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FINAL TASK SPECIFIC PLAN BUILDING 4 FOOTPRINT SCOPING SURVEY NAS WILLOW GROVE PA
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TETRA TECH INC

Final

Task Specific Plan
Building 4 Footprint
Scoping Survey

Naval Air Station Joint Reserve Base
Willow Grove
Horsham, Pennsylvania

October 2014

Prepared for:
Department of the Navy
Base Realignment and Closure
Program Management Office Northeast
Philadelphia, Pennsylvania

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FINAL

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BUILDING 4 FOOTPRINT
SCOPING SURVEY

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REVIEW AND APPROVAL

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ACRONYMS AND ABBREVIATIONS

BRAC	Base Realignment and Closure
cpm	counts per minute
DFW	definable feature of work
DoD	Department of Defense
DQO	data quality objective
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
FSS	Final Status Survey
GPS	Global Positioning System
HASP	Health and Safety Plan
HRA	Historical Radiological Assessment
IRP	Installation Restoration Program
JRB	Join Reserve Base
LBGR	lower boundary of the gray region
LLRW	Low Level Radioactive Waste
m^2	square meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	minimum detectable concentration
MDCR	minimum detectable count rate
$MDCR_{SURVEYOR}$	minimum detectable count rate calculated assuming a surveyor efficiency
mrem/y	millirem per year
NaI	sodium iodide
NAS	Naval Air Station
NRC	U.S. Nuclear Regulatory Commission
OSWER	Office of Solid Waste and Emergency Response
pCi/g	picocuries per gram
PHP	Project Health Physicist
Ra-226	radium-226
RASO	Radiological Affairs Support Office
RCT	Radiological Control Technician
RESRAD	Residual Radioactivity computer code
RI	Remedial Investigation
ROC	radionuclide of concern
RWP	Radiation Work Permit
SOP	Standard Operating Procedure
SS	Scoping Survey
SSO	Site Safety Officer
TSP	Task-specific Plan

TASK-SPECIFIC PLAN FOR BUILDING 4 FOOTPRINT SCOPING SURVEY

This Task-specific Plan (TSP) provides the details for the Scoping Surveys of the Building 4 footprint at the former Naval Air Station (NAS) Joint Reserve Base (JRB) Willow Grove, Pennsylvania. The survey will be conducted in accordance with the general approach, radiological controls and methodologies provided in the Basewide Radiological Management Plan (Management Plan) [Tetra Tech 2014a] and Standard Operating Procedures (SOPs)[Tetra Tech 2014a, Attachment 4]. The survey activities will conform to the requirements of the Health and Safety Plan (HASP) [Tetra Tech 2014b]. No exceptions to the SOPs or HASP are noted.

This survey is being performed, as recommended in the Historical Radiological Assessment (HRA)[Tetra Tech 2013) to determine if residual radioactivity is present in the surface soil (0-6 inches) within the Building 4 footprint. The survey of this area has been designed as a Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) NUREG-1575 Class 3 survey [DoD et al. 2000] based on historical records and the little or no potential for delivering a dose above the release criterion. This methodology will allow the use of survey data to assess the risk posed by the presence of residual radioactivity in surficial soils.

1.0 SITE DESCRIPTION AND HISTORICAL SUMMARY

The Academic and General Instruction Building (Building 4) was originally built as a pre-flight training facility and also housed the Electronics Tactical Training Unit (Figure 1). In 1951, the building became the Reserve Antisubmarine Warfare Training Center (RESASWTRACEN) until this operation moved to Building 140 in 1961. The building was constructed in 1943 and was approximately 18,080 square feet in area. No historical floor plans for this building were available for review to determine the locations of operational activities within the building. It was identical to Building 2, which was still in use up until 2011 and is a wood frame structure with a gabled central pavilion and long wings extended from each side and at the rear. From comparing maps and building lists, it appears that Building 4 was demolished sometime before 1983. The area available for survey is now a paved parking lot.

Electronic components used for training would have contained the same components as aircraft. Plane and helicopter trainers/simulators used in this building would have had these same components also. Examples of radioactive materials possibly used in Building 4 are radar transmitters and self-illuminating instrument panels.

The radionuclide of concern (ROC) suspected for this building is radium 226 (Ra-226) [Tetra Tech 2013].

2.0 SCOPING SURVEY

The purpose of this section is to provide guidance for performance of a Scoping Survey (SS) under this TSP. This SS will allow the use of survey data to assess the risk posed by the presence of residual radioactivity in surficial soils.

All radiological surveys will be performed in accordance with SOP 006, *Radiation and Contamination Surveys*. Since the entire survey unit is a paved parking lot, a gamma walkover survey would not produce usable data. Only soil samples from beneath the asphalt covering will be collected.

Soil samples will be analyzed for radium 226 (Ra-226) by a Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) approved laboratory [Tetra Tech 2014a, Attachment 3].

2.1 RELEASE CRITERIA

This survey is being performed to assess whether residual radioactivity above the established release criteria, as defined on Table 2-1, is present in the area. The site will be modeled using residual radionuclide concentrations to evaluate total dose and risk.

2.2 REFERENCE AREA

The reference area will be selected with the concurrence of the Navy Radiological Affairs Support Office (RASO). The reference area will contain the same physical and geological characteristics as the survey area and will have no history of radiological operations. A minimum of 16 soil samples will be collected at the 0-6 inch depth. These samples will be analyzed by an offsite DoD ELAP-accredited laboratory for Ra-226, total Sr and isotopic U. A static gamma measurement and a gamma exposure measurement will be obtained from each survey location. A GPS correlated gamma walkover survey will be performed of the reference area. The reference background area results will be included in the survey report.

The reference area identified in the IR Site 3 TSP will be evaluated for applicability to the Building 4 footprint. Additional reference areas may be selected by the Radiation Safety Officer Representative, in consultation with the RASO, if the physical and geological characteristics of the IR Site 3 reference are differ from those associated with the Building 4 footprint.

2.3 SURVEY UNITS

A single survey unit has been identified for investigation within the Building 4 footprint (Figure 2). The survey unit was based on the historical location of the facility. Since the entire footprint of Building 4 is now a paved parking lot, no gamma walkover survey will be performed. Direct push technology (DPT) cores will be advanced through the asphalt to obtain a soil sample in the 0-6 inch interval.

2.4 ESTABLISHING THE NUMBER OF MEASUREMENTS

To determine the number of measurements, N, to be taken per survey unit/reference area combination when the contaminant is present in background, Equation 5-1 of MARSSIM (NRC 2000) is used:

$$N = \left(\frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{3(P_r - 0.5)^2} \right)(1.2)$$

Where:

N = Number of data points

$Z_{1-\alpha}$ = Type I decision error level, 1.645

$Z_{1-\beta}$ = Type II decision error level, 1.645

P_r = random measurement probability, 0.871014

1.2 = 20 percent increase in number of samples over the minimum

The values used in the calculation are from MARSSIM guidance (NRC 2000) and are based on a recommended value for the relative shift (Δ/σ) of 1.6 as discussed in Section 5.5.2.2 of MARSSIM (NRC 2000). Type I and Type II decision errors are based on 0.05 false negative and 0.05 false positive rates. The associated Z values are obtained from MARSSIM Table 5.2 (NRC 2000). The random measurement probability, P_r, is from MARSSIM Table 5.1 (NRC 2000).

Using the defined values, the equation becomes:

$$N = \left(\frac{(1.645 + 1.645)^2}{3(0.871014 - 0.5)^2} \right)(1.2)$$

The calculation results in a value of N = 31.45366. Therefore, a minimum of 32 measurements will be obtained in each survey unit/reference area combination. Sample locations will be determined using a triangular grid pattern as specified in Section 4.4.2 for the Basewide Radiological Management Plan [Tetra Tech 2014a].

Each sample location investigation will consist of:

- a soil sample from the 0-6 inch (0-15 cm) soil layer (SOP 009) [Tetra Tech 2014a, Attachment 4].

GPS coordinates will be obtained for all sample locations.

2.5 GAMMA SCANS

Since the area of interest is now a paved asphalt parking lot, any gamma radiation associated with residual radiological contamination would be effectively shielded from detection. Therefore only soils samples will be collected for this survey. All holes in the asphalt resulting from sampling operations will be repaired after the soil samples have been collected.

2.6 SOIL MEDIA SAMPLING

Survey unit solid soil samples will be collected at the sampling locations and analyzed by an offsite DoD ELAP-accredited laboratory for Ra-226 (GL-RAD-A- 013) [Tetra Tech 2014a, Attachment 3]. Summary, statistics and data evaluation will be presented to RASO and summarized in SS report.

2.7 DOSE MODELING IN SUPPORT OF A RADIOLOGICAL RISK ASSESSMENT

The intent of the survey is to provide radiological risk analysis for residual contamination in surficial soils (0 – 6 inches) within the Building 4 footprint. To accomplish this goal, it is necessary to provide a means for calculating residual dose to the critical group; the default residential farmer scenario for RESRAD (version 6.5 or as updated) was selected.

After the residual dose is determined, the Department of the Navy will also determine the excess lifetime cancer risk to the critical group. These values will be provided in the SS report to demonstrate that the net residual dose is less than 15 mrem/y (equivalent to 3 x 10^{-4} excess lifetime cancer risk per Office of Solid Waste and Emergency Response (OSWER) Directive 9200.4-18 [EPA 1997]).

3.0 QUALITY CONTROL

The DQOs for the survey are provided on Table 3-1.

Definable features of work (DFWs) establish the measures required to verify both the quality of work performed and compliance with project requirements. The DFW for this task are radiological surveys and the associated sample results. A description of the DFW and the associated phases of quality control are presented in Table 3-2. Quality control data will be provided in the SS report.

4.0 ENVIRONMENTAL PROTECTION

Environmental protection-driven requirements addressed in the Management Plan [Tetra Tech 2014a] apply to this TSP. No additional requirements are necessary.

5.0 REFERENCES

AEC (Atomic Energy Commission). 1974. Regulatory Guide 1.86. Termination of Operating Licenses for Nuclear Reactors. June.

DoD (Department of Defense), Department of Energy, Nuclear Regulatory Commission, and U.S. Environmental Protection Agency. 2000. Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG-1575, Revision 1. August.

EPA (U.S. Environmental Protection Agency). 1997. OSWER No. 9200.4-18, Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination. August.

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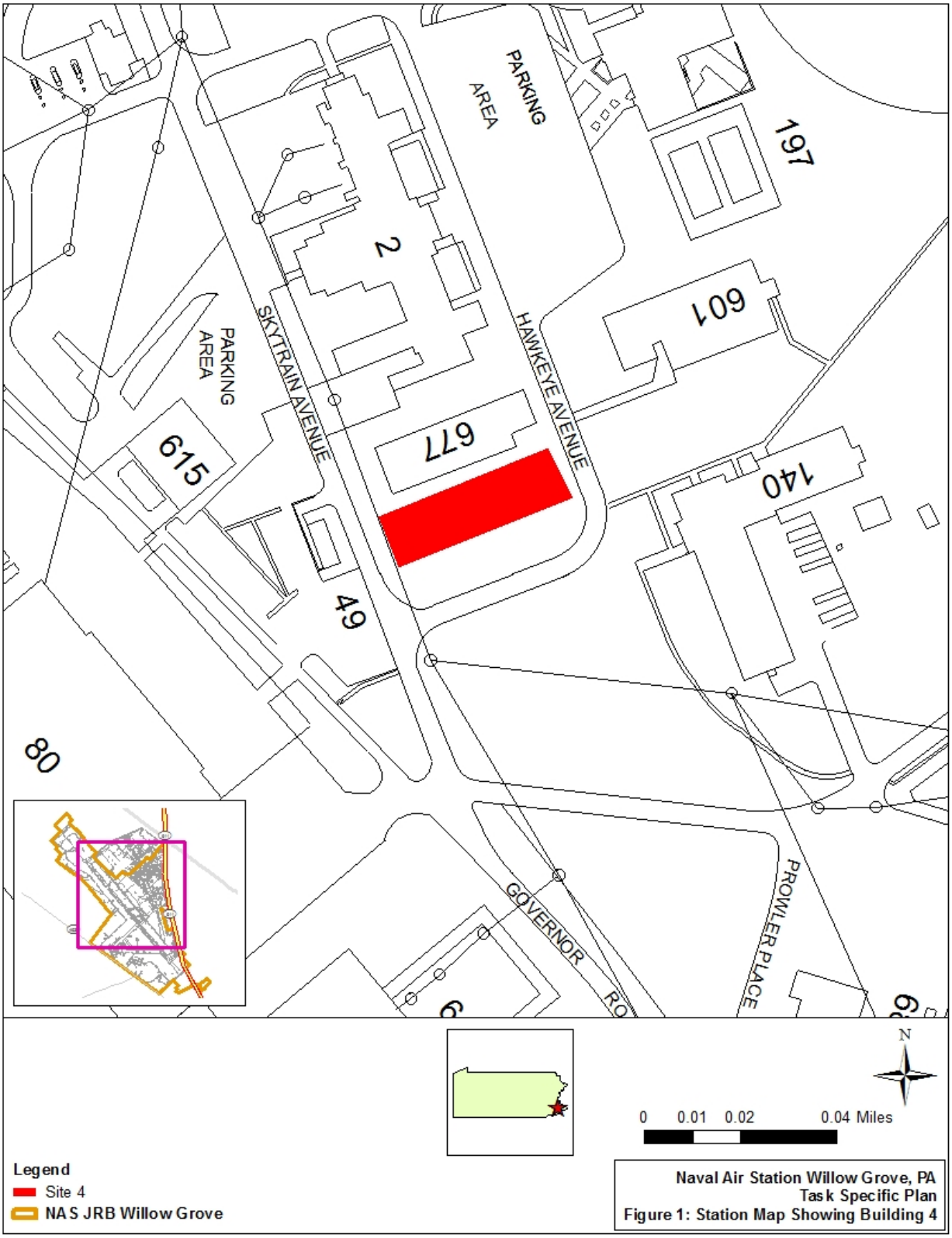
Tetra Tech (Tetra Tech, Inc.). 2014a. Final Basewide Radiological Management Plan, Naval Air Station Joint Reserve Base Willow Grove, Willow Grove, Pennsylvania. March.

Tetra Tech (Tetra Tech, Inc.). 2014b. Health and Safety Plan, Naval Air Station Joint Reserve Base Willow Grove, Willow Grove, Pennsylvania. May.

FIGURES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197
2
601
SKYTRAIN AVENUE
HAWKEYE AVENUE
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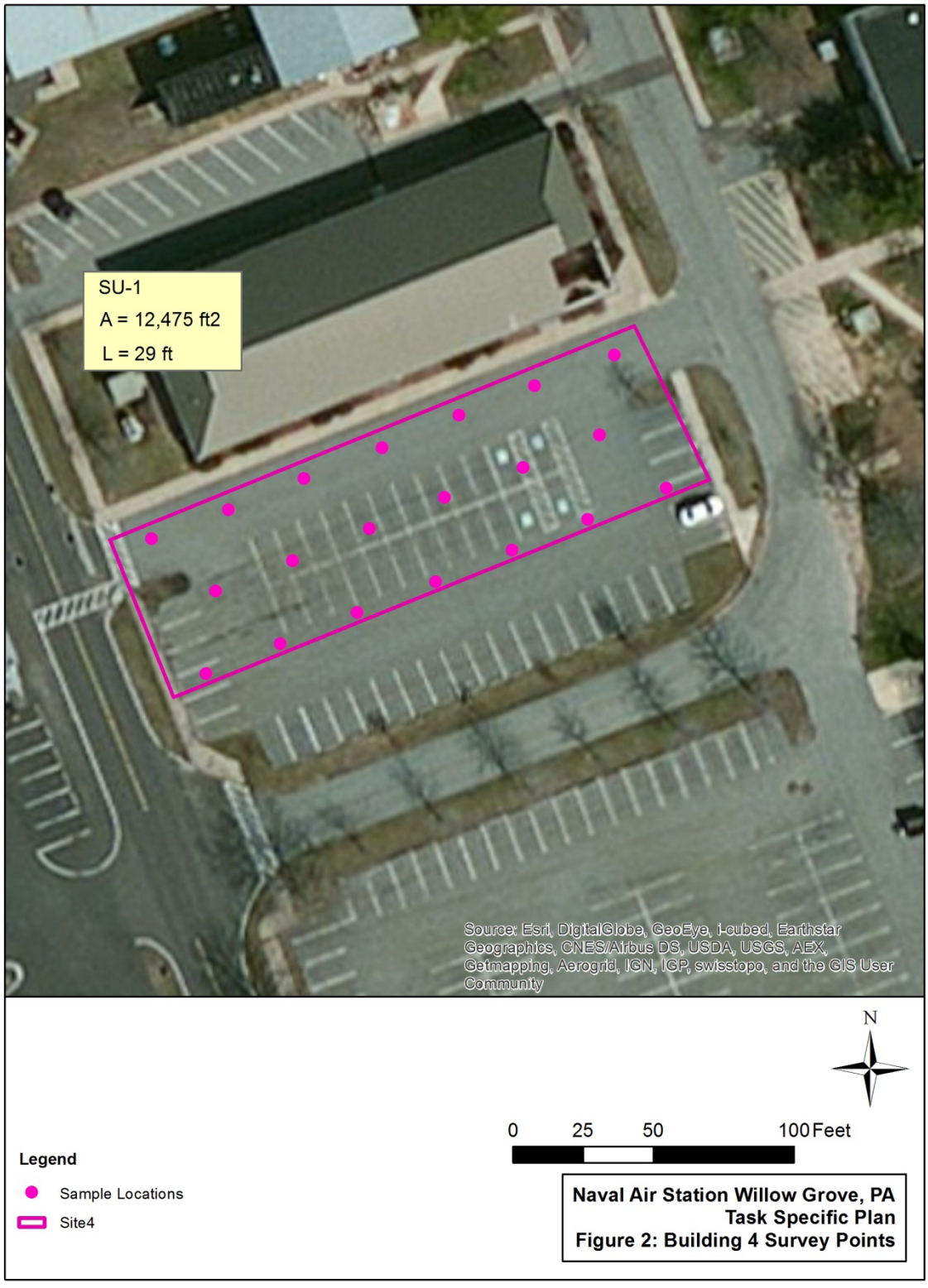
615
677
140
49
80
GOVERNOR
PROWLER PLACE
N
0 0.01 0.02 0.04 Miles
Legend
Site 4
NAS JRB Willow Grove
Naval Air Station Willow Grove, PA
Task Specific Plan
Figure 1: Station Map Showing Building 4


SU-1
A = 12,475 ft2
L = 29 ft
Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
N
0 25 50 100 Feet
Legend
Sample Locations
Site4
Naval Air Station Willow Grove, PA
Task Specific Plan
Figure 2: Building 4 Survey Points

TABLES

TABLE 2-1 PRIMARY RADIATION PROPERTIES AND RELEASE CRITERIA FOR RADIONUCLIDES OF CONCERN

Radionuclide	Primary Radiation Properties		Release Criteria		
			Materials, Equipment, and Wastes		Release Criteria for Residential Reuse Solid Samples[c,d] (pCi/g)
	Half-life	Type	Total Surface Activity[a,b]	Removable Activity[ab]	
Ra-226	1,600 y	Alpha Gamma	100	20	1.0

Notes:

[a] Units are disintegrations per minute per 100 square centimeters.

[b] These limits are based on AEC Regulatory Guide 1.86 (**USAEC 1974**). Values indicate the measured value above background as determined from the reference area. Limits for removable surface activity are 20 percent of these values.

[c] These limits are based on Nuclear Regulatory Commission document NUREG-1757, Consolidated Decommissioning Guidance (**NRC 2006**), whose limits are deemed in compliance with the 25 mrem/y unrestricted dose limit in 10CFR20.1402. Listed values were developed by scaling the NUREG-1757 values to 15 mrem/y unrestricted dose.

[d] Criteria is above background for those radionuclides found in background soils.

Abbreviations and Acronyms:

pCi/g – picocuries per gram
Ra-226 – radium-226
y – year

TABLE 3-1 SUMMARY OF DATA QUALITY OBJECTIVES

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7
Statement of Problem	**Decisions**	**Inputs to the Decisions**	**Boundaries of the Study**	**Decision Rules**	**Limits on Decision Errors**	**Optimize the Sampling Design**
The Building 4 footprint is listed as an area impacted by radiological activities. The radionuclide of concern for this Site is Ra-226. It will be determined if residual contamination in surficial soil meet the site-specific release criteria for these radionuclides.	The primary use of the data expected to result from completion of this TSP is to support the Scoping Survey of the Building 4 footprint. Therefore, the decision to be made can be stated as, "Do the results of the survey meet the release criteria?"	Radiological surveys required to support the Scoping Survey of the Building 4 footprint will include: • Soil samples will be analyzed for total Ra-226.	The boundaries of the survey units are shown in Figure 2. The spatial boundaries are consistent to assess radiological risks associated with residual contamination in surficial soil.	The results of the survey will be used to assess radiological risks from residual contamination in surficial soil.	Limits on decision errors are set at 5 percent, as specified in the Management Plan Revision 1 [Tetra Tech 2014a].	Operational details for the radiological survey process have been developed. The theoretical assumptions are based on guidelines contained in MARSSIM (DoD et al. 2000). Specific assumptions regarding types of radiation measurements, instrument detection capabilities, quantities and locations of data to be collected, and investigation levels are contained in this TSP and the Management Plan [Tetra Tech 2014a].

Abbreviations and Acronyms:
MARSSIM – Multi-Agency Radiation Survey and Site Investigation Manual
Ra-226 – radium-226
RASO – Radiological Affairs Support Office
TSP – Task-specific Plan

TABLE 3-2 DEFINABLE FEATURES OF WORK FOR RADIOLOGICAL SURVEYS

ACTIVITY	PREPARATORY (Prior to initiating survey activity)	DONE	INITIAL (At outset of survey activity)	DONE	FOLLOW-UP (Ongoing during survey activity)	DONE
Radiological surveys and sampling	• Verify that an approved TSP is in place. • Verify that the Remedial Project Manager, the Radiological Site Manager, and Caretaker Site Office are notified about mobilization. • Verify that an approved RWP is available, if necessary, and has been read and signed by assigned personnel. • Verify that TSP and HASP have been reviewed. • Verify that assigned personnel are trained and qualified. • Verify that personnel have been given an emergency notification procedure. • Verify that workers assigned dosimetry have completed NRC Form 4. • Verify that the relevant SOPs and/or manufacturers' instructions are available and have been reviewed for equipment to be used for radiological surveys. • Verify that equipment is on-site and is in working order (initial daily check).		• Verify that radiological instruments are as specified in the Basewide Plan and TSP. • Inspect training records. • Verify that a qualified RCT and SSO are present at active work areas. • Verify that site activities are being photographed. • Verify that the reference area measurements have been obtained using the procedure described in the Basewide Plan, which states that the same survey methodology and instruments used to collect the background data will be used to perform measurements within survey units. • Verify that daily checks were performed on all portable survey instruments. • Verify that radiological instrument calibrations and setup are current. • Verify that required dosimetry is being worn. • Verify that field logbooks, proper forms, and chain-of-custody documents are in use. • Verify that samples and measurements are being collected in accordance with the TSP, the Basewide Plan, and relevant SOPs. • Verify that sample handling and analyses are in accordance with the Basewide Plan and applicable SOPs.		• Verify that site is properly posted and secured, if necessary. • Conduct ongoing inspection of material and equipment. • Verify that a qualified RCT and SSO are present at active work areas. • Verify that daily instrument checks and background measurements were obtained and documented. • Verify that survey and sample analysis results are documented. • Verify that personnel have read and signed the revised RWP, if revision is required. • Inspect sample chain of custody and survey log for completeness. • Verify that survey and analytical activities conform to the TSP. • Verify that survey instruments are recalibrated after repairs or modifications. • Verify that site activities are being photographed. • Verify that survey documentation is reviewed by the PHP.	

Abbreviations and Acronyms:
HASP – Health and Safety Plan
NRC – Nuclear Regulatory Commission
PHP – Project Health Physicist
RCT – Radiological Control Technician
RWP – Radiation Work Permit
SOP – Standard Operating Procedure
SSO – Site Safety Officer
TSP – Task-specific Plan