *Pratt & Whitney Building 10 Middletown Final Status Survey Report Pratt & Whitney Middletown, Connecticut Site Building 10 Decommissioning and Final Radiological Status Report, Radiation Safety Associates, Inc., February 19, 2013.*
13. *United Technologies Corp. Amendment Request Ltr, "Decommissioning and Final Radiological Status Report for Pratt & Whitney Middletown, CT Facility", Dated February 18, 2013 ML13063A520.*
14. *NRC Letter to United Technologies Corporation, Pratt & Whitney, Voidance Of Application For License Amendment, Control No. 580086, May 23, 2013 ML13151A094.*
15. *Pratt & Whitney Letter to Betsy Ulrich U.S. NRC, License No. 5MB-151 (Expiration Date: 01131/2021) & NRC Letter of Correspondence Addressed to Renee Welsh of Pratt & Whitney Dated May 23, 2013, June 19, 2013.*
16. *NRC Letter from Betsy Ulrich to Renee Welsh, Releasing Bus 10 Pad, "United Technologies Corporation, Pratt and Whitney, License Amendment, Control No. 581153", August 26, 2013.*

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17. RSCS SOP 4.1.6, *Preparation and Implementation of Final Status Survey Packages for Pratt & Whitney, Revision 00, September 26, 2014.*
18. NUREG-1575, *"Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," dated December 1997.*
19. *Adoption of the 19 mrem per year total dose equivalent standard for remediation of sources of ionizing radiation within the State of Connecticut, Connecticut, State of, Office of the Attorney General Letter, From Robert D. Snook (Assistant Attorney General).*
20. *Remediation Standard Regulations, § 22a-133k, Hartford, CT, January 30, 1996.*
21. *NRC Region 1 Inspection No. 030-90001/95-001, dated Aug 2, 1995.*
22. *PNNL-19915, Visual Sample Plan Version 6.0 User's Guide, Pacific Northwest National Laboratory, June 2010.*
23. *RSCS SOP 2.7.1, Setup And Operation Of The E-600 Digital Survey Instrument For Multiple Modes Of Operation and With Various Probes, Revision 00, September 2010.*
24. *RSCS SOP 2.7.4, Operation of Radiological Instrumentation, Revision 00, September 2010.*
25. *NUREG-1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions, June 1998.*
26. *RSCS SOP 2.1.15, Chain Of Custody For Samples to be Analyzed In RSCS Laboratory, Revision 00, March 2014.*
27. *RSCS SOP 2.9.2, Tennelec Series 5 LB5100 Operation, Revision 01, June 2013.*

Attachment 1 Calibration Certificates



Pratt & Whitney Middletown Site Final Status Survey Report

ID Number: 22394583190-0

Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

Instrument
 Ludlum Model 43-89

Serial Number
 223945

Probe Model & SN	Isotope	Efficiency	NIST Source ID	Geometry
Internal Probe	Tc-99	0.0408 C/D	Tc-99 (SN: 63963 (Beta))	@1/4"
Internal Probe	Th-230	0.0922 C/D	Th-230 (SN: S-963)	@1/4"
Internal Probe	Th-230	0.1828 C/D	Th-230 (SN: S-963)	On Flat Surface

Outer Physical Check: *Pass*
 Tap Test: *Pass*

Electronics Checks	As Found	As Left
High Voltage	742 Volts	742 Volts

Comments: All As Left readings taken subsequent to repair. Calibrated with E-600 SN 01033 (Calibration Due Date = 9/19/2015)

Check Source Acceptance Range (With RSCS Projects Alpha/Beta Source 001) = 2.916 to 4.374 kcpm on the alpha plus beta channel

Calibrated by:

QA Review:

Date: 10/21/2014
 Expires: 10/21/2015

Atmospheric Conditions - Temperature: 74° F Humidity: 23% Barometric Pressure: 29.88 in/hg
 This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
 Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
 J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
 RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%.
 Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
 Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994
 This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc.



Pratt & Whitney Middletown Site Final ~~Source Survey~~ Report

ID Number: 22394683187-0

Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

Instrument
 Ludlum Model 43-89

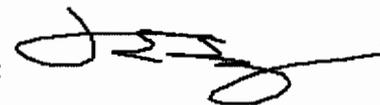
Serial Number
 223946

Probe Model & SN	Isotope	Efficiency	NIST Source ID	Geometry
Internal Probe	Tc-99	0.0672 C/D	Tc-99 (SN: 63963 (Beta))	@1/4"
Internal Probe	Th-230	0.0954 C/D	Th-230 (SN: S-963)	@1/4"
Internal Probe	Th-230	0.1673 C/D	Th-230 (SN: S-963)	On Flat Surface

Outer Physical Check: *Pass*
 Tap Test: *Pass*

Electronics Checks	As Found	As Left
High Voltage	674 Volts	645 Volts

Comments: Calibrated with E-600 SN 01018 (Calibration Due Date = 10/21/2015)
 Check Source Acceptance Range (With RSCS Projects Alpha/Beta Source 001) = 4.444 to 6.666 kcpm on the alpha plus beta channel

Calibrated by:  QA Review: 

Date: 10/22/2014
 Expires: 10/22/2015

Atmospheric Conditions - Temperature: 70° F Humidity: 43% Barometric Pressure: 29.98 in/hg
 This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
 Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
 J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
 RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%.
 Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
 Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994
 This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc.



Pratt & Whitney Middletown Site Final Status Survey Report

ID Number: 31168383199-0

Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

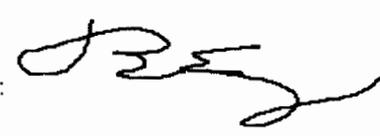
Instrument Ludlum Model 43-89
Serial Number 311683

Probe Model & SN	Isotope	Efficiency	NIST Source ID	Geometry
Internal Probe	Tc-99	0.0695 C/D	Tc-99 (SN: 63963 (Beta))	@1/4"
Internal Probe	Th-230	0.1106 C/D	Th-230 (SN: S-963)	@1/4"
Internal Probe	Th-230	0.1629 C/D	Th-230 (SN: S-963)	On Flat Surface

Outer Physical Check: *Pass*
 Tap Test: *Pass*

Electronics Checks	As Found	As Left
High Voltage	762 Volts	762 Volts

Comments: Calibrated with E-600 SN 3689 (Calibration Due Date = 10/21/2015)
 Check Source Acceptance Range (With RSCS Projects Alpha/Beta Source 001) = 4.148 to 6.223 kcpm on the alpha plus beta channel

Calibrated by:  QA Review: 

Date: 10/22/2014
 Expires: 10/22/2015

Atmospheric Conditions - Temperature: 70° F Humidity: 43% Barometric Pressure: 29.98 in/hg
 This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
 Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
 J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
 RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%.
 Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
 Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994
 This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc.



Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

Instrument
 Ludlum Model 43-89

Serial Number
 312071

Probe Model & SN	Isotope	Efficiency	NIST Source ID	Geometry
Internal Probe	C-14	0.0091 C/D	C-14 (SN: 488-10-9)	On Contact
Internal Probe	Cs-137	0.2162 C/D	Cs-137(Beta) (SN: 98CS5004751)	@1cm
Internal Probe	Cs-137	0.2536 C/D	Cs-137(Beta) (SN: 98CS5004751)	On Contact
Internal Probe	Sr/Y-90	0.1989 C/D	Sr/Y-90 (SN: 63962 (Beta))	On Contact
Internal Probe	Tc-99	0.0793 C/D	Tc-99 (SN: 63963 (Beta))	@1cm
Internal Probe	Tc-99	0.0853 C/D	Tc-99 (SN: 63963 (Beta))	On Contact
Internal Probe	Co-60	0.0934 C/D	Tc-99 (SN: 63963 (Beta))	On Contact
Internal Probe	Th-230	0.1095 C/D	Th-230 (SN: S-963)	@1/4"
Internal Probe	Th-230	0.0966 C/D	Th-230 (SN: S-963)	@1cm
Internal Probe	Th-230	0.2012 C/D	Th-230 (SN: S-963)	On Contact

Outer Physical Check: *Pass*
 Tap Test: *Pass*

Electronics Checks	As Found	As Left
High Voltage	771 Volts	771 Volts

Comments: Calibrated with E-600 SN 3689 (Calibration Due Date = 12/02/2014) Added Cs-137 efficiencies 7/29/14 dsc.
 Added C-14, Sr-90 and Co-60 9/12/14 dsc.
 Updated 10/21/14 to add Th-230 efficiency at 1/4" and check source reading
 Check Source Acceptance Range (With RSCS Projects Alpha/Beta Source 001 on the alpha + beta channel) = 4.336 to 6.504 kcpm

Calibrated by:

QA Review:

Date: 06/17/2014
 Expires: 06/17/2015

Atmospheric Conditions - Temperature: 72° F Humidity: 29% Barometric Pressure: 29.94 in/hg
 This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
 Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
 J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
 RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%.
 Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
 Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994
 This calibration certificate shall not be reproduced except in full without the express written consent of RSCS, Inc.



Pratt & Whitney Middletown Site Final Status Survey Report
Calibration Certificate
ID Number: 0101883208-0

Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

Instrument
 Eberline Model E-600

Serial Number
 01018

Precision Check				
Test 1	Test 2	Test 3	Mean	Results
7.98 Kcpm	7.97 Kcpm	7.99 Kcpm	7.98 Kcpm	Satisfactory

Accuracy Check			
Range	Target Value	As Found	As Left
100K	80 Kcpm	79.9 Kcpm #	79.9 Kcpm #
100K	20 Kcpm	19.93 Kcpm #	19.93 Kcpm #
10K	8 Kcpm	7.98 Kcpm #	7.98 Kcpm #
10K	2 Kcpm	1.99 Kcpm #	1.99 Kcpm #
1K	800 cpm	797 cpm #	797 cpm #
1K	200 cpm	200 cpm #	200 cpm #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10.00% of Target value
 Readings with # indicate ranges where pulser was used.

MTE Instrument Type	Model	CalDueDate
Pulser	Eberline MP-2 SN: 886	10/29/2014

Outer Physical Check: *Pass*
 Tap Test: *Pass*

Comments: High Voltage Accuracy Check: Set at 898 V, Measured = 897 V

Calibrated by:

QA Review:

Calibration Date: 10/21/2014
 Expires: 10/21/2015

Atmospheric Conditions - Temperature: 74°F Humidity: 23% Barometric Pressure: 29.88"hg

This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:

Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.

J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.

RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%

Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures. Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994

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Pratt & Whitney Middletown Site Final Status Survey Report

Calibration Certificate
ID Number: 0103382009-0

Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
91 Portsmouth Avenue
Stratham, NH 03885

Instrument
Eberline Model E-600

Serial Number
01033

Precision Check				
Test 1	Test 2	Test 3	Mean	Results
7.99 Kcpm	7.98 Kcpm	7.99 Kcpm	7.99 Kcpm	Satisfactory

Accuracy Check			
Range	Target Value	As Found	As Left
100K	80 Kcpm	79.8 Kcpm #	79.8 Kcpm #
100K	20 Kcpm	19.98 Kcpm #	19.98 Kcpm #
10K	8 Kcpm	7.99 Kcpm #	7.99 Kcpm #
10K	2 Kcpm	2.00 Kcpm #	2.00 Kcpm #
1K	800 cpm	801 cpm #	801 cpm #
1K	200 cpm	201 cpm #	201 cpm #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10.00% of Target value
Readings with # indicate ranges where pulser was used.

MTE Instrument Type	Model	CalDueDate
Pulser	Ludlum 500-4 SN: 66151	10/30/2014

Outer Physical Check: *Pass*
Tap Test: *Pass*

Comments: High Voltage Accuracy Check: Set at 1201 V, As-Found, Measured = 1217 V, As-Left = 1201

Calibrated by:

QA Review:

Calibration Date: 09/19/2014
Expires: 09/19/2015

Atmospheric Conditions - Temperature: 73°F Humidity: 25% Barometric Pressure: 30.23"hg

This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:

Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.

J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.

RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%

Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.

Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994

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**Pratt & Whitney Middletown Site Final Calibration Certificate
Status Survey Report**
ID Number: 00368577615-1

Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
91 Portsmouth Avenue
Stratham, NH 03885

Instrument
Eberline Model E-600

Serial Number
003685

Precision Check				
Test 1	Test 2	Test 3	Mean	Results
11.53 mrem/hr	10.98 mrem/hr	10.29 mrem/hr	10.93 mrem/hr	Satisfactory

Accuracy Check			
Range	Target Value	As Found	As Left
AUTO	20 mrem/hr	19.79 mrem/hr	19.79 mrem/hr
AUTO	12 mrem/hr	11.53 mrem/hr	11.53 mrem/hr
AUTO	8 mrem/hr	6.996 mrem/hr	6.996 mrem/hr
AUTO	2 mrem/hr	1.892 mrem/hr	1.892 mrem/hr

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10.00% of Target value

Outer Physical Check: Pass
Tap Test: Pass

Electronics Checks	As Found	As Left
High Voltage	set @ 2334 V	set @ 2334 V

Calibrated by: *[Signature]*

QA Review: *[Signature]*

Calibration Date: 03/26/2014
Expires: 03/26/2015

Atmospheric Conditions - Temperature: 73°F Humidity: 16% Barometric Pressure: 29.75"hg
This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%
Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994
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Pratt & Whitney Middletown Site Final Status Survey Report
Calibration Certificate
ID Number: 368983210-0

Customer:	Joan Ervey Radiation Safety & Control Services, Inc. 91 Portsmouth Avenue Stratham, NH 03885	Instrument	Eberline Model E-600	Serial Number	3689
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Precision Check				
Test 1	Test 2	Test 3	Mean	Results
7.98 Kcpm	7.99 Kcpm	7.99 Kcpm	7.99 Kcpm	Satisfactory

Accuracy Check			
Range	Target Value	As Found	As Left
100K	80 Kcpm	79.9 Kcpm #	79.9 Kcpm #
100K	20 Kcpm	19.92 Kcpm #	19.92 Kcpm #
10K	8 Kcpm	7.98 Kcpm #	7.98 Kcpm #
10K	2 Kcpm	2.0 Kcpm #	2.0 Kcpm #
1K	800 cpm	800 cpm #	800 cpm #
1K	200 cpm	201 cpm #	201 cpm #

Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10.00% of Target value
 Readings with # indicate ranges where pulser was used.

MTE Instrument Type	Model	CalDueDate
Pulser	Eberline MP-2 SN: 886	10/29/2014

Outer Physical Check: <i>Pass</i>	Tap Test: <i>Pass</i>
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Comments: High Voltage Accuracy Check: Set at 898 V, Measured = 898 V

Calibrated by:  QA Review:  Calibration Date: 10/21/2014
 Expires: 10/21/2015

Atmospheric Conditions - Temperature: 74°F Humidity: 23% Barometric Pressure: 29.88"hg
 This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:
 Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
 J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
 RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%
 Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
 Calibration Laboratory is operated in accordance with ANSI/NCSL Z540-1-1994
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Pratt & Whitney Middletown Site Final Status Survey Report

Calibration Certificate

ID Number: 00369082008-0

Customer: Joan Ervey
Radiation Safety & Control Services, Inc.
 91 Portsmouth Avenue
 Stratham, NH 03885

Instrument
 Eberline Model E-600

Serial Number
 003690

Precision Check				
Test 1	Test 2	Test 3	Mean	Results
7.96 Kcpm	7.96 Kcpm	7.95 Kcpm	7.96 Kcpm	Satisfactory

Accuracy Check			
Range	Target Value	As Found	As Left
100K	80 Kcpm	79.8 Kcpm #	79.8 Kcpm #
100K	20 Kcpm	19.90 Kcpm #	19.90 Kcpm #
10K	8 Kcpm	7.96 Kcpm #	7.96 Kcpm #
10K	2 Kcpm	1.989 Kcpm #	1.989 Kcpm #
1K	800 cpm	796 cpm #	796 cpm #
1K	200 cpm	201 cpm #	201 cpm #

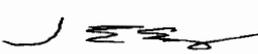
Readings with * indicate ranges where As-Found readings are >20% of Target value. Readings with ** indicate As-left readings are >10.00% of Target value
 Readings with # indicate ranges where pulser was used.

MTE Instrument Type	Model	CalDueDate
Pulser	Eberline MP-2 SN: 678	03/19/2015

Outer Physical Check: *Pass*
 Tap Test: *Pass*

Comments: High Voltage Accuracy Check: Set at 1200 V, Measured = 1200 V

Calibrated by: 

QA Review: 

Calibration Date: 09/19/2014
 Expires: 09/19/2015

Atmospheric Conditions - Temperature: 73°F Humidity: 25% Barometric Pressure: 30.23"hg

This calibration was performed by RSCS using one or more of the following NIST Traceable radiation sources:

Tech Ops Model 773 Cs-137 Beam Calibrator (S/N S-1110), characterized using Exradin Model A6 (S/N 185) and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-008, with estimated uncertainty of 6.0%.
 J.L. Shepherd and Associates Model 89 Cs-137 Box Calibrator (S/N 9141), characterized using Exradin, Model A6 (S/N 185), A3 (S/N 197), A12 (S/N XA091124), and Keithley Electrometer Model 617 (S/N 0547677) in accordance with methods specified in RSCS TSD 11-001, with estimated uncertainty of 2.7%.
 RSCS Neutron Calibrator, AmBe Source Model NUMEC-AM-31 (S/N Am-478), characterized using Far West Technologies Model FWAD-1 "HAWK" TEPC (S/N 021) in accordance with the methods specified in RSCS TSD 13-002, with estimated uncertainty of 9.4%
 Calibrations performed in conformance to the following documents: ANSI N323A (1997); RSCS New Hampshire Radioactive Material License Number 381R. RSCS calibration services are performed in accordance with the RSCS Radiation Protection Program Manual and Standard Operating Procedures.
 Calibration Laboratory is operated in accordance with ANSI/NCCL Z540-1-1994
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Attachment 2 Survey Unit B220M-EH

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: B220M-EH	FSSP number: B220M-EH-001
Survey unit name: Building 220M East Half	
DATA QUALITY OBJECTIVES (DQO)	
1.0	State the problem
	<p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit B220M-EH, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the Middletown Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	Identify the decision
	<p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	Identify the inputs to the decision
	<p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the Middletown Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the Middletown Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_w). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _w	Survey unit meets the release criterion
Average concentration exceeds the DCGL _w	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _w and the average concentration is less than the DCGL _w	Conduct the Sign test

Basis for Determining the Operational DCGL: The Middletown Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_w equal to 354 dpm/100 cm². This DCGL_w corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The Middletown Final Status Survey Plan, Revision 1, has specified that approximately 10% of the accessible areas will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The Middletown Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

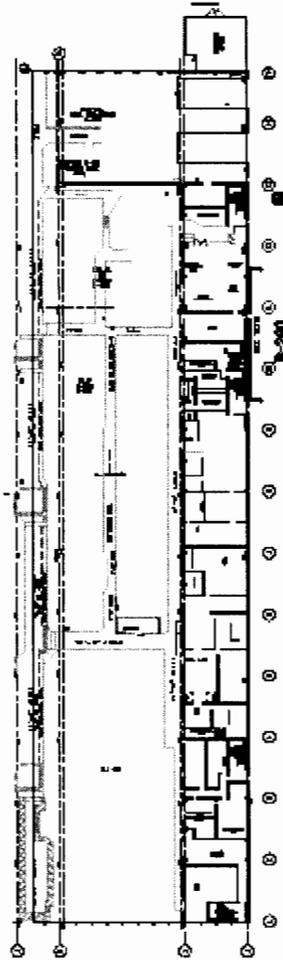
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is located inside the large manufacturing and Assembly Building 220. The survey unit surface area is approximately 7,230 square meters (7,230 m^2) or 77,823 square feet (77,823 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit B220M-EH



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The Middletown Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The Middletown Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in The Middletown Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.

10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89, Ludlum 43-90 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example;

the first direct measurement from the scanning at location 1 would be annotated as 1-1.

- 3) Obtain a 100 cm² smear at the location of the direct measurement
- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

Pratt & Whitney Middletown Site Final Status Survey Report

FSSP number: B220M-EH-001

14. The Health Physicist will complete the package review in accordance with the FSS Plan, Termination of License SMB-151 at the Middletown, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

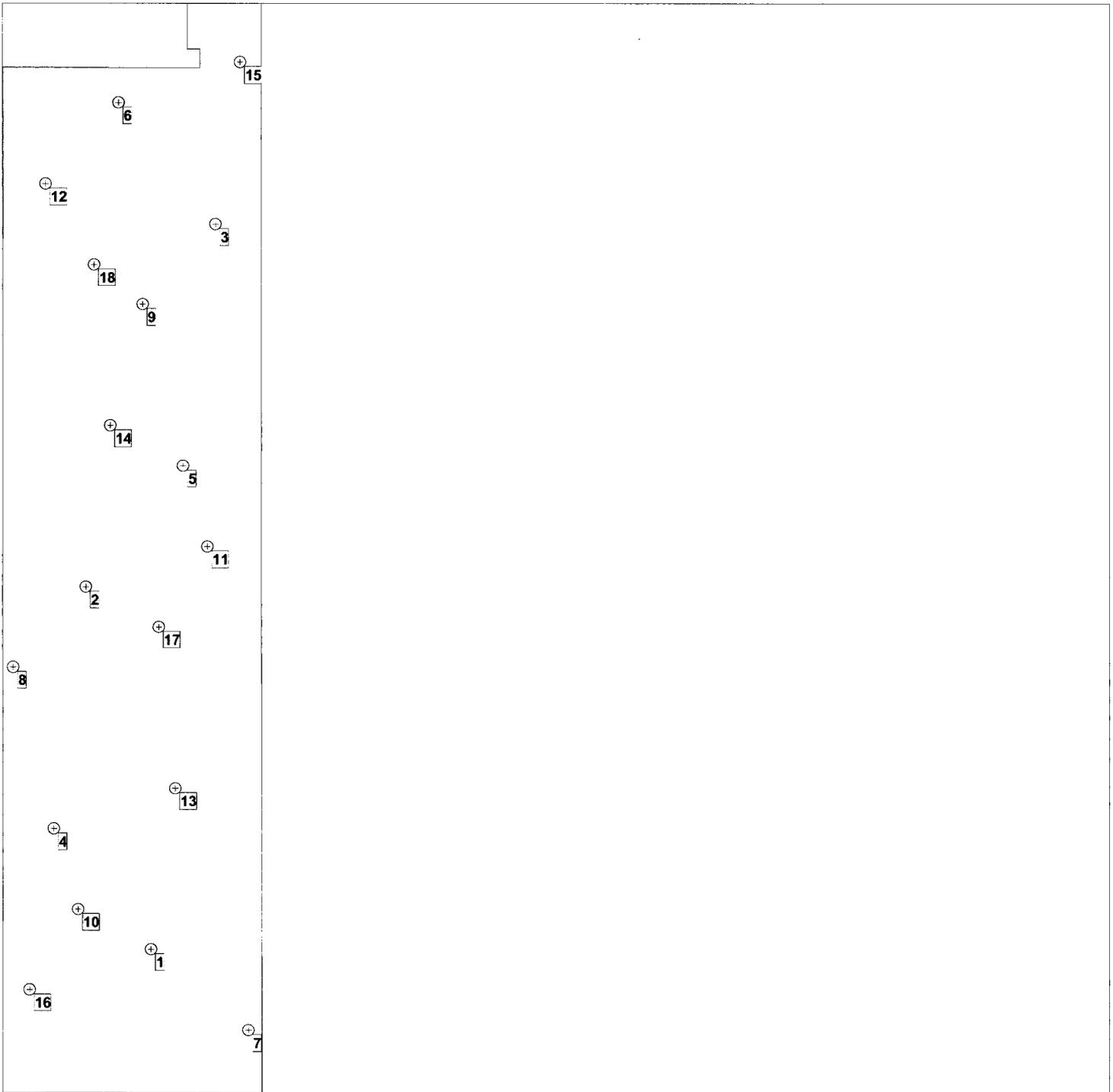
Prepared by: P Hollenbeck

Date: 29-Oct-14

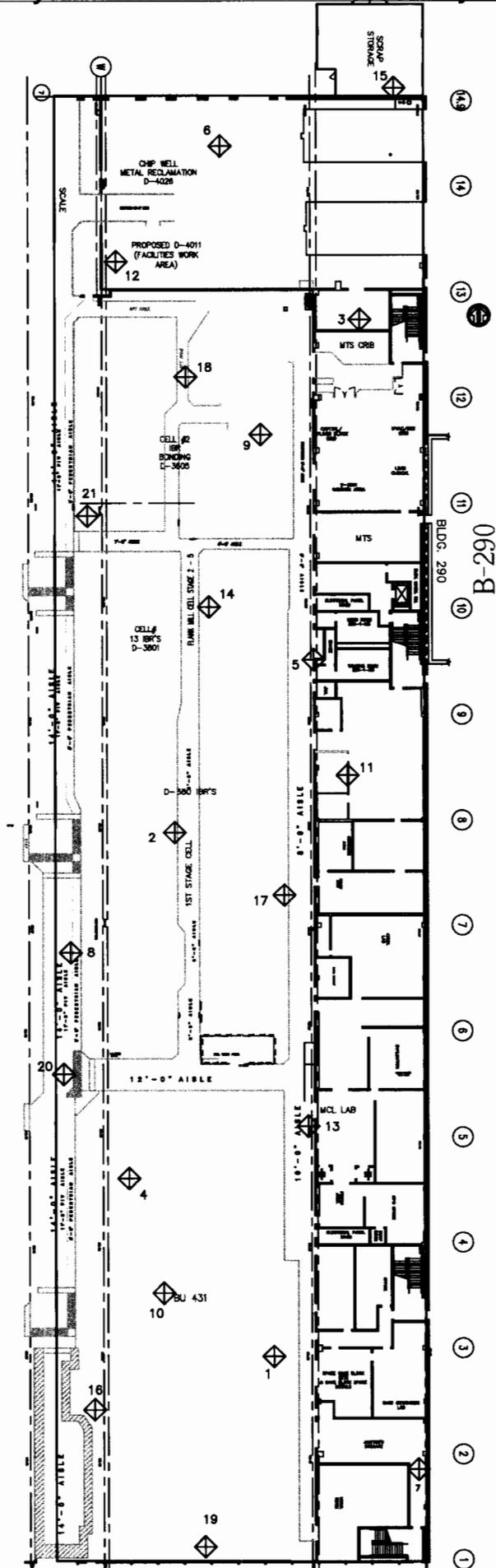
Approved by: [Signature]

Date 29-Oct-14

Planned B220M-EH Survey Location Map - (VSP)
Pratt & Whitney Middletown Site Final Status Survey Report



As Surveyed B220M-EH Survey Location Map
 Pratt & Whitney Middletown Site Final Status Survey Report



Pratt & Whitney Middletown Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: B220M-EH-001

Survey Date: 11/3/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #1018/43-89 # 223946			
Survey meter (2):		E-600 #3685/43-89 # 312071			
Meter (1) Details			Meter (2) Details		
Count time (min):	3		Count time (min):	3	
Meter (1) background (counts):	17.8		Meter (2) background (counts):	7.8	
Meter (1) Efficiency (c/d):	0.0954		Meter (2) Efficiency (c/d):	0.1095	
Meter (1) MDC (dpm/100 cm ²):	63.2		Meter (2) MDC (dpm/100 cm ²):	38.9	
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	1	20	2.2	6.1	N
2	2	11	3.2	7.8	N
3	1	27	9.2	25.7	N
4	2	3	-4.8	-11.7	N
5	1	21	3.2	8.9	N
6	2	10	2.2	5.4	N
7	1	32	14.2	39.7	N
8	2	12	4.2	10.2	N
9	1	25	7.2	20.1	N
10	2	19	11.2	27.3	N
11	2	11	3.2	7.8	N
12	2	12	4.2	10.2	N
13	1	15	-2.8	-7.8	N
14	2	7	-0.8	-1.9	N
15	2	21	13.2	32.1	N
16	2	12	4.2	10.2	N
17	1	17	-0.8	-2.2	N
18	1	22	4.2	11.7	N
19	1	23	5.2	14.5	N
20	2	4	-3.8	-9.3	N
21	1	17	-0.8	-2.2	N

survey unit average => 9.7 dpm/100 cm²
dose estimate => 0.5 mrem/y

**Pratt & Whitney Middletown Site Final Status Survey Report
Sample Report**

B22M-EH-001

Batch ID:	LT Th-230 - 201411111344	Count Date:	11/11/2014
Group:	A	Count Minutes:	4.0
Device:	LB5100	Count Mode:	Alpha Only
Batch Key:	26,776	Operating Volts:	840

Selected Geometry: 1/4" Stainless Steel

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	0.77			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	5.64			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	18.00			Beta Bkgd (CPH)	0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
0141111134435-A1	1			0.00	0.70	0.50	
20141111134916-A2	2			0.00	-0.18	0.25	
0141111135326-A3	3			0.00	-1.05	0.00	
0141111135746-A4	4			0.00	-1.05	0.00	
20141111140156-A5	5			0.00	0.70	0.50	
20141111140616-A6	6			0.00	-1.05	0.00	
0141111141026-A7	7			0.00	-1.05	0.00	
20141111141447-A8	8			0.00	-1.05	0.00	
20141111141857-A9	9			0.00	-0.18	0.25	
0141111142317-A10	10			0.00	-0.18	0.25	
20141111142727-A11	11			0.00	-0.18	0.25	
20141111143147-A12	12			0.00	-1.05	0.00	
0141111143557-A13	13			0.00	1.58	0.75	
20141111144018-A14	14			0.00	-0.18	0.25	
20141111144438-A15	15			0.00	-1.05	0.00	
0141111144848-A16	16			0.00	0.70	0.50	
0141111145308-A17	17			0.00	-1.05	0.00	
20141111145718-A18	18			0.00	-1.05	0.00	
0141111150138-A21	Smear 19			0.00	-0.18	0.25	
20141111150548-A22	20			0.00	-0.18	0.25	
20141111151008-A23	21			0.00	0.70	0.50	

Reviewed by: *JES*

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 S/N L11263 Cal due 06/06/2014
 9/23/15

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 C:\Program Files (x86)\Tennelec Systems\Eclipse\activity report_dpm_a_b.rpt

Rev. 0
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 Print Time 3:14:25PM

Attachment 3 Survey Unit B220M-WH

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: B220M-WH	FSSP number: B220M-WH-001
Survey unit name: Building 220M West Half	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit B220M-WH, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the Middletown Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the Middletown Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the Middletown Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_W). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

Basis for Determining the Operational DCGL: The Middletown Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_W equal to 354 dpm/100 cm². This DCGL_W corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The Middletown Final Status Survey Plan, Revision 1, has specified that approximately 10% of the accessible areas will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The Middletown Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

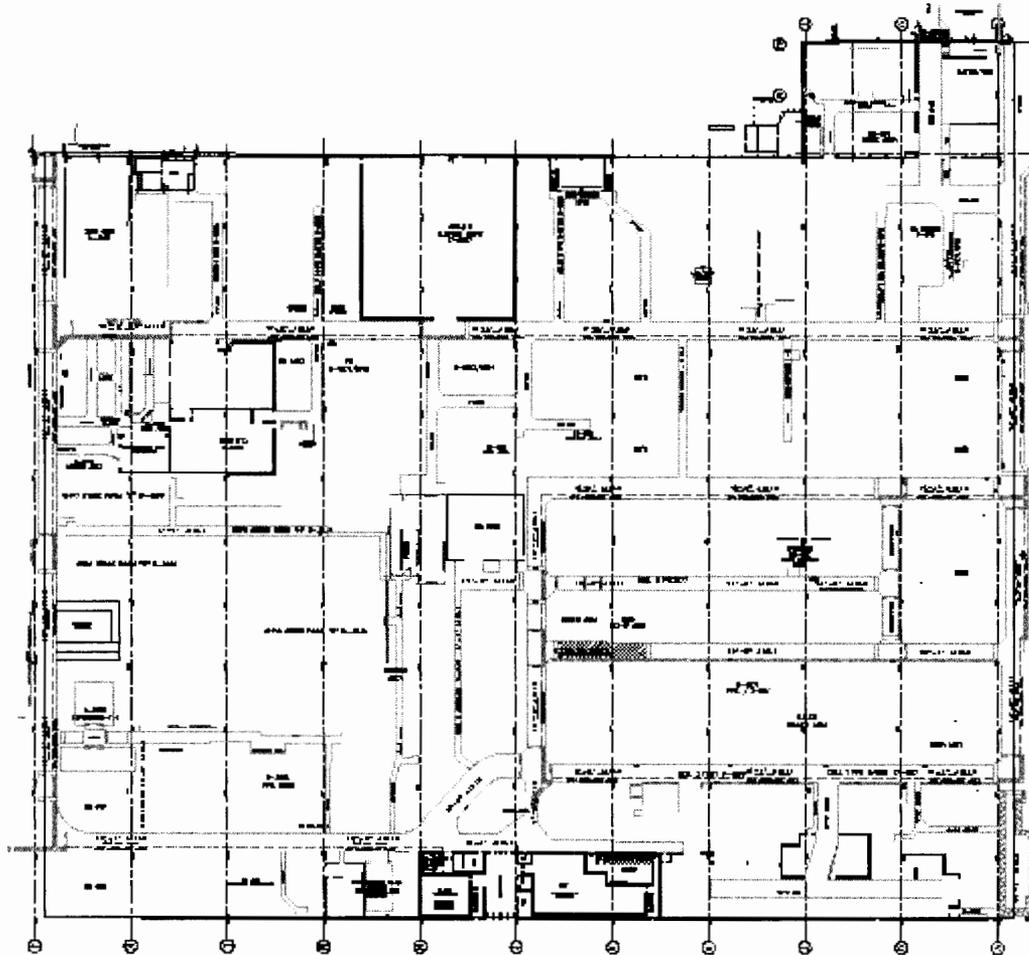
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is located inside the large manufacturing and Assembly Building 220. The survey unit surface area is approximately 27,930 square meters (27,930 m^2) or 300,643 square feet (300,643 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit B220M-WH



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The Middletown Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The Middletown Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in The Middletown Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.

10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89, Ludlum 43-90 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example;

the first direct measurement from the scanning at location 1 would be annotated as 1-1.

- 3) Obtain a 100 cm² smear at the location of the direct measurement
- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

Pratt & Whitney Middletown Site Final Status Survey Report

FSSP number: B220M-WH-001

14. The Health Physicist will complete the package review in accordance with the FSS Plan, Termination of License SMB-151 at the Middletown, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

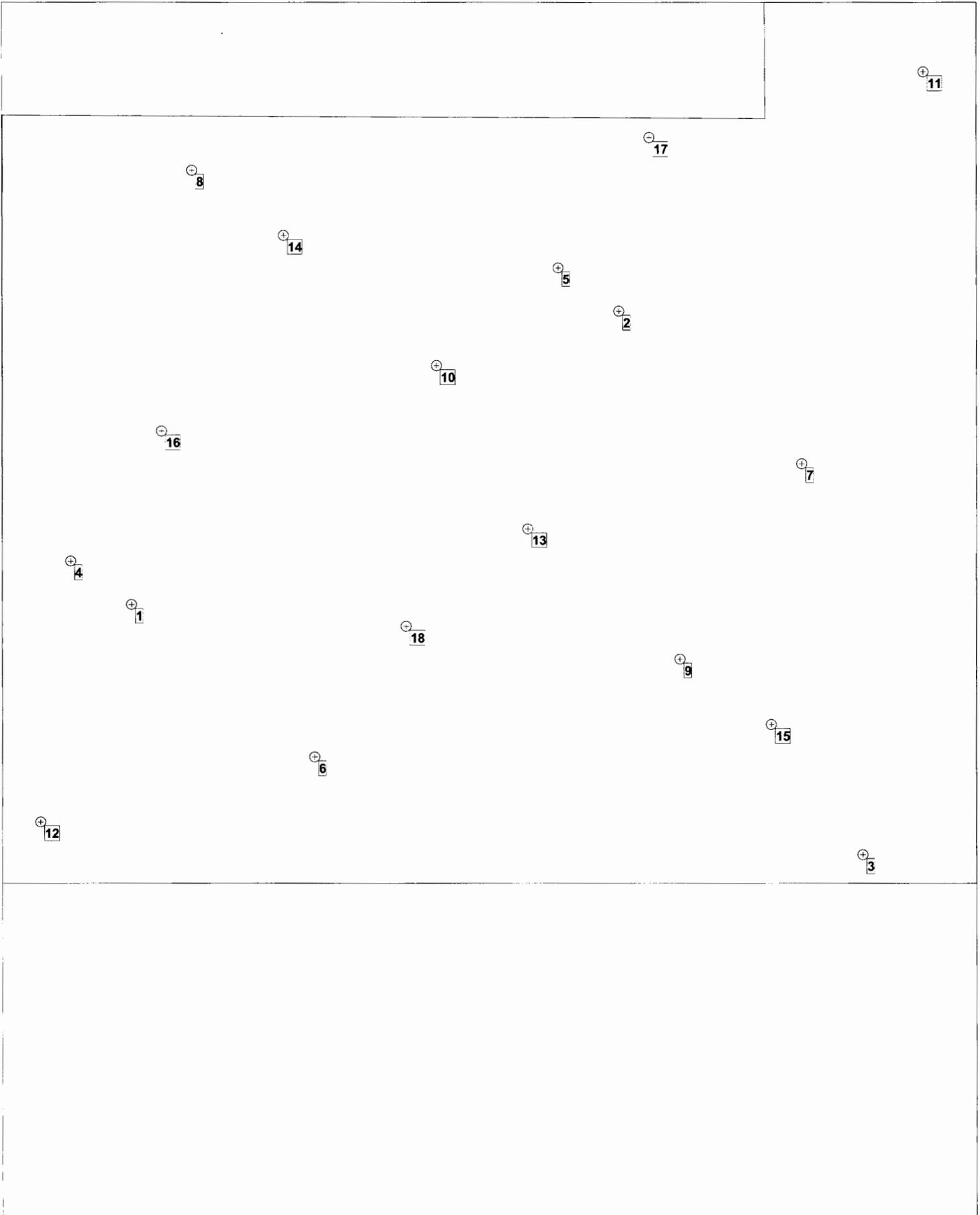
Prepared by: P Hollenbeck

Date: 29-Oct-14

Approved by: [Signature]

Date: 29-Oct-14

Planned B220M-WH Survey Location Map - (VSP)
Pratt & Whitney Middletown Site Final Status Survey Report



Pratt & Whitney Middletown Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: B220M-WH-001

Survey Date: 11/3/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #3689/43-89 # 311683			
Survey meter (2):		E-600 #1033/43-89 # 223945			
Meter (1) Details			Meter (2) Details		
Count time (min):		3	Count time (min):		3
Meter (1) background (counts):		7.8	Meter (2) background (counts):		6.6
Meter (1) Efficiency (c/d):		0.1106	Meter (2) Efficiency (c/d):		0.0922
Meter (1) MDC (dpm/100 cm²):		38.5	Meter (2) MDC (dpm/100 cm²):		43.2
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	1	4	-3.8	-9.2	N
2	1	2	-5.8	-14.0	N
3	2	0	-6.6	-19.1	N
4	2	4	-2.6	-7.5	N
5	2	2	-4.6	-13.3	N
6	1	5	-2.8	-6.8	N
7	1	2	-5.8	-14.0	N
8	2	2	-4.6	-13.3	N
9	2	1	-5.6	-16.2	N
10	2	6	-0.6	-1.7	N
11	2	2	-4.6	-13.3	N
12	2	3	-3.6	-10.4	N
13	2	1	-5.6	-16.2	N
14	2	1	-5.6	-16.2	N
15	1	3	-4.8	-11.6	N
16	1	3	-4.8	-11.6	N
17	2	2	-4.6	-13.3	N
18	1	2	-5.8	-14.0	N
19	1	4	-3.8	-9.2	N
20	1	3	-4.8	-11.6	N
21	1	6	-1.8	-4.3	N

survey unit average => -11.7 dpm/100 cm²
dose estimate => 0.0 mrem/y

Pratt & Whitney Middletown Site Final Status Survey Report
Sample Report

3220 M-WH-001

Batch ID: LT Th-230 - 201411110943
 Group: A
 Device: LB5100
 Batch Key: 26,769
 Selected Geometry: 1/4" Stainless Steel

Count Date: 11/11/2014
 Count Minutes: 4.0
 Count Mode: Alpha Only
 Operating Volts: 840

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	0.77			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	5.64			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	18.00			Beta Bkgd (CPH)	0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
0141111094345-A1	1			0.00	0.70	0.50	
20141111094826-A2	2			0.00	-1.05	0.00	
0141111095236-A3	3			0.00	-1.05	0.00	
0141111095656-A4	4			0.00	-1.05	0.00	
2014111100106-A5	5			0.00	-1.05	0.00	
2014111100526-A6	6			0.00	-1.05	0.00	
014111100937-A7	7			0.00	0.70	0.50	
2014111101357-A8	8			0.00	1.58	0.75	
2014111101807-A9	9			0.00	0.70	0.50	
014111102227-A10	10			0.00	-0.18	0.25	
2014111102637-A11	11			0.00	-0.18	0.25	
2014111103057-A12	12			0.00	-1.05	0.00	
014111103517-A13	13			0.00	-1.05	0.00	
2014111103928-A14	14			0.00	0.70	0.50	
2014111104348-A15	15			0.00	-1.05	0.00	
014111104758-A16	16			0.00	-1.05	0.00	
2014111105218-A17	17			0.00	0.70	0.50	
2014111105628-A18	18			0.00	0.70	0.50	
014111110048-A21	19			0.00	-0.18	0.25	
014111110458-A23	20			0.00	-1.05	0.00	
201411110918-A22	21			0.00	-0.18	0.25	

Reviewed by:

Attachment 4 Survey Unit B220A-SE

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: B220A-SE	FSSP number: B220A-SE-001
Survey unit name: Building 220A South East Quadrant	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit B220A-SE, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the Middletown Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the Middletown Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the Middletown Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_w). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _w	Survey unit meets the release criterion
Average concentration exceeds the DCGL _w	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _w and the average concentration is less than the DCGL _w	Conduct the Sign test

Basis for Determining the Operational DCGL: The Middletown Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_w equal to 354 dpm/100 cm². This DCGL_w corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The Middletown Final Status Survey Plan, Revision 1, has specified that approximately 10% of the accessible areas will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The Middletown Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

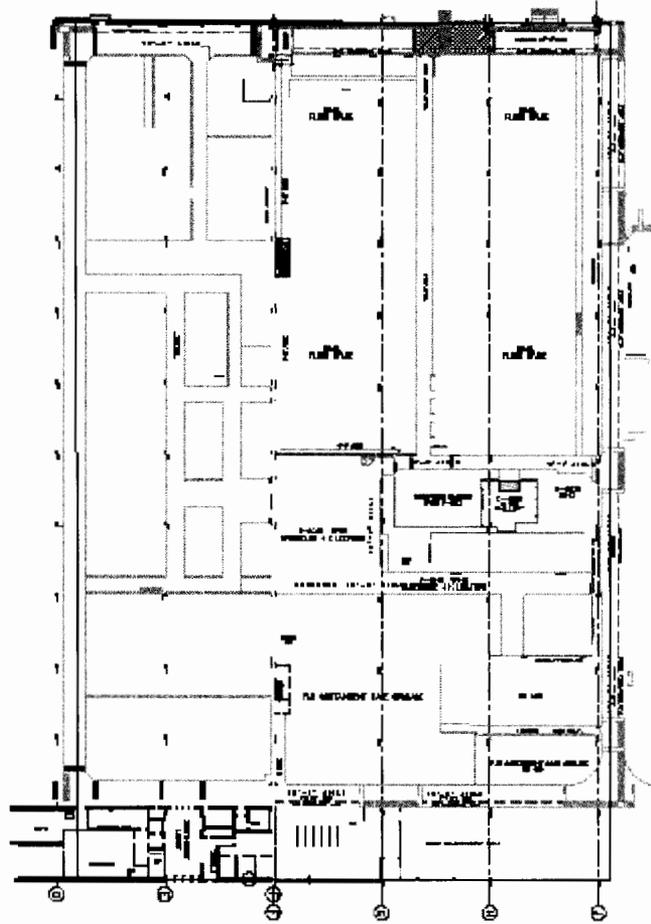
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is located inside the large manufacturing and Assembly Building 220. The survey unit surface area is approximately 13,229 square meters (13,229 m^2) or 142,397 square feet (142,397 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit B220A-SE



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The Middletown Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The Middletown Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in The Middletown Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.

10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89, Ludlum 43-90 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example;

the first direct measurement from the scanning at location 1 would be annotated as 1-1.

- 3) Obtain a 100 cm² smear at the location of the direct measurement
- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shiftDocument the investigation on the attached Data Investigation form. Record actions taken on the form such as:
 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.
14. The Health Physicist will complete the package review in accordance with the FSS Plan, Termination of License SMB-151 at the Middletown, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

Pratt & Whitney Middletown Site Final Status Survey Report

FSSP number: B220A-SE-001

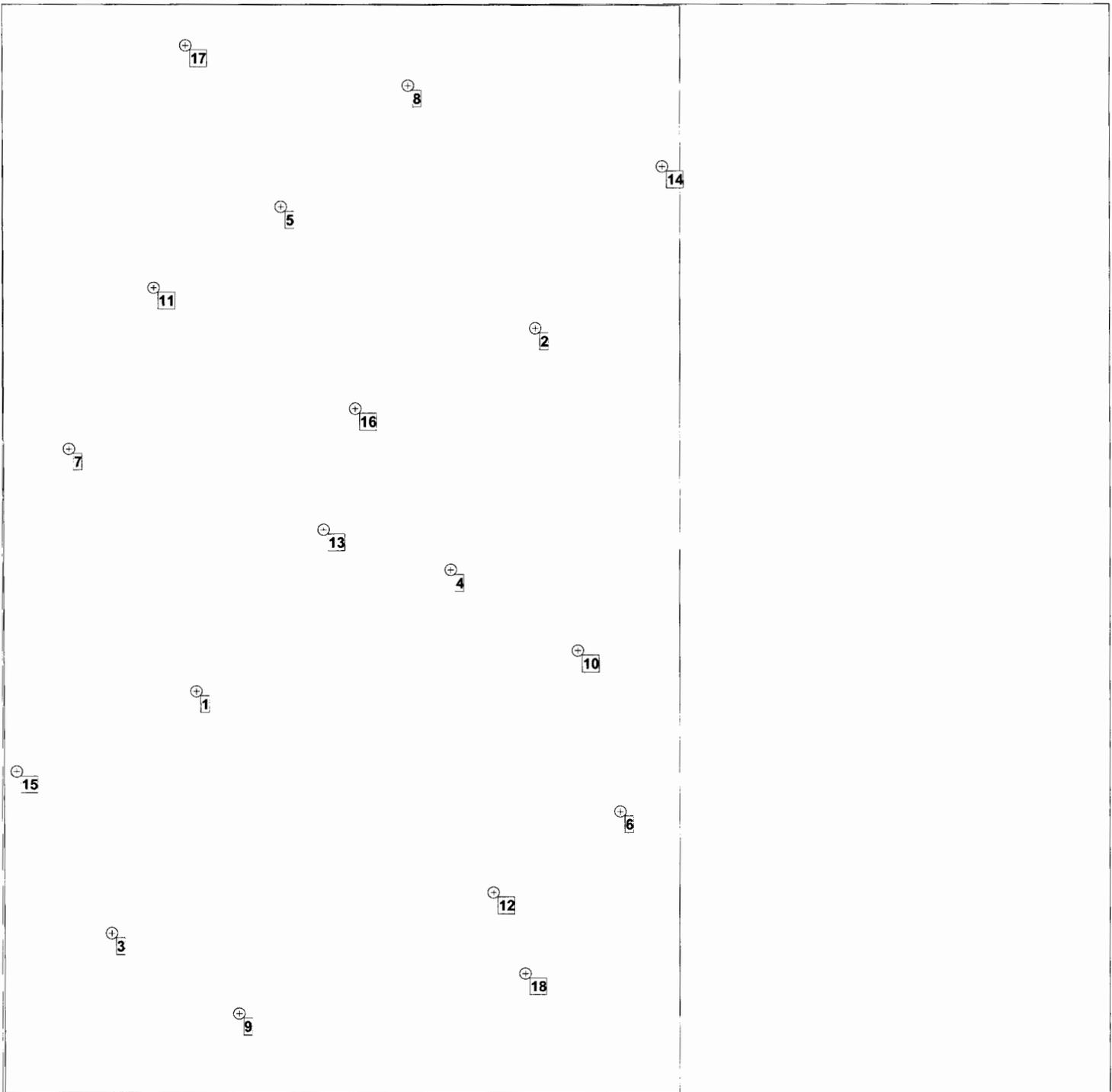
Prepared by: P Hollenbeck

Date: 29-Oct-14

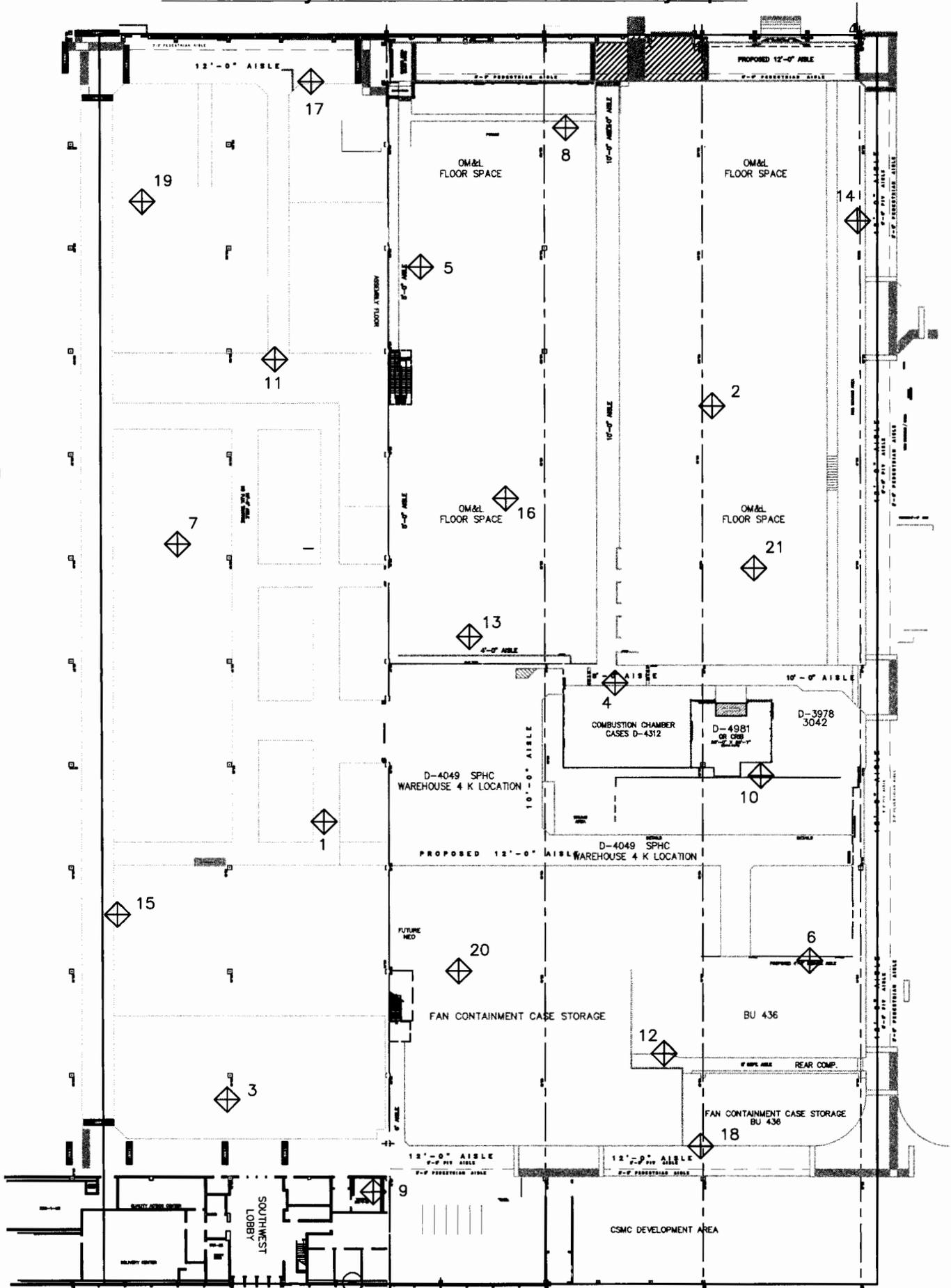
Approved by: [Signature]

Date: 29-Oct-14

Planned B220A-SE Survey Location Map - (VSP)
Pratt & Whitney Middletown Site Final Status Survey Report



As Surveyed B220A-SE Survey Location Map
Pratt & Whitney Middletown Site Final Status Survey Report



Pratt & Whitney Middletown Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: B220A-SE-001

Survey Date: 11/4/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #1018/43-89 # 223946			
Survey meter (2):		E-600 #3685/43-89 # 312071			
Meter (1) Details			Meter (2) Details		
Count time (min):		3	Count time (min):		3
Meter (1) background (counts):		25.0	Meter (2) background (counts):		14.2
Meter (1) Efficiency (c/d):		0.0954	Meter (2) Efficiency (c/d):		0.1095
Meter (1) MDC (dpm/100 cm²):		73.4	Meter (2) MDC (dpm/100 cm²):		50.0
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	1	23	-2.0	-5.6	N
2	2	17	2.8	6.8	N
3	1	28	3.0	8.4	N
4	2	12	-2.2	-5.4	N
5	1	24	-1.0	-2.8	N
6	2	25	10.8	26.3	N
7	1	34	9.0	25.2	N
8	2	18	3.8	9.3	N
9	1	26	1.0	2.8	N
10	2	12	-2.2	-5.4	N
11	1	37	12.0	33.5	N
12	2	7	-7.2	-17.5	N
13	1	31	6.0	16.8	N
14	2	10	-4.2	-10.2	N
15	1	30	5.0	14.0	N
16	2	9	-5.2	-12.7	N
17	1	27	2.0	5.6	N
18	2	18	3.8	9.3	N
19	1	22	-3.0	-8.4	N
20	2	2	-12.2	-29.7	N
21	1	24	-1.0	-2.8	N

survey unit average => 2.7 dpm/100 cm²
dose estimate => 0.1 mrem/y

Pratt & Whitney Middletown Site Final Status Survey Report
Sample Report

B-220A-SE-001

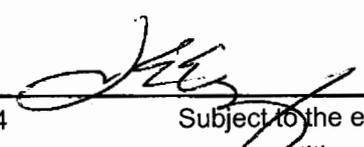
Batch ID: LT Th-230 - 201411101237
 Group: A
 Device: LB5100
 Batch Key: 26,762
 Selected Geometry: 1/4" Stainless Steel

Count Date: 11/10/2014
 Count Minutes: 4.0
 Count Mode: Alpha Only
 Operating Volts: 840

Alpha Efficiency:(%) 28.4770 ± 0.53
 Alpha Action Level (cpm) 0.77
 Alpha MDA (dpm) 5.64
 Alpha Bkgd (CPH) 18.00

Beta Efficiency: (%) ±
 Beta Action Level (cpm) 0.00
 Beta MDA (dpm) 0.00
 Beta Bkgd (CPH) 0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
20141110123734-A1	1			0.00	1.58	0.75	
20141110124215-A2	2			0.00	-0.18	0.25	
20141110124625-A3	3			0.00	-1.05	0.00	
20141110125045-A4	4			0.00	-1.05	0.00	
20141110125456-A5	5			0.00	0.70	0.50	
20141110125916-A6	6			0.00	2.46	1.00	*
20141110130326-A7	7			0.00	-1.05	0.00	
20141110130746-A8	8			0.00	-1.05	0.00	
20141110131206-A9	9			0.00	-0.18	0.25	
20141110131616-A10	10			0.00	-1.05	0.00	
20141110132036-A11	11			0.00	-1.05	0.00	
20141110132446-A12	12			0.00	-0.18	0.25	
20141110132907-A13	13			0.00	-0.18	0.25	
20141110133317-A14	14			0.00	-1.05	0.00	
20141110133737-A15	15			0.00	-1.05	0.00	
20141110134147-A16	16			0.00	0.70	0.50	
20141110134607-A17	17			0.00	-1.05	0.00	
20141110135027-A18	18			0.00	0.70	0.50	
20141110135437-A21	Smear 19			0.00	-0.18	0.25	
20141110135858-A22	Smear 20			0.00	0.70	0.50	
20141110140308-A23	Smear 21			0.00	1.58	0.75	

Reviewed by: 

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Subject to the export control restrictions on the

S/N L11263 Cal due 06/06/2014

Page 1 of 1

title page of this document

C:\Program Files (x86)\Tennelec Systems\Eclipse\activity report_dpm_a_b.rpt

Rev. 0

Print Date 11/10/2014

Print Time 2:07:34PM

9/23/15

Attachment 5 Survey Unit B220A-SW

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: B220A-SW	FSSP number: B220A-SW-001
Survey unit name: Building 220A South West Quadrant	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit B220A-SW, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the Middletown Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the Middletown Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the Middletown Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_w). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _w	Survey unit meets the release criterion
Average concentration exceeds the DCGL _w	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _w and the average concentration is less than the DCGL _w	Conduct the Sign test

Basis for Determining the Operational DCGL: The Middletown Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_w equal to 354 dpm/100 cm². This DCGL_w corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The Middletown Final Status Survey Plan, Revision 1, has specified that approximately 10% of the accessible areas will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The Middletown Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

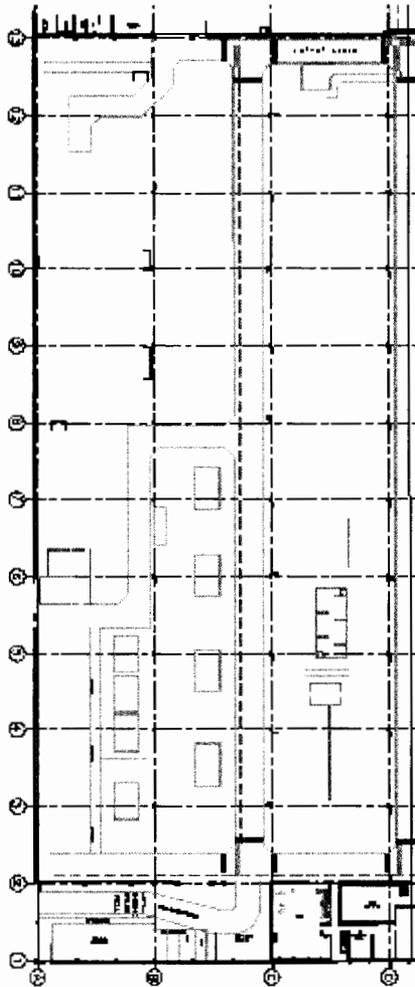
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is located inside the large manufacturing and Assembly Building 220. The survey unit surface area is approximately 8,606 square meters (8,606 m^2) or 92,629 square feet (92,629 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit B220A-SW



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The Middletown Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The Middletown Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in The Middletown Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.

10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89, Ludlum 43-90 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example;

the first direct measurement from the scanning at location 1 would be annotated as 1-1.

- 3) Obtain a 100 cm² smear at the location of the direct measurement
- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.
14. The Health Physicist will complete the package review in accordance with the FSS Plan, Termination of License SMB-151 at the Middletown, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

Pratt & Whitney Middletown Site Final Status Survey Report

FSSP number: B220A-SW-001

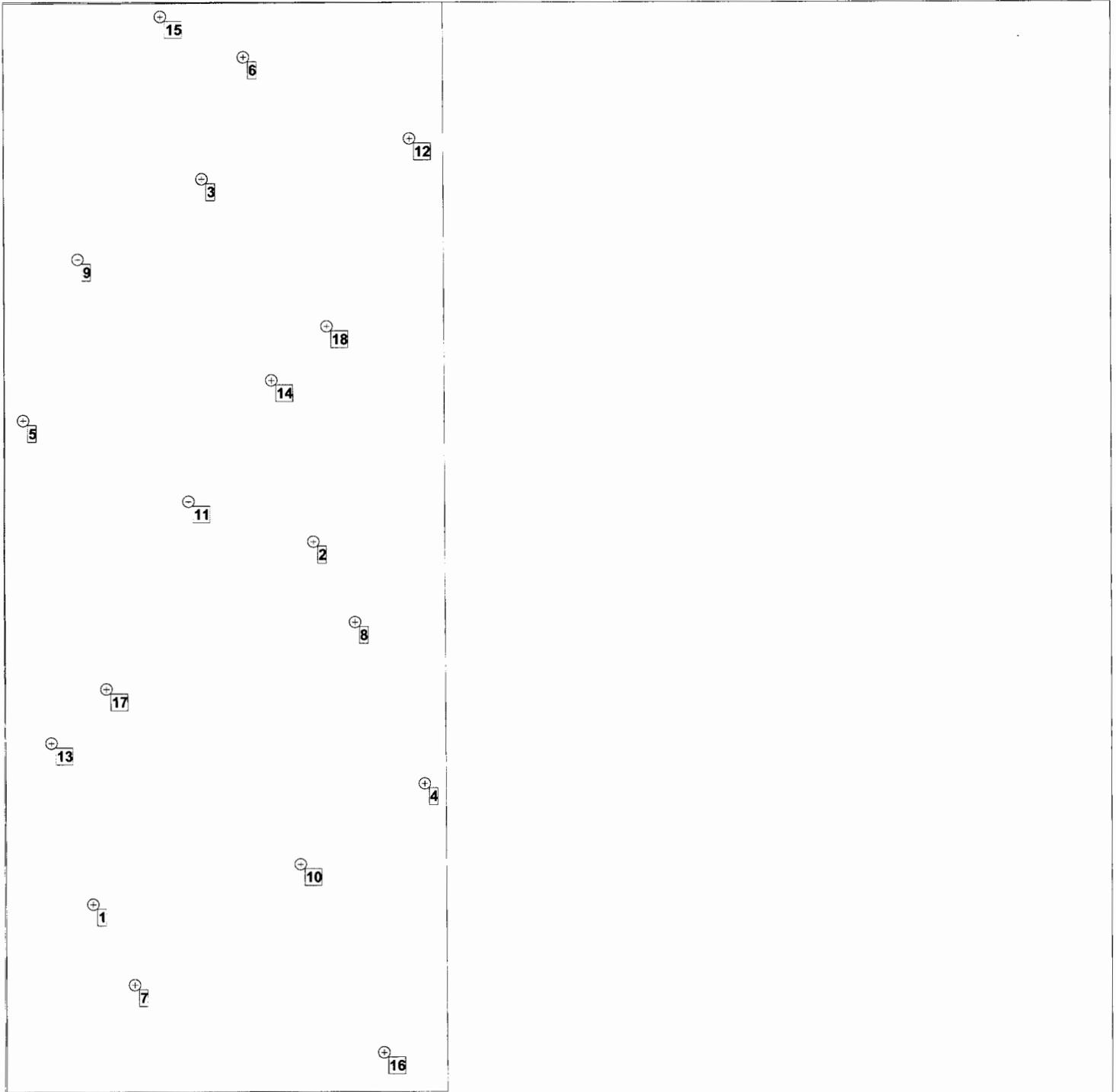
Prepared by: P Hollenbeck

Date: 29-Oct-14

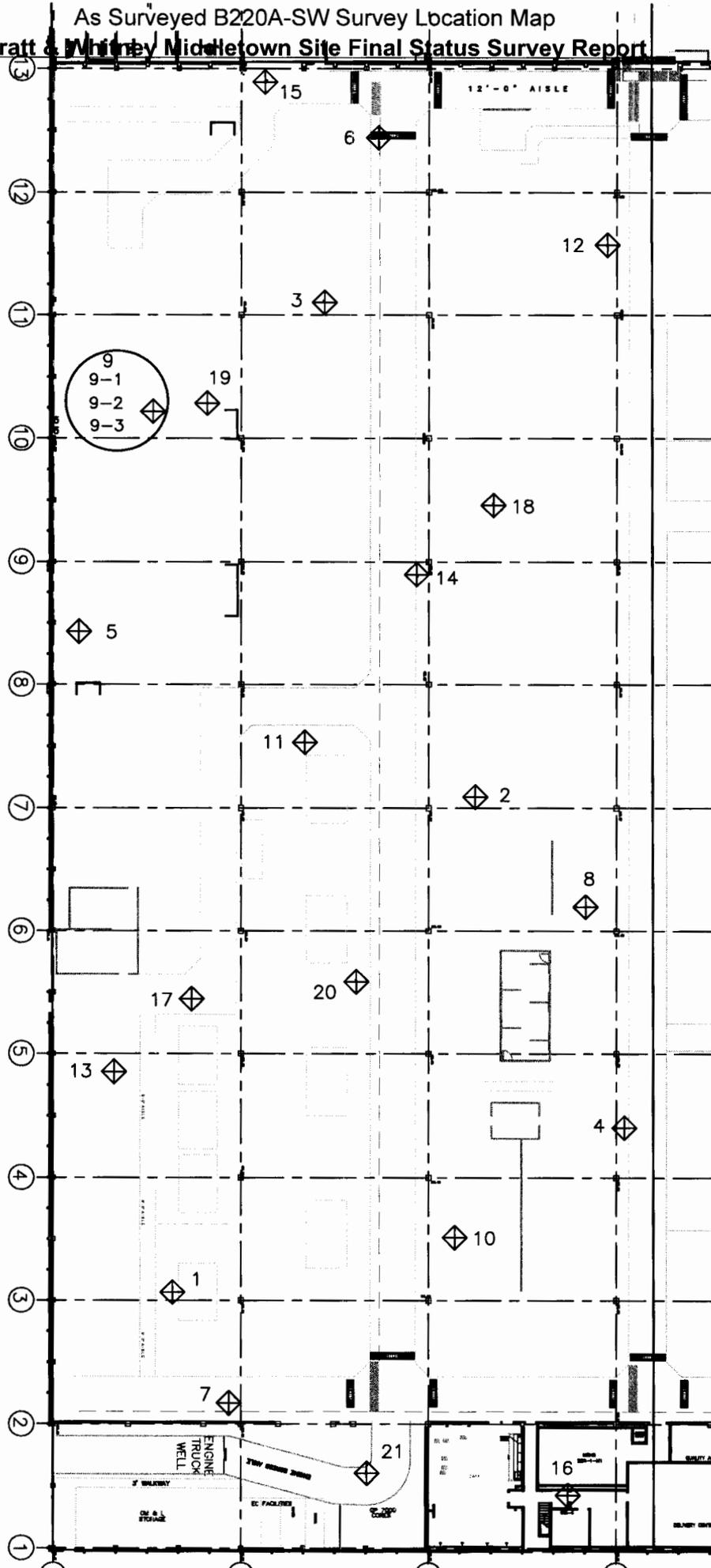
Approved by: [Signature]

Date: 29-Oct-14

Planned B220A-SW Survey Location Map - (VSP)
Pratt & Whitney Middletown Site Final Status Survey Report



As Surveyed B220A-SW Survey Location Map
Pratt & Whitney Middletown Site Final Status Survey Report



Pratt & Whitney Middletown Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: B220A-SW-001

Survey Date: 11/4/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #3689/43-89 # 311683			
Survey meter (2):		E-600 #1033/43-89 # 223945			
Meter (1) Details			Meter (2) Details		
Count time (min):	3	Count time (min):	3		
Meter (1) background (counts):	9.6	Meter (2) background (counts):	10.2		
Meter (1) Efficiency (c/d):	0.1106	Meter (2) Efficiency (c/d):	0.0922		
Meter (1) MDC (dpm/100 cm ²):	42.0	Meter (2) MDC (dpm/100 cm ²):	51.6		
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	2	3	-7.2	-20.8	N
2	1	7	-2.6	-6.3	N
3	2	1	-9.2	-26.6	N
4	2	6	-4.2	-12.1	N
5	1	6	-3.6	-8.7	N
6	1	8	-1.6	-3.9	N
7	1	11	1.4	3.4	N
8	2	3	-7.2	-20.8	N
9	2	9	-1.2	-3.5	N
10	2	8	-2.2	-6.4	N
11	2	8	-2.2	-6.4	N
12	1	7	-2.6	-6.3	N
13	1	11	1.4	3.4	N
14	1	12	2.4	5.8	N
15	1	8	-1.6	-3.9	N
16	2	1	-9.2	-26.6	N
17	2	7	-3.2	-9.3	N
18	1	7	-2.6	-6.3	N
19	2	9	-1.2	-3.5	N
20	1	8	-1.6	-3.9	N
21	1	9	-0.6	-1.4	N
9-1	2	51	40.8	118.0	N
9-2	2	32	21.8	63.1	N
9-3	2	31	20.8	60.2	N

survey unit average => 3.2 dpm/100 cm²
dose estimate => 0.2 mrem/y

Pratt & Whitney Middletown Site Final Status Survey Report

Sample Report

B-22A-SW-001

Batch ID: LT Th-230 - 201411121016
 Group: A
 Device: LB5100
 Batch Key: 26,783
 Selected Geometry: 1/4" Stainless Steel

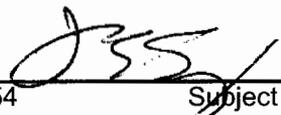
Count Date: 11/12/2014
 Count Minutes: 4.0
 Count Mode: Alpha Only
 Operating Volts: 840

Alpha Efficiency:(%) 28.4770 ± 0.53
 Alpha Action Level (cpm) 0.77
 Alpha MDA (dpm) 5.64
 Alpha Bkgd (CPH) 18.00

Beta Efficiency: (%) ±
 Beta Action Level (cpm) 0.00
 Beta MDA (dpm) 0.00
 Beta Bkgd (CPH) 0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
20141112101628-A1	1			0.00	1.58	0.75	
20141112102109-A2	2			0.00	-1.05	0.00	
20141112102519-A3	3			0.00	-0.18	0.25	
20141112102939-A4	4			0.00	0.70	0.50	
20141112103349-A5	5			0.00	-1.05	0.00	
20141112103809-A6	6			0.00	-0.18	0.25	
20141112104219-A7	7			0.00	-0.18	0.25	
20141112104639-A8	8			0.00	-1.05	0.00	
20141112105049-A9	9			0.00	1.58	0.75	
20141112105510-A10	10			0.00	-1.05	0.00	
20141112105920-A11	11			0.00	1.58	0.75	
20141112110340-A12	12			0.00	0.70	0.50	
20141112110750-A13	13			0.00	0.70	0.50	
201411121111210-A14	14			0.00	-1.05	0.00	
20141112111620-A15	15			0.00	-0.18	0.25	
20141112112040-A16	16			0.00	-0.18	0.25	
20141112112501-A17	17			0.00	-1.05	0.00	
20141112112911-A18	18			0.00	-0.18	0.25	
20141112113331-A21	Smear 19			0.00	-1.05	0.00	
20141112113741-A22	20			0.00	-1.05	0.00	
20141112114201-A23	21			0.00	-0.18	0.25	
20141112114611-A24	2-1			0.00	-1.05	0.00	
20141112115031-A25	9-2			0.00	-1.05	0.00	
20141112115441-A26	9-3			0.00	-0.18	0.25	

Reviewed by:



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Page 1 of 1

Print Date 11/12/2014

9/23/15

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Attachment 6 Survey Unit B220A-NW

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: B220A-NW	FSSP number: B220A-NW-001
Survey unit name: Building 220A North West Quadrant	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit B220A-NW, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the Middletown Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the Middletown Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the Middletown Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_w). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _w	Survey unit meets the release criterion
Average concentration exceeds the DCGL _w	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _w and the average concentration is less than the DCGL _w	Conduct the Sign test

Basis for Determining the Operational DCGL: The Middletown Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_w equal to 354 dpm/100 cm². This DCGL_w corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The Middletown Final Status Survey Plan, Revision 1, has specified that approximately 10% of the accessible areas will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The Middletown Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

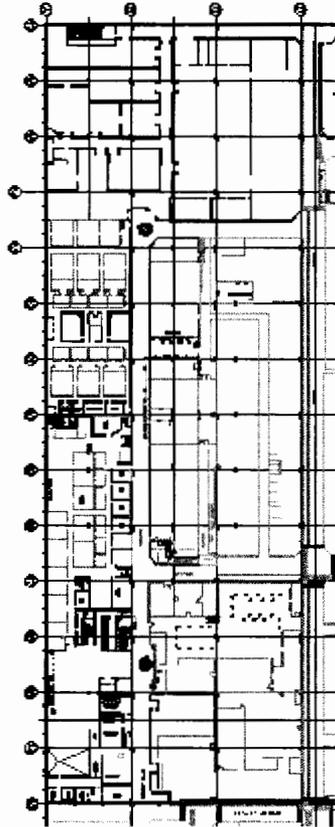
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is located inside the large manufacturing and Assembly Building 220. The survey unit surface area is approximately 9,918 square meters (9,918 m^2) or 106,757 square feet (106,757 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit B220A-NW



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The Middletown Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The Middletown Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in The Middletown Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.
10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89, Ludlum 43-90 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.
 - 3) Obtain a 100 cm² smear at the location of the direct measurement

- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.
14. The Health Physicist will complete the package review in accordance with the FSS Plan, Termination of License SMB-151 at the Middletown, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

Pratt & Whitney Middletown Site Final Status Survey Report

FSSP number: B220A-NW-001

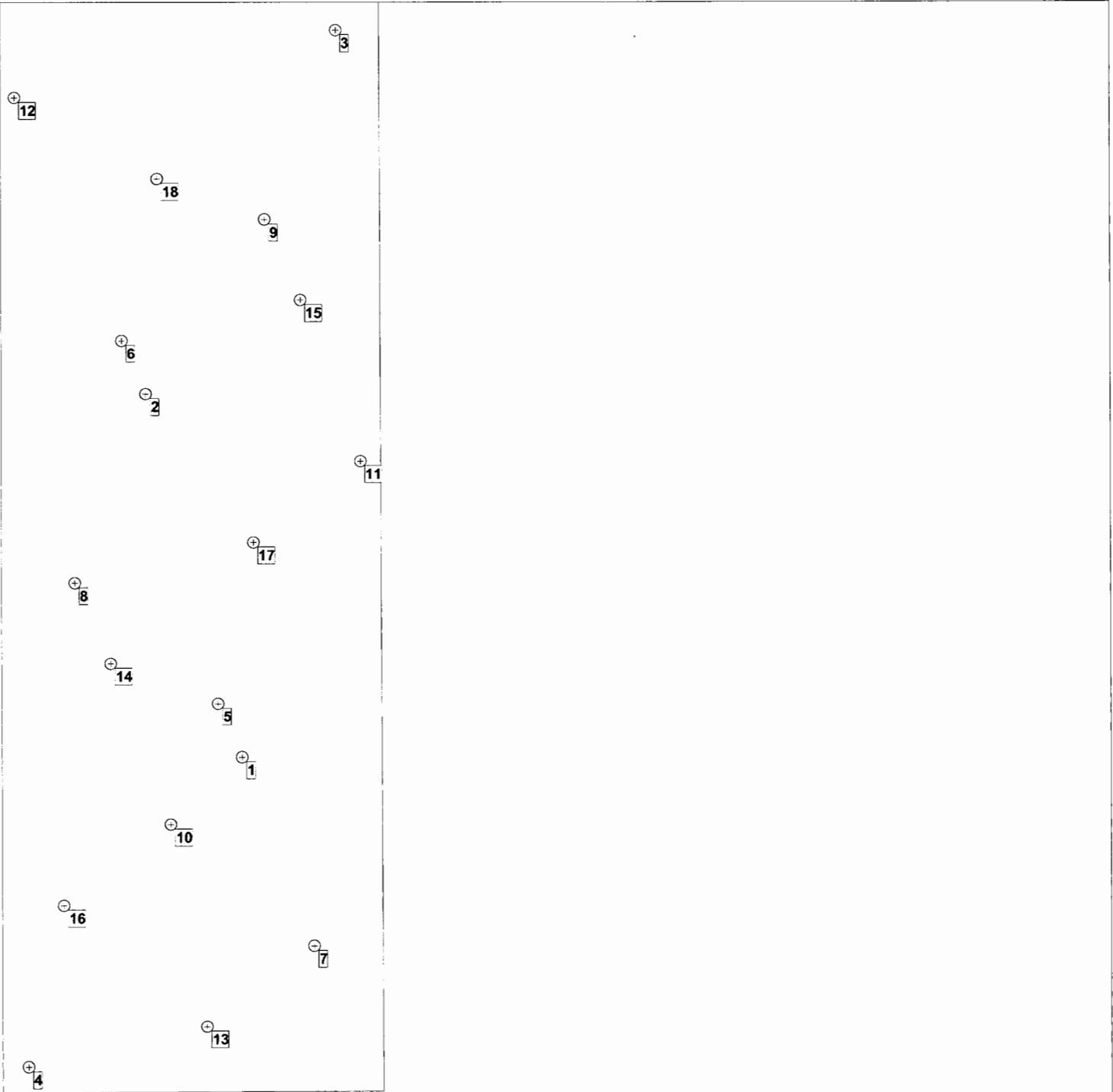
Prepared by: P Hollenbeck

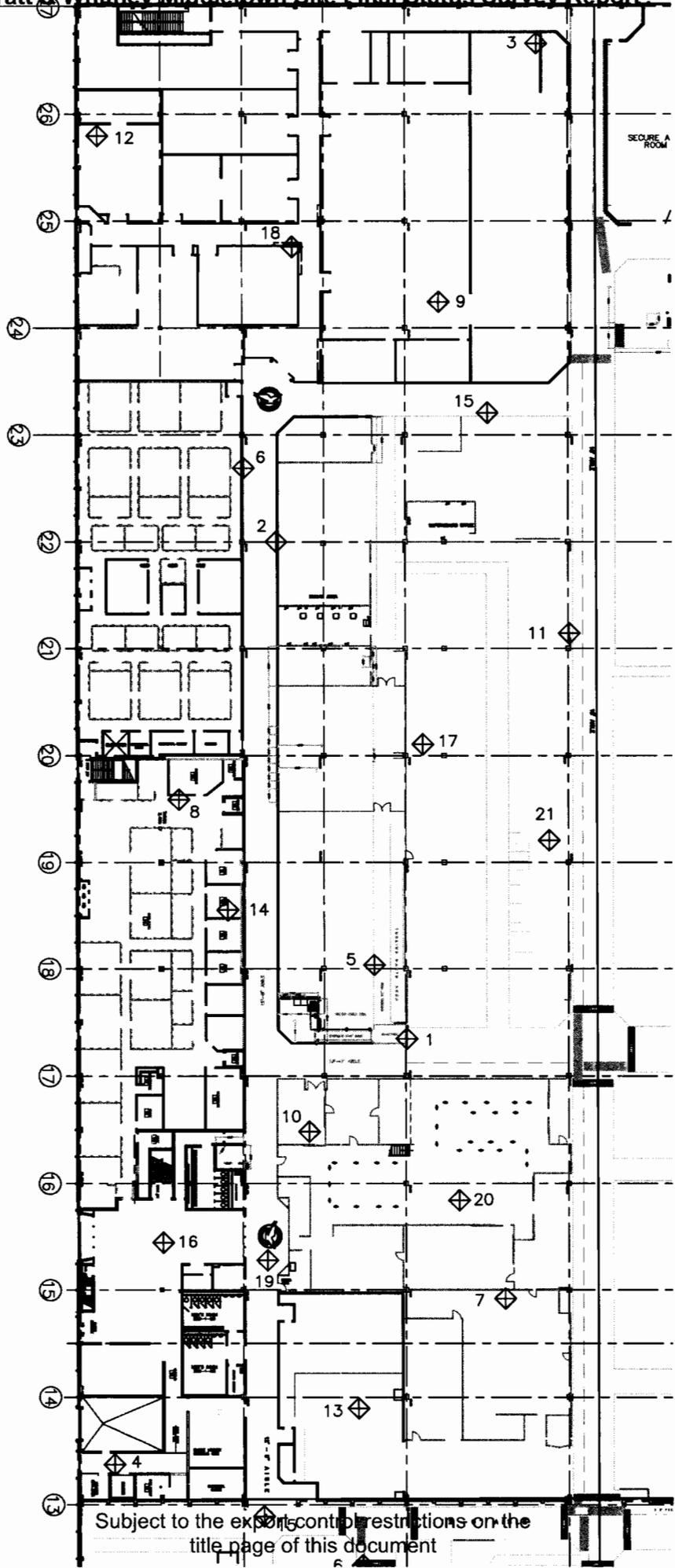
Date: 29-Oct-14

Approved by: 

Date 29-Oct-14

Planned B220A-NW Survey Location Map - (VSP)
Pratt & Whitney Middletown Site Final Status Survey Report





Pratt & Whitney Middletown Site Final Status Survey Report
Final Status Survey Package Direct Measurement Results

FSSP: B220A-NW-001

Survey Date: 11/5/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #1018/43-89 # 223946			
Survey meter (2):		E-600 #3685/43-89 # 312071			
Survey meter (3):		E-600 #1033/43-89 # 223945			
Survey meter (4):		E-600 #3689/43-89 # 311683			
Meter (1) Details			Meter (2) Details		
Count time (min):	3	Count time (min):	3		
Meter (1) background (counts):	16.4	Meter (2) background (counts):	7.2		
Meter (1) Efficiency (c/d):	0.0954	Meter (2) Efficiency (c/d):	0.1095		
Meter (1) MDC (dpm/100 cm ²):	61.0	Meter (2) MDC (dpm/100 cm ²):	37.7		
Meter (3) Details			Meter (4) Details		
Count time (min):	3	Count time (min):	3		
Meter (3) background (counts):	7.6	Meter (4) background (counts):	5.6		
Meter (3) Efficiency (c/d):	0.0922	Meter (4) Efficiency (c/d):	0.1106		
Meter (3) MDC (dpm/100 cm ²):	45.8	Meter (4) MDC (dpm/100 cm ²):	33.8		
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	4	5	-0.6	-1.4	N
2	4	8.3	2.7	6.5	N
3	4	8	2.4	5.8	N
4	4	9	3.4	8.2	N
5	1	23	6.6	18.4	N
6	1	11	-5.4	-15.1	N
7	1	12	-4.4	-12.3	N
8	1	11	-5.4	-15.1	N
9	2	21	13.8	33.6	N
10	2	18	10.8	26.3	N
11	2	24	16.8	40.9	N
12	2	12	4.8	11.7	N
13	3	4	-3.6	-10.4	N
14	3	5	-2.6	-7.5	N
15	3	6	-1.6	-4.6	N
16	3	3	-4.6	-13.3	N
17	3	5	-2.6	-7.5	N
18	3	6	-1.6	-4.6	N
19	1	16	-0.4	-1.1	N
20	2	16	8.8	21.4	N
21	4	10	4.4	10.6	N

survey unit average => 4.3 dpm/100 cm²
dose estimate => 0.2 mrem/y

**Pratt & Whitney Middletown Site Final Status Survey Report
Sample Report**

B220A-NW-001

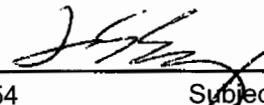
Batch ID: LT Th-230 - 201411121305
Group: A
Device: LB5100
Batch Key: 26,786
Selected Geometry: 1/4" Stainless Steel

Count Date: 11/12/2014
Count Minutes: 4.0
Count Mode: Alpha Only
Operating Volts: 840

Alpha Efficiency:(%) 28.4770 ± 0.53
Alpha Action Level (cpm) 0.77
Alpha MDA (dpm) 5.64
Alpha Bkgd (CPH) 18.00

Beta Efficiency: (%) ±
Beta Action Level (cpm) 0.00
Beta MDA (dpm) 0.00
Beta Bkgd (CPH) 0.00

<u>Carrier ID</u>	<u>Sample ID</u>	<u>Source ID</u>	<u>Net Beta DPM</u>	<u>Beta Gross Cpm</u>	<u>Net Alpha DPM</u>	<u>Alpha Gross Cpm</u>	<u>> Action Level?</u>
20141112130546-A1	1			0.00	-0.18	0.25	
20141112131017-A2	2			0.00	-1.05	0.00	
20141112131437-A3	3			0.00	-1.05	0.00	
20141112131857-A4	4			0.00	-0.18	0.25	
20141112132307-A5	5			0.00	1.58	0.75	
20141112132727-A6	6			0.00	1.58	0.75	
20141112133138-A7	7			0.00	-0.18	0.25	
20141112133558-A8	8			0.00	0.70	0.50	
20141112134008-A9	9			0.00	-0.18	0.25	
20141112134428-A10	10			0.00	0.70	0.50	
20141112134838-A11	11			0.00	-1.05	0.00	
20141112135258-A12	12			0.00	-1.05	0.00	
20141112135708-A13	13			0.00	0.70	0.50	
20141112140129-A14	14			0.00	-1.05	0.00	
20141112140539-A15	15			0.00	-1.05	0.00	
20141112140959-A16	16			0.00	-0.18	0.25	
20141112141409-A17	17			0.00	-1.05	0.00	
20141112141829-A18	18			0.00	-0.18	0.25	
20141112142239-A21	Smar 19			0.00	-0.18	0.25	
20141112142659-A22	20			0.00	-1.05	0.00	
20141112143109-A23	21			0.00	2.46	1.00	*

Reviewed by: 

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Print Date 11/12/2014

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Attachment 7 Survey Unit B220A-NE

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: B220A-NE	FSSP number: B220A-NE-001
Survey unit name: Building 220A North East Quadrant	
DATA QUALITY OBJECTIVES (DQO)	
1.0	State the problem
	<p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit B220A-NE, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the Middletown Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	Identify the decision
	<p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	Identify the inputs to the decision
	<p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the Middletown Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the Middletown Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_W). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

Basis for Determining the Operational DCGL: The Middletown Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_W equal to 354 dpm/100 cm². This DCGL_W corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The Middletown Final Status Survey Plan, Revision 1, has specified that approximately 10% of the accessible areas will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The Middletown Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

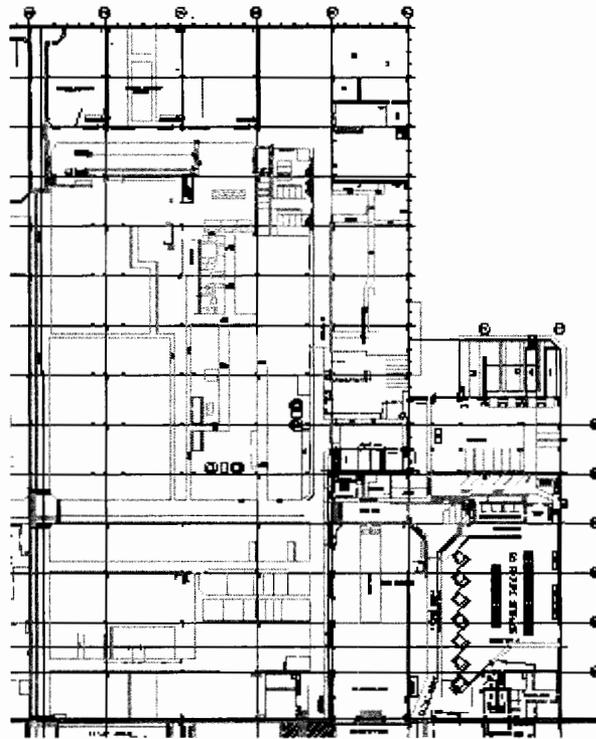
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is located inside the large manufacturing and Assembly Building 220. The survey unit surface area is approximately 18,455 square meters (18,455 m^2) or 198,652 square feet (198,652 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit B220A-NE



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The Middletown

Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The Middletown Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in The Middletown Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.
10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89, Ludlum 43-90 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.

- 3) Obtain a 100 cm² smear at the location of the direct measurement
 - f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

Pratt & Whitney Middletown Site Final Status Survey Report

FSSP number: B220A-NE-001

14. The Health Physicist will complete the package review in accordance with the FSS Plan, Termination of License SMB-151 at the Middletown, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

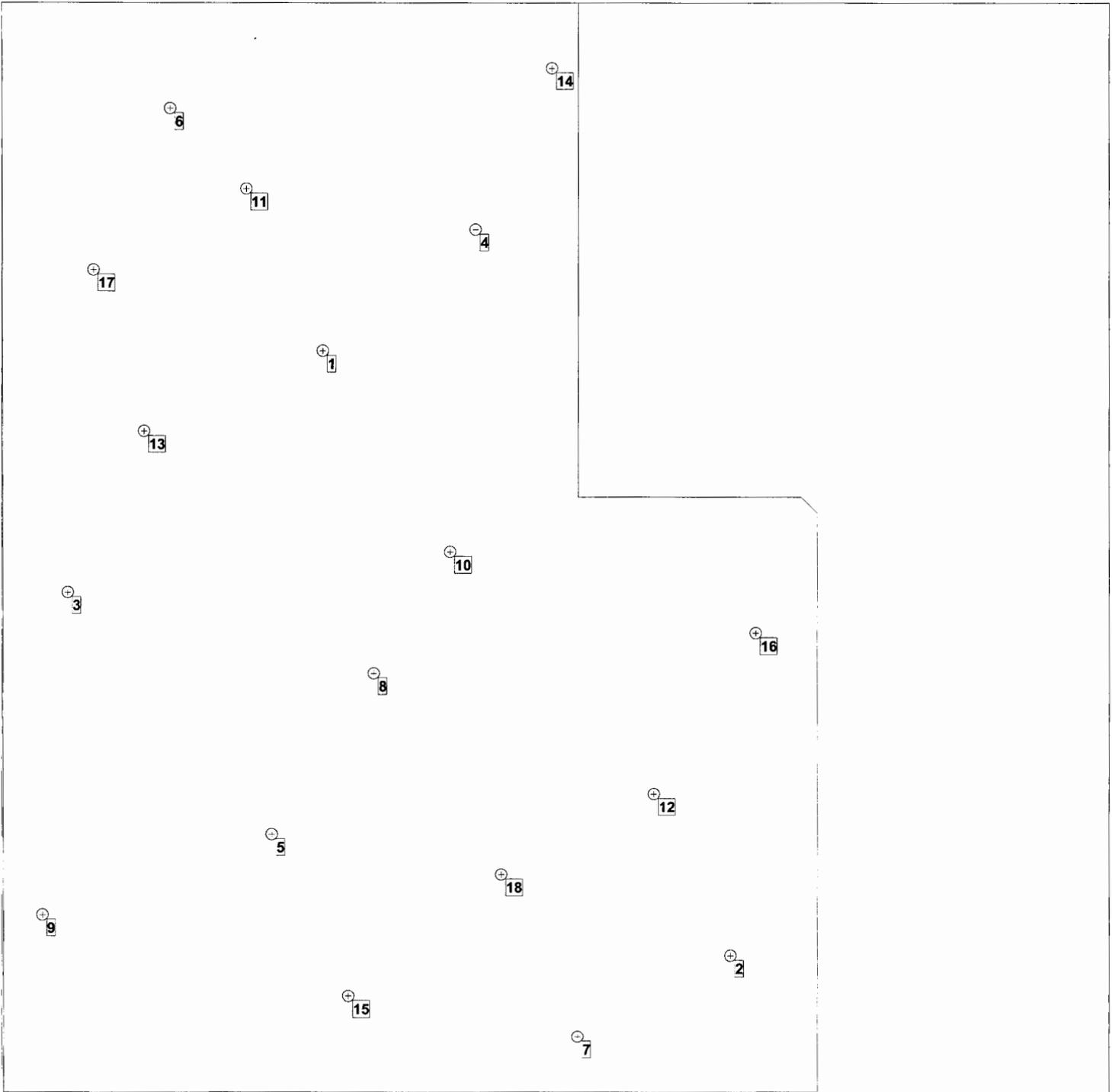
Prepared by: P Hollenbeck

Date: 29-Oct-14

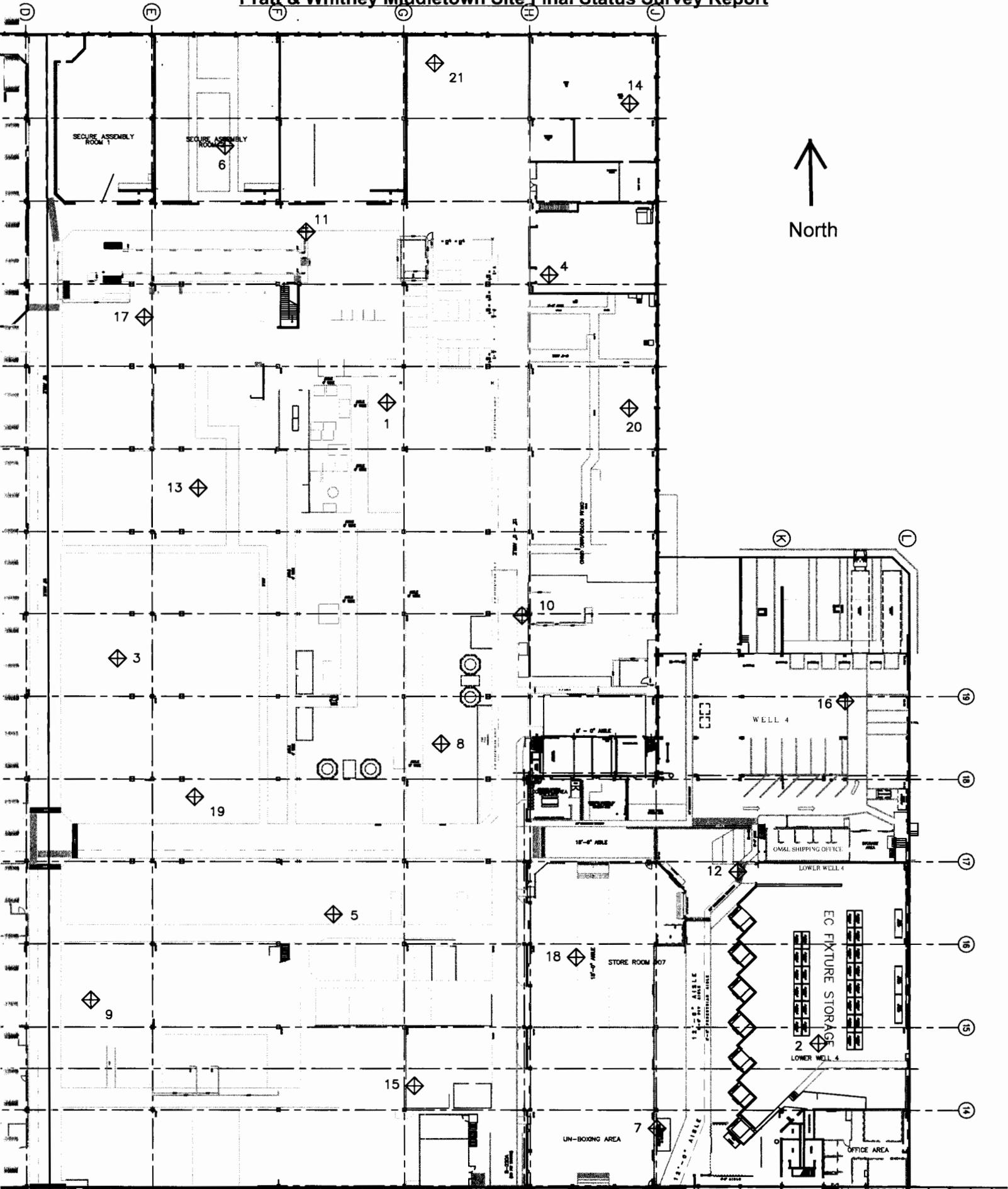
Approved by: [Signature]

Date: 29-Oct-14

Planned B220A-NE Survey Location Map - (VSP)
Pratt & Whitney Middletown Site Final Status Survey Report



As Surveyed B220A-NE Survey Location Map
Pratt & Whitney Middletown Site Final Status Survey Report



Pratt & Whitney Middletown Site Final Status Survey Report
Final Status Survey Package Direct Measurement Results

FSSP: B220A-NE-001

Survey Date: 11/4/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #1018/43-89 # 223946			
Survey meter (2):		E-600 #3685/43-89 # 312071			
Survey meter (3):		E-600 #1033/43-89 # 223945			
Survey meter (4):		E-600 #3689/43-89 # 311683			
Meter (1) Details			Meter (2) Details		
Count time (min):	3	Count time (min):	3		
Meter (1) background (counts):	17.6	Meter (2) background (counts):	8.0		
Meter (1) Efficiency (c/d):	0.0954	Meter (2) Efficiency (c/d):	0.1095		
Meter (1) MDC (dpm/100 cm ²):	62.9	Meter (2) MDC (dpm/100 cm ²):	39.3		
Meter (3) Details			Meter (4) Details		
Count time (min):	3	Count time (min):	3		
Meter (3) background (counts):	7.2	Meter (4) background (counts):	9.0		
Meter (3) Efficiency (c/d):	0.0922	Meter (4) Efficiency (c/d):	0.1106		
Meter (3) MDC (dpm/100 cm ²):	44.8	Meter (4) MDC (dpm/100 cm ²):	40.9		
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	1	19	1.4	3.9	N
2	2	2	-6.0	-14.6	N
3	1	13	-4.6	-12.9	N
4	2	5	-3.0	-7.3	N
5	1	19	1.4	3.9	N
6	2	11	3.0	7.3	N
7	1	24	6.4	17.9	N
8	2	10	2.0	4.9	N
9	1	17	-0.6	-1.7	N
10	2	8	0.0	0.0	N
11	2	7	-1.0	-2.4	N
12	3	1	-6.2	-17.9	N
13	3	2	-5.2	-15.0	N
14	3	3	-4.2	-12.1	N
15	3	5	-2.2	-6.4	N
16	4	7	-2.0	-4.8	N
17	4	8	-1.0	-2.4	N
18	4	11.43	2.4	5.9	N
19	1	18	0.4	1.1	N
20	1	25	7.4	20.7	N
21	2	6	-2.0	-4.9	N

survey unit average => -1.8 dpm/100 cm²
dose estimate => 0.0 mrem/y

Sample Report

B-220A-NE-001

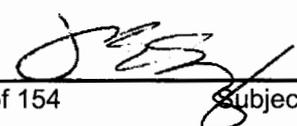
Batch ID: LT Th-230 - 201411101440
 Group: A
 Device: LB5100
 Batch Key: 26,764
 Selected Geometry: 1/4" Stainless Steel

Count Date: 11/10/2014
 Count Minutes: 4.0
 Count Mode: Alpha Only
 Operating Volts: 840

Alpha Efficiency:(%) 28.4770 ± 0.53
 Alpha Action Level (cpm) 0.77
 Alpha MDA (dpm) 5.64
 Alpha Bkgd (CPH) 18.00

Beta Efficiency: (%) ±
 Beta Action Level (cpm) 0.00
 Beta MDA (dpm) 0.00
 Beta Bkgd (CPH) 0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
20141110144025-A1	1			0.00	0.70	0.50	
20141110144506-A2	2			0.00	-0.18	0.25	
20141110144916-A3	3			0.00	-0.18	0.25	
20141110145336-A4	4			0.00	-1.05	0.00	
20141110145746-A5	5			0.00	0.70	0.50	
20141110150207-A6	6			0.00	-1.05	0.00	
20141110150617-A7	7			0.00	-1.05	0.00	
20141110151037-A8	8			0.00	-1.05	0.00	
20141110151447-A9	9			0.00	-0.18	0.25	
20141110151907-A10	10			0.00	-0.18	0.25	
20141110152317-A11	11			0.00	1.58	0.75	
20141110152737-A12	12			0.00	-0.18	0.25	
20141110153157-A13	13			0.00	-1.05	0.00	
20141110153607-A14	14			0.00	0.70	0.50	
20141110154027-A15	15			0.00	-1.05	0.00	
20141110154438-A16	16			0.00	0.70	0.50	
20141110154858-A17	17			0.00	-1.05	0.00	
20141110155308-A18	18			0.00	-1.05	0.00	
20141110155728-A21	Smens 19			0.00	-0.18	0.25	
20141110160138-A22	20			0.00	-0.18	0.25	
20141110160558-A23	21			0.00	1.58	0.75	

Reviewed by: 

Attachment 8 Survey Unit B-440

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: B-440	FSSP number: B-440-001
Survey unit name: Building 440	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit B-440, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the Middletown Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the Middletown Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the Middletown Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_w). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _w	Survey unit meets the release criterion
Average concentration exceeds the DCGL _w	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _w and the average concentration is less than the DCGL _w	Conduct the Sign test

Basis for Determining the Operational DCGL: The Middletown Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_w equal to 354 dpm/100 cm². This DCGL_w corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The Middletown Final Status Survey Plan, Revision 1, has specified that approximately 10% of the accessible areas will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The Middletown Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

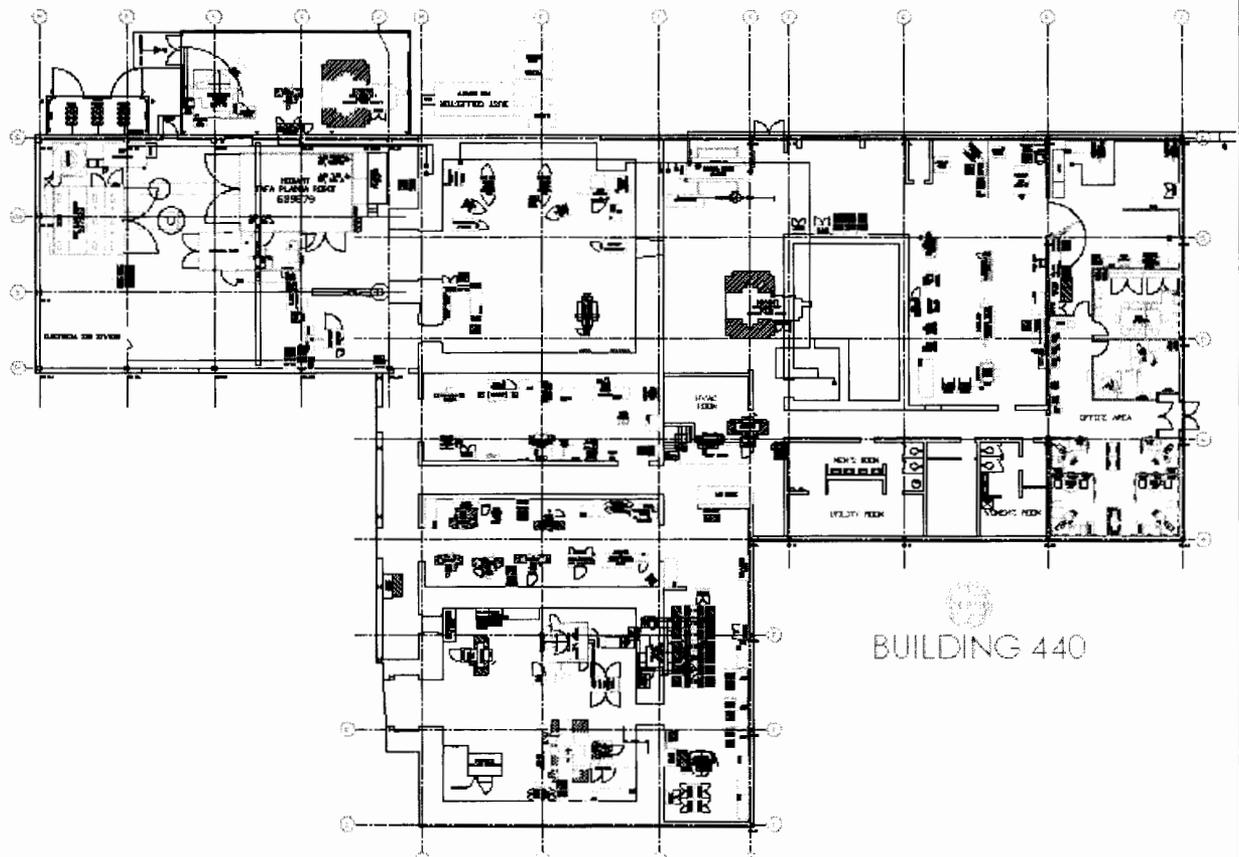
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is Building 440. The survey unit surface area is approximately 2,200 square meters (2,200 m^2) or 23,672 square feet (23,672 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit B-440



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

- 6.0 Specify tolerable limits on decision errors
- The Null Hypothesis:* Residual radioactivity in the survey unit exceeds the release criterion.
- Type I Error:* This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The Middletown Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.
- Type II Error:* This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The Middletown Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.
- 7.0 Optimize the design
- Type of statistical test:* The Sign Test will be the statistical test as specified in The Middletown Final Status Survey Plan, Revision 1.
- Number of measurements:* There are eighteen (18) random measurement locations as specified in The Middletown Final Status Survey Plan, Revision 1.
- Number of judgmental measurements and locations:* A minimum of three (3) judgmental measurements as specified in The Middletown Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.

10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89, Ludlum 43-90 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results

form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.

- 3) Obtain a 100 cm² smear at the location of the direct measurement
- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shiftDocument the investigation on the attached Data Investigation form. Record actions taken on the form such as:
 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

Pratt & Whitney Middletown Site Final Status Survey Report

FSSP number: B-440-001

14. The Health Physicist will complete the package review in accordance with the FSS Plan, Termination of License SMB-151 at the Middletown, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

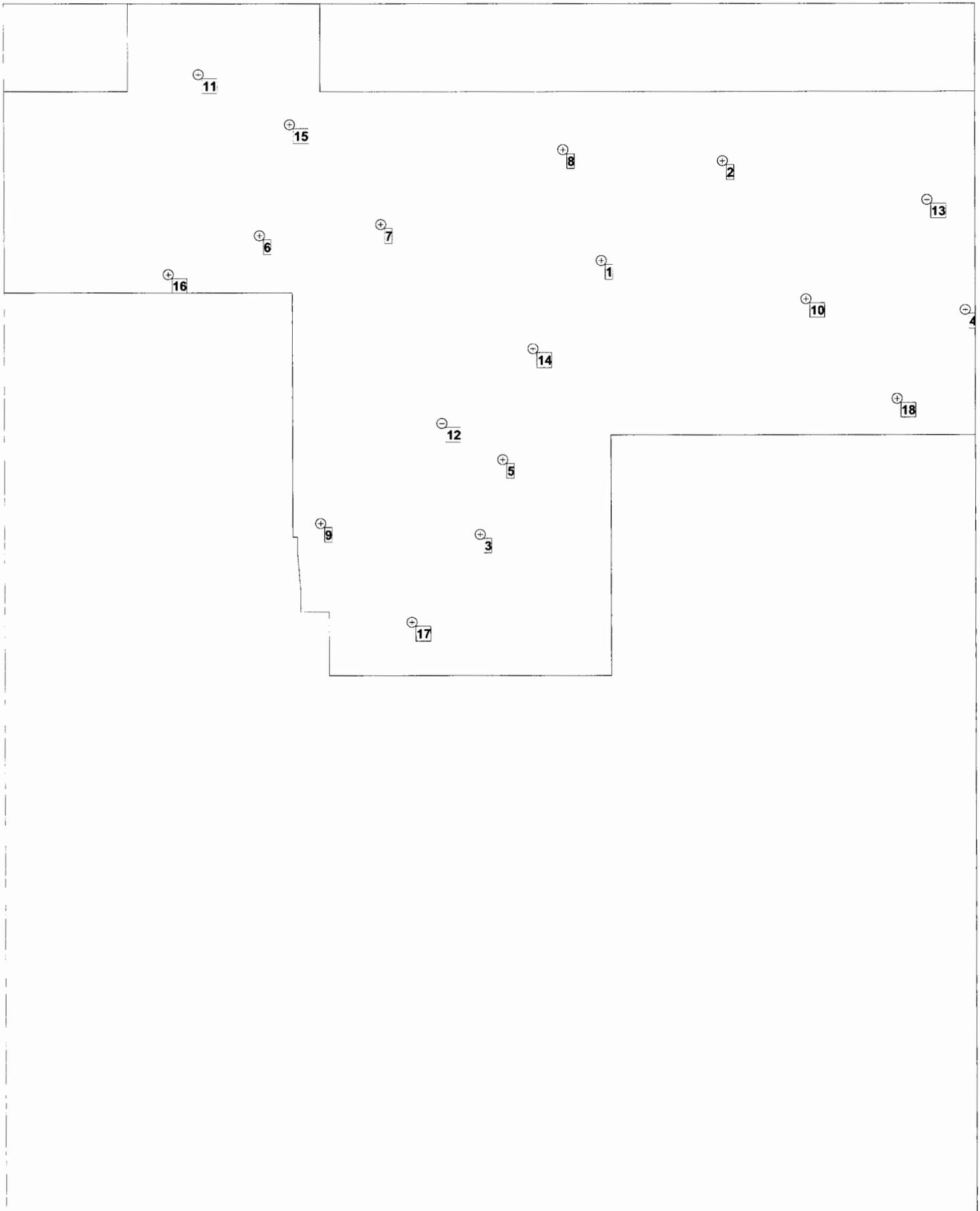
Prepared by: P Hollenbeck

Date: 29-Oct-14

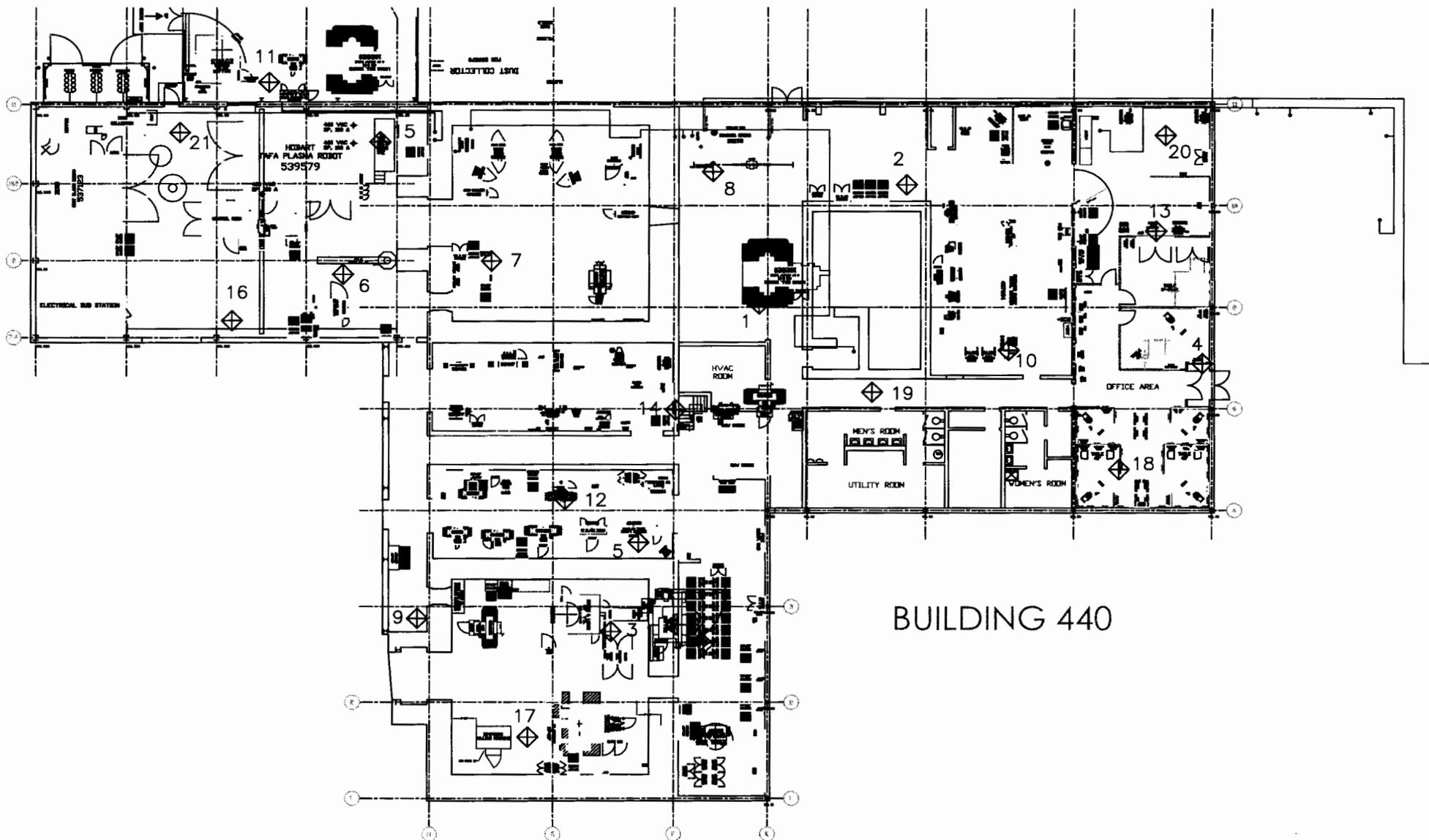
Approved by: [Signature]

Date: 29-Oct-14

Planned B-440 Survey Location Map - (VSP)
Pratt & Whitney Middletown Site Final Status Survey Report



As Surveyed B-440 Survey Location Map
Pratt & Whitney Middletown Site Final Status Survey Report



Pratt & Whitney Middletown Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: B-440-001

Survey Date: 11/6/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #3685/43-89 # 312071			
Survey meter (2):		None			
Meter (1) Details			Meter (2) Details		
Count time (min):		3	Count time (min):		NA
Meter (1) background (counts):		32.2	Meter (2) background (counts):		NA
Meter (1) Efficiency (c/d):		0.1095	Meter (2) Efficiency (c/d):		NA
Meter (1) MDC (dpm/100 cm²):		71.6	Meter (2) MDC (dpm/100 cm²):		NA
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	1	48	15.8	38.5	N
2	1	28	-4.2	-10.2	N
3	1	25	-7.2	-17.5	N
4	1	23	-9.2	-22.4	N
5	1	21	-11.2	-27.3	N
6	1	22	-10.2	-24.8	N
7	1	31	-1.2	-2.9	N
8	1	22	-10.2	-24.8	N
9	1	37	4.8	11.7	N
10	1	25	-7.2	-17.5	N
11	1	20	-12.2	-29.7	N
12	1	23	-9.2	-22.4	N
13	1	23	-9.2	-22.4	N
14	1	13	-19.2	-46.8	N
15	1	27	-5.2	-12.7	N
16	1	18	-14.2	-34.6	N
17	1	23	-9.2	-22.4	N
18	1	18	-14.2	-34.6	N
19	1	23	-9.2	-22.4	N
20	1	21	-11.2	-27.3	N
21	1	31	-1.2	-2.9	N

survey unit average => -17.9 dpm/100 cm²
dose estimate => 0.0 mrem/y

**Pratt & Whitney Middletown Site Final Status Survey Report
Sample Report**

B3440-001

Batch ID: LT Th-230 - 201411140936
 Group: A
 Device: LB5100
 Batch Key: 26,818
 Selected Geometry: 1/4" Stainless Steel

Count Date: 11/14/2014
 Count Minutes: 4.0
 Count Mode: Alpha Only
 Operating Volts: 840

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)		±
Alpha Action Level (cpm)	0.77			Beta Action Level (cpm)	0.00	
Alpha MDA (dpm)	5.64			Beta MDA (dpm)	0.00	
Alpha Bkgd (CPH)	18.00			Beta Bkgd (CPH)	0.00	

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
20141114093656-A1	1			0.00	3.34	1.25	*
20141114094136-A2	2			0.00	-1.05	0.00	
20141114094546-A3	3			0.00	-0.18	0.25	
20141114095007-A4	4			0.00	-1.05	0.00	
20141114095417-A5	5			0.00	0.70	0.50	
20141114095837-A6	6			0.00	-1.05	0.00	
20141114100247-A7	7			0.00	-1.05	0.00	
20141114100707-A8	8			0.00	-1.05	0.00	
20141114101117-A9	9			0.00	-0.18	0.25	
20141114101537-A10	10			0.00	-0.18	0.25	
20141114101947-A11	11			0.00	-0.18	0.25	
20141114102408-A12	12			0.00	-0.18	0.25	
20141114102828-A13	13			0.00	-1.05	0.00	
20141114103238-A14	14			0.00	0.70	0.50	
20141114103658-A15	15			0.00	-0.18	0.25	
20141114104108-A16	16			0.00	-1.05	0.00	
20141114104528-A17	17			0.00	-1.05	0.00	
20141114104938-A18	18			0.00	1.58	0.75	
20141114105358-A21	Sum 19			0.00	-0.18	0.25	
20141114105808-A22	20			0.00	-1.05	0.00	
20141114110229-A23	21			0.00	0.70	0.50	

Reviewed by: 

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S/N L11263 Cal due 06/06/2014

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title page of this document

C:\Program Files (x86)\Tennelec Systems\Eclipse\activity report_dpm_a_b.rpt

Rev. 0

Print Date 11/14/2014
 Print Time 11:06:45AM

Attachment 9 Survey Unit B-150

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: B-150	FSSP number: B-150-001
Survey unit name: Building 150	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit B-150, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the Middletown Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the Middletown Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the Middletown Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_W). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

Basis for Determining the Operational DCGL: The Middletown Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_W equal to 354 dpm/100 cm². This DCGL_W corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The Middletown Final Status Survey Plan, Revision 1, has specified that approximately 10% of the accessible areas will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The Middletown Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

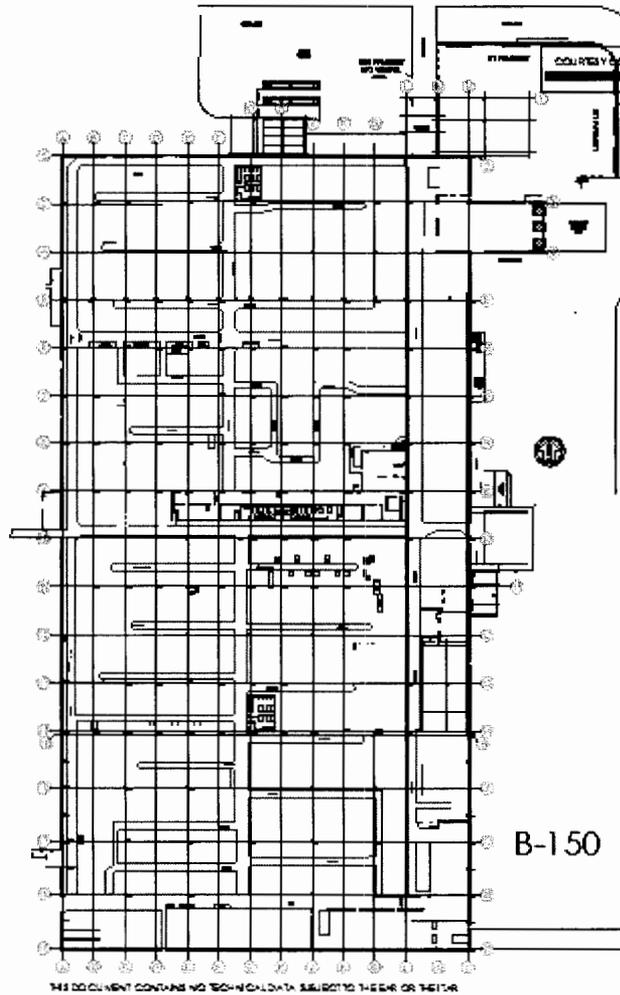
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is Building 150. The survey unit surface area is approximately 20,756 square meters (20,756 m^2) or 223,420 square feet (223,420 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit B-150



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The Middletown Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The Middletown Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in The Middletown Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The

reason for the change will be included in the field notes.

10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89, Ludlum 43-90 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning

- 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.
- 3) Obtain a 100 cm² smear at the location of the direct measurement
- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shiftDocument the investigation on the attached Data Investigation form. Record actions taken on the form such as:
 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.

Pratt & Whitney Middletown Site Final Status Survey Report

FSSP number: B-150-001

14. The Health Physicist will complete the package review in accordance with the FSS Plan, Termination of License SMB-151 at the Middletown, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

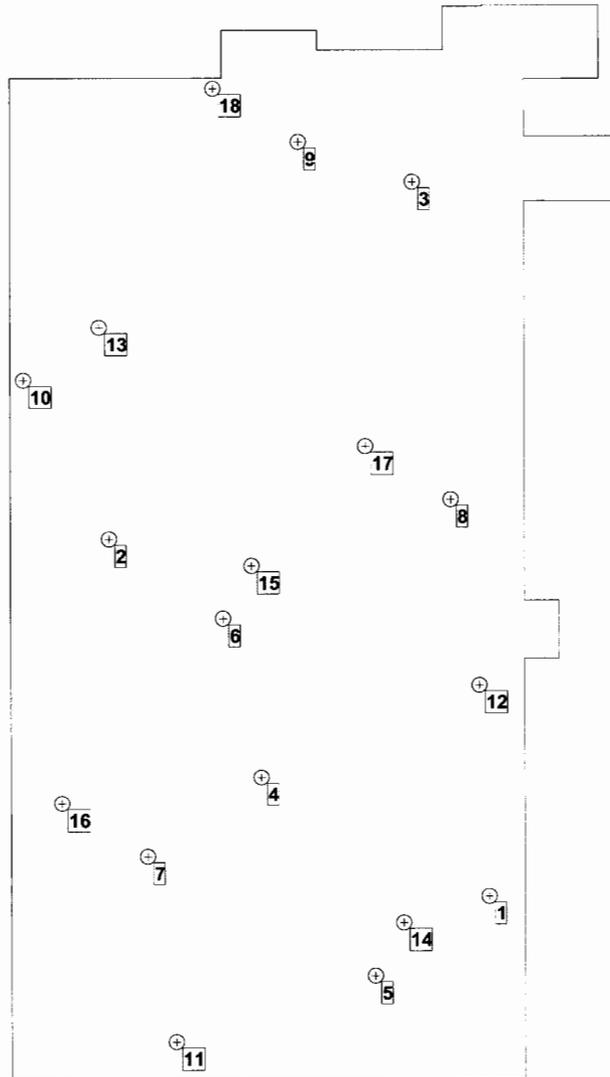
Prepared by: P Hollenbeck

Date: 29-Oct-14

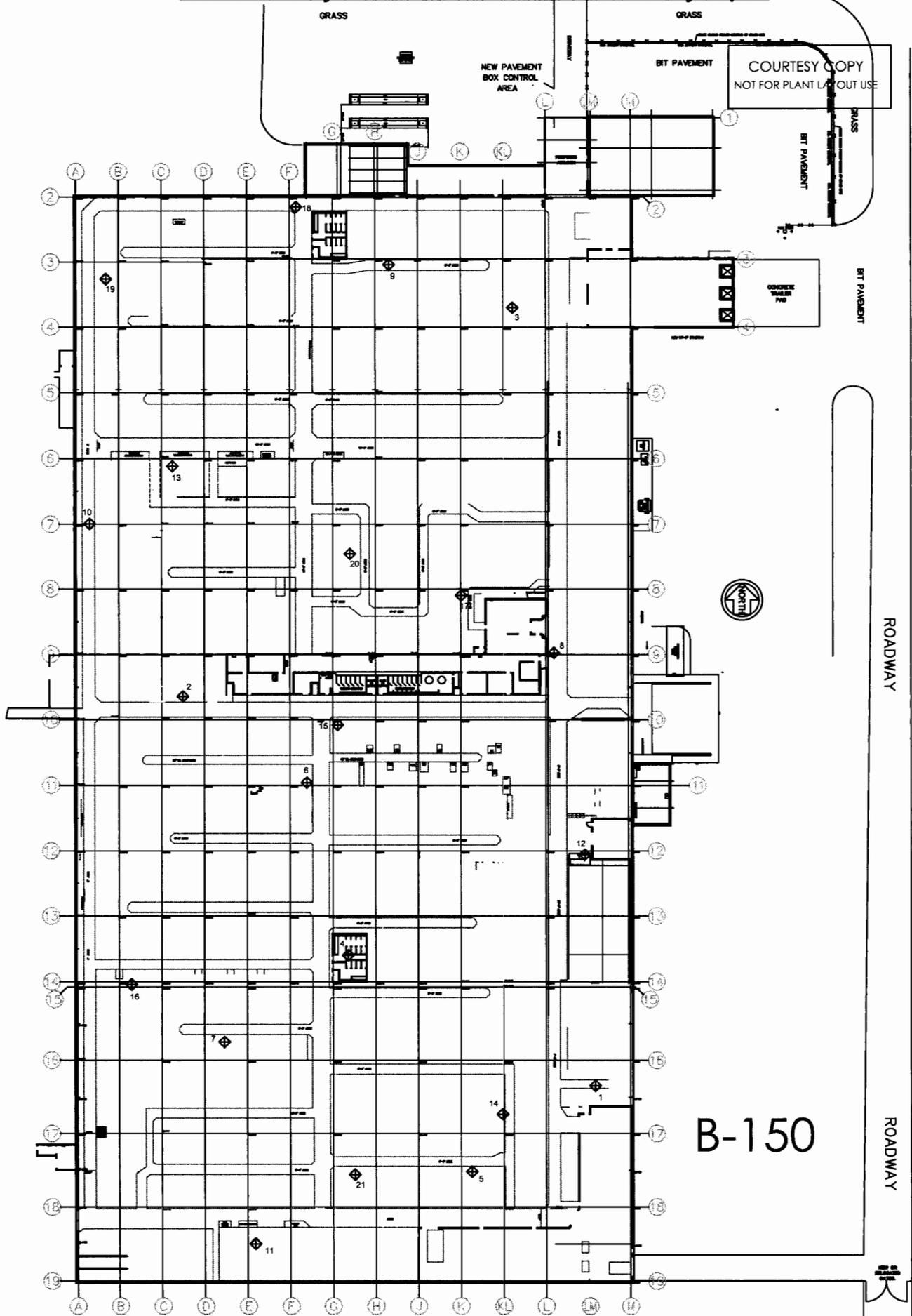
Approved by: [Signature]

Date 29-Oct-14

Planned B-150 Survey Location Map - (VSP)
Pratt & Whitney Middletown Site Final Status Survey Report



As Surveyed B-150 Survey Location Map
Pratt & Whitney Middletown Site Final Status Survey Report



Pratt & Whitney Middletown Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: B-150-001

Survey Date: 11/6/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #3689/43-89 # 311683			
Survey meter (2):		E-600 #3690/43-89 # 223945			
Meter (1) Details			Meter (2) Details		
Count time (min):	3	Count time (min):	3		
Meter (1) background (counts):	5.4	Meter (2) background (counts):	7.8		
Meter (1) Efficiency (c/d):	0.1106	Meter (2) Efficiency (c/d):	0.0922		
Meter (1) MDC (dpm/100 cm ²):	33.3	Meter (2) MDC (dpm/100 cm ²):	46.2		
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	1	8	2.6	6.3	N
2	2	5	-2.8	-8.1	N
3	1	14	8.6	20.7	N
4	2	7	-0.8	-2.3	N
5	1	5	-0.4	-1.0	N
6	2	5	-2.8	-8.1	N
7	2	5	-2.8	-8.1	N
8	2	9	1.2	3.5	N
9	1	14	8.6	20.7	N
10	1	9	3.6	8.7	N
11	1	7	1.6	3.9	N
12	2	4	-3.8	-11.0	N
13	2	3	-4.8	-13.9	N
14	1	9	3.6	8.7	N
15	2	6	-1.8	-5.2	N
16	1	13	7.6	18.3	N
17	2	7	-0.8	-2.3	N
18	1	5	-0.4	-1.0	N
19	1	6	0.6	1.4	N
20	1	5	-0.4	-1.0	N
21	1	8	2.6	6.3	N

survey unit average => 1.7 dpm/100 cm²
dose estimate => 0.1 mrem/y

**Pratt & Whitney Middletown Site Final Status Survey Report
Sample Report**

B-150-001

Batch ID: LT Th-230 - 201411111200
Group: A
Device: LB5100
Batch Key: 26,775

Count Date: 11/11/2014
Count Minutes: 4.0
Count Mode: Alpha Only
Operating Volts: 840

Selected Geometry: 1/4" Stainless Steel

Alpha Efficiency: (%) 28.4770 ± 0.53	Beta Efficiency: (%) ±
Alpha Action Level (cpm) 0.77	Beta Action Level (cpm) 0.00
Alpha MDA (dpm) 5.64	Beta MDA (dpm) 0.00
Alpha Bkgd (CPH) 18.00	Beta Bkgd (CPH) 0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
0141111120049-A1	1			0.00	1.58	0.75	
20141111120530-A2	2			0.00	-1.05	0.00	
20141111120940-A3	3			0.00	-0.18	0.25	
0141111121400-A4	4			0.00	-1.05	0.00	
20141111121810-A5	5			0.00	-1.05	0.00	
20141111122230-A6	6			0.00	2.46	1.00	*
0141111122640-A7	7			0.00	-1.05	0.00	
20141111123100-A8	8			0.00	-1.05	0.00	
20141111123510-A9	9			0.00	-1.05	0.00	
0141111123931-A10	10			0.00	-1.05	0.00	
20141111124341-A11	11			0.00	-1.05	0.00	
20141111124801-A12	12			0.00	-0.18	0.25	
0141111125221-A13	13			0.00	0.70	0.50	
0141111125631-A14	14			0.00	0.70	0.50	
20141111130051-A15	15			0.00	-1.05	0.00	
0141111150501-A16	16			0.00	-0.18	0.25	
0141111130921-A17	17			0.00	-1.05	0.00	
20141111131332-A18	18			0.00	-0.18	0.25	
0141111131752-A21	19	Simenr		0.00	-1.05	0.00	
0141111132202-A22	20			0.00	0.70	0.50	
20141111132622-A23	21			0.00	3.34	1.25	*



Reviewed by: _____

Attachment 10 Survey Unit B-410

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: B-410	FSSP number: B-410-001
Survey unit name: Building 410 Test Cell Exhaust Ducts	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit B-410, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the Middletown Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, <i>Then</i> review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the Middletown Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the Middletown Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_W). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

Basis for Determining the Operational DCGL: The Middletown Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_W equal to 354 dpm/100 cm². This DCGL_W corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003.

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The Middletown Final Status Survey Plan, Revision 1, has specified that approximately 10% of the accessible areas will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected

norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The Middletown Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 354 dpm/100 cm^2 , or 177 dpm/100 cm^2 .

The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 35 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 35 dpm/100 cm^2 , or 17 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is the first 10 foot section of each test cell exhaust duct. There are 8 test cells. All 8 exhaust ducts are considered as 1 survey unit. The exhaust ducts are approximately 25 feet in diameter, making the total surface area of all 8 test cells approximately equal to 4,000 square meters (4,000 m^2) or 43,200 square feet (43,200 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit. The hatched area at the opening of each exhaust duct is the survey area. Figure 2 is a photo of the exhaust duct.

Figure 1 – Survey Unit B-410

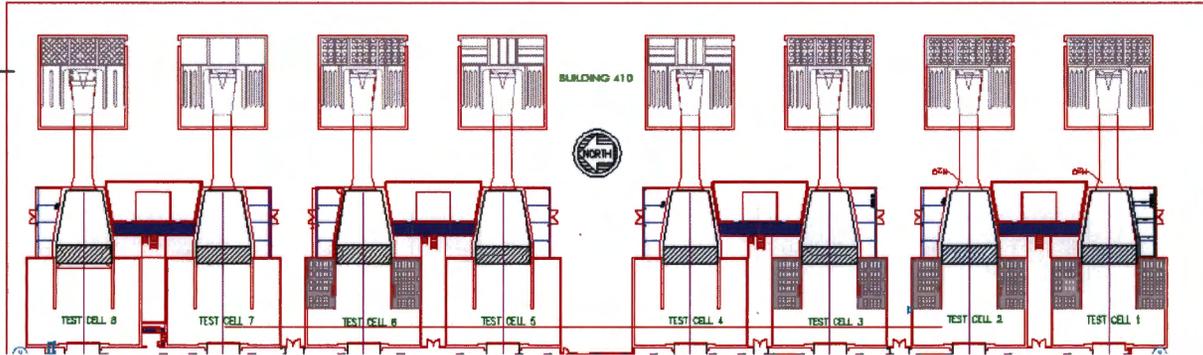


Figure 2 – Photo of Exhaust Duct



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraint is the confined space issue. The first 10 feet of the duct is not considered a confined space. Beyond 10 feet is considered as a 'permit-required' confined space. Special training is required to enter that area along with a rescue team and other safety measures. We will limit our survey to the accessible areas in first 10 feet of the duct.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The Middletown Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The Middletown Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in The Middletown Final Status Survey Plan, Revision 1. Due to the unique shape of this survey unit and the confined space issue, 3 measurements will be taken in each exhaust duct in locations that can be reached without ladders or scaffolding for a total of 24 measurement locations.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in The Middletown Final Status Survey Plan, Revision 1. Due to the unique shape of this survey unit and the confined space issue, 3 measurements will be taken in each exhaust duct in locations that can be reached without ladders or scaffolding for a total of 24 measurement locations.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.
10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89, Ludlum 43-90 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 177 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. Pick a spot on the left wall of the duct in the 10 foot zone that can be reached while standing.
 - b. Pick a spot on the bottom of the duct in the 10 foot zone.
 - c. Pick a spot on the right wall of the duct in the 10 foot zone that can be reached while standing.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.
 - 3) Obtain a 100 cm² smear at the location of the direct measurement
 - f. Upon completion of the scan, record the result on the Scan Results form with this FSSP

Pratt & Whitney Middletown Site Final Status Survey Report

FSSP number: B-410-001

6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 177 dpm/100 cm²
 - If any instrument source check failed at the end of the shiftDocument the investigation on the attached Data Investigation form. Record actions taken on the form such as:
 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 17 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.
14. The Health Physicist will complete the package review in accordance with the FSS Plan, Termination of License SMB-151 at the Middletown, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

Prepared by: P Hollenbeck

Date: 29-Oct-14

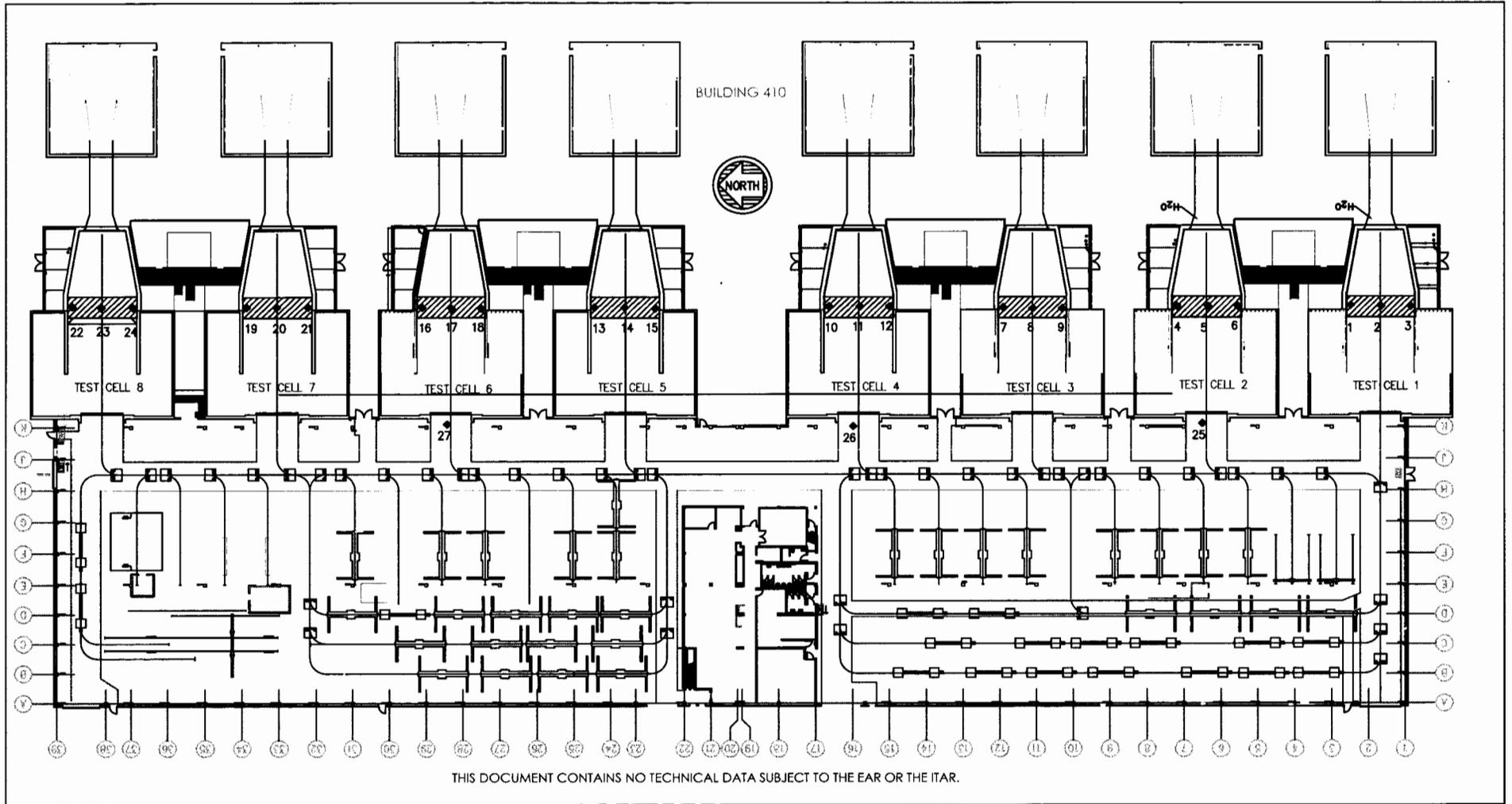
Approved by: [Signature]

Date: 29-Oct-14

Pratt & Whitney Middletown Site Final Status Survey Report
Planned B-410 Survey Location Map - (VSP)



As Surveyed B-410 Survey Location Map
Pratt & Whitney Middletown Site Final Status Survey Report



Pratt & Whitney Middletown Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: B-410-001

Survey Date: 11/5-6/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #1018/43-89 # 223946			
Survey meter (2):		E-600 #3685/43-89 # 312071			
Survey meter (3):		E-600 #1033/43-89 # 223945			
Survey meter (4):		E-600 #3689/43-89 # 311683			
Meter (1) Details			Meter (2) Details		
Count time (min):	3	Count time (min):	3		
Meter (1) background (counts):	14.4	Meter (2) background (counts):	9.0		
Meter (1) Efficiency (c/d):	0.0954	Meter (2) Efficiency (c/d):	0.1095		
Meter (1) MDC (dpm/100 cm ²):	57.7	Meter (2) MDC (dpm/100 cm ²):	41.3		
Meter (3) Details			Meter (4) Details		
Count time (min):	3	Count time (min):	3		
Meter (3) background (counts):	8.8	Meter (4) background (counts):	4.8		
Meter (3) Efficiency (c/d):	0.0922	Meter (4) Efficiency (c/d):	0.1106		
Meter (3) MDC (dpm/100 cm ²):	48.6	Meter (4) MDC (dpm/100 cm ²):	31.8		
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	1	12	-2.4	-6.7	N
2	1	19	4.6	12.9	N
3	1	17	2.6	7.3	N
4	3	5	-3.8	-11.0	N
5	3	6	-2.8	-8.1	N
6	3	5	-3.8	-11.0	N
7	3	6	-2.8	-8.1	N
8	3	4	-4.8	-13.9	N
9	3	6	-2.8	-8.1	N
10	2	9	0.0	0.0	N
11	2	9	0.0	0.0	N
12	2	11	2.0	4.9	N
13	1	26	11.6	32.4	N
14	1	22	7.6	21.2	N
15	1	25	10.6	29.6	N
16	2	11	2.0	4.9	N
17	2	12	3.0	7.3	N
18	2	13	4.0	9.7	N
19	4	13	8.2	19.8	N
20	4	8	3.2	7.7	N

Pratt & Whitney Middletown Site Final Status Survey Report

Final Status Survey Package Direct Measurement Results

FSSP: B-410-001

Survey Date: 11/5-6/14

Investigation Level (dpm/100 cm²): 177

Survey meter (1):		E-600 #1018/43-89 # 223946			
Survey meter (2):		E-600 #3685/43-89 # 312071			
Survey meter (3):		E-600 #1033/43-89 # 223945			
Survey meter (4):		E-600 #3689/43-89 # 311683			
Meter (1) Details			Meter (2) Details		
Count time (min):	3	Count time (min):	3		
Meter (1) background (counts):	14.4	Meter (2) background (counts):	9.0		
Meter (1) Efficiency (c/d):	0.0954	Meter (2) Efficiency (c/d):	0.1095		
Meter (1) MDC (dpm/100 cm ²):	57.7	Meter (2) MDC (dpm/100 cm ²):	41.3		
Meter (3) Details			Meter (4) Details		
Count time (min):	3	Count time (min):	3		
Meter (3) background (counts):	8.8	Meter (4) background (counts):	4.8		
Meter (3) Efficiency (c/d):	0.0922	Meter (4) Efficiency (c/d):	0.1106		
Meter (3) MDC (dpm/100 cm ²):	48.6	Meter (4) MDC (dpm/100 cm ²):	31.8		
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
21	4	10	5.2	12.5	N
22	2	11	2.0	4.9	N
23	2	12	3.0	7.3	N
24	2	13	4.0	9.7	N
25	1	12	-2.4	-6.7	N
26	2	9	0.0	0.0	N
27	4	4	-0.8	-1.9	N

survey unit average => 4.3 dpm/100 cm²
dose estimate => 0.2 mrem/y

**Pratt & Whitney Middletown Site Final Status Survey Report
Sample Report**

B-410-001

Batch ID: LT Th-230 - 201411131512
Group: A
Device: LB5100
Batch Key: 26,809
Selected Geometry: 1/4" Stainless Steel

Count Date: 11/13/2014
Count Minutes: 4.0
Count Mode: Alpha Only
Operating Volts: 840

Alpha Efficiency:(%) 28.4770 ± 0.53
Alpha Action Level (cpm) 0.77
Alpha MDA (dpm) 5.64
Alpha Bkgd (CPH) 18.00

Beta Efficiency: (%) ±
Beta Action Level (cpm) 0.00
Beta MDA (dpm) 0.00
Beta Bkgd (CPH) 0.00

Carrier ID	Sample ID	Source ID	Net Beta DPM	Beta Gross Cpm	Net Alpha DPM	Alpha Gross Cpm	> Action Level?
20141113151238-A1				0.00	-0.18	0.25	
20141113151719-A2				0.00	-0.18	0.25	
20141113152129-A3				0.00	-0.18	0.25	
20141113152549-A4				0.00	-0.18	0.25	
20141113152959-A5				0.00	-0.18	0.25	
20141113153419-A6				0.00	-0.18	0.25	
20141113153830-A7				0.00	-1.05	0.00	
20141113154250-A8				0.00	-1.05	0.00	
20141113154700-A9				0.00	-1.05	0.00	
20141113155120-A10				0.00	-1.05	0.00	
20141113155530-A11				0.00	0.70	0.50	
20141113155950-A12				0.00	-0.18	0.25	
20141113160400-A13				0.00	2.46	1.00	*
20141113160820-A14				0.00	0.70	0.50	
20141113161241-A15				0.00	-0.18	0.25	
20141113161651-A16				0.00	-0.18	0.25	
20141113162111-A17				0.00	-0.18	0.25	
20141113162521-A18				0.00	-1.05	0.00	
20141113162941-A21	Smear #19			0.00	0.70	0.50	
20141113163351-A22	20			0.00	0.70	0.50	
20141113163811-A23	21			0.00	-0.18	0.25	
20141113164221-A24	22			0.00	-1.05	0.00	
20141113164642-A25	23			0.00	-1.05	0.00	
20141113165052-A26	24			0.00	-1.05	0.00	
20141113165512-A27	25			0.00	-0.18	0.25	
20141113165932-A28	26			0.00	-0.18	0.25	
20141113170342-A29	27			0.00	0.70	0.50	

Reviewed by: JES

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Subject to the export control restrictions on the

Page 1 of 1

title page of this document

C:\Program Files (x86)\Tennelec Systems\Eclipse\activity report_dpm_a_b.rpt

Rev. 0

Print Date 11/13/2014

Print Time 5:07:59PM

S/N L11263 Cal due 06/09/2014

9/23/15

Attachment 11 Survey Unit B-140

Attachment A – Final Status Survey Package

GENERAL SECTION	
Survey unit #: B-140	FSSP number: B-140-001
Survey unit name: Building 140 Training Building	
DATA QUALITY OBJECTIVES (DQO)	
1.0	<p>State the problem</p> <p><i>The problem:</i> To demonstrate that the level of residual radioactivity in survey unit B-140, a class 3 area, does not exceed the release criteria of 19 mrem/year Total Effective Dose Equivalent (TEDE) as specified in the Middletown Final Status Survey Plan and that the potential dose from residual radioactivity is ALARA (As Low As Reasonably Achievable).</p> <p><i>Stakeholders:</i> The primary stakeholders interested in the answer to this problem are Pratt & Whitney, the CT Department of Energy & Environmental Protection (CT DEEP) and the US Nuclear Regulatory Commission (USNRC).</p> <p><i>The Planning Team:</i> The planning team consists of Radiation Safety & Control Services (RSCS) personnel. The primary decision maker is RSCS management.</p> <p><i>Schedule:</i> Approximately one (1) working day is projected to implement this Final Status Survey Package (FSSP). Processing and shipping smears to the RSCS laboratory is expected to take one (1) working day.</p> <p><i>Resources:</i> The primary resources needed to determine the answer to the problem are two (2) survey technicians to take measurements and obtain smears, one (1) Survey Supervisor to monitor and direct field activities and one (1) RSCS Engineer to prepare the plan, generate maps and evaluate data. A technician at the RSCS laboratory will analyze the smears and provide a hard copy of the results.</p>
2.0	<p>Identify the decision</p> <p><i>Principal Study Question:</i> Does the survey unit meet the release criteria specified above?</p> <p><i>Alternate Actions:</i> Alternative actions include failure of the survey unit, remediation, reclassification and no action.</p> <p><i>The Decision:</i> If the survey unit fails to demonstrate compliance with the release criteria, Then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.</p>
3.0	<p>Identify the inputs to the decision</p> <p><i>Information Needed:</i> New total surface contamination measurements and removable surface contamination of the survey unit floor are needed to determine the concentration (dpm/100 cm²) and variability of Th-232 present in the survey unit at the time of the Final Status Survey.</p>

Source of the Information: The sources for the information to resolve the decision include historical records, professional judgment and new data collection. Survey design and implementing procedures are based on the Middletown Final Status Survey Plan with input from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM NUREG-1575, Revision1).

Basis for the Action Level: The Action Level provides the criterion used during the decision process for choosing among alternative actions (e.g., whether to take action or not to take action or whether to choose action 1 versus action 2). The Action Levels associated with implementing this plan are based on commitments in the Middletown Final Status Survey Plan.

The first step in evaluating FSS data for a given survey unit is to draw simple comparisons between the measurement results and the release criterion, which is identified as the derived concentration guideline value (DCGL_W). The result of these comparisons will be one of three conclusions or Action Levels shown in Table 1 for this survey plan.

Table 1

Evaluation Result	Conclusion
All measured concentrations less than the DCGL _W	Survey unit meets the release criterion
Average concentration exceeds the DCGL _W	Survey unit does not meet the release criterion
Individual measurement result(s) exceeds the DCGL _W and the average concentration is less than the DCGL _W	Conduct the Sign test

Basis for Determining the Operational DCGL: The Middletown Final Status Survey Plan, Revision 1, has defined the total surface activity TD-Ni concentration DCGL_W equal to 354 dpm/100 cm². This DCGL_W corresponds to the state of Connecticut release criterion of less than 19 mrem/year. RESRAD-BUILD v3.5 was selected to perform site-specific dose modeling of impacted structural surfaces at Pratt & Whitney. The end use scenario entails continued use of the buildings for industrial purposes; therefore, the Building Occupancy Scenario described in NUREG/CR-5512, Volume 1, was selected to estimate potential radiation doses from radioactive material in buildings at the site. Results of the probabilistic sensitivity analysis and parameter selections for the RESRAD-BUILD code runs are presented in RSCS Technical Support Document number 14-003. Because of potential residual Cs-137 and Co-60 radioactivity from previously licensed CANEL operations, the operational DCGL_W for this survey unit has been reduced 21.4% to a value of 278 dpm/100 cm².

Basis for Scan Measurements: Scanning is the process by which the technician uses portable radiation detection instruments to detect the presence of radionuclides on a specific surface (e.g., structural surfaces). A scanning survey is used to identify areas of elevated activity on that surface. The Middletown Final Status Survey Plan, Revision 1, has specified that approximately 10% of the accessible areas will be scanned.

Basis for the Investigation Levels: Investigation levels serve as a quality control check to determine when a measurement process begins to deviate from expected norms. For example, a measurement that exceeds an investigation level may indicate a failing instrument or an improper measurement. However, in general, investigation levels are used to confirm that survey units have been properly classified.

Exceeding an Investigation Level will require additional actions as identified later in this survey plan. The Investigation Levels specific to this survey unit are shown in Table 2.

Table 2

Measurement Type	Investigation Criteria
Fixed measurements or samples	$> 0.5 \times DCGL_W$
Scan measurements	Detectable over background

Surveying and Smear Analysis Methods to Meet the Data Requirements:

The Middletown Final Status Survey Plan, Revision 1, requires that the Minimum Detectable Concentration (MDC) for fixed measurements be as far below the $DCGL_W$ as possible. A value of 10% is the desired level of sensitivity with up to 50% of the $DCGL_W$ being acceptable.

The maximum MDC for fixed measurements cannot exceed 50% of 278 dpm/100 cm^2 , or 139 dpm/100 cm^2 .

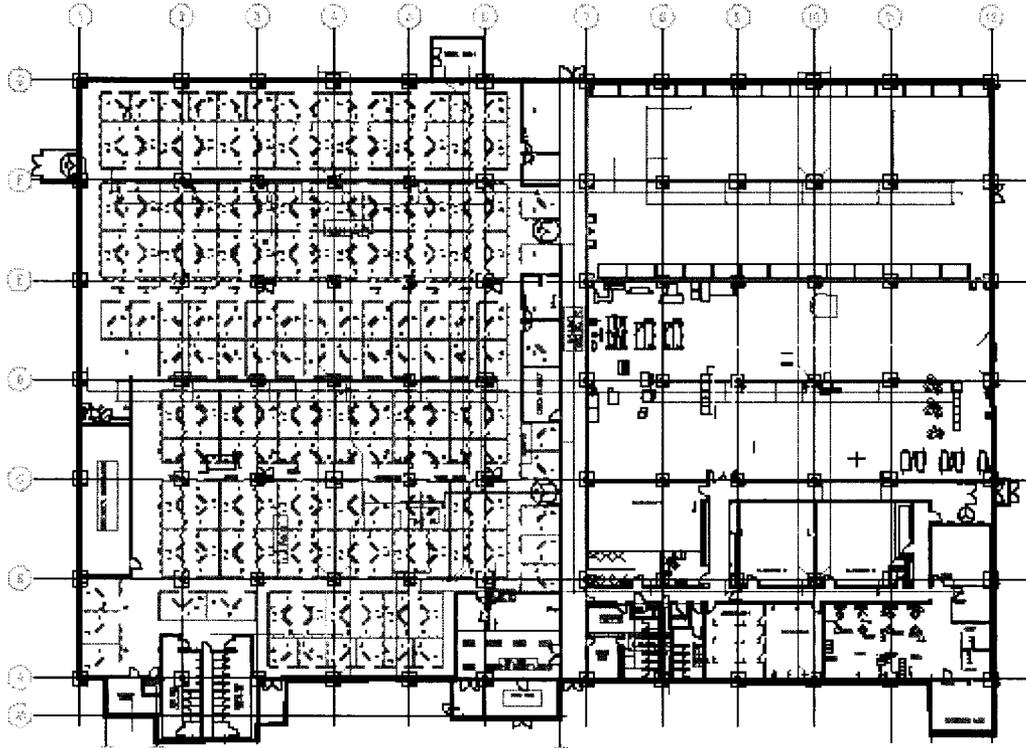
The limit for removable surface contamination has been set at 10% of the total surface contamination limit equal to 27 dpm/100 cm^2 .

The maximum MDC for smear analyses cannot exceed 50% of 27 dpm/100 cm^2 , or 13 dpm/100 cm^2 .

4.0 Define the boundaries of the survey

Boundaries of the survey: The area to be assessed is Building 140. The survey unit surface area is approximately 5,335 square meters (5,335 m^2) or 57,428 square feet (57,428 ft^2), based upon CAD drawings. Figure 1 presents an overview of the survey unit.

Figure 1 – Survey Unit B-140



Temporal boundaries: Scanning and surveying in this survey unit will normally be performed only during the day.

Constraints: The biggest constraints are time and obstacles. The survey unit is filled with operating equipment and personnel. It is anticipated many of the randomly chosen measurement locations will have to be moved around the existing equipment.

5.0 Develop a decision rule

The following decision rule has been developed to define a logical process for choosing among alternative actions for the principal study question associated with this survey unit.

Decision Rule: If the survey unit fails to demonstrate compliance with the release criteria, then review and confirm the data using the DQO process to identify the appropriate alternate action or combination of actions.

6.0 Specify tolerable limits on decision errors

The Null Hypothesis: Residual radioactivity in the survey unit exceeds the release criterion.

Type I Error: This is also known as the α error. This is the error associated with incorrectly concluding that the null hypothesis has been rejected. The Middletown Final Status Survey Plan, Revision 1 has set the α error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this

survey unit.

Type II Error: This is also known as the β error. This is the error associated with incorrectly concluding that the null hypothesis has been accepted. The Middletown Final Status Survey Plan, Revision 1 has set the β error at 0.05 (5%). Therefore, a value of 0.05 (5%) will be used for survey planning and data assessment for this survey unit.

7.0 Optimize the design

Type of statistical test: The Sign Test will be the statistical test as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of measurements: There are eighteen (18) random measurement locations as specified in The Middletown Final Status Survey Plan, Revision 1.

Number of judgmental measurements and locations: A minimum of three (3) judgmental measurements as specified in The Middletown Final Status Survey Plan, Revision 1 will be collected at locations selected by the Survey Supervisor.

GENERAL INSTRUCTIONS

1. Survey personnel will follow the safety directives of P&W safety personnel when working in and around equipment.
2. Survey personnel will have a pre-job briefing each morning.
3. Survey personnel need to be aware of their surroundings in the survey unit.
4. Survey and smears will be performed and obtained by qualified senior HP technicians under the direction of the Survey Supervisor.
5. Detailed field notes and observations will be documented during the survey.
6. Field instruments will be source checked before starting measurements and after completing measurements for the day.
7. Photographs should be taken when possible.
8. Smears will be controlled under COC in accordance with procedure SOP 2.1.15, "Chain of Custody for Samples to be Analyzed in RSCS Laboratory"
9. Field changes to this survey and sampling plan may be made by Survey Supervision. All changes will be made using a single line-out followed by an initial and date. The reason for the change will be included in the field notes.
10. Documents generated during the performance of survey and sampling will be complete and legible. Corrections will be made using a single line-out followed by an initial and date.

SPECIFIC INSTRUCTIONS

1. Initiate and utilize the Daily Survey Journal Sheet attached to this FSSP
2. Field instruments to be used for this survey are the Eberline E-600 meter with a Ludlum 43-89, Ludlum 43-90 or Ludlum 43-93 detector.
3. Establish the instrument background for measurements
 - a. Initiate the Background and MDC form attached to this FSSP
 - b. Stand near the center of the survey unit
 - c. Hold the detector face down and waist height
 - d. Set the count time to 3 minutes or integrate for 3 minutes
 - e. Record the result on the form
 - f. Perform 5 counts and complete the bottom of the form
 - g. If the MDC is greater than 139 dpm/100 cm², increase the count time and repeat
 - h. Set the survey meter to the count rate mode
 - i. Observe the meter and record the result on the form
 - j. Repeat for a total of 5 results and complete the bottom of the form
4. Locate each measurement location from the survey map with this FSSP
 - a. If unable to perform measurements at that location, move that location to the nearest assessable spot and annotate the survey map.
 - b. If many locations are moved due to obstructions, generate a new survey map at the end of the survey to document the actual measurement locations
 - c. After establishing the 18 random locations, determine the locations of 3 judgmental survey locations. Annotate the survey map with the locations and identify them as 19, 20 and 21.
5. Perform scanning around each measurement location
 - a. Hold the detector approximately 0.25 inch from the surface
 - b. Turn the meter audio on
 - c. Scan at a speed approximately 1 to 2 inches per second
 - d. Scan a 1 meter radius around the measurement location
 - e. If any detectable positive indication is observed (e.g. audible and/or visual) stop and hold the position for 2 seconds, backup and re-scan the spot.
 - 1) If the positive indication is not observed, continue scanning
 - 2) If the positive indication is observed again, stop and perform a direct measurement at that location and record on the Direct Measurement Results form with this FSSP. Record the location number and 1, 2 etc. For example; the first direct measurement from the scanning at location 1 would be annotated as 1-1.

- 3) Obtain a 100 cm² smear at the location of the direct measurement
- f. Upon completion of the scan, record the result on the Scan Results form with this FSSP
6. Perform a direct measurement at each location
 - a. Set the detector at approximately 0.25 inch from the surface
 - b. Set the count time on the meter to 3 minutes or integrate for 3 minutes or the count time established in step 3 above.
 - c. Record the result on the Direct Measurement Results form with this FSSP
7. Obtain a smear at the measurement location
 - a. Obtain a smear over a 100 cm² area at the location of the direct measurement
 - b. Prevent cross contamination of the smear after collection
8. Complete the Direct Measurements Results form by calculating the activity for each measurement in dpm/100 cm².
9. Forward all paperwork to the Survey Supervisor for review.
10. The Survey Supervisor will initiate an investigation if:
 - If any direct measurement is greater than or equal to 139 dpm/100 cm²
 - If any instrument source check failed at the end of the shift

Document the investigation on the attached Data Investigation form. Record actions taken on the form such as:

 - Resurvey of all data collected by a failed post survey response check
 - Collection of additional direct measurements surrounding an elevated measurement to estimate the size of the elevated area
 - Collection of a gamma spectrum of the elevated area to determine radionuclides present
 - Collection of samples
11. Generate a chain of custody for the smears. Annotate the form to ensure the MDA is less than 13 dpm.
12. Gather all documents generated by this FSSP; background data, direct measurement results, survey maps, smear results, etc and place together in a survey file.
13. The Survey Supervisor will forward the survey package to the Health Physicist for final review.
14. The Health Physicist will complete the package review in accordance with the FSS Plan, Termination of License SMB-151 at the Middletown, CT Facility. This review and approval shall include determining that the data is complete and accurate, if further investigation or remediation is required, perform ALARA Cost benefit analysis as required, and determine if the decision rule is met.

Pratt & Whitney Middletown Site Final Status Survey Report

FSSP number: B-140-001

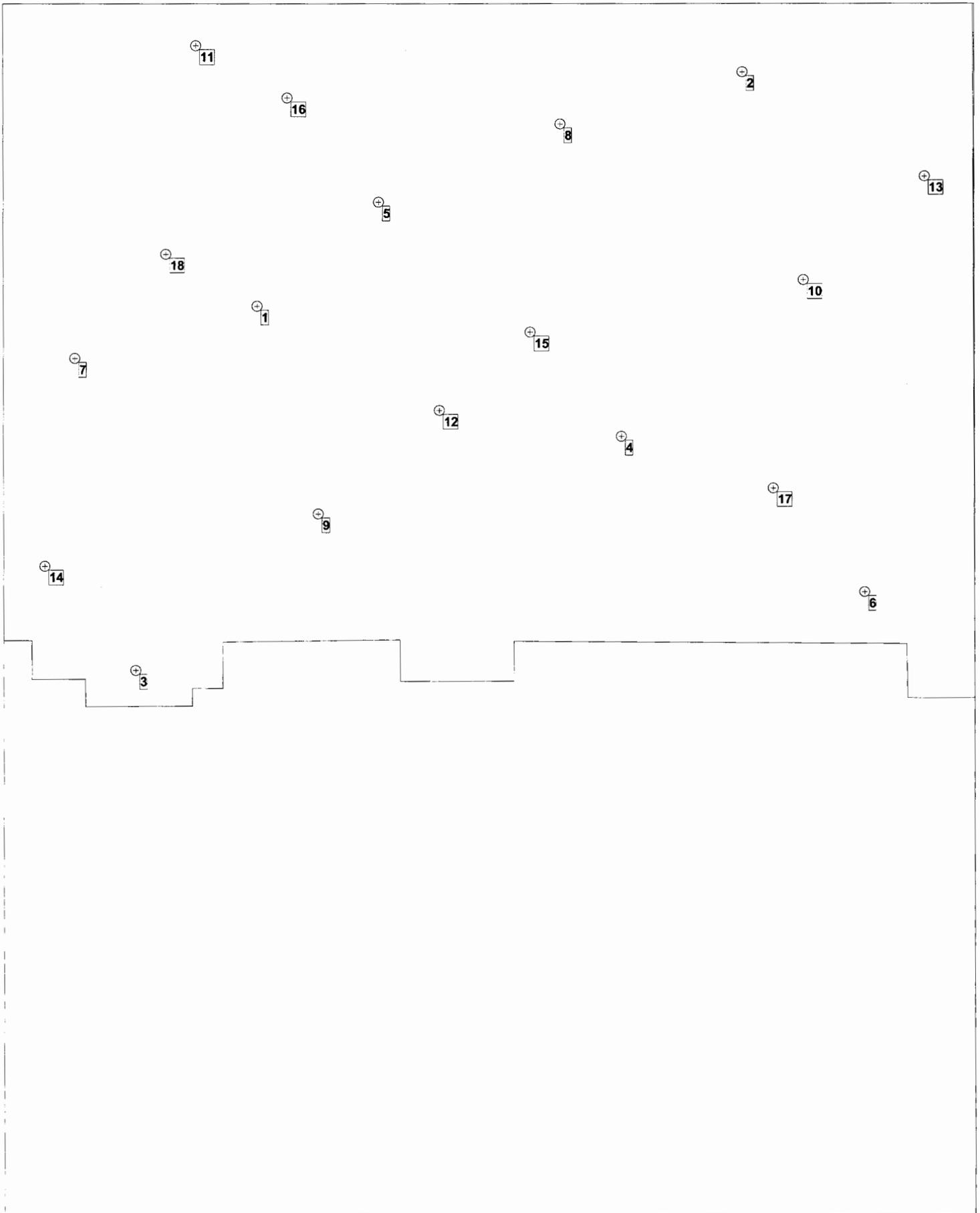
Prepared by: P Hollenbeck

Date: 29-Oct-14

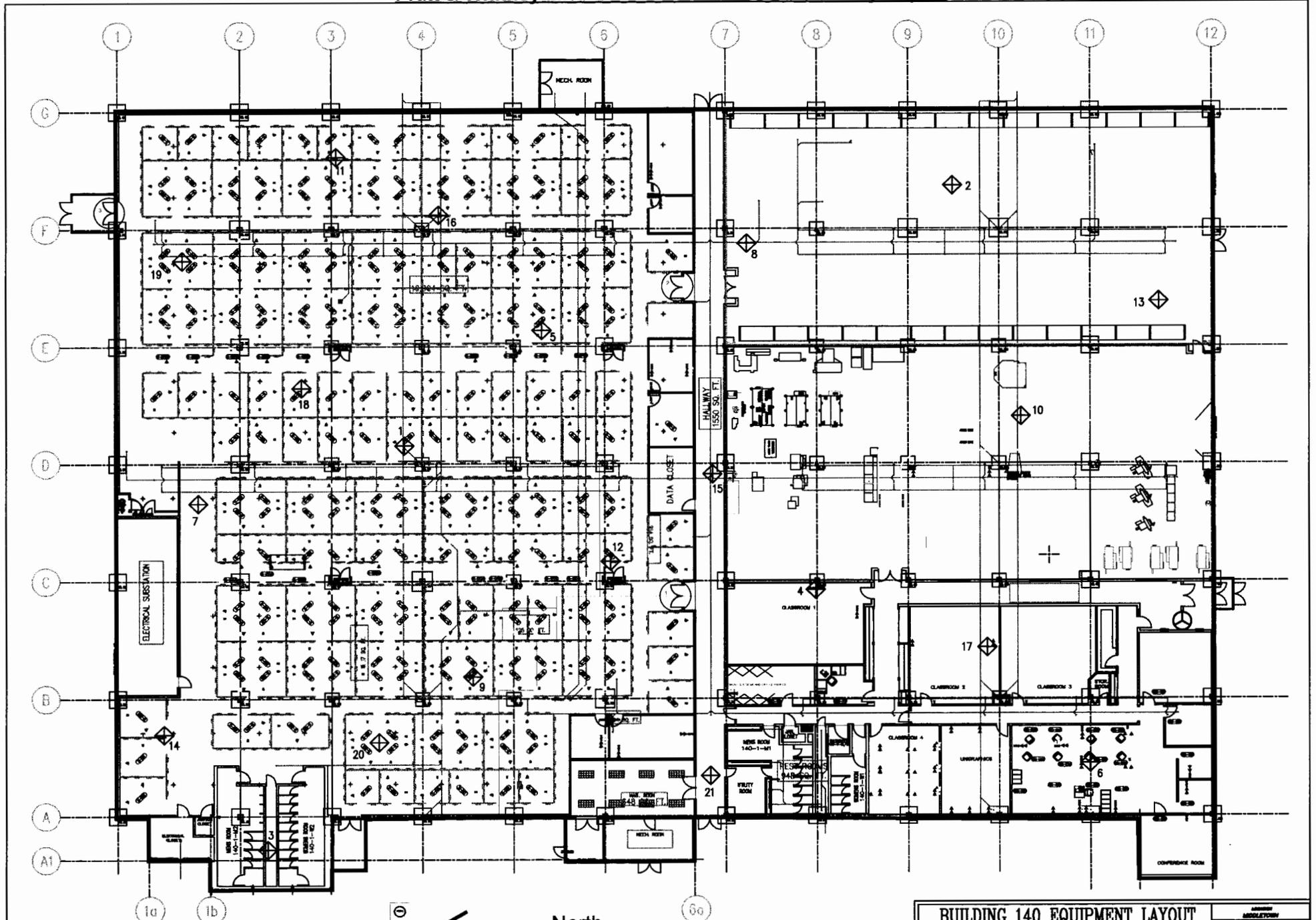
Approved by: [Signature]

Date 29-Oct-14

Planned B-140 Survey Location Map - (VSP)
Pratt & Whitney Middletown Site Final Status Survey Report



As Surveyed B-140 Survey Location Map
 Pratt & Whitney Middletown Site Final Status Survey Report



← North
 Subject to the export control restrictions on the
 title page of this document

BUILDING 140 EQUIPMENT LAYOUT		ASSEMBLY
PRATT & WHITNEY		REV 0

Pratt & Whitney Middletown Site Final Status Survey Report
Final Status Survey Package Direct Measurement Results

FSSP: B-140-001

Survey Date: 11/7/14

Investigation Level (dpm/100 cm²): 139

Survey meter (1):		E-600 #1018/43-89 # 223946			
Survey meter (2):		E-600 #3685/43-89 # 312071			
Survey meter (3):		E-600 #3690/43-89 # 223945			
Survey meter (4):		E-600 #3689/43-89 # 311683			
Meter (1) Details			Meter (2) Details		
Count time (min):	3	Count time (min):	3		
Meter (1) background (counts):	24.8	Meter (2) background (counts):	15.0		
Meter (1) Efficiency (c/d):	0.0954	Meter (2) Efficiency (c/d):	0.1095		
Meter (1) MDC (dpm/100 cm ²):	73.1	Meter (2) MDC (dpm/100 cm ²):	51.2		
Meter (3) Details			Meter (4) Details		
Count time (min):	3	Count time (min):	3		
Meter (3) background (counts):	8.0	Meter (4) background (counts):	6.2		
Meter (3) Efficiency (c/d):	0.0922	Meter (4) Efficiency (c/d):	0.1106		
Meter (3) MDC (dpm/100 cm ²):	46.7	Meter (4) MDC (dpm/100 cm ²):	35.1		
Location	Meter #	Gross Result (counts)	Net Result (counts)	Activity (dpm/100 cm ²)	>Inv Level (Y/N)
1	3	8	0.0	0.0	N
2	1	29	4.2	11.7	N
3	3	11	3.0	8.7	N
4	1	38	13.2	36.9	N
5	4	16	9.8	23.6	N
6	1	25	0.2	0.6	N
7	3	7	-1.0	-2.9	N
8	1	33	8.2	22.9	N
9	4	10	3.8	9.2	N
10	1	30	5.2	14.5	N
11	4	10	3.8	9.2	N
12	2	14	-1.0	-2.4	N
13	1	21	-3.8	-10.6	N
14	2	14	-1.0	-2.4	N
15	3	8	0.0	0.0	N
16	2	25	10.0	24.4	N
17	3	9	1.0	2.9	N
18	2	14	-1.0	-2.4	N
19	4	12	5.8	14.0	N
20	2	15	0.0	0.0	N
21	3	6	-2.0	-5.8	N

survey unit average => 7.2 dpm/100 cm²
dose estimate => 0.5 mrem/y

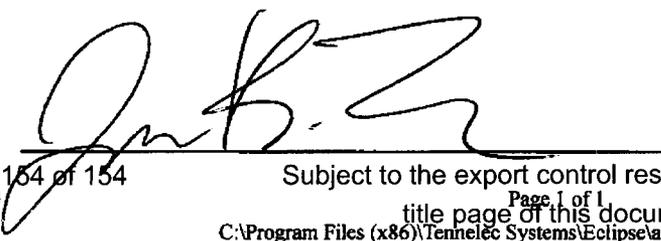
**Pratt & Whitney Middletown Site Final Status Survey Report
Sample Report**

B-140-001

Batch ID:	LT Th-230 - 201411131126	Count Date:	11/13/2014
Group:	A	Count Minutes:	4.0
Device:	LB5100	Count Mode:	Alpha Only
Batch Key:	26,798	Operating Volts:	840
Selected Geometry: 1/4" Stainless Steel			

Alpha Efficiency:(%)	28.4770	±	0.53	Beta Efficiency: (%)	±
Alpha Action Level (cpm)	0.77			Beta Action Level (cpm)	0.00
Alpha MDA (dpm)	5.64			Beta MDA (dpm)	0.00
Alpha Bkgd (CPH)	18.00			Beta Bkgd (CPH)	0.00

<u>Carrier ID</u>	<u>Sample ID</u>	<u>Source ID</u>	<u>Net Beta DPM</u>	<u>Beta Gross Cpm</u>	<u>Net Alpha DPM</u>	<u>Alpha Gross Cpm</u>	<u>> Action Level?</u>
20141113112635-A1	1			0.00	-1.05	0.00	
20141113113116-A2	2			0.00	-0.18	0.25	
20141113113526-A3	3			0.00	-1.05	0.00	
20141113113946-A4	4			0.00	-1.05	0.00	
20141113114356-A5	5			0.00	0.70	0.50	
20141113114817-A6	6			0.00	-1.05	0.00	
20141113115227-A7	7			0.00	-1.05	0.00	
20141113115647-A8	8			0.00	1.58	0.75	
20141113120057-A9	9			0.00	-1.05	0.00	
20141113120517-A10	10			0.00	-1.05	0.00	
20141113120927-A11	11			0.00	-1.05	0.00	
20141113121347-A12	12			0.00	0.70	0.50	
20141113121808-A13	13			0.00	0.70	0.50	
20141113122218-A14	14			0.00	-0.18	0.25	
20141113122638-A15	15			0.00	-1.05	0.00	
20141113123048-A16	16			0.00	-1.05	0.00	
20141113123508-A17	17			0.00	-1.05	0.00	
20141113123918-A18	18			0.00	-1.05	0.00	
20141113124338-A21	19			0.00	-1.05	0.00	
20141113124748-A22	20			0.00	-1.05	0.00	
20141113125208-A23	21			0.00	-1.05	0.00	

Reviewed by: 

This is to acknowledge the receipt of your letter application dated

01/15/2015, and to inform you that the initial processing which includes an administrative review has been performed.

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 585804.
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 (R1)
(6-96)

Sincerely,
Licensing Assistance Team Leader.