Sampling and Analysis Plan

Volume 1 – Field Sampling Plan

Niagara Falls Storage Site
Building 401 Demolition
Lewiston, New York

Contract No. W912P4-07-D-0003-0002

Prepared by:
TPMC-Energy*Solutions* Environmental Services, LLC

Prepared for:
U.S. Army Corps of Engineers (USACE)
Buffalo District
Buffalo, New York

US Army Corps of Engineers®
Buffalo District

August 2010

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Lewiston, New York

Authored By: [redacted] 09 AUGUST 2010

[redacted], CHP Date

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[redacted], PhD, CHP, Program Manager Date

Approved By: [redacted] 09 AUGUST 2010

[redacted] PM / CQM System Manager Date

- [x] New Plan
- [ ] Title Change
- [ ] Plan Revision
- [ ] Plan Rewrite

INTRODUCTION

This Sampling and Analysis Plan (SAP) describes activities planned during the demolition of Building 401 at the Niagara Falls Storage Site (Site), Lewiston, New York.

TPMC-Energy*Solutions* Environmental Services, LLC (TES) has prepared this document in fulfillment of the requirements of Contract W912P4-07-D-0003, Task Order 0001. The U.S. Army Corps of Engineers (USACE), Buffalo District, will provide technical oversight responsibilities for the tasks described in this document.

This SAP consists of **two components**: a **Field Sampling Plan (FSP)** and a **Quality Assurance Project Plan (QAPP)**

The FSP, which is Volume I of the SAP, describes and presents procedures and protocols for project-specific field radiological surveys, sampling, documentation, sample packaging, control, preparation, on-site radiological scanning, and off-site physical, chemical, and radiological laboratory analysis.

The QAPP, which is Volume 2 of the project SAP, describes the applicable data quality objectives, the analytical methods and measurements, quality assurance/quality control protocols, and the data assessment procedures for the evaluation and identification of any data limitations.

The primary objective of the SAP is to obtain field measurements and samples to support the segregation of wastes for disposal and free release of building material for recycling and disposal during the demolition of Building 401 at NFSS.

	Title	Document No.	Revision
TES TPMC-EnergySolutions Environmental Services, LLC	Field Sampling Plan	NFSS-0012-1	REV.0

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AUGUST 2010

CERTIFICATION OF INDEPENDENT TECHNICAL REVIEW

COMPLETION OF INDEPENDENT TECHNICAL REVIEW

TES, LLC (TES) has DRAFTED the *Field Sampling Plan (Volume 1 of the Sampling and Analysis Plan)* for the Niagara Falls Storage Site Building 401 Demolition Project located in Lewiston, New York. Notice is hereby given that an independent technical review has been conducted that is appropriate to address all regulatory and compliance issues appropriate to ensure management of sampling, analysis and characterization tasks for the Niagara Falls Storage Site Building 401 demolition, as defined in the TES NFSS Sampling and Analysis Plan. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of assumptions; methods, procedures, and material used in analyses; alternatives evaluated; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with existing USACE policy.

Signature/TES Report Preparer

[redacted]

Signature/TES Independent Technical Reviewer — Date 20 JULY 2010

[redacted]

Date 20 JULY 2010

Signature/TES Independent Technical Reviewer

[redacted]

Date 20 JULY 2010

Signature/TES Independent Technical Reviewer

[redacted]

Date 20 JULY 2010

Independent Technical Review Team Members: [redacted]

CERTIFICATION OF INDEPENDENT TECHNICAL REVIEW

Significant concerns and the explanation of the resolution are as follows:

Item	Technical Concerns	Possible Impact	Resolutions
Field Sampling and Analysis Plan			
1	See attached sheets		

As noted above, all concerns resulting from independent technical review of the plan have been resolved.

[redacted]

Signature/[redacted] — Date 20 JULY 2010

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ATTACHMENTS

1. BLDG 401 Drawings:
   - First Floor Plan, dwg 158-DDxyz-C02,
   - Second Floor Plan, dwg158-DDxyz-C03,
   - Decontamination Excavation Plan, dwg 158-DDxyz-C04
2. NFSS Building 401 – Review of Previous Analyses to Establish RCOC and Weighted Average of Regulatory Guide 1.86 Criteria
3. Fifty-Six Services, Inc. Asbestos Survey Procedure

LIST OF ACRONYMS

ACM	Asbestos Containing Material
AEC	Atomic Energy Commission
AHERA	Asbestos Hazard Emergency Response Act
ALARA	As Low As Reasonably Achievable
Am-241	Americium-241
APP/SSHP	Accident Prevention Plan/Site Safety and Health Plan
bgs	Below Ground Surface
BRA	Baseline Risk Assessment
CFR	Code of Federal Regulations
cm	Centimeter
COC(s)	Contaminant(s) of Concern
cpm	Counts Per Minute
CQC	Contractor Quality Control
DoD ELAP	Department of Defense Environmental Laboratory Accreditation Program
DoD QSM	Department of Defense Quality Systems Manual
DOE	Department of Energy
DOT	Department of Transportation
dpm	Disintegrations Per Minute
DQO	Data Quality Objectives
DQCR	Daily Quality Control Report
EPA	Environmental Protection Agency
ft	Feet
FSP	Field Sampling Plan
FUSRAP	Formerly Utilized Sites Remedial Action Program
IATA	International Air Transport Association
IAW	In Accordance With
IDW	Investigation Derived Waste
ISO	International Standards Organization
LLRW	Low Level Radioactive Waste

LOOW	Lake Ontario Ordnance Works
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
MDL	Method Detection Limit
MED	Manhattan Engineering District
NaI(Tl)	Sodium Iodide Thallium Activated
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFSS	Niagara Falls Storage Site
NIST	National Institute of Standards and Technology
NOB	Non-friable Organically Bound
RPP	Radiation Protection Plan
ORISE	Oak Ridge Institute for Science and Education
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
pCi/g	Picocuries Per Gram
PHA	Polynuclear Aromatic Hydrocarbons
PLM	Polarized Light microscopy
PM	Project Manager
PRA	Post Remedial Action
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
Ra-226	Radium-226
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RCOC	Radiological Contaminant of Concern
ROC	Radionuclide of Concern
ROD	Record of Decision
RCM	Radiation Control Manager
RCT	Radiological Control Technician
RI	Remedial Investigation
RSP	Radiation Safety Program

SAP	Sampling and Analysis Plan
SOW	Scope of Work
SVOC	Semi-Volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TES	TerranearPMC-Energy*Soultions* Environmental Services, LLC
Th-228	Thorium-228
Th-230	Thorium-230
Th-232	Thorium-232
TM/COR	Technical Manager/Contracting Office Representative
TO	Task Order
TNT	Trinitrotoluene
U-234	Uranium-234
U-235	Uranium-235
U-238	Uranium-238
UIN	Unique identification number
USACE	U.S. Army Corps of Engineers
USDOT	United States Department of Transportation
UTL	Upper Tolerance Level
VOC	Volatile Organic Compound
WAC	Waste Acceptance Criteria

1.0 INTRODUCTION

TPMC-Energy*Solutions* Environmental Services, LLC (TES), has been contracted by the U.S. Army Corp of Engineers (USACE) Buffalo District under Contract W912P4-07-D-0003, Task Order 0002, to demolish Building 401 and three silos at the Niagara Falls Storage Site (NFSS) and segregate and dispose of the waste. Building 401 was used to store radioactive materials in support of Manhattan Engineer District (MED) activities during and after World War II.

1.1 SITE BACKGROUND AND DESCRIPTION

NFSS is located at 1397 Pletcher Road, Lewiston, New York. A vicinity/location map and site plan is included in the Site Operations Plan for the project. The Federal Government currently owns the site that is part of the USACE Formerly Utilized Sites Remedial Action Program (FUSRAP). The site was originally a part of the Lake Ontario Ordnance Works (LOOW). The primary use of the site from early 1940s through mid 1950s was for storage, trans-shipment, and disposal of radioactive waste from various sources. Building 401 was initially the boilerhouse for the production of trinitrotoluene (TNT) at LOOW, and was also used to store radioactive materials in support of MED activities during World War II. Building 401 was renovated and used for the production of non-radioactive Boron-10 from 1953 to 1959 and from 1965 to 1971 and later became a waste storage facility used by the Atomic Energy Commission/Department of Energy (AEC/DOE). In 1971, Building 401 was gutted and its instrumentation and hardware were disposed of as surplus materials. The building has been largely inactive since, and evidence of bird and animal occupation has been observed. An asbestos abatement was performed on Building 401 in the spring and summer of 2002, resulting in the removal of interior asbestos containing material (ACM). Potential exterior ACM was not included in the original abatement.

Building 401 is a multi-story, steel-framed structure with a ridge height of approximately 76.5 feet and enclosing approximately 30,100 square feet (2,800 m^2) of floor area. The main structural system of the building consists of steel and concrete load bearing walls supporting what may be a transite roof. The interior walls are concrete, concrete block and other construction materials. The exterior appears to be comprised of sections of corrugated steel and transite siding and roofing. Inside the Building 401 there are multiple floors, which contain rooms and offices and building service areas (boiler rooms and tower areas). Also included is a tower area and high bay that may be as high as 75 feet. Additionally, Building 401 has three large concrete silos that will be demolished along with the building proper. The building floor is a concrete slab on grade. Removal of the concrete slab and footer system is not included in this demolition task order (TO).

This FSP will support characterization and packaging of miscellaneous debris in Building 401, demolition of Building 401 and adjacent silos, packaging, loading, transporting, recycling and disposing of the demolition debris and wastes.

1.2 PREVIOUS FIELD INVESTIGATION RESULTS

The most extensive investigation into the radiological condition of Building 401 was completed in 1994 by Oak Ridge Institute for Science and Education (ORISE) and documented in ORISE 95/C-70, *Radiological Survey of Buildings 401, 403, and the Hittman Building Niagara Falls Storage Site, Lewiston, New York*, March 1995. The gross surface activity data collected during the survey were compared with the most restrictive surface activity guidelines from DOE Order 5400.5 (same values as provided in US NRC Regulatory Guide 1.86 Table I, and USACE EM 385-1-80 Table 6-4). The most restrictive guideline values were for radium-226 (Ra-226) at 100 dpm/100cm^2 for alpha measurements, and thorium-232 (Th-232) at 1,000 dpm/100cm^2 for beta measurements (by monitoring for the Th-232 progeny in secular equilibrium). Samples taken during the ORISE survey showed that uranium isotopes were the predominant radionuclides with surface limits of 5,000 dpm α/100cm^2, however the more restrictive surface contamination limits were used to determine areas requiring remediation. After the ORISE survey, efforts were made to decontaminate the isolated areas, drains, and I-beams showing elevated levels of radioactive material.

Bechtel National, Inc., updated and summarized the status of Building 401 in *Current Radiological Contamination Status of Niagara Falls Storage Site (NFSS) Buildings 401, 403 and the Soils Outside of Building 401*, August 1998. This report established Unique Identification Numbers (UINs) for each area or item showing elevated activity. The Bechtel National report drawings provided by the USACE show areas that have been remediated, and areas that require further investigation or remediation for each floor of Building 401. The drawings are provided in Attachment 1 to this plan and show the UINs that can be referenced back to the tables in the Bechtel report. The Bechtel report will be used along with the drawings to guide the initial sampling and measurements required by this FSP. Table 4a of the Bechtel report presents the findings of the ORISE radiological survey of Building 401 floor, lower wall areas, drains, ceilings and I beams. Table 5a of the Bechtel report provides the status of the radiological contamination in Building 401 for specific contaminated items identified by the UIN, decontamination efforts, and actions that are needed. The UIN identifies each area within the building that is recommended for decontamination and/or post-remedial action (PRA) survey. No UIN is assigned to the areas that require "No action". Radiological conditions of the areas and items with UINs will be confirmed and re-evaluated using the unrestricted release criteria established in this FSP.

The Remedial Investigation (RI) for the NFSS is documented in *Remedial Investigation Report for the Niagara Falls Storage Site*, December 2007. During Phase 3 of the RI, ten cores were collected from the floor slab inside Building 401. The Building 401 cores were collected from stained areas and locations near floor sumps and drains. In order to investigate whether any of the previous activities that occurred inside Building 401 had resulted in the release of chemical or radiological compounds, the cores collected from inside Building 401 were submitted for total metals, pesticides, PCBs, VOC, SVOC, and radiological analysis.

Because of the varied past uses of Building 401, there was a broad range of chemicals and radiological compounds that were potentially present. The purpose of the coring, in addition to the collection of a sample of the concrete floor, was to facilitate the collection of subsurface soil samples below the floor slab. Locations were first selected based on presence of staining on the floor. Other locations were selected based on cracks in the concrete, which could serve as migration routes to the subsurface. Lastly, some locations were selected based on the apparent former use of a particular room or area. The locations of the core samples inside Building 401 are shown in the SOW (a location map for the previous core samples is not provided in this FSP). Metals and radionuclides were detected in all of the samples. The highest concentrations of radionuclides were less than 2 pCi/g, except for one sample, which contained 5.7 pCi/g of plutonium-239.[1] PCBs were detected in eight samples with a maximum detection of 26,000 µg/kg for Aroclor-1254. All PCB samples from the cores were below the 50 ppm level that is considered unregulated for disposal in accordance with 40 CFR761.1. Polynuclear Aromatic Hydrocarbons (PAH) were also detected in a number of samples with the maximum concentration of 135 µg/kg for phenanthrene. SVOCs were found in nine of the samples and included bis (2-ethylhexyl) phthalate and di-n-butylphthalate. Di-n-butylphthalate exhibited the highest concentration at 2,540µg/kg.

Fourteen floor drains in Building 401 were also sampled during Phase 3 of the RI to assess the chemical and radiological impacts that could have been introduced into the sewer system(s) by activities in Building 401. Sediment was present in all 14 drains. Water was present in only six of the drains. In most of the drains with water, the volume of water present was insufficient to satisfy all analytical requirements, so the analytical lists were reduced to accommodate the limited sample size. Oil was present in three of the drains, though the amount present in one of the drains was insufficient for analysis. Samples of the oil were collected and submitted for SVOC, metals, pesticide, PCB, and radiological analysis. Findings and conclusions are:

[1] Although Pu-239 was detected in the one core sample from Building 401, plutonium was not detected in any of the other numerous drain, water, core, or dust samples from the building. Since the concrete slab floor will remain after the building demolition, this sample was not used in the determination of the site radiological contaminants of concern.

Radiological contaminants were present in the floor drain sediment samples, though the magnitudes of exceedances were not as extreme as that observed for some of the metals and organic compounds. Drain 03-S-3705 exhibited the highest uranium isotope concentrations detected in the drain sediment samples. Uranium-234, -235, and -238 were detected at the following concentrations: 26.2 pCi/g, 6.99 pCi/g, and 28.5 pCi/g. Other radionuclides were detected at smaller concentrations.

Four water samples collected from the drains were submitted for total metals analysis. Many metals were found at concentrations over 100 times greater than the background upper tolerance levels (UTLs)[2]. However, these results were to a large degree attributable to solids present in the samples. Sample Drain 04-W-3706 tended to have higher concentrations of total metals than the other drain water samples. Unfortunately, the volume of water available in Drain 04 was not sufficient to allow analysis for dissolved metals.

• Dissolved thorium isotopes were detected at levels that exceeded background UTLs at drain location Drain 01.

• 2-Butanone, acetone, bis (2-ethylhexyl) phthalate, 4, 4'-DDT, Aroclor-1254 and Aroclor-1260 were also infrequently detected in drain water samples.

The contaminants assumed to remain within Building 401 and the silos includes:

- Bird and animal waste within the building and silos.
- Potential ACM in roofing and siding materials.
- Potential lead based paint on surfaces within and outside Building 401.
- Potentially contaminated concrete floors inside of Building 401.
- Potentially contaminated steel beams and rafters inside of Building 401.
- Potentially contaminated floor drains and sumps inside of Building 401.
- Potentially contaminated soils around the perimeter of Building 401 (Identified but not removed).
- Miscellaneous debris inside of Building 401.

[2] UTLs are statistically derived from the RI background data set and presented in the RI.

1.3 RADIOLOGICAL CONTAMINANTS OF CONCERN AND UNRESTRICTED RELEASE CRITERIA

Data from the RI drain samples were reviewed for radiological contaminants that were above the Method Detection Level (MDL) and also above the site-specific background UTL. Radionuclide data in the 1995 ORISE report, for samples taken from within the building, were also evaluated to determine the radionuclide mixture for the residual contamination. Sample analysis results from the "I" beams and the drains are assumed to provide the most representative results for residual contamination within Building 401. Based on these samples, the radiological contaminants of concern (RCOCs) are primarily natural uranium. A few samples also showed slightly elevated Th-230, and one sample from a pipe removed from the ceiling of Room 102 was reported by ORISE to be primarily Th-230. Two samples obtained during the ORISE survey showed a small fraction of the activity to be Am-241. In addition, the Section 5.9.4.1 of the Remedial Investigation (Site-Wide Evaluation of Transuranic and fission Product Data) notes "The conclusion based on available data is that americium-241, which has not been identified as a ROC in the BRA, is not a contaminant." None of the drain samples taken in Building 401 during the RI showed detectable plutonium. However, because plutonium was detected in the core sample (see Section 1.2), samples will be analyzed for isotopic plutonium. Cs-137 was not detected in drain sediment samples above the site-specific background UTL (0.39 pCi/g), however Cs-137 was detected in the water from one of the drains at a concentration of 1.96 pCi/L (slightly above the MDL of 1.95 pCi/L). Therefore, Cs-137 analysis will also be performed. Similarly, the sediment from the drain samples did not show Ra-226 results that were above the range observed in background sediment samples and all were significantly below the Ra-226 site-specific background UTL for sediment of 2.43 pCi/g. Ra-228 results in drain samples were also all significantly below the site-specific background UTL for sediment (1.14 pCi/g). A few of the water samples showed Ra-226 slightly above the background surface water UTL. Although Ra-226 does not appear to be present in Building 401 as a primary radionuclide of concern, samples will also be analyzed for Ra-226. The majority of the samples showing activity above background revealed uranium that accounted for 80 to 100% of the activity. The contaminants of concern with their decay modes, and intensities are shown in Table 1-1.

Table 1-1 – Radiological Contaminants of Concern

RCOCs (Primary) [Notes 1, 2]	Symbol	Half-Life (years)	Decay Modes, Energies, and Intensities
Thorium-230	Th-230	7.7E4	α (4.62, 4.69 MeV) 100% γ (0.068 MeV) 0.37%

Uranium-234	U-234	2.4E5	α (4.72, 4.78 MeV) 100% γ (0.053 MeV) 0.12%
Uranium-235	U-235	7.0E8	α (4.32, 4.36, 4.40, 4.60 MeV) 100% γ (0.144 MeV) 10%, (0.186 MeV) 54%
Uranium-238	U-238	4.5E9	α (4.15, 4.20 MeV) 100% β (0.188 MeV) 72%, (0.096 MeV) 18%, (2.28 MeV) 100% (from Th-234 and Pa-234m in secular equilibrium) γ (0.063 MeV) 4%, (0.093 MeV) 5% (from Th-234 in secular equilibrium)
Radionuclides that are Not Primary Radionuclides of Concern but Which will be Analyzed			
Americium-241	Am-241	4.3E2	α (5.44, 5.49 MeV) 100% γ (0.0595 MeV) 35.9%,
Plutonium-238	Pu-238	8.8E1	α (5.46, 5.50 MeV) 100%
Plutonium-239/240	Pu-239/240	2.4E4/6.6E3	α (~5.14, ~5.16 MeV) 100%
Cesium-137	Cs-137	3.0E1	β (0.511 MeV) 95%, (1.17 MeV) 5.4%, γ (0.661 MeV) 85%, (from Ba-137m in secular equilibrium)
Radium-226	Ra-226	1.6E3	α (4.6 , 4.78 MeV) 100% γ (0.186 MeV) 3.28%,
[1] The primary RCOCs are those radionuclides that were identified in building dust and drain samples above the MDL and above the background UTLs. [2] Although uranium is an alpha emitter, there are enough short lived beta-emitting progeny in secular equilibrium to detect the 5,000 dpm/100cm^2 α uranium release criteria using beta survey techniques.			

Demolition debris and material with radiological surface contamination levels exceeding the unrestricted release criteria[3] in U.S. NRC Regulatory Guide 1.86 Table I or are distinguishable from background[4] will be considered radiologically contaminated. Surface scans, static point measurements, and smears of surfaces and materials will be used to segregate the materials that are radiologically contaminated. An evaluation of the historical samples showing radioactive material in excess of 25 pCi/g was performed to determine the gross activity unrestricted release limit. Using the individual sample radionuclide mixture and Regulatory Guide 1.86 criteria, the average surface contamination limits were calculated, and will be used to survey Building 401 surfaces and materials for unrestricted release. The calculation is provided as Attachment 2 to this FSP. The following limits were established based on the mixture of radionuclides seen in Building 401 samples. Although these limits will be used for survey design and instrument selection/setup, TES's intention is not to release any material from the site that is distinguishable from background. The intent of ALARA will be met since materials to be disposed of in NY State will be surveyed to indistinguishable from background levels. If a piece of material or equipment assigned for disposition is suspected as having radiation count rates distinguishable from background, the Radiological Control Technician (RCT) will flag this material/equipment for re-survey and decontamination or disposition as radioactive waste.

- Static Average Alpha: 2,000 dpm/100cm^2
- Maximum Alpha (over an area not to exceed 100cm^2): 6,000 dpm/100cm^2
- Removable Alpha: 200 dpm/100cm^2
- Static Average Beta: 5,000 dpm/100cm^2
- Maximum Beta (over an area not to exceed 100cm^2): 15,000 dpm/100cm^2
- Removable Beta: 500 dpm/100cm^2

While the above limits demonstrate what would be allowable by Regulatory Guide 1.86,

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[3] U.S. NRC Regulatory Guide 1.86 criteria provides the same surface contamination levels as EM 385-1-80, USACE Radiation Protection Manual. Regulatory Guide 1.86 criteria is noted to be more restrictive than New York State Department of Labor Part 38 – Ionizing Radiation Protection, Section 38.23 – Vacating Installations and Property, Table 5- Acceptable Surface Contamination Levels

[4] Background measurements will be obtained in accordance with Section 5.2 of this plan. Final Status Survey measurements will be evaluated by comparison with the background measurements using the ProUCL Version 4.0 Nonparametric statistical tests Wilcoxon Mann Whitney test, and Quantile test to determine if the survey area is distinguishable from background. These tests are similar conceptually to the tests in NUREG 1505, Section 13 "Demonstrating Indistinguishability from Background."

to demonstrate that the materials are not above background will require a material specific background study to be performed as described in Section 5.2 of this plan. This background study will include the building materials that are not impacted and will include sheet metal, poured concrete, and concrete block. A one minute count time will be used for all static measurements during the background study. A shorter count time may be used during release surveys if it is sufficient to see the desired background levels determined during the background study and evaluation.

6 NYCRR 360, Solid Waste Management Facilities, and 6 NYCRR 380, Department of Environmental Conservation, Prevention and Control of Environmental pollution by Radioactive Materials, prohibit the disposal of radioactive materials in NY State land disposal facilities. Therefore the building will be surveyed and any material that is distinguishable from background will not be disposed of in NY State.

1.4 ASBESTOS, HAZARDOUS MATERIALS AND CHEMICAL CONTAMINANTS OF CONCERN

Asbestos containing materials (ACM) may be present in the exterior roof and siding, and paint in Building 401. Hazardous material contaminants that may be present include: lead based paint, thermostats containing mercury, PCB-containing capacitors and light ballasts, light fixtures containing mercury, mercury/sodium vapor lights. Chemical contaminants found in the water and sediments from drains include: oils; organic solvents, phenols, pesticides, and PCBs; and metals including arsenic, cadmium, chromium, mercury, lead, and nickel.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The Project Organization chart is shown in the Site Operations Plan. The following outlines personnel responsibility and lines of authority for this project. Additional details are in the project Quality Control Plan.

Program Manager – The Program Manager is responsible for facilitating the project via upper-level programmatic support.

Project Manager - The Project Manager (PM) is responsible for providing adequate resources (budget and staff) for implementation of the Project. The PM has overall management responsibility for the project. The PM may explicitly delegate specific tasks to other staff, but retains ultimate responsibility for completion of the project.

Radiation Control Manager – The Radiation Control Manager (RCM) is the manager responsible for the overall radiological sampling and survey activities at the site and is responsible for the quality of work. The RCM shall maintain a physical presence at the site, and is responsible for all field radiological related activities at the site throughout the project. In addition to the Field Sampling Plan responsibilities the RCM will also provide the radiological engineering and health physics oversight and review required to assure the integrity and consistency of the data generated during the site investigation. This individual will be responsible for developing the procedural requirements and defining the instrumentation used for field surveys. This individual will be responsible for assuring that only properly calibrated equipment and instruments are available for use. Additional responsibilities will include liaison with the off-site analytical laboratory and support of analytical data verification and reviews.

Contractor Quality Control (CQC) Systems Manager – The CQC Systems Manager will maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC Systems Manager shall be responsible for overall management of CQC and have the authority to act in all matters for the contractor.

Site Safety and Health Officer – The Site Safety and Health Officer will have overall responsibility for the safety and health of all personnel on the Site.

Waste/Site Support Manager – the Waste Support/Site Manager will manage and coordinate on-site activities associated with collection, packaging, handling and preparation for disposition of wastes generated as a result of site operations. This individual will also provide site operations and logistics support for vehicles, equipment operation and maintenance, subcontractor and supplier coordination and support for sample collection, preparation and shipment.

Senior Radiological Control Technicians (RCTs) – The Senior RCTs will be responsible for establishing and providing oversight for on-site environmental monitoring and radiological control programs in accordance with applicable regulatory guidelines, USACE requirements and the Accident Prevention Plan / Safety and Health Plan. The Senior RCTs will lead the field radiological survey activities, assure properly calibrated equipment and field instruments are available for use, and provide day to day supervision of other RCTs in efforts associated with sample collection and preparation of documentation related to radiological data generated from field measurements.

2.1 SUBCONTRACTORS

On-Site Subcontractors

The following subcontractors will perform on-site services on this project. These subcontractors shall work under the provisions of this FSP:

DEMCO - will provide services for site access to performance of field surveys and sampling activities. DEMCO will also collect all contact water, decontamination water, and sludge, debris and liquids from the Building 401 sumps, drains and trenches

GPR Professional Services - will provide the GPR location of underground utilities.

Fifty-Six, Inc., a NYS certified and licensed asbestos inspector, will survey the exterior of the building for ACM. Unless specifically exempt by an approved variance, confirmed ACM will be removed prior to building demolition by a NYS certified and licensed abatement contractor in accordance with NYS Code Rule 56. A copy of Fifty-Six, Inc. license will be obtained prior to the start of field activities.

Off-Site Subcontractors

Off-site analytical services will be used for waste sample analysis and quality assurance/quality control samples. Results will include electronic data packages.

Name: General Engineering Laboratories, LLC (GEL)
Address: 2040 Savage Road
Charleston, SC 29407
843-556-8171

Name: TestAmerica Laboratories, Inc.
Address: 13715 Rider Trail North
Earth City, MO 63045
314-298-8566

3.0 PROJECT SCOPE AND OBJECTIVES

3.1 TASK DESCRIPTION

Building 401 will be demolished in accordance with the Demolition Plan. Field sampling activities in this FSP are specific to the requirements necessary to identify and remove all waste from Building 401, to perform a final release survey of Building 401 prior to demolition, to provide confirmatory surveys during demolition, to process waste and debris for recycling or disposal, and prepare waste for shipment to an off-site disposal or recycling facility. This FSP does not address sampling necessary to support radiation or occupational safety during remediation activities. Sampling for occupational safety is detailed in the Accident Prevention Plan/Site Safety and Health Plan.

TES will utilize the information contained in historical reports to guide and direct surveys, sampling and analysis to meet the Data Quality Objectives (DQOs) in the QAPP. This FSP describes locations, scanning and sampling techniques.

A list of the procedures to be used during the field sampling and surveys is included in the QAPP.

Solid Waste Disposal or Recycling

Pre-demolition sampling and surface scanning will be performed, as needed, to determine waste streams for recycling, decontamination and free release disposal with possible LLW disposition to the Clive Disposal facility in Utah in accordance with the Demolition Plan. Use of previous radiological surveys will direct the sampling. Suspect "stained" areas will be evaluated for RCRA sampling or decontamination.

Contact Water Management

The TES Project Team will perform both radiological and RCRA waste sampling of all contact water and decontamination water collected directly from Building 401 demolition area during demolition activities. Contact water and decontamination water will be collected in accordance with the Demolition Plan. Composite sampling of containerized liquids prior to release from the Site will be performed and analyzed for radiological and RCRA contaminants prior to shipment for processing.

Sludge and Liquid Disposal

The TES Project Team will perform both radiological and RCRA waste sampling of all sludge, liquid and debris taken from Building 401 sumps, pits, and drains prior to grouting. Use of previous radiological and chemical surveys will direct the sample analysis.

Final Building Release Surveys

A Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) based radiological survey will be performed prior to demolition in accordance with this FSP. The final release surveys will be performed after radiologically contaminated items have been removed from the building. The survey will consist of surface scanning, direct (static point) measurements, and smears for removable contamination. A grid system will not be established for these surveys. Where available, the previous grid markings that were established by ORISE may be used as reference for the survey documentation.

Disturbed Areas Surrounding Building 401

The TES Project Team will perform radiological surface scan of all disturbed areas affected by the demolition equipment and operations prior to and after demolition activities are performed.

Imported Gravel Material

All gravel material imported for use at the Site will meet the USACE requirements for imported soil and crushed stone. The material suppliers will provide confirmatory sampling from a USACE approved laboratory meeting the same requirements.

Other Miscellaneous Wastes and Monitoring

Universal Waste – All universal waste, such as mercury switches, florescent lights, batteries, etc. discovered during demolition will be disposed of at an appropriate disposal site.

Bird and Animal Waste – All bird and animal waste discovered during demolition will be treated to neutralize any potential biological hazards and disposed of in accordance with the Demolition Plan.

Air Monitoring - Site required air-monitoring sampling for radiological constituents will be addressed in the Radiation Safety Program (RSP). The RSP is provided as an Attachment to the Accident Prevention Plan/ Site Safety and Health Plan (APP/SSHP) for this project.

Asbestos Monitoring – Site required asbestos monitoring and sampling will be provided by a State of New York Licensed Third Party Asbestos Inspection Service Fifty-Six Services, Inc. Their survey and sampling procedure is provided as Attachment 3 to this plan.

3.2 PROJECT SCHEDULE

The Project schedule for the project is included in the Site Operations Plan.

3.3 FSP OBJECTIVES

The objectives of this FSP are to:

Perform pre-demolition radiation surveys of all work areas including 15 meters outside Building 401. These surveys will include surveying items previously identified and shown in Attachment 1 of this plan, to determine if the levels exceed the unrestricted release criteria defined in 1.3 of this plan.

Specify sampling and analysis requirements to ensure waste material is properly characterized for safe removal from the building, and waste is properly segregated upon removal from the building. Waste streams will be identified based on the similarity of physical, chemical, and radiological characteristics, and planned disposition. Waste segregation will be accomplished using historical information and samples, visual inspection, and surveys obtained using this plan. Materials will be segregated into the following categories. The expected volumes and expected disposition sites are outlined in the Waste Management Plan. All materials disposed in NYS sites will comply with applicable NYS regulations.

- Metal that can be free released and recycled (through Niagara Metals),

- Material that can be free released and disposed of as clean waste (at the Modern Landfill),
- Radiologically contaminated waste (to be shipped and disposed of at EnergySolutions site in Clive, UT),
- ACM and Construction/Demolition Debris (Modern landfill)
- Hazardous waste (to be disposed of at the Chemical Waste Management (CWM) landfill),
- Mixed waste (to be shipped and disposed of at Energy*Solutions* in Clive, UT), and
- Water collected from the project (to be disposed of at Lockport Wastewater Treatment Plant).

Obtain samples to characterize the waste streams. The sampling and analyses of the waste streams will be consistent with the requirements of the waste disposal facility to establish the waste profiles. A minimum of three (3) discrete grab samples (not composite) per waste stream will be collected and analyzed for the expected contaminants, and based on analysis requirements of the waste disposal facility. Samples of radiological waste and samples of hazardous waste will be obtained in accordance with the disposal site WAC.

Perform final surveys of walls, floors, ceilings, and drains and penetrations above the first floor, to document unrestricted release criteria using MARSSIM protocols, prior to building demolition.

Perform confirmatory radiological surveys during demolition and waste packaging.

Obtain samples of water and sludges collected during the demolition process including decontamination liquids for analysis of radiological and RCRA contamination.

Perform perimeter and local air monitoring for radioactive contaminants.

Obtain samples of gravel material from the off-site borrow source for analysis of radiological and RCRA contamination.

Perform post-demolition radiation surveys of the building slab and surrounding area.

Information on project Data Quality Objectives (DQOs) are located within section 3.0 of the QAPP (Vol. 2 of the SAP).

3.4 FIELD MEASUREMENTS

Radiological field measurements will be performed throughout the project. The specific field survey activities are described in Section 5.0 of this plan. The surveys within Building 401 will focus on the primary radiological contaminants of concern as described in Section 1.3. A gamma scan of the soils surrounding Building 401 (out to 15 meters beyond the work area) will be performed to document the status prior to and following demolition of the buildings. Soils will not be remediated. Gamma scans are to document that the area was not negatively impacted by the building demolition.

3.4.1 Radiological Survey Instrumentation

Radiation detection and measurement instrumentation will be selected based on the type and quantity of radiation to be measured. The instruments used for direct measurements will be capable of detecting the radiation of concern to minimum detectable concentrations (MDCs) outlined in Section 3.4.4. The instrumentation to be used by the TES project team is provided in Table 3-1.

The TES project team plans to use the Ludlum Model 2350-1 Data Logger or equivalent with gas flow proportional detectors for building surface scans and direct measurements of total alpha+beta[5] surface activity. Sodium Iodide (NaI(Tl)) scintillation detectors will be used for gamma radiation scans. The Data Logger is a portable microprocessor computer based counting instrument capable of operation with NaI(Tl) gamma scintillation, gas-flow proportional, GM, and zinc sulfide (ZnS) scintillation detectors. The Data Logger is capable of retaining in memory the survey results and instrument/detector parameters for up to 1,000 measurements. This data is then downloaded to a computer for subsequent reporting and analysis.

The Ludlum Model 43-68 (126 cm2), gas-flow proportional detector with 0.8 mg/cm2 Mylar windows will be used for surface scans and direct alpha+beta measurements and a Ludlum Model 44-10, a 2"×2" NaI(Tl) gamma scintillation detector for gamma radiation scans and field screening of soil cores. Other instruments and detectors may be used based on the progress of survey activities. Smears for removable surface activity measurements and airborne particulate samples will be analyzed using a Ludlum Model 2929 or equivalent. Instruments will be operated in accordance with CS-FO-PR-005, *General Operations of Radiological Survey Instruments*. Additional operational information on use of the Ludlum Model 2350-1 data loggers will be in accordance with Procedures CP-INST-201, *Operation of the Ludlum Model 2350-1 Series Data Loggers*, and CP-CSA-203, *Ludlum Model 2350-1 Series Data Logger Download Operation*.

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[5] Alpha+beta measurements are performed using either a Geiger-Mueller counter or a gas proportional detector operated at an alpha+beta voltage.

Table 3-1 Radiological Survey Instrumentation

Instrument/ Detector	Quantity	Detector Type	Radiation Detected	Calibration Source[1]	Use
Ludlum Model 2350-1 or 2360 with. 43-68 detector	4	Gas-Flow proportional ($126 cm^2$)	Alpha and Beta	^{230}Th (α) ^{99}Tc (β)	Total Alpha and Beta Measurement and Beta Scans.
Ludlum Model 2350-1 or 2360 with 44-10 detector (or equivalent)	2	2" X 2" NaI (Tl) Scintillator	Gamma	^{137}Cs (γ)	Exposure Rates
Ludlum 2929 with a 43-10-1 detector (or equivalent)	2	Phoswich ZnS(Ag) & plastic scintillator	Alpha and Beta	^{230}Th (α) ^{99}Tc (β)	Smear Counting
Ludlum Model 2350-1 or 2360 with 44-9 detector (or equivalent)	2	Geiger Muller 15 cm^2	Beta and Gamma	^{99}Tc (β)	Total Beta Measurements and Beta Scans on Small Surfaces
Ludlum Model 2350-1 or 2360 with 43-5 detector (or equivalent)	2	Alpha Scintillator $50 cm^2$	Alpha	^{230}Th (α)	Total Alpha Measurements on Small Surfaces
Ludlum Model 177 with 44-9 detector	2	Geiger Muller 15 cm^2	Beta and Gamma	^{99}Tc (β)	Personnel Monitoring and Beta Scans
Eberline E-520 with HP-270 probe or Equivalent	1	GM Tube	Gamma surveys	^{137}Cs (γ)	Shipping Surveys

These calibration sources are generally conservative for determining the detector efficiencies for the RCOC shown in Table 1-1. At the discretion of the RCM a weighted efficiency to the specific radionuclides in the mixture may be determined, documented, and retained with instrument calibration documentation.

3.4.2 Instrument Calibration

Survey instruments, counting devices, and other equipment used for radioactivity detection and measurement shall be cared for and maintained as discussed in CS-FO-PR-002 (as listed in the QAPP).

All radiological survey instruments will be calibrated at least annually using approved procedures, using sources traceable to the National Institute of Standards and Technology (NIST), and using industry standard calibration equipment.

The instrument calibration includes:

- high voltage calibration,
- discriminator/threshold calibration,
- window calibration,
- alarm operation verification, and
- scaler calibration verification.

The detector calibration includes:

- operating voltage determination,
- calibration constant determination, and
- dead time correction determination.

Calibration labels showing the instrument identification number, calibration date, and calibration due date are attached to all portable field instruments. The Radiological Control Technicians (RCT) are trained to check the instrument calibration label before each use to ensure they are using a properly calibrated instrument.

3.4.3 Response Checks and Radioactive Sources

Prior to use on-site by the TES project team, all instrument calibrations will be verified and initial response data collected by the Radiological Control Technicians (RCT). These initial measurements may be used to establish instrument control charts and performance standards (response ranges) in which the instruments can be tested against on a daily basis when in use. An acceptable response for field instrumentation is an instrument reading within ±20% of the established check source value. Control charts for the Ludlum Model 2929 with a 43-10-1 detector will be established in accordance with CS-FO-PR-004, *QA/QC of Portable Radiological Survey Instruments*.

The daily response tests results will be documented and compared to these operating parameters and ranges to ensure that the instrumentation was functioning properly. When an instrument fails a response check, the results will be investigated to determine the cause of failure. In the event that the instrument is not functioning properly, the instrument will be removed from service for repair and re-calibration.

All radioactive sources used for calibration or efficiency determinations for this project will be representative or conservative to the instrument's response of the identified nuclides that are present at the site and are traceable to NIST.

3.4.4 MDC Calculations

Count times for field measurements will be set to see less than 50% of the limits specified in Section 1.3 of this plan. Specifically the MDCs shown in Table 3-2 will be met. If the background study shows that lower detection limits are needed in order to determine that materials are not statistically different from background, then lower MDC limits will be used. In practice the MDCs for the static alpha, static alpha+beta, removable alpha, and removable beta will likely achieve approximately 10% of the limits shown in Section 1.3. Surface scans will be performed to 50% of the limits as shown in Table 3-2.

While the MDCs in Table 3-2 will be low enough to demonstrate what would be allowable by Regulatory Guide 1.86, to demonstrate that the materials are not distinguishable from background will require a material specific background study to be performed as described in Section 5.2 of this plan. This background study will include the building materials that are not-impacted and will include sheet metal, poured concrete, and concrete block. A one minute count time will be used for all static measurements during the background study. A shorter count time may be used during release surveys if it is sufficient to see the desired background levels determined during the background study and evaluation.

Table 3-2 MDCs for Field Instruments

Measurement	MDC (dpm/100cm^2)
Static Alpha	1,000
Removable Alpha	100
Static Alpha+Beta and building surface scans	2,500
Removable Beta	250
MDCs based on 50% of the Regulatory Guide 1.86 criteria shown in Section 1.3. The background study will determine the required MDCs for the survey. Static count times during building surveys will be less than or equal to 1 minute.	

3.4.4.1 MDC for Static Measurements for Total Alpha+Beta or Total Alpha Surface Activity

The MDC is defined as the smallest concentration of radioactive material in a sample that will yield a net positive count with a 5% probability of falsely interpreting background responses as true activity. The MDC is dependent on the counting time, geometry, sample size, detector efficiency, and background count rate. The equation used for calculating the MDC, in dpm/100 cm^2, for total surface activity is:

$$\mathrm{MDC} = \frac{3 + 3.29\sqrt{R_B\, t_S\left(1 + \frac{t_S}{t_B}\right)}}{(\varepsilon_s)(\varepsilon_i)(t_S)\left(\frac{\text{probe area}}{100\ \text{cm}^2}\right)} \quad \text{(Equation 3-1)}$$

where:

R_B	=	background count rate (counts per minute [cpm]);
t_S	=	sample count time (min);
t_B	=	background count time (min);
ε_s	=	surface efficiency (determined using ISO-7503);
ε_i	=	2π instrument efficiency.

The efficiency determinations for static point alpha and static point beta measurements will be made in accordance with the recommendations found in the International Standards Organization (ISO) publication ISO-7503-1, *Evaluation of Surface Contamination – Part 1: Beta Emitters and Alpha Emitters* -1988. The ISO standard specifies that an instrument efficiency, ε_i, is determined based on the 2 pi alpha or beta emission rate from the radioactive source standard. A surface efficiency, ε_s, is specified in the ISO standard for alpha emitters as 0.25 and for beta emitters with energies greater than 0.4 MeV as 0.5. The total efficiency is given as the product of $\varepsilon_i\varepsilon_s$.

The static MDC for a Ludlum Model 43-68 gas proportional detector with a thin Mylar window (0.8 mg/cm^2), a probe area of 126 cm^2 will be determined in the field prior to use for each mode (alpha+beta, and/or alpha only detection) that the instrument will be operated.

3.4.4.2 MDC for Removable Surface Activity

The equation for determining the MDC, in dpm, for smear counters (removable surface activity) is similar to the equation for total surface activity (Equation 3-1). The difference is that the probe area variable and the surface efficiency is not required because smears are collected from an area of 100 cm^2 and provide a consistent surface for counting both alpha and beta contamination on the smear. Refer to variable definitions for Equation 3-1.

$$MDC = \frac{3 + 3.29\sqrt{R_B t_S \left(1 + \frac{t_S}{t_B}\right)}}{(\varepsilon_s)(\varepsilon_i)(t_S)} \quad \text{(Equation 3-2)}$$

3.4.4.3 MDC Scan Survey

Building Surfaces and Structures

Following the guidance of MARSSIM and NUREG-1507, the scan MDC for building and structural surfaces is determined by using the following equation:

$$\text{Scan MDC (dpm/100 cm}^2\text{)} = \frac{d'\sqrt{b_i}\left(\frac{60}{i}\right)}{\sqrt{p}\,(\varepsilon_s)(\varepsilon_i)\left(\frac{\text{probe area}}{100\text{ cm}^2}\right)} \quad \text{(Equation 3-3)}$$

where:

d'	=	index of sensitivity (Table 6.5 of MARSSIM);
b_i	=	background counts per observation interval;
i	=	observation interval (seconds);
p	=	surveyor efficiency (0.5 per MARSSIM);
ε_s	=	surface efficiency (determined using ISO-7503);
ε_i	=	2π instrument efficiency

In the case of the scan measurements, the counting interval will be the time the probe is over a specific source of radioactivity. This time depends upon the scan speed, the size of the source, and the fraction of the detector's sensitive area that passes over the source; with the latter depending on the direction of probe travel. The scan speed is typically one probe width per second so the observation interval will be one second.

Gamma Scans of Exposed Gravel

Scan MDCs for various radionuclides are listed in NUREG-1507, Table 6.4 for a scan speed of approximately 1 meter per second. The radionuclides that will be measured are primarily natural uranium and Ra-226. NUREG -1507, Table 6.4 lists scan MDCs for a 2”×2” NaI(Tl) scintillation detector of 80 and 2.8 picocuries per gram (pCi/g) for natural uranium and Ra-226, respectively.

3.4.5 Instrument Quality Control

Daily instrument quality control (QC) checks will be documented and performed before and after each day's work and as outlined in this FSP.

3.5 OFF-SITE LABORATORY ANALYSIS

Off-site laboratory analyses of samples may include the following:

Samples of waste to be removed from Building 401, to include volumetric solids, liquids, and debris, (or other samples) obtained to properly classify and profile wastes for disposal or acceptance at recycling facilities. These samples are needed: to verify that conditions of the WAC are satisfied, to complete required waste profile records and declarations (e.g., Hazardous Waste Analysis, and PCB Certifications) and to complete U.S. Department of Transportation (DOT), U.S. NRC, and disposal/recycling facility required manifests and shipping papers.

Liquid waste (wastewater), including water from sedimentation and erosion control areas, water drained and collected from debris following building demolition, decontamination liquids, and surface water runoff from established project work zones.

Samples of off-site gravel borrow material proposed for use as pre or post-demolition backfill.

Off-site laboratory analyses of gravel, building debris, waste and wastewater samples will address the parameters and analysis methods identified in the Quality Assurance Project Plan (QAPP).

4.0 NON MEASUREMENT DATA ACQUISITION

This plan has used the information contained in previous studies to define the radionuclides of concern and the number and types of surveys that will be described in Section 5.0 of this plan.

5.0 SURVEY/SAMPLING DESIGN

5.1 INTRODUCTION

The TES project team will perform surveys according to standard operations procedures as identified in the QAPP, this plan, and applicable requirements of the Accident Prevention Plan / Site Safety and Health Plan. The types of surveys supporting the project are detailed below in the chronological order that they are likely to occur.

Table 5-1 lists the number of samples and the types of analyses for the various waste streams. These samples meet the requirement in the SOW for 3 discrete samples. The information in the RI may provide the needed information to establish waste profiles for each disposal site. The samples in Table 5-1 will verify the expected contaminants or their absence. The sample locations will be selected during initial walk-downs and surveys of the building. Building debris samples may be collected from dust, sludge, or from the building surfaces. Discrete sample locations should be selected from material that is representative of the material to be disposed. If necessary, samples may be collected using a saw, a drill or a chipping hammer as necessary. Any drilling or chipping must be done with appropriate radiological controls.

Table 5-1 Number and Types of Samples

Material and Disposal Site	Minimum Number of Samples*	Analysis
Clean Building Debris (Modern Landfill)	3	RAD – Isotopic Uranium (U-234, U-235, U-238)
		RAD – Isotopic Thorium (Th-228, Th-230, Th-232)
		RAD – Isotopic Plutonium (Pu-238, Pu-239/240)
		RAD – Gamma Spectroscopy (Am-241, Cs-137, Ra-226)
		TCLP – Metals
		TCLP VOCs
		TCLP SVOCs
		PCB
		PAH
		Boron
Radiologically Contaminated Building Debris (Energy*Solutions*, Clive Utah)	3	RAD – Isotopic Uranium (U-234, U-235, U-238)
		RAD – Isotopic Thorium (Th-228, Th-230, Th-232)
		RAD – Isotopic Plutonium (Pu-238, Pu-239/240)
		RAD – Gamma Spectroscopy (Am-241, Cs-137, Ra-226)
		TCLP – Metals
		TCLP VOCs
		TCLP SVOCs
		PCB

		PAH
		Boron
RCRA Waste (WM Model City, NY)	3	RAD – Isotopic Uranium (U-234, U-235, U-238)
		RAD – Isotopic Thorium (Th-228, Th-230, Th-232)
		RAD – Isotopic Plutonium (Pu-238, Pu-239/240)
		RAD – Gamma Spectroscopy (Am-241, Cs-137, Ra-226)
		TCLP – Metals
		TCLP VOCs
		TCLP SVOCs
		PCB
		PAH
		Boron
IDW – Water City of Lockport (Wastewater Treatment Plant)	3	RAD – Isotopic Uranium (U-234, U-235, U-238)
		RAD – Isotopic Thorium (Th-228, Th-230, Th-232)
		RAD – Isotopic Plutonium (Pu-238, Pu-239/240)
		RAD – Gamma Spectroscopy (Am-241, Cs-137, Ra-226)
		Metals: arsenic, cadmium, chromium, copper, cyanide, lead, mercury, molybdenum, nickel, phosphorus, selenium, silver, zinc
		Total Dissolved Solids
		Biochemical Oxygen Demand (BOD)
		PAH
		Boron
ACM (Modern Landfill)	(**)	ACM. ACM will also be surveyed for radiological contamination, in place, PRIOR to removal.
Clean Metal for Recycling (Niagara Metals)	0	Metal will be surveyed for radiological release using the criteria in Section 1.3 of the FSP.
* A minimum of three (3) discrete grab samples are required for each waste stream (in accordance with the SOW). Separate samples may be required for each type of analysis.		

** The number of samples will be determined by the licensed Asbestos inspector.
Analysis and Disposal will be in accordance with applicable State and Federal Regulations.

5.2 Material Specific Background Study

5.2.1 Rationale

A background study to establish the material specific background of each type of building material will be performed using non-impacted surfaces within Building 401. The areas will be selected using the ORISE surveys as guidance for locations where no activity was detected. Suitable background locations will be located such that the material is representative but unaffected by FUSRAP contamination.

5.2.2 Survey Method

Static alpha, static alpha+beta, removable alpha, removable beta, and direct gamma exposure rate measurements will be obtained for the background study. Instrumentation will be the same instrument types that will be used during the project surveys. More than one survey instrument will be used for static alpha, and static alpha+beta measurements.

A study will be performed for: metal, poured concrete (including the silos), and block concrete. If other material types are encountered that cannot be represented by the material backgrounds, then additional materials will be evaluated on a case by case basis to establish additional data sets as necessary.

For each material approximately 4 separate areas will be selected and within each area 10 measurements of each (static alpha, static alpha+beta, removable alpha, removable beta, and gamma exposure) will be obtained at unique locations within the area. This will establish a data set of 40 independent measurements for each material and each type of measurement.

It is expected that static measurement count times will be 1 minute each unless otherwise directed by the RCM to achieve lower detection limits.

The following measurements will be taken using the 43-68 gas proportional detectors at each location:

- A shielded (with a plexiglass shield over the detector window) field background.
- A measurement of the material surface.

Concrete samples should be collected at three locations and analyzed to determine the concentrations of naturally occurring radionuclides (U-234, U-235, U-238, Ra-226, Th-230, Th-232, and Th-228).

5.2.3 Documentation

Each background measurement will be evaluated to determine the "material specific" background. The material-specific background will be determined by subtracting the plexiglass shielded field background measurement from the measurement of the material surface. The background data sets will be tabulated, summarized and basic statistics performed to determine the mean, standard deviation, minimum and maximum.

It is anticipated that the mean + 3 sigma will be used to establish a point above which any measurement will be assumed to be statistically above background. However, until the evaluation of the data is completed other methods may be utilized to establish the background measurement criteria.

The background study will be documented, reviewed and submitted to the USACE for approval prior to use for surveying materials for free release or for recycle use.

5.3 (PRE-DEMOLITION) INITIAL RADIOLOGICAL SURVEYS OF OUTSIDE AREAS

5.3.1 Rationale

Gamma scans will be performed of outside areas out to 15 meters beyond the work area to establish the existing radiological conditions. This data will establish the comparison for post-surveys to insure demolition activities do not radiologically contaminate other areas and to prevent contamination from outside areas from contaminating the demolition debris.

5.3.2 Survey Method

Gamma scans of the areas will be performed using a 2"X 2" NaI(Tl) detector (Ludlum Model 44-10 detector or equivalent) with a 2350-1 data logger or equivalent. Surveys will be performed moving the detector in a serpentine pattern at a speed of no greater than 1 meter per second, covering at least 50% of the area. The surveys will identify posted areas and areas of elevated radioactivity in the soils. Elevated areas may be covered with a geotextile fabric and 4 inch layer of 2 inch crusher stone, as described in the Demolition Plan.

5.3.3 Documentation

The survey will be documented on a survey map with areas of elevated (greater than 2 times the area background) exposure rates (or count rates) clearly marked. Areas of elevated activity will be reviewed by the RCM and PM.

5.4 (Pre-Demolition) Initial Radiological Surveys of Building 401 and the Silos

5.4.1 Rationale

These surveys will identify materials and surfaces that will need to be disposed of as LLW. Building scans and removable contamination levels will be used to identify areas previously identified and shown as UINs on the Attachment 1 drawings. These areas will be surveyed and areas exceeding the limits in Section 1.3 will be marked for remediation and segregation as radiologically contaminated waste. Other suspect areas will be investigated including

- Horizontal surfaces of accessible I beams within rooms 117, 121, and 122 will be surveyed with a 50% scan frequency due to the previous identification of elevated surfaces
- Drains on the second floor, ventilation equipment, fans, and penetrations will be surveyed at the discretion of the RCM to identify materials that need to be segregated as radioactive waste.

5.4.2 Survey Method

A gamma scan of the building will be performed using a 2"X2" NaI(Tl) detector with a Ludlum model 2350-1 data logger. The detector will be held approximately 10 cm from the floor and scans performed at a rate of approximately 1 meter per second. Approximately 25% of the floor areas will be scanned and biased surveys will also be performed of suspect areas (drains, crevices, penetrations, etc.). Areas exceeding 2 times background will be investigated.

Surface alpha+beta scanning and smears for removable contamination will be performed on the first floor at a scan frequency of approximately 25% of the area to document the initial condition for comparison with final condition of the as slab after demolition. Walls (below 2 meters) and floors on the second level will also be scanned at approximately 25% frequency or at the discretion of the RCM. Work and surveys will begin with the areas previously identified to be contaminated and recommended for follow-up scanning (guidance obtained from Attachment 1 drawings in this plan and the Bechtel National Report). A building wide confirmatory scanning will follow beginning on the roof and work will continue down through the structure with particular attention to suspect areas and areas not previously surveyed. The silos should be surveyed more thoroughly during this survey since there does not appear to be characterization data on the silos.

Survey personnel will mark using bright orange paint and/or detail on a survey map the sample and measurement locations exceeding the limits from the background study of this plan to ensure that the sample and/or measurement can be referenced to a physical site location.

5.4.3 Documentation

The survey will be documented on a survey map with areas exceeding the surface criteria in Section 1.3 clearly marked. Gamma scan measurements exceeding the scan MDC will also be marked on the survey map. Areas of elevated activity will be reviewed by the RCM and PM.

If the first floor (floor) areas are noted to contain removable contaminated above the criteria in Section 1.3 (Regulatory Guide 1.86 removable contamination criteria), consideration will be given to covering the areas prior to demolition, as described in the Demolition Plan. This will be done to prevent the building demolition materials from becoming contaminated when the building is razed.

5.5 (PRE-DEMOLITION) SURVEYS FOR NON-RADIOLOGICAL CONTAMINANTS

5.5.1 Rationale

These surveys provide the basis for the identification of ACM, hazardous materials and chemical contaminants.

5.5.2 Metals, SVOC, VOC, and PCB Sampling and Analyses of Waste Samples

TCLP analysis is an Environmental Protection Agency (EPA) SW-846 analytical method (Method 1311) that simulates sanitary landfill contaminant leaching in waste samples. Based upon concentrations of the TCLP constituents and guidelines set forth in 40CFR261.4, where the solid waste samples can be deemed hazardous or non-hazardous. The number of TCLP samples will be determined based on the hazard assessment. Each waste stream will have 3 representative samples analyzed for TCLP.

5.5.3 Asbestos Sampling and Analyses

5.5.3.1 Asbestos Sampling

A properly trained Asbestos Hazard Emergency Response Act (AHERA)-accredited Asbestos Building Inspector whose licensure is current in the State of New York will perform asbestos sampling for asbestos containing materials (ACM). The number of samples will be determined based on the asbestos hazard assessment.

ACM sampling and the building inspection shall comply with the procedures specified in the EPA's AHERA regulation (40CFR763.86).

5.5.3.2 Asbestos Analyses

ACM is defined in the EPA's National Emission Standards for Hazardous Air Pollutants (NESHAPs) as materials containing more than 1 percent asbestos as determined by polarized light microscopy (PLM) utilizing the method specified in the EPA's AHERA regulation (40CFR763).

5.5.3.3 Radiological Survey of ACM

Prior to removal of the ACM, the materials will be surveyed in place using alpha+beta scanning. Any material above background will be marked for removal as radioactively contaminated ACM. The surveys shall be documented.

5.5.4 Lead Sampling and Analyses

Lead Paint adhering to the surfaces meets the WAC for both recycling and disposal. No plans for Lead Sampling and Analysis are scheduled for the Site.

5.5.5 PCB Sampling and Analyses

5.5.5.1 PCB Sampling

PCB levels reported in the previously collected samples of the floor drains and sumps in the RI will be used for disposal. Confirmatory sampling of collected liquids and sludges and building debris will be performed.

5.5.6 Chemical Sample Protocol

Samples for chemical analyses will be collected in appropriate containers, evaluated to the appropriate holding times, and analyzed by the laboratory specified in Section 2.1.

5.6 IN PROCESS RADIOLOGICAL SURVEYS OF BUILDING 401 AND THE SILOS

In process surveys will be performed as directed by the RCM during removal of contaminated items to verify the conditions. These surveys will be performed as part of the operational program described in the RSP.

5.7 (PRE-DEMOLITION) MARSSIM- BASED FINAL RADIOLOGICAL SURVEYS OF BUILDING 401 AND THE SILOS

5.7.1 Rationale

After radiologically contaminated materials have been removed and or wrapped and marked (for structural materials that cannot be removed prior to building demolition) a MARSSIM-based final status survey will be performed of Building 401 and the silos.

This survey is the final confirmation that the building surfaces are not radiologically contaminated, and can be demolished and prepared for shipment for disposal as non-radioactive.

5.7.2 MARSSIM Final Radiological Survey Methods

5.7.2.1 Survey Overview

Building 401 and the silos will be surveyed using MARSSIM Class 3 radiological survey protocols, except for areas where previous remediation was conducted. Areas where there was remediation will be surveyed as MARSSIM Class 1 but the areas will be limited to the area covering and surrounding the remediation (out to a buffer of 5 feet surrounding the remediated area). A class 3 survey can be any size but the sizes for this survey will be based on the historical information with a greater survey frequency of scans and measurements in areas that are known to have elevated radioactivity. If the MARSSIM Class 3 survey results indicate the presence of contamination at 75% of the limits in Section 1.3, then: the number of measurements per unit area, and the scanning frequency should be increased to correspond to a Class 2 or Class 1 survey unit (at the discretion of the RCM). Class 1 and Class 2 areas will not be gridded as described in MARSSIM. Where available the grid markings that were developed during the ORISE survey will be used as reference for the survey documentation.

Survey units will be established to complete the Final Status Survey and will be based on historical information and potential for residual contamination. Survey packages will be developed for each survey unit that describe the survey unit, survey instructions, the number and types of measurements and/or samples required, codes for tracking the data, and identify any abnormal conditions or safety concerns that may be encountered during the survey.

The RCM or designee shall perform a walk-down of each survey unit during the development of the survey package.

Expected survey units are described in Table 5-1. These surveys may change at the discretion of the RCM based on information obtained during the remediation or area walk-downs. Note: since the first floor floors will not be free released a final survey of the first-floor floors will not be performed.

Table 5-2 Expected Final Status Survey Units

Survey Unit	Description	Alpha+Beta Scan Frequency	No. of Static Point and Smear Measurements (random locations)
1	Room 217 (2nd floor) floor areas previously remediated including a buffer zone out 5 feet	100% (Class 1)	20
2	Room 211 and Room 203 (2nd floor) floor areas previously remediated including a buffer zone out 5 feet from each area	100% (Class 1)	20
3	Room 122 Walls Below 2 meters	10%	20
4	Room 122 I beam horizontal surfaces	25%	20
5	Room 117 Walls Below 2 Meters	10%	20
6	Room 117 I beam horizontal surfaces	25%	20
7	Room 119 Walls Below 2 Meters	25%	20
8	Rooms 102, 108, and 115, Walls Below 2 Meters	10%	20
9	Room 121 Walls Below 2 Meters	10%	20
10	Rooms 127, 131, 132 Walls Below 2 Meters	10%	20
11	All Remaining First Floor Room Walls Below 2 Meters	10%	20
12	Room 217, 203, and 211 Floor	25%	20
13	Room 217, 203, and 211 Walls Below 2 Meters	10%	20
14	Room 217 I beam horizontal surfaces	25%	20
15	All Remaining Second-Floor Floors	25%	20
16	All Remaining Second-Floor Walls Below 2 Meters	10%	20
17	Second-Floor Remaining Horizontal I Beam Surfaces	10%	20
18	Silo Inner and outer Walls up to 3 meters	10%	30 (10 in each silo)
Static Point Measurements will include: (1) Static alpha, (2) Static alpha+beta, (3) Smear to be analyzed for alpha and beta removable contamination. Surface scans and static point measurements will be done with Ludlum model 43-68 gas proportional detectors unless the surface (such as an I beam) is too narrow for the detector width – for these cases a smaller detector will be used as specified in the survey package.			

5.7.2.2 Survey Methodology

Alpha+Beta Scans

Surface activity scans will be performed with the frequency shown in Table 5-1 and as specified in the survey package. The scans will be performed by moving the detector over the surface being scanned at a height of approximately 0.5 inches and at a rate of approximately 1 detector's width per second. While scanning, the technician will monitor the audible output of the survey meter. Areas of elevated activity will be investigated by collecting biased static point alpha and static point alpha+beta measurements. Areas of activity exceeding 5,000 dpm/100cm^2 alpha+beta, or as otherwise determined by the background study and specified by the RCM, will be marked and the corresponding static point measurements recorded.

Static Point Alpha and Static Point Alpha+Beta Measurements

Static point alpha and alpha+beta measurements will be taken at each static point measurement location. Measurements will be at predefined random locations (established using a pair of random numbers and then establishing the measurement location on the survey map).

Direct measurements will be taken using large area gas flow proportional detectors, (126 cm^2) in direct contact with the surface being measured.

For each survey unit a minimum of 4 shielded field background measurements will be required for each type of measurement (i.e., 4 shielded background measurements in the alpha+ beta mode, and 4 shielded background measurements in the alpha mode). The detector shield is simply a plexiglass or cardboard shield sufficient to shield out the surface activity while still allowing the detector to respond to ambient gamma radiation, effectively establishing the instrument background. The average of the 4 field background measurements will be used to convert gross count rate to net count rate.

The location of each measurement will be marked in the field and its location recorded on a drawing.

Smears for Removable Alpha and Removable Beta Contamination

At each static point measurement location, except on those surfaces subjected to environmental weathering, a smear will be collected to assess removable contamination. Smears will be analyzed on a Ludlum Model 2929 for simultaneous alpha and beta determinations.

Miscellaneous Samples

Miscellaneous samples will be collected as specified in the associated survey package. Sample media may include, sludge, concrete debris, etc. Minimum sample volumes are specified in the QAPP.

5.7.2.3 Sample Handling and Analysis

Samples will be sent to the off-site laboratory and analyzed for isotopic uranium, isotopic thorium, Ra-226, Cs-137 and Am-241.

5.7.2.4 Instrumentation

Instrumentation is as specified in Section 3.4 of this plan. Instrument logged data will be downloaded from the survey instrument into a database for storage, analysis, and reporting on a daily basis.

Results will be printed out, reviewed for completeness with the survey package requirements, and reviewed for analysis results that exceed the criteria in Section1.3.

5.7.2.5 Survey Package Documentation Review

The project team will maintain records of surveys for each area according to project procedures (as listed in the QAPP). The survey records may include the following information depending upon the survey design and protocols:

- Worksheet providing identification, survey location information, general survey instructions, and any specific survey instructions.
- Comments from the survey technician regarding any unusual situation encountered while surveying.
- Diagram/map of the area surveyed as available.
- Photographs of the survey area, as necessary, to show special or unique conditions.
- Printout of laboratory analysis results (if performed).
- Ludlum Model 2350-1 data files and values for all radiation survey measurements.
- Gamma radiation scan results.

Data and document control will include the maintenance of the raw data files, translated data files, and documentation of corrections made to the data. The data files will be backed up on a daily basis.

The RCM or designee will review the completed survey packages to ensure that all required surveys have been performed in compliance with this plan and the QAPP. In addition, the review will ensure that the completed survey packages contain all the necessary information to evaluate the data to the DQO decision rules listed the QAPP.

The survey package data will be compared to the material specific backgrounds that were established.

5.7.2.6 Reporting

Once all Final Status Survey Packages are completed and areas found to be less than the criteria of no activity statistically different from background, a report will be prepared summarizing the results. The report shall be reviewed by the RCM, a Certified Health Physicist, CQC, and the PM and transmitted to the USACE.

Building Demolition will then proceed.

5.8 IN-PROCESS DEMOLITION SURVEYS

5.8.1 Rationale

Verification surveys will be performed during demolition and as wastes are being staged for waste disposition. These surveys are simply a final check to verify the absence of radioactive material in the material segregated for disposal as non-radiologically contaminated and the material that will be sent for recycling.

5.8.2 Survey Method

Surveys will be performed using gamma scanning for waste piles, and surface contamination scans for metal to be recycled. The measurements will be such that approximately 5% of the material receives a verification check.

Notify the USACE within one (1) day of any material found identifying radioactive material.

5.8.3 Documentation

In-Process demolition surveys will be performed as a job coverage type of survey. The verification surveys of the waste piles will be recorded in a survey log book or on a survey form – the results will clearly note that the measurements and material is acceptable for free release. Elevated measurements will also be recorded and the material segregated for additional evaluation or disposal as LLRW.

5.9 (POST-DEMOLITION) RADIOLOGICAL SURVEYS OF OUTSIDE AREAS AND BUILDING SLAB

5.9.1 Rationale

Gamma scans will be performed of outside areas out to 15 meters beyond the work area to determine the final radiological conditions. This data will be compared to the pre-demolition surveys to insure the demolition activities did not radiologically contaminate other areas.

The Building Slab will be surveyed to ensure that the removable contamination does not exceed the regulatory guide 1.86 derived removable contamination limits shown in Section 1.3 of this plan.

5.9.2 Survey Method

Gamma scans of the areas will be performed using a 2"X 2" NaI(Tl) detector (Ludlum Model 44-10 detector or equivalent) with a 2350-1 data logger or equivalent. Surveys will be performed moving the detector in a serpentine pattern at a speed of no greater than 1 meter per second, covering at least 50% of the area. The surveys will identify posted areas and areas of elevated radioactivity in the soils. Elevated areas may be covered with a geotextile fabric and 4 inch layer of 2 inch crusher stone, as described in the Demolition Plan.

Surface alpha+beta scanning and smears for removable contamination will be performed on the first floor at a scan frequency of approximately 25% of the area to document the final condition of the slab. Smears will be taken at a frequency of approximately 1 per square meter and the removable contamination values compared to the removable activity limits in Section 1.3 (removable alpha < 200 dpm/100cm^2, and removable beta < 500 dpm/100cm^2).

5.9.3 Documentation

The survey will be documented on a survey map with areas of elevated (greater than 2 times the area background) exposure rates (or count rates) clearly marked. Areas of elevated activity will be reviewed by the RCM and PM.

5.10 Equipment Release Surveys

All equipment and instrumentation used in potentially contaminated areas will be scanned, and cleaned if necessary, prior to leaving the area to assure that contamination is not inadvertently moved out of controlled areas and does not interfere with accuracy of subsequent measurements. The results of these scans will be documented in the site logbook and reviewed by the RCM.

When there is a potential for contamination of containers or equipment during sample transport, suspect surfaces will be surveyed as directed by the RCM. Should decontamination be necessary, a follow-up survey will be performed to assure that all surfaces are as low as reasonably achievable (ALARA). Surveys of equipment or other items will be documented in the site logbook and reviewed by the RCM.

6.0 SAMPLE IDENTIFICATION, STORAGE, PACKAGING AND SHIPMENT

6.1 Sample Identification

All samples will be identified using an alphanumeric code for the purpose of identification and traceability as indicated in procedure CS-FO-PR-003, *Soil Surveys; Collection of Water, Sediment, Vegetation, and Soil Samples; and Chain of Custody Procedure* (as listed in the QAPP), using the following sample identification system. All samples collected for analysis will be identified using an alphanumeric code.

(1) The first four characters represent the acronym for the facility (NFSS)

(2) The fifth character designates the general category describing the sampling approach.

- a. B – Biased: Samples collected to provide further information about specific areas such as "hot spots" or locations suspected of having high potential for contamination.
- b. R – Random: Samples collected at either a random location on a predetermined point on a random-start grid.
- c. A – Background: Samples collected on-site in areas not impacted by radioactive material or collected from remote areas.
- d. O – Other: Note the category on the identification label.

(3) The sixth and seventh characters are abbreviations of the medium or the type of sample collected. Also note on the sample identification label wheather the

sample is a discrete grab sample, a composite sample, depth, elapsed time of samples, etc. as needed.

SL – Soil

SD – Sediment

TC – Transferable Contamination (smear)

MB – Base Metal

MP – Metal Plateout

DS – Drain Sediment

CN – Concrete

GW – Groundwater

SW – Surface Water

CW – Containerized Water

O - Other

(4) The eight through the eleventh characters are the unique sample number. This is the sample number contained in the sample log. These numbers should be sequential unless otherwise specified by the project management.

(5) Example of a sample code

NFSSBMB0001 – Niagara Falls Storage Site, biased, base metal, number 1

6.2 Sample Storage

All samples will be stored in a controlled area established by the TES project team in consultation with USACE. Samples will be inspected prior to being placed in the storage area for legible identification, potential damage, adequate packaging, and traceability to sample records. Packaging and identification shall be consistent with the duration and conditions of storage. An inventory and sample retention time shall be maintained throughout the storage period. All chemical samples will be stored in appropriate containers to ensure all laboratory specific requirements (temperature, moisture, etc.) are maintained prior to shipment.

6.3 SAMPLE PACKAGING

Sample containers will be packaged in thermally insulated rigid-body coolers. Sample packaging and shipping will be conducted in accordance with applicable DOT and Internaltional Air Transport Association (IATA) (if shipped by air) regulatory requirements. Prior to sample shipment, each container will be prepared as follows:

- Contents of sample containers will be identified with definitive labels placed onto each container.
- The cap tightness will be checked and clear tape placed over the label completely encircling the container.
- Each sample container will be wrapped in bubble wrap or closed cell foam sheets
- Each sample container will be enclosed in a clear zip-lock plastic bag. As much air as possible will be forced from the sample container bags before sealing.

Once the above procedures have been completed for each sample container, the following procedures will be performed for each sample cooler:

Several layers of bubble wrap (inert packing material) will be placed on the bottom of the cooler and inside the cooler to prevent shifting during transport. The cooler will be lined with an open garbage bag, all samples will be placed upright inside the garbage bag, and the bag will be tied. Ice is not required for shipping most radiological solid samples. Ice is required for shipment of debris samples, surface water samples and sediment samples that will be analyzed for TCLP metals or PCB analysis – The receipt temperature is required to be < 4 degrees centigrade. Before initial placement of samples into a rigid-body cooler, the cooler drain plug will be taped shut both inside and outside the container.

All required laboratory paperwork, including the chain of custody form(s), will be placed inside the cooler. If more than one cooler is being used, each cooler will have its own documentation.
Upon completion of the packing process, the cooler lid will be closed and two signed/dated custody seals will be placed on the cooler, one across the front and one across the side of the cooler, such that opening the cooler will result in breaking the custody seals.

Rigid-body coolers will be sealed by applying strapping tape directly to the cooler body. Arrows indicating “This Way Up” will be placed on each cooler. The cooler will then be delivered by commercial courier to the laboratory.

6.4 Requirements for Samples Classified as Radioactive Materials

Samples Generated during project activities will be transported IAW procedures that ensure compliance with regulatory requirements for shipping radioactive samples. Radiological samples will follow the Sample Packing procedures presented above for container preparation prior to sample shipment including a radiological survey on the outside of the container for radioactivity. In addition, each cooler will also undergo the following:

The cooler will be surveyed for radiation and contamination IAW HP-702 "Transfer of Radioactive Material" to ensure the package meets the requirements for limited quantity as found in 49 CFR Part 173.

A notice will be placed on the outside of each cooler that includes the name of the cosigner and the statement "This package conforms to the conditions and limitations specified in 49 CFR 173.421 for radioactive material, excepted package-limited quantity of material, UN2910". The outside of the inner packaging or, if there is no inner packaging, the outside of the package itself, will be labeled "Radioactive" if fully applicable.

6.5 Sample Shipping

All environmental samples collected during the project will be shipped no later than 12 to 72 hours after time of collection. The latter time of 72 hours may be necessary if the samples are collected on a Friday and have to be shipped Monday. During the time between collection and shipment, all samples will be stored in a secure area to maintain custody.

6.6 Sample Accountability/ Chain of Custody

All samples will be tracked from the time the sample is obtained through final disposition or disposal of the sample by the analytical laboratory. If samples are returned to the site from the laboratory, those samples will be retained until authorization for disposal in the appropriate waste stream is provided by the USACE. Tracking will include the use of a Chain-of-Custody Record to track samples that are sent offsite for analysis as indicated in procedure CS-FO-PR-003 (as listed in the QAPP). Samples that may be returned to the site from the laboratory will also be tracked.

7.0 QUALITY ASSURANCE AND QUALITY CONTROL

All work will be performed in a quality manner using this field sampling plan and implementing procedures as listed in the QAPP.

The following Quality Control measures will be utilized as an integral part of the survey process.

General Provisions

7.1 SELECTION OF PERSONNEL

Project management and supervisory personnel are required to be familiar with this field sampling plan, the procedures referenced in the QAPP.

Personnel for this project will be selected based upon their experience and familiarity with area remediation and decontamination activities. Likewise, health physics technicians who will perform the surveys will be selected based upon their qualifications and experience.

7.2 WRITTEN PROCEDURES

Procedures referenced in the QAPP and this FSP shall control all survey tasks performed to ensure survey data quality.

7.3 INSTRUMENTATION SELECTION, CALIBRATION, AND OPERATION

Instruments proven to reliably detect natural uranium will be utilized. The TES project team will calibrate instruments or use qualified vendors under approved procedures using calibration sources traceable to the NIST. All detectors are subject to daily response checks when in use.

Instrument selection, calibration, and response checks were also discussed in selected sections of this field sampling plan.

7.4 SURVEY DOCUMENTATION

Records of surveys will be documented and managed in accordance with procedure CS-FO-PR-001. The forms in procedure CS-FO-PR-001 may be used as templates for project specific forms for the surveys to be performed by the TES project team. Survey measurements will be identified by the date, technician, instrument type and serial number, detector type and serial number, location code, type of measurement, mode of instrument operation, and QC sample number, as applicable.

The field data collected will be managed using forms or bound field notebooks. Laboratory data may be transcribed onto a computer-based management system. This data will be summarized in a manner that provides efficiency in data reduction, tabulation, and evaluation. All measurements taken during this project will be identified by source, type, and sample location to avoid ambiguity. Field records will include the following minimum information:

- A chronological listing of significant site events and sampling activities
- Site Name, field team members, signature, and date on each page
- Site conditions, notes or sketches of sampling locations and sample descriptions
- Sample times
- Record of all measurements (e.g. field screening parameters).
- Photographic Log (if taken)

7.5 CHAIN OF CUSTODY

Responsibility for the custody of samples from the time of collection until results are obtained is provided for in procedure CS-FO-PR-003, *Soil Surveys; Collection of Water, Sediment, Vegetation, and Soil Samples; and Chain-of-Custody Procedures*, (as listed in the QAPP). All samples shipped offsite for analysis will be accompanied by a chain-of-custody record to track each sample.

Chain-of-custody forms will be completed and will accompany each sample at all times. Data on the forms will include the sample ID, tracking number, depth interval, date sampled, time sampled, project name, project number, and signatures of those in possession of the sample. Forms will accompany those samples shipped to the designated laboratory so that sample possession information can be maintained. The field team will retain a separate copy of the chain-of-custody reports at the field office. Additionally, the sample ID; date and time collected; collection location; tracking number; and analysis will be documented in the field logbook.

The individual responsible for shipping the samples from the field to the laboratory will be responsible for completing the chain of custody form. This individual will also inspect the form for completeness and accuracy. In addition, this individual will be responsible for determining the shipping classification for samples under United States Department of Transportation (USDOT) regulatory requirements. After the form has been inspected and determined to be satisfactorily completed, the responsible individual will sign, date, and note the time of transfer on the form. For commercial carriers, the chain of custody form will be placed in a sealable plastic bag and placed inside the cooler used for sample transport after the field copy of the form has been detached. The chain of custody form will be placed in a sealable plastic bag inside the cooler. The field copy of the form will be appropriately filed and kept at the site for the duration of the field investigative activities.

Shipping containers will be secured using nylon strapping tape and chain of custody seals. Chain of custody seals will be placed on each cooler used for sample transport. These seals will consist of a tamper-proof adhesive material placed across the lid and body of the coolers in such a manner that if the cooler is opened, the seals will be broken. Chain of custody seals placed in this manner will ensure that no sample tampering occurs between the time of sample placement in the coolers to the time the coolers are opened for analysis at the laboratory. Cooler custody seals will be signed and dated by the individual responsible for completing the chain of custody form contained within the cooler.

7.6 Records Management

Generation, handling, and storage of survey data packages are controlled by procedure QC 4.2, *Records Management* (as listed in the QAPP).

7.7 Independent Review of Survey Results

All survey results shall be reviewed by the RCM.

Final Status Survey packages and data from each survey unit will receive review by the RCM, and an independent review from an off-site TES project team professional to verify all documentation is complete and accurate prior to being submitted to the USACE.

7.8 Sample Analyses and Measurements

The TES project team will ensure that quality control checks are performed per the QAPP on all measurements and sample analyses, to include those collected as defined by the Accident Prevention Plan / Safety and Health Plan for health and safety. If samples do not contain sufficient material to prepare two separate samples, then the duplicate analyses will not be performed. Duplicate measurements will be performed for direct measurements and duplicate analyses will be performed for smears. Alpha+beta direct measurements will be duplicated on randomly selected locations at different times with different detectors if possible to check the quality control of the measurement.

All samples sent offsite will be analyzed for their hazardous constituent by either TestAmerica Laboratories, LLC, or GEL Laboratories, LLC approved vendors of the TES project team. Holding times and container requirements are defined by the laboratories as described in the QAPP. Both laboratories meet DoD QSM requirements and are DoD ELAP certified.

7.9 TRAINING

All project personnel will receive site specific training to identify the specific hazards present in the work and survey areas. In addition, the TES project team and their subcontractors will receive a briefing and review of this field sampling plan, applicable procedures (as listed in QAPP), the QAPP, and the Accident Prevention Plan / Safety and Health Plan. Copies of all training records will be maintained onsite through the duration of onsite activities.

During site orientation and training, survey personnel will become familiar with site emergency procedures. In the event of emergency, personnel will act in accordance with all applicable site emergency procedures.

8.0 INVESTIGATION DERIVED WASTE (IDW)

Any investigation derived waste (IDW) such as personnel protective equipment, sampling tools, plastic sheeting, etc. will be surveyed and either disposed of as LLW or as clean debris to the approved landfill. Water used during demolition will be collected and sampled for the analytes listed in Table 5-1 of this FSP

9.0 SURVEY REPORT

The TES project team will begin preparing a Survey Report in parallel with survey activities while onsite. This report will include all relevant survey and sample analysis data. The report will also contain survey forms, survey and sampling maps, instrument calibration information, and other information necessary to support the validity of the data. The survey report will be included in the project completion report.

All testing and sampling, including but not limited to air monitoring results; and radiological contamination screening, surveying, and sampling will be provided to the USACE.

10.0 REFERENCES

ISO Standard 7503-1, Evaluation of Surface Contamination – Part 1 Beta Emitters (Maximum Beta Energy Greater than 0.15 MeV) and Alpha Emitters.

New York Department of Environment and Conservation, 6 NYCRR 360, Solid Waste Management Facilities.

New York Department of Environment and Conservation, 6 NYCRR 380, Prevention and Control of Environmental Pollution by Radioactive Materials.

New York State Department of Labor, Part 38, Ionizing Radiation Protection, Section 38.23, Vacating Installations and Property.

ORISE, Radiological Survey of Buildings 401, 403, and the Hittman Building, Niagara Falls Storage Site, Lewiston, NY.

U.S. Army Corps of Engineers, EM 200-1-3, Requirements of Sampling and Analysis Plans, February 2001.

U.S. Army Corps of Engineers, EM 385-1-80, Radiation Protection Manual, May 30, 1997.

U.S. Environmental Protection Agency, EPA/600/R-07/041, ProUCL Version 4.0 Technical Guide.

U.S. Environmental Protection Agency, QA/G-4, Guidance on Systematic Planning Using the Data Quality Objectives Process; February 2006.

U.S. Nuclear Regulatory Commission, NUREG-1505, A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys, June 1998.

U.S. Nuclear Regulatory Commission. NUREG-1507, inimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions; June 1998.

U.S. Nuclear Regulatory Commission. NUREG-1575, Revision 1, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM); August 2000, includes the June 2001 updates. Sample Packaging and Shipping Requirements

U.S. Nuclear Regulatory Commission. NUREG-1757, Consolidated Decommissioning Guidance – Decommissioning Process for Materials Licensees, includes the September 2006 updates.

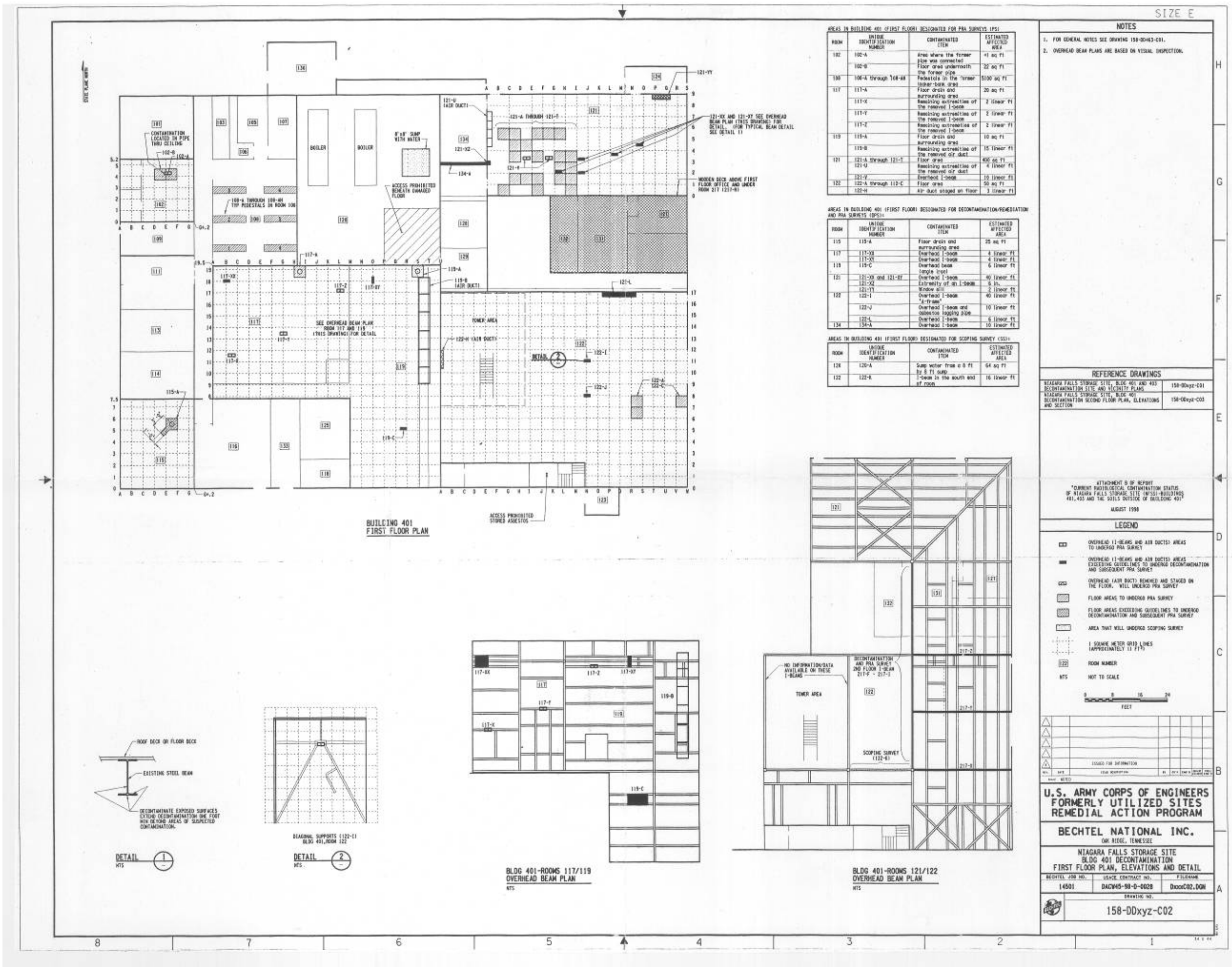
U.S. Nuclear Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors, June 1974.

Attachment 1

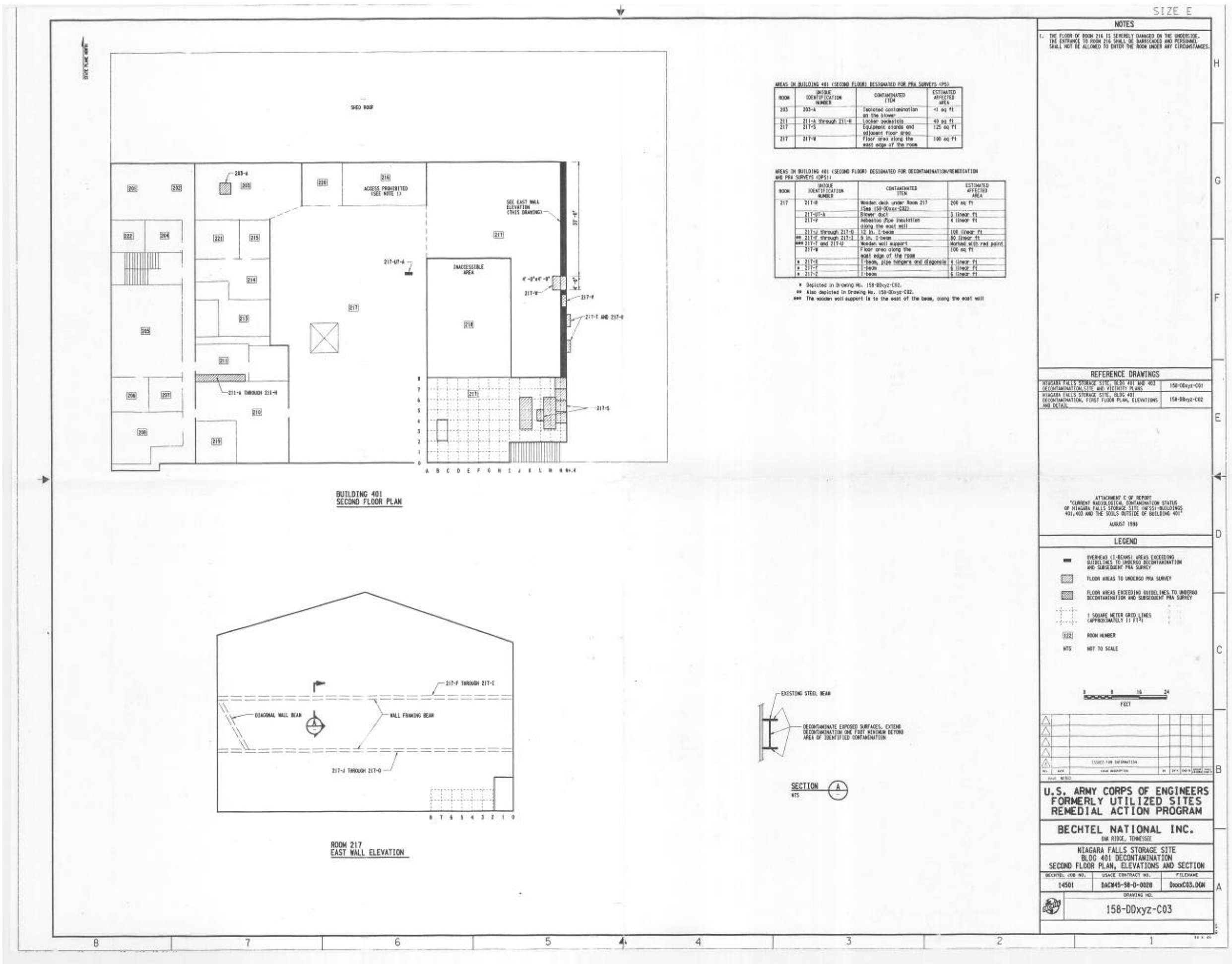
BLDG 401 Drawings:

- First Floor Plan, dwg 158-DDxyz-C02,
- Second Floor Plan, dwg158-DDxyz-C03,
- Decontamination Excavation Plan, dwg 158-DDxyz-C04

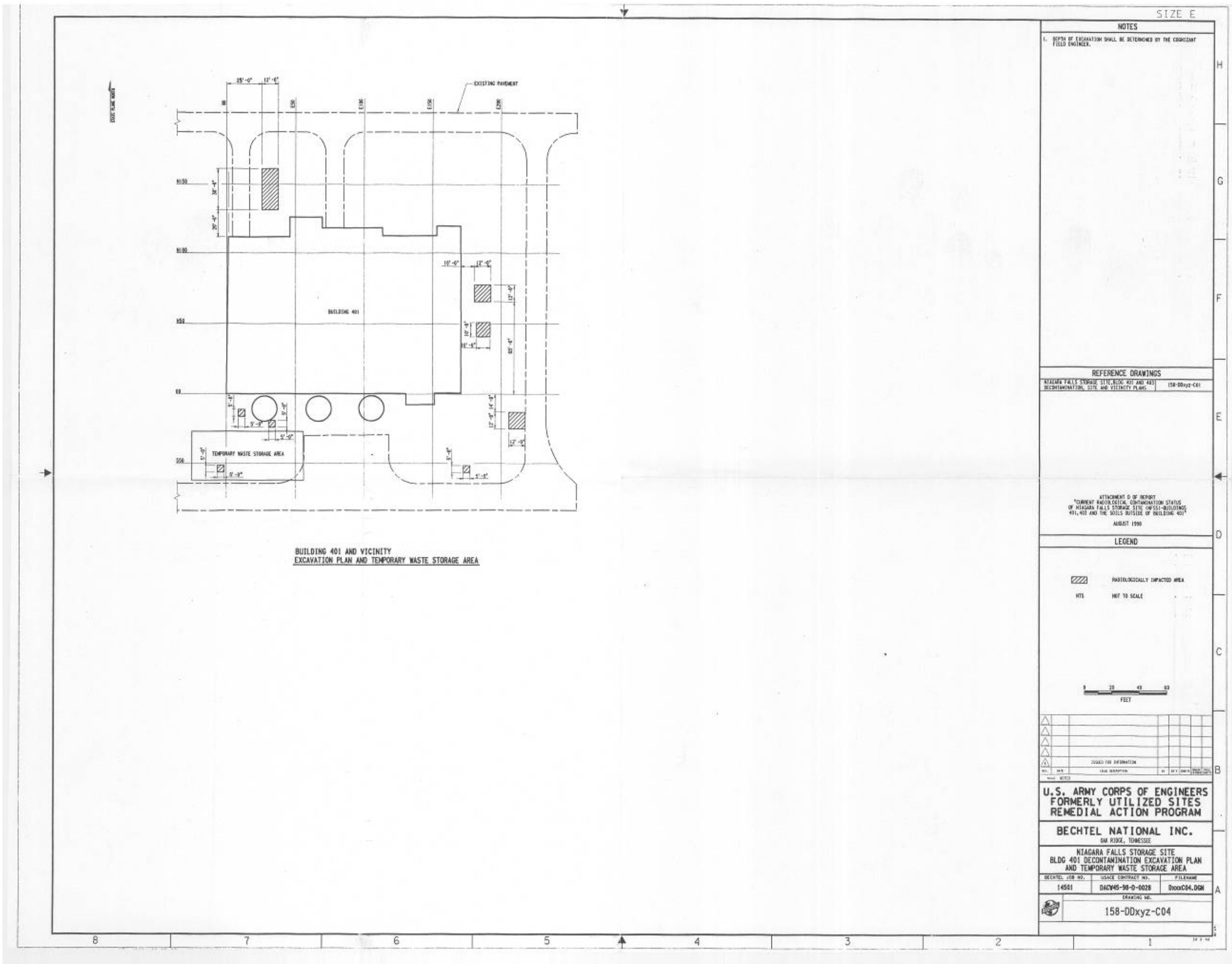
Building 401 – First Floor Plan



Building 401 – Second Floor Plan



Building 401 Decontamination Excavation Plan



Attachment 2

MEMORANDUM

To: Luke Servedio

Phill Malich

From: Elizabeth Langille, CHP

Date: May 17, 2010

SUBJECT: NFSS BUILDING 401- REVIEW OF PREVIOUS ANALYSES TO ESTABLISH UNRESTRICTED RELEASE CRITERIA FOR SURVEYS

cc: Amanda Moore

SUMMARY

This memo provides the basis for the surface contamination release limits to be used to segregate radiological waste during the demolition of Building 401 at the Niagara Falls Storage Site in Lewiston, NY. The limits were determined using Regulatory Guide 1.86 acceptable surface contamination levels, for the radionuclide mixture seen in representative samples from Building 401.

	Bldg 401 Surface Contamination Limits
Alpha average contamination (total):	2,000 dpm/100cm^2
Alpha removable contamination:	200 dpm/100cm^2
Beta average contamination (total):	5,000 dpm/100cm^2
Beta removable contamination:	500 dpm/100^2

These limits will be described in the Field Sampling Plan (FSP) for performing beta scans, static beta measurements, static alpha measurements, and smears for removable alpha and beta contamination.[6]

EVALUATION

The task order scope of work (SOW) for the NFSS Building 401 demolition (Reference 1) specifies in Section 3.6.1 that *demolition debris and material with radiological surface contamination levels exceeding the unrestricted release criteria (assumed to be the NRC Reg Guide 1.86 criteria or as otherwise required by local, state, and federal regulations) will for the purpose of this project, be considered radiologically contaminated materials*.[7]

To determine the criteria in Reg Guide 1.86 that will be applied to the Building 401 surfaces, I reviewed previous surveys (referenced in Attachment 2 to the SOW) and the drain radionuclide analysis results in Attachment 3 to the SOW. Only sampling and analysis results within the building were used. Soil samples outside and below the building surface are not representative of the mixture of contaminants within the building and were not used.

The residual radioactivity, remaining in the drains and on I beams, is predominantly uranium in a natural uranium mixture. Elevated Th-230 was found in a pipe that was removed from the ceiling of Room 102 (Unique Identification Number 102-A), the activity in the pipe is noted to be different from the mixture seen in other samples of residual surface contamination in Building 401. The attached tables show the results for samples that showed elevated activity; only radionuclides that were detected above the method detection level (MDL) are shown.

The acceptable alpha surface contamination limit was calculated based on the radionuclide mix in each of the individual samples with total activity in excess of 25 pCi/g using the equation below. Where f_i is the fraction of radionuclide "*i*" in the alpha

[6] Alpha scans will not be performed. Uranium can be effectively detected using beta scanning.

[7] Reg Guide 1.86 criteria provides the same surface contamination levels as EM 385-1-80, USACE Radiation Protection Manual. The Reg Guide 1.86 criteria is noted to be more restrictive than New York State Department of Labor Part 38 - Ionizing Radiation Protection, Section 38.23 - Vacating Installations and Property, Table 5 - Acceptable Surface Contamination Levels

mixture, and *RG 1.86 Limit* is the limit for radionuclide "*i*" found in Table I of Reg Guide 1.86.

$$Alpha\ Limit\,(dpm/100cm^2) = \frac{1}{\sum \frac{f_i}{RG1.86\,Limit_i}}$$

Because all the radionuclides of concern are naturally occurring, only samples showing a total activity greater than 25 pCi/g were used to determine the alpha limit. In this way, the background contribution to the mixture becomes less significant and the limit is more representative of the contaminants of concern.

The total beta limit of 5,000 dpm/100cm^2 is based on uranium isotope short lived decay products. The removable limits are based on 10% of the total contamination limits.

Observations about Building 401 sample analysis results:

1. Uranium isotopes are the predominant radionuclide in Building 401.

2. Drain samples were analyzed for U-238, U-234, and U-235. All drain samples showed approximately equal concentrations of U-234 and U-238 indicating that the mixture is a natural uranium mixture rather than depleted or enriched.

3. Cs-137 was present in a number of drain samples but it appeared to be in concentrations that were only slightly higher than background concentrations of Cs-137 in environmental samples.

4. Th-232 was not observed in concentrations above typical background soil levels; All samples were below 1pCi/g Th-232. Therefore Th-232 is not considered a radionuclide of concern for Building 401.

5. Ra-228 was not observed in concentrations above typical background soil levels; ie all samples were below 1pCi/g Ra-228. Therefore Ra-228 is not considered a radionuclide of concern for Building 401.

6. Th-230 was slightly elevated in a few samples but was only significant in the pipe that was removed from Room 102 ceiling (Unique Identification Number 102-A).

7. Ra-226 was slightly elevated in a few samples but was not the predominant alpha emitter in the mixture.

ATTACHMENTS

1. Evaluation of Sample Results

REFERENCES

1. USNRC, Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors, June 1974.

2. New York State Department of Labor, Part 38, Ionizing Radiation Protection, Section 38.23, Vacating Installations and Property.

3. U.S. Army Corps of Engineers, EM 385-1-80, Radiation Protection Manual, May 30, 1997.

4. ORISE, Radiological Survey of Buildings 401, 403, and the Hittman Building,

Niagara Falls Storage Site, Lewiston, NY.

Evaluation of Radionuclides and Mixture for Building 401 Demolition

Source Document	Sample ID	Sample Location	Unique Identification Number	Radionuclide	Decay Mode	Result	(units)	Alpha fraction f_i	RG 1.86 Acceptable Levels	Alpha f_i/RG1.86 Lev	Alpha Acceptable Level	Comments
ORISE 1995	Table 3 (no ID)	1 Rm 119 I Beam	117-XY	Am-241	α	12.1	pCi/g	0.003	100	2.87E-05		
				U-235	α	185	pCi/g	0.044	5000	8.76E-06		
				U-238	α	4025	pCi/g	0.953	5000	1.91E-04		
					total activity	4222.1					4384	
				alpha fraction from uranium				0.997				
ORISE 1995	Table 3 (no ID)	2 Rm 102 Pipe in Ceiling	102-A	Am-241	α	35	pCi/g	0.022	100	2.23E-04		15 ft. long, 1.5 inch diameter pipe has been removed, the pipe extremities are suspected to be radiologically impacted.
				Ra-226	α	0.6	pCi/g	0.000	100	3.82E-06		
				Th-230	α	1333	pCi/g	0.848	100	8.48E-03		
				Th-232	α	198.9	pCi/g	0.126	1000	1.26E-04		

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				U-238	α	4.9	pCi/g	0.003	5000	6.23E-07		
					total activity	1572.4					113	
ORISE 1995	Table 3 (no ID)	3 Rm 121 drain? Or floor trench?		Ra-226	α	0.6	pCi/g	0.042	100	4.20E-04		Total Activity is less than 25 pCi/g and therefor not used in the determination of the Alpha Limit
				Th-232	α	1.3	pCi/g	0.091	1000	9.09E-05		
				U-235	α	1.1	pCi/g	0.077	5000	1.54E-05		
				U-238	α	11.3	pCi/g	0.790	5000	1.58E-04		
					total activity	14.3						
				alpha fraction from uranium				0.867				
ORISE 1995	Table 3	4 Rm 122	122-J	Cs-137	α	0.2	pCi/g	0.006	5000	1.20E-06		

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Source Document	Sample ID	Sample Location	Unique Identification Number	Radionuclide	Decay Mode	Result	(units)	Alpha fraction f_i	RG 1.86 Acceptable Levels	Alpha f_i/RG1.86 Lev	Alpha Acceptable Level	Comments
	(no ID)	I Beam		Ra-226	α	0.2	pCi/g	0.006	100	6.02E-05		
				U-235	α	1.8	pCi/g	0.054	5000	1.08E-05		
				U-238	α	31	pCi/g	0.934	5000	1.87E-04		
					total activity	33.2					3860	
				alpha fraction from uranium				0.988				
ORISE 1995				Cs-137	β	0.6	pCi/g		5000			
	Table 3 (no ID)	5 Rm 217 Ledge		Ra-226	α	1.8	pCi/g	0.006	100	5.79E-05		
				U-235	α*	14.5	pCi/g	0.047	5000	9.33E-06		
				U-238	α*	294.6	pCi/g	0.948	5000	1.90E-04		
					total activity	311.5					3895	

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Source Document	Sample ID	Sample Location	Unique Identification Number	Radionuclide	Decay Mode	Result	(units)	Alpha fraction f_i	RG 1.86 Acceptable Levels	Alpha f_i/RG1.86 Lev	Alpha Acceptable Level	Comments
				total alpha activity		310.9						
				alpha fraction from uranium				0.994				
Attachment 3	DRAIN03-S-3705	Drain 3 sediment (0.5')		Cs-137	β	0.461	pCi/g		5000	0.00E+00		
				Ra-228	β	0.343	pCi/g		100	0.00E+00		
				Th-228	α	0.365	pCi/g	0.006	100	5.67E-05		
				Th-230	α	1.84	pCi/g	0.029	100	2.86E-04		
				Th-232	α*	0.469	pCi/g	0.007	1000	7.29E-06		
				U-233/234	α	26.2	pCi/g	0.407	5000	8.14E-05		
				U-235	α*	6.99	pCi/g	0.109	5000	2.17E-05		
				U-238	α*	28.5	pCi/g	0.443	5000	8.86E-05		

Evaluation of Radionuclides and Mixture for Building 401 Demolition

Source Document	Sample ID	Sample Location	Unique Identification Number	Radionuclide	Decay Mode	Result	(units)	Alpha fraction f_i	RG 1.86 Acceptable Levels	Alpha f_i/RG1.86 Lev	Alpha Acceptable Level	Comments
				total activity		65.2					1847	
				total alpha activity		64.4						
				alpha fraction from uranium				0.958				
Attachment 3	DRAIN03-W-3704	Drain 3 water		Ra-226	α	4.29	pCi/L	0.029	100	2.88E-04		
				Th-230	α	4.92	pCi/L	0.033	100	3.30E-04		
				Th-232	α*	0.673	pCi/L	0.005	1000	4.52E-06		
				U-233/234	α	58.7	pCi/L	0.394	5000	7.89E-05		
				U-235/236	α*	16.8	pCi/L	0.113	5000	2.26E-05		
				U-238	α*	63.5	pCi/L	0.427	5000	8.53E-05		
				total activity		148.9					1235	

Evaluation of Radionuclides and Mixture for Building 401 Demolition

Source Document	Sample ID	Sample Location	Unique Identification Number	Radionuclide	Decay Mode	Result	(units)	Alpha fraction f_i	RG 1.86 Acceptable Levels	Alpha f_i/RG1.86 Lev	Alpha Acceptable Level	Comments
				alpha fraction from uranium				0.934				
Attachment 3	DRAIN04-S-3707	Drain 4 sediment (0.5')		Ra-226	α	1.04	pCi/g		100			Total Activity is less than 25 pCi/g and therefor not used in the determination of the Alpha Limit
				Ra-228	β	0.533	pCi/g		100			
				Th-230	α	2.18	pCi/g		100			
				Th-232	α	0.656	pCi/g		1000			
				U-233/234	α	7.42	pCi/g		5000			
				U-235/236	α*	1.36	pCi/g		5000			
				U-238	α*	6.42	pCi/g		5000			
					total activity	19.6						

Evaluation of Radionuclides and Mixture for Building 401 Demolition

Source Document	Sample ID	Sample Location	Unique Identification Number	Radionuclide	Decay Mode	Result	(units)	Alpha fraction f_i	RG 1.86 Acceptable Levels	Alpha f_i/RG1.86 Lev	Alpha Acceptable Level	Comments
Attachment 3	DRAIN05-S-3709	Drain 5 sediment (0.5')		Cs-137	β	0.0973	pCi/g		5000			
				Ra-226	α	0.719	pCi/g		100			
				Ra-228	β	0.196	pCi/g		100			
				Th-228	α	0.2	pCi/g		100			Total Activity is less than 25 pCi/g and therefor not used in the determination of the Alpha Limit
				Th-230	α	1.24	pCi/g		100			
				U-233/234	α	2.24	pCi/g		5000			
				U-235/236	α*	0.222	pCi/g		5000			
				U-238	α*	2.05	pCi/g		5000			
					total activity	7.0						
Attachment 3	DRAIN06-	Drain 6 sediment		Cs-137	β	0.29	pCi/g		5000			Total Activity is less than 25 pCi/g and therefor not

Evaluation of Radionuclides and Mixture for Building 401 Demolition

Source Document	Sample ID	Sample Location	Unique Identification Number	Radionuclide	Decay Mode	Result	(units)	Alpha fraction f_i	RG 1.86 Acceptable Levels	Alpha f_i/RG1.86 Lev	Alpha Acceptable Level	Comments
	S-3711	(0.5')		Ra-226	α	1.2	pCi/g		100			used in the determination of the Alpha Limit
				Ra-228	β	0.321	pCi/g		100			
				Th-228	α	0.542	pCi/g		100			
				Th-230	α	4.32	pCi/g		100			
				Th-232	α*	0.235	pCi/g		1000			
				U-233/234	α	5.73	pCi/g		5000			
				U-235/236	α*	2.01	pCi/g		5000			
				U-238	α*	5.3	pCi/g		5000			
					total activity	19.9						
Attachment 3	DRAIN06-	Drain 6		Cs-137	β	2.12	pCi/L		5000			

Evaluation of Radionuclides and Mixture for Building 401 Demolition

Source Document	Sample ID	Sample Location	Unique Identification Number	Radionuclide	Decay Mode	Result	(units)	Alpha fraction f_i	RG 1.86 Acceptable Levels	Alpha f_i/RG1.86 Lev	Alpha Acceptable Level	Comments
	W-3710	water		Ra-226	α	1.13	pCi/L	0.034	100	3.40E-04		
				Th-228	α	0.559	pCi/L	0.017	100	1.68E-04		
				Th-230	α	2.76	pCi/L	0.083	100	8.31E-04		
				U-233/234	α	13	pCi/L	0.391	5000	7.83E-05		
				U-235/236	α*	1.77	pCi/L	0.053	5000	1.07E-05		
				U-238	α*	14	pCi/L	0.421	5000	8.43E-05		
				total activity		35.3					661	
				total alpha activity		33.2						
				alpha fraction from uranium				0.866				
Attachment 3	DRAIN07-	Drain 7 sediment		Cs-137	β	0.223	pCi/g		5000			

Evaluation of Radionuclides and Mixture for Building 401 Demolition

Source Document	Sample ID	Sample Location	Unique Identification Number	Radionuclide	Decay Mode	Result	(units)	Alpha fraction f_i	RG 1.86 Acceptable Levels	Alpha f_i/RG1.86 Lev	Alpha Acceptable Level	Comments
	S-3712	(0.5')		Ra-226	α	1.36	pCi/g	0.047	100	4.67E-04		
				Th-228	α	0.969	pCi/g	0.033	100	3.32E-04		
				Th-230	α	2.03	pCi/g	0.070	100	6.97E-04		
				Th-232	α*	0.754	pCi/g	0.026	1000	2.59E-05		
				U-233/234	α	10.4	pCi/g	0.357	5000	7.14E-05		
				U-235/235	α*	1.63	pCi/g	0.056	5000	1.12E-05		
				U-238	α*	12	pCi/g	0.412	5000	8.24E-05		
					total activity	29.4					593	
					total alpha activity	29.1						
				alpha fraction from uranium				0.825				

Evaluation of Radionuclides and Mixture for Building 401 Demolition

Source Document	Sample ID	Sample Location	Unique Identification Number	Radionuclide	Decay Mode	Result	(units)	Alpha fraction f_i	RG 1.86 Acceptable Levels	Alpha f_i/RG1.86 Lev	Alpha Acceptable Level	Comments
Attachment 3	DRAIN08-S-3713	Drain 8 sediment (0.5')		Cs-137	β	0.272	pCi/g		5000			
				Ra-226	α	0.994	pCi/g	0.041	100			
				Ra-228	β	0.253	pCi/g		100			
				Th-228	α	0.533	pCi/g	0.022	100			
				Th-230	α	1.68	pCi/g	0.070	100			Total Activity is less than 25 pCi/g and therefor not used in the determination of the Alpha Limit
				Th-232	α*	0.438	pCi/g	0.018	1000			
				U-233/234	α	9.34	pCi/g	0.387	5000			
				U-235/236	α*	1.22	pCi/g	0.051	5000			
				U-238	α*	9.9	pCi/g	0.411	5000			
					total activity	24.6						
					total alpha activity	24.1						

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				alpha fraction from uranium				0.849				
Attachment 3	DRAIN09-S-3713	Drain 9 sediment (0.5')		Ra-226	α	1.17	pCi/g	0.050	100			Total Activity is less than 25 pCi/g and therefor not used in the determination of the Alpha Limit
				Ra-228	β	0.402	pCi/g		100			
				Sr-90	β	0.74	pCi/g		1000			
				Th-228	α	0.442	pCi/g	0.019	100			
				Th-230	α	2.3	pCi/g	0.098	100			
				Th-232	α*	0.388	pCi/g	0.017	1000			
				U-233/234	α	7.96	pCi/g	0.340	5000			
				U-235/236	α*	2.63	pCi/g	0.112	5000			
				U-238	α*	8.54	pCi/g	0.364	5000			

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					total activity	24.6						
					total alpha activity	23.4						
					alpha fraction from uranium			0.816				
Attachment 3	DRAIN10-S-3715	Drain 10 sediment (0.5')		Cs-137	β	0.245	pCi/g		5000			Total Activity is less than 25 pCi/g and therefor not used in the determination of the Alpha Limit
				Ra-226	α	1.28	pCi/g		100			
				Th-228	α	0.882	pCi/g		100			
				Th-230	α	2.61	pCi/g		100			
				Th-232	α*	0.382	pCi/g		1000			
				U-233/234	α	6.8	pCi/g		5000			
				U-235/236	α*	0.468	pCi/g		5000			

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				U-238	α*	7.79	pCi/g		5000			
				total activity		20.5						
									Average alpha limit (dpm/100cm^2)		2074	

Notes

Sample Location:

ORISE 1995, *Radiological Survey of buildings 401, 403, and the Hittman Building Niagara Falls Storage Site, Lewiston, New York,* T.J. Vitkus

Attachment 3, Attachment 3 to the SOW for Demolition of building 401 FUSRAP - NFSS

Decay Mode:

α, alpha

α*, alpha but short lived particulate progeny decays by beta and can be readily detected using beta survey techniques

β, beta

Attachment 3

Fifty-Six Services, Inc.

Asbestos Survey Procedure

FIFTY-SIX services, inc. environmental and demolition consulting

ASBESTOS SURVEY FIELD SURVEY PROCEDURES AND SAMPLE ANALYSIS METHODS

Guidelines used for the asbestos inspection were established by the Environmental Protection Agency (EPA) in the Guidance for Controlling Asbestos Containing Materials in Buildings, Office of Pesticides and Toxic Substances, Doc 560/5-85-024, and 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA).

Field information is organized in accordance with the AHERA methodology of homogenous area (HA). During the survey, reasonable effort are made to identify all locations and types of ACM materials associated with the scope of work. Sampling has included multiple samples of the same materials chosen at random. However, due to inconsistencies of a manufacturer's processes and the contractor's installation methods, materials of similar construction may contain various amounts of asbestos. Furthermore, some materials that were not originally specified to contain asbestos may in fact contain this mineral. For example, cemantatious pipe insulation and plaster were frequently mixed with asbestos at the construction site for ease of application. Locating all asbestos materials can only be definitively achieved by conducting exploratory demolition and sampling every section of pipe insulation, fitting or valve covering, fireproofing, and other suspect ACM.

Bulk samples of suspect ACM were analyzed using polarized light microscopy (PLM) coupled with dispersion staining, as described in 40 CFR Part 763 and the National Emissions Standard for Hazardous Air Pollutants (NESHAPS). NESHAPS is the standard industry protocol for the determination of asbestos in building materials. A suspect material is immersed in a solution of known refractive index and subjected to illumination by polarized light. The color displays that result are compared to a standardized atlas whereby the specific variety of asbestos is determined. It should also be recognized that PLM is primarily a qualitative identification method whereby asbestos percentage, if any, is estimated. While EPA and New York State regulations governing ACM consider materials containing greater then 1-percent as asbestos, accurately quantifying asbestos content below 5-percent has been shown to be unreliable.

The New York State Department of Health has revised the PLM Stratified Point Counting Method. The new method, "Polarized Light Microscopy Methods for Identifying and Quantifying Asbestos in Bulk Samples" can be found as item 198.1 in the Environmental Laboratory Approval program (ELAP) Certification manual. The method specifies a procedure of analysis for bulk samples that fall into the category of "Non-friable Organically Bound" (NOB). This category includes any sample in a flexible to rigid asphalt or vinyl matrix (floor tiles, mastic, roofing shingles, roofing felt, etc.). Additional materials that may fall into this category are textured paints and stucco, pipe valve and joint packing, and a variety of other applications. These samples must be “ashed” in a muffle furnace at 480-degrees Celsius (to remove organic matrix), treated with acid (to remove any mineral carbonate), and filtered through a 0.4-micron filter before being analyzed by PLM. The sample must be weighted between each of these steps to track the percent loss of organic matrix.

ELAP has determined that analysis of NOB materials is not reliably performed by PLM. Therefore, if PLM yields results of 1-percent asbestos or less, the result must be confirmed by TEM. Bulk samples that undergo TEM analysis use the sample reduction methodology stated above for NOB analysis by PLM. ELAP certified laboratories must include the following statement with their PLM analysis results for each “negative” (1-percent or less asbestos) NOB sample: "Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Before this material can be considered or treated as non-ACM, confirmation must be made by quantitative transmission electron microscopy".

All samples were initially analyzed by Polarized Light Microscopy. Samples which yielded a negative PLM result and which are classified as a "non-friable" material, were then re-analyzed utilizing Transmission Electron Microscopy methodology described above. The laboratory performing both these analysis procedures was Paradigm Environmental, Inc. located at 1815 Love Rd, Grand Island, New York. Paradigm is accredited with the following agencies:

- National Voluntary Laboratory Accreditation Program
- New York State Environmental Laboratory Approval Program