Reference 11 –

Quality Assurance Project Plan

MJW TECHNICAL SERVICES, INC.

Quality Assurance Project Plan
For the
Western New York Nuclear Service Center
In Follow Up to
Aerial gamma Radiation Survey
Conducted in 2014

Prepared For

New York State Energy and Research Development Authority

West Valley Site Management Program

9030-B Route 219 | West Valley, NY 14171

Prepared By

MJW Technical Services

243 Root St #100, Olean, NY 14760

This QAPP was prepared based on EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5), and Guidance for the Data Quality Objective Process (EPA QA/G-4)

The primary purpose of the QAPP is to present the data collection activities to be Implemented, including all necessary QA and QC, to ensure that all data produced are of known and documented quality, and that the data will satisfy the stated performance criteria

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243 Root Street, Suite 100
Olean, NY 14760-2436
Voice: (716) 372-5300 Fax: (716) 372-5307 Toll Free: (866) 300-3659 mjwts.com

SECTION A – PROJECT MANAGEMENT

A.1 Quality Assurance Project Plan

Prepared by:

Jack Gerber, PQA/QCM

Louis Henry, Project Manager Date: 8/22/16

Jack Gerber, PQA/QCM Date: 8/22/16

Andrea Mellon, NYSERDA, Project Manager Date: 8/22/2016

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Distribution List

The following individuals must receive a copy of the approved QA Project Plan (QAPP) and any subsequent revisions.

Name	Title	Document Type
Louis Henry	Project Manager	Electronic
Jack Gerber	Project QA & QC Manager	Electronic
Andrea Mellon	NYSERDA Project Manager	Electronic
Julie Brown	Field Supervisor	Electronic
James Griffin	Certified Health Physicist	Electronic
Mutty Sharfi	Health Physicist	Electronic
Deborah Hutchison	Data Validation Specialist	Electronic
Michael Wierowski	IT/GIS Specialist	Electronic

A.3 Project/Task Organization

The project will be performed by MJW Technical Services Inc. (MJWTS) with support by NYSERDA staff. Key positions for executing the project are defined below and reporting relationships depicted in Figure A.3.1, Project Organization Chart.

Project Manager

The Project Manager (PM) bears overall responsibility for execution of the field survey, sampling, and dose assessment activities. The PM will ensure that the project is executed in a timely manner, in accordance with the Field Sampling and Dose Assessment Plan ("FSDP"), and in conformance with all applicable regulatory requirements.

Project Quality Assurance and Control Manager

The Project Quality Assurance and Control Manager (PQA/QCM) is responsible for all aspects of project Quality Assurance and Quality Control and will ensure that appropriate measures are implemented during survey and analysis operations, as well as by the contracted radiochemistry laboratory. The PQA/QCM also serves as the Safety Officer for this project.

Project Certified Health Physicist

The Project Certified Health Physicist (PCHP) will ensure that the collection and analysis of survey data, and the derived dose assessments, are conducted properly and in accordance with appropriate professional and regulatory standards and practices to ensure that results are accurate, and defensible.

Project HP

The project Health Physicist will be responsible for review of all data collected, translation into calculation and worksheets, and the development of the derivative dose estimates.

Project Data Validation Specialist

The Project Data Validation Specialist (PDVS) will be responsible for the validation of data as required by accepted professional practices and standards.

Project Field Supervisor

The Project Field Supervisor (PFS) will be responsible for the in-field conduct of survey and sampling operations, and will ensure that applicable safety, compliance, and QA/QC requirements are followed during the execution of field activities. The PFS will supervise the activities of Sampling and Survey Technicians (SST) and any other staff working in the field. The PFS will in addition ensure that all field operations are appropriately documented. If multiple field survey/sampling teams are in the field at the same time, the PFS may designate a team lead to

oversee survey/sampling operations and safety.

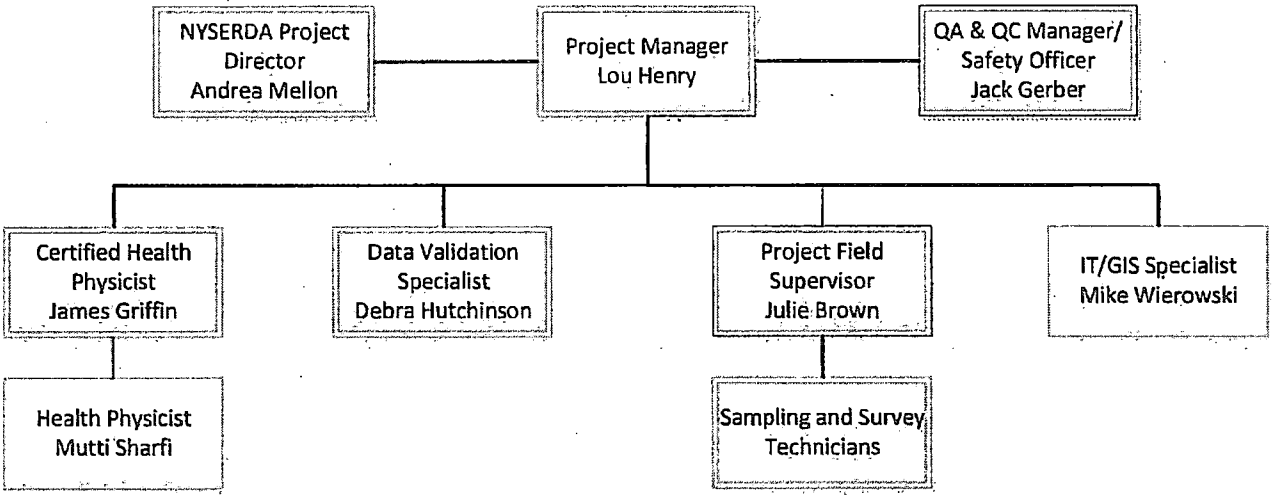
Project Sampling and Survey Technicians

The Project Sampling and Survey Technicians (SST) will be responsible for in-field collection of samples and conduct of the survey under the direction of the PFS.

Project IT/GIS Specialist

The Project IT/GIS Specialist (IT/GIS) will be responsible for oversight of data file storage and the processing of acquired data, in particular GPS-driven radiation survey data.

Figure A.3.1 Project Organization Chart



A.4 Problem Definition/Background

In September 2014, DOE and NYSERDA jointly initiated an aerial radiological survey to examine the radiological conditions of the Western New York Nuclear Service Center (WNYNSC) and adjacent areas, as well as Cattaraugus Creek from the WNYNSC to Lake Erie in Western New York. This survey was conducted by the National Nuclear Security Administration's (NNSA) Remote Sensing Laboratory (RSL).

The 2014 aerial radiation survey shows five limited areas outside the WNYNSC property with radiation levels that are slightly above the "background" radiation levels seen throughout Western New York. Two of these areas were identified during previous aerial surveys, and the three other locations were only identified during the 2014 aerial survey. The identification of the three new areas is likely due to either: (i) the fact that the areas were not examined during the earlier surveys; (ii) improvements in instrument sensitivity since the time of the earlier surveys, and/or deposition

of additional contamination.

The purpose of this project is to collect additional information on radionuclide concentrations in the soil to verify whether the five areas identified as having elevated radiation in the 2014 survey are confirmed to have elevated levels of radionuclides in the soil. If the radionuclide levels in the soil are elevated, a dose assessment will be conducted to confirm that there is no health and safety concern (see *Field Sampling and Dose Assessment Plan for the WNYNSC,* Section 1, *Background and Introduction,* and 2, *Project Objectives* for detail).

Areas of elevated soil concentration levels identified in the 2014 aerial survey results will be verified through the following sampling and survey activities:

- Determining area and regional background soil concentrations of Cs-137 and other radionuclides of interest.

- Perform walk-over radiological surveys of the elevated locations identified to qualitatively identify above background readings and variability within the survey unit. Locations with elevated radiation readings will be selected for soil sample collection.

- Use radiation exposure readings and soil sample analysis results to perform radiation dose assessments and determine maximum credible radiation exposures to members of the public using credible exposure pathways specific to the general area.

- Compare calculated exposures to applicable regulatory standards to identify public health and safety issues.

A.5 Project/Task Description

The FSDP describes work to be performed, products to be delivered, and the schedule for implementation and completion of survey and exposure assessment activities. Section 7 of the FSDP depicts the geographic locations of field tasks and gives an overall picture of how the project will address the project objectives described in Section A.4. Table A.5.1 below summarizes the primary project tasks:

Table A.5.1 Project Task Description

TASK	DESCRIPTION	INPUT INFO/DATA	PROJECT OUTCOME
Locate Survey Areas (SA) and survey/sample locations	Coordinate location of the five SAs and background areas are identified using the 2014 RSL aerial data and background coordinates.	RSL 2014 WNYNSC Aerial survey results; Regional GIS and GPS data and mapping information, landmarks.	Correct map and GPS coordinate location of SAs and survey/sample locations
Field Sampling	SAs and sample locations are identified using project maps, landmarks, and GPS. Perform field radiation measurements and collect soil profile samples at	Project FSDP, Soil sampling, GPS survey, and Instrument use procedures, site maps	Adequate data for SAs including gamma radiation levels (cpm), dose rate (uRem/hr), and depth specific soil concentration (pCi/g).

TASK	DESCRIPTION	INPUT INFO/DATA	PROJECT OUTCOME
	random and elevated locations. Project Field Sampling Plan (FSDP)Sec 7.0 through 10.0	and coordinates.	FSDP Table 3 has sample numbers for each SA.
Analysis	Soil samples parameters include: indicator parameters (gross alpha/beta and gamma spec.) and isotopic as required in FSDP Section 7.	Off-site WNYNSC Cs Prong data, RSl 2014 Aerial. WVDP ASER.	Adequate soil concentration in pCi/g by depth profile for indicator and isotopic results of samples identified in Table 3 of FSDP
Quality Control	Field and lab instruments are calibrated prior to field and laboratory use. Daily field instrument operability tests and source checks are performed. Sample /survey location and depths are confirmed. . Duplicate and equipment samples are analyzed. Analytical data is validated. GPS locations relocated, project specific field guides.	Daily equipment rinsate samples, deionized water blank, SA duplicates (min 2 per sub area), equipment cleaning, PFS and PM review of logs and data sheets, lab quality checks, level IV analytical packages.	Adequate records for verifying accuracy, repeatability. Data validation reports.
Data Management	Maintaining field notes, sample documentation, field and laboratory data.	Field notes, electronic field and lab data, instrument calibrations and operability checks, sample chain-of-custody and data reports. laboratory data packages	Complete project data records for collection repeatability, accuracy and completeness.
Documents and Records	Historical data used, Field logs, field survey data (i.e., gamma cpm, dose rate, GPS), FSDP, PSPs, chain-of-custody (COC), shipping records, Dose assessment model, analytical data reports, Data assessments, project reports	Field and laboratory reports, FSDP, SOPS, RSL aerial data, dose assessment methodology, location information and data verification and validation	Complete project documentation and accountability.
Data Verification and Validation	Data are verified through acceptable analytical results of laboratory prepared QC samples.	Lab data packages, data qualifiers, QC sample results, field instrument and laboratory checks, project detection and validation requirements	Data completeness, acceptability, sensitivity, and accuracy.
Data Usability	Data usability is directly related to verification and validation, where only valid data are used	Data validation and verification assessment report, dose assessment model requirements	Usable data for determining SA mean soil concentrations and application in dose assessment model

Critical measurements and activities required to meet the project Objectives include:

- GPS or alternative location identification measurements to identify survey areas and sample locations
- MicoRem instrument readings
- Soil depth measurements
- Soil/sediment sampling, handling, and shipping
- Field documentation and record keeping
- Data verification, validation, and assessment
- Dose assessment methodology and code validation

To assure measurements are collected accurately, field staff will be familiar with the FSDP, QAPP, and project specific procedures/field guides developed for each measurement type. Field staff will be trained to the FSDP, QAPP, Health and Safety Plan (HASP), and project specific procedures/field guides prior to initiation of field activities.

A.6 Data Quality Objectives & Indicators

A.6.1 Data Quality Objectives (DQO)

This soil sampling and dose assessment study will be completed in accordance with the FSDP and this QAPP. Within the context of the Environmental Protection Agency's guidance for identifying data quality objectives (EPA QA/G-4 Guidance for the Data Quality Objectives Process, 2000), the rationale for the sampling approach is as follows:

1. State the problem – This soil and dose assessment effort is being performed as a follow up activity to the 2014 Aerial Survey of the WNYNSC. Specifically, the 2014 Aerial Survey identified five areas potentially having elevated levels of radioactivity above background. An aerial radiation survey does not, however, provide the data to confirm that all of the areas identified are below public health and safety standards, for example the criteria in 10 CFR 20.1402, Radiological Criteria for Unrestricted Use.

2. Identify the goals of the study - The key goal for this activity is to evaluate each of the five areas to determine if these areas do in fact contain elevated radionuclide concentrations in the soils, and for those with elevated concentrations, to complete a dose assessment that evaluates the current and future land use information to determine if there are any health and safety issues for the property.

   The criteria used to evaluate each area are the NRC Radiological Criteria for Unrestricted Use (10 CFR 20.1402), which establishes the requirements that exposure for the public must be less than 25 millirem per year for license termination with unrestricted use.

3. Identify the inputs to the decision – The input to the decision of whether the decision criteria were met include:

- The dose rate data collected during the 2014 Aerial Survey,
- The field dose rate measurements collected for each area,
- The soil samples collected and analyzed for specific alpha, beta and gamma-emitting radionuclides,
- A comparison to the WVDP Phase 1 Decommissioning Plan Derived Concentration Guidelines
- A dose assessment completed for the current land use, and
- A conservative Resident Farmer land use dose assessment.

4. Define the boundaries of the study – The study is focused on five areas identified through the aerial radiation survey, and land use information.

5. Develop a the analytic approach - If the soil sampling data for cesium, gross alpha or gross beta are greater than 2 standard deviations above background, then a dose assessment will be conducted.

   If the dose assessment information from the various evaluation methods are below 25 mrem/year, then the 10 CFR 20.1402 criteria used for comparison purposes are met.

6. Specify performance or acceptance criteria - Acceptance criteria developed for the aerial survey data are discussed in Section 3.1. The acceptance criteria developed for the field and soil sampling data are listed below.

   Field Survey and Soil Sampling Data Acceptance Criteria

   The field survey and soil sampling acceptance criteria identified in the plan include:

   a) Use of certified standards (e.g., National Institute of Standards and Technology) to calibrate and daily evaluate the operability of instrumentation. The acceptance criteria for the instrumentation is specified in the applicable quality assurance documents for the field and laboratory instrumentation.

   b) Quality control standards to ensure that the laboratory instrumentation maintained calibration during the sample analysis period. The frequency and acceptance criteria for the laboratory analyses is specified in the GEL Quality Assurance Plan, Rev. 29.

   c) Field and laboratory duplicates will be collected and analyzed at a frequency of 20% to ensure that the soil sampling and laboratory analysis methodologies were consistent with the quality control parameters defined by the laboratory.

   d) Multiple sample locations and soil depths sent for analysis to ensure that the soil concentration data was representative of the area

7. Optimizing the design for obtaining data – In order to optimize the design and obtain survey data that addresses the goal of this effort, sampling will be conducted using multiple survey

methods and data collection efforts in order to compare the dose values calculated for each area. These multiple survey and data collection efforts include:

a) Aerial radiation survey data of the entire area identified the five locations where follow up activities were warranted.

b) Follow up gamma walkovers and tissue equivalent surveys for each area to determine if any elevated locations were within an area, and the dose rates at each location.

c) If any elevated locations are identified they will be sampled and the remainder of the random sampling conducted based on the size of the areas. Soil samples will be collected from 0-100 cm, with at least two at depth samples collected from each area.

d) All surface soil samples will be sent for gross alpha, gross beta and gamma spectroscopy.

e) Next depth interval soil sample analysis will be completed if the initial surface analysis was greater than background mean plus 2 standard deviations.

f) Detailed radionuclide analysis will be completed for a minimum of 20% of each area.

g) Finally, dose assessments will be conducted for all areas with dose rate readings or soil sample results greater than 2 standard deviations above background. These assessments were compared to the 10 CFR20.1402 dose standard (25 mrem/year).

A.6.2 Data Quality Indicators (DQI)

As part of systematic planning, measurement performance criteria for DQIs are be established and documented for each data collection effort. DQIs apply to both laboratory and field activities and include precision, accuracy, representativeness, comparability, and completeness (PARCC).

The following presents a list of the PARCC parameters for this project. Field instrumentation quality records will be documented and evaluated through:

- calibration certifications,
- daily source check logs and periodic field performance checks

Table A.6.1 Summary of Data Quality Indicators

Data Quality Indicators	Performance Criteria and Sample Frequency	QC Sample and/or Activity Used to Assess Measurement Performance
Precision-Field	20% relative percent difference (RPD) on field duplicates: 1/20 samples and 2/SA , <Minimum Detectable Concentration (MDC) rinsate and DI water samples	Field instrument operability checks (3 times daily), repeat counts, source checks, equipment rinsate sample (daily) , DI water blank
Precision-lab	10% RPD on lab duplicates ; 1/20 samples and 2/SA	Duplicates, 2/SA from 0-15, 15-30 cm and 1/20 samples
Accuracy/Bias	+/- 20% for field instrument readings. +/- 10% for laboratory Matrix Spike Duplicate (MSD) and Matrix Spike (MS)	Matrix Spikes/MS Duplicates
Representativeness	Survey and sample location verification, , topography, soil depth verification, vegetative cover, soil type	Obtain profile specific samples by following FSDP and field procedures, measuring depth and field notes of soil and location physical parameters. Location and depth confirmed by team member.
Comparability	Compliance with the FSDP, PSPs, and protocols. Relocate SA and sample locations at each SA. Daily field operability and source checks for field instruments. Laboratory QC.	Locate SA and sample locations using field maps and GPS. Documentation of daily instrument operability and source checks, site specific physical characteristics. Compatibility with dose assessment scenario criteria.
Sensitivity	Laboratory specified contract required detection limit ((CRDL)) and minimum detectable concentration (MDC) for analytical parameters identified in the FSDP. (Table B.4.1 below)	Laboratory QA/QC test results, sample duplicate results, and matrix spikes.
Completeness	95% samples collected/ 90% usability	Location GPS data, FSDP, data completeness check and validation
Field and Lab Contamination Bias	<=Detection limit	Field equipment rinsate and laboratory prepared matrix blanks

A.6.1.1 Precision

Precision measures the agreement among a set of replicate measurements. Field Precision is assessed through the collection and analysis of field duplicates. Analytical Precision is estimated by duplicate/replicate analyses, usually on laboratory control samples, spiked samples and/or field samples. The most commonly used estimates of precision are the relative standard deviation (RSD) and, when only two samples are available, the relative percent difference (RPD).

(1)
$$RPD = \frac{|x_1 - x_2|}{\frac{x_1 + x_2}{2}} \times 100\%$$

where x_1 is the original sample concentration
x_2 is the duplicate sample concentration

RPDs < 20% will be deemed acceptable for field duplicates and < 10% for laboratory duplicates.

During this project, the following quality control samples will be collected:

- Field duplicate soil samples will be collected from each survey area identified in Figures 1 and 2 of the FSDP. The duplicates will be taken from the 0 -5 cm depth at each sampling location. Samples will be evaluated for indicator parameters (gross alpha/beta and gamma scan).

- Equipment rinsate blank samples will be collected by each sampling team at the end of each sampling day. Sampling equipment will be cleaned and then rinsed with DI water. A sample of the rinsate will be evaluated for indicator parameters (gross alpha/beta and gamma scan) and found to be less than MDA.

A. 6.1.2 Accuracy

Accuracy is the closeness of a measured result to an accepted reference value. Accuracy is usually measured as a percent recovery. QC analyses used to measure accuracy in the analytical laboratory include standard recoveries, laboratory control samples, spiked samples, and surrogates,
During this project, laboratory accuracy will be evaluated through standard daily QA/QC tests performed for each analytic test/method required for project samples by GEL Laboratories. Typically, instrument control measurements and indicator parameter determination for duplicates and matrix spikes will be performed.

Field instrument accuracy will be evaluated through daily source checks with responses being within +/- 20% of the calibration standard count rate.

A.6.1.3 Representativeness

Sample representativeness is the extent to which measurements actually depict the true environmental condition or population that you are evaluating. It is dependent on the proper design of the sampling program and will be satisfied by ensuring the approved plans were followed during sampling and analysis.

During this project, field staff will be required to accurately determine soil depth, and identify soil type and location micro-topography. These parameters will provide information for evaluation of the representativeness of soil concentration results with other SAs and locations.

A.6.1.4 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another. It is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the approved plans are followed and that proper sampling and analysis techniques are applied. Further, when assessing comparability, data sets should be of known and documented quality.

During the project, because dose assessment scenarios can only be applied to locations compatible with dose scenario assumptions and location uses, comparability will be evaluated through duplicates, along with review of field sampling documentation of location specific physical parameters.

A.6.1.5 Completeness

Completeness is a measure of the amount of valid data collected compared to the amount planned. Measurements are considered to be valid if they are unqualified or qualified as estimated data during validation.

During the project, field completeness will be evaluated through comparison of the number of samples collected versus the number of samples planned. Laboratory completeness will be evaluated through comparison of the number of valid measurements to the total number of measurements planned.

Based on the project objectives, a 95% completeness factor will be required for field sample collection. Some latitude is given for samples collected verses those planned to account for possible inaccessibility of locations or soil types that do not allow for adequate volume, or the inability to achieve desired sample depths due to sampling tool refusal. Data results will require a 90% completeness rate. Since survey area gamma readings will be automatically collected and field conditions such as terrain and vegetation are unknown, it is reasonable to assume some data may not be acquired due to location and satellite accessibility. In addition, soil sample results may be below target minimum detectable activity (MDA) or laboratory quality objectives may be missed.

A.6.1.6 Bias

Bias is the systematic or persistent distortion of a measurement process that causes error in one direction (e.g., the sample measurement is consistently lower than the sample's true value). Bias can be introduced during sampling, analysis, and data evaluation.

During the project, sampling bias will be addressed through the proper selection and use of sampling tools, and adherence to sampling procedures that limit the loss or gain of constituents to the sample media. Analytical bias refers to deviation in one direction (i.e., high, low or unknown) of the measured value from a known spiked amount. During the project, analytical bias will be evaluated by GEL Laboratories through their analytical QC program.

A.6.1.8 Repeatability

Repeatability is a quantitative indicator that is used within a single laboratory (i.e., intralaboratory precision). It is determined when the laboratory, analyst, test method and equipment remain constant and random aliquots of the same sample are analyzed within a short period of time. GEL Laboratories participates in intralaboratory comparison programs which confirm acceptable

repeatability.

A.6.1.9 Sensitivity

Sensitivity is an instruments or methods minimum concentration that can be reliably measured or reported. The laboratory MDAs for each analysis required has been provided and is listed in the FSDP. Daily laboratory QA/QC samples and tests performed by GEL Laboratories will verify MDAs for each sample batch counted. Minimum detectable count rate (MDCR) and MDC for Cs-137 in soil using project field survey instrumentation will not be determined because the data are non-critical and are being collected to identify relative changes in area radiation levels without correlation to soil concentration.

A.7 Special Training/Certification

Project personnel will be briefed on the Field Sampling Plan (FSDP), the project Health and Safety Plan, and project specific procedures and protocols. No specialized training will be necessary.

A.8 Documents and Records

Documents used or generated during the course of the project will be controlled and will become part of the project files upon completion of the project. Original records (hardcopy and electronic) will be transferred to NYSERDA.

Table A.8.1 shows the project records that will be generated and included in the file.

Table A.8.1 Project Documents and Records

Sample Collection Documents & Records	On-site Analysis Documents & Records	Off-site Analysis Documents & Records	Data Assessment Documents & Records	Other
Field notes and sample collection data sheets	Instrument calibration logs/records	Sample receipt, custody, and tracking records	Data validation reports	Field survey maps
Chain-of-custody records	Equipment maintenance, testing, & inspection logs/records	Reported analytical results		Dose assessment results
Corrective actions	Field sampling logbooks/records	Analytical QC results		Soil analysis results
Photographs, diagrams, etc.	Field data (see A.8.1)	Laboratory data (see A.8.2)		Controlled FSDP, field procedures
				Training

A.8.1 Field Data

Logbooks for sampling and field investigation purposes must contain sufficient information to distinguish samples from each other. Entries should be recorded in waterproof ink.

A.8.2 Laboratory Data

In addition to the documentation requirements listed in Table A.8.1, GEL will also be responsible for providing analytical reports to MJWTS. These analytical reports must contain all information required to verify and validate the analytical results that are the subject of each report. The laboratory will be required to provide control charts, analytical methods, method validation reports, and performance evaluation sample results. All analytical results will undergo Level IV data validation by the Project Data Validation Specialist as described in Section D.

SECTION B – DATA GENERATION & ACQUISITION

B.1 Sampling Process Design

The sampling processes presented in the FSDP are designed to meet the project objectives discussed in Section A.6. The following subsections provide details related to sample collection to ensure the data are of known and acceptable quality

B.1.1 Walkover Survey

The GPS course grid walkover survey is described in Section 10.a of the FSDP. The walkover survey sampling network design and rationale are described in Section 2 of the FSDP and is focused on providing information for confirming (or not confirming) the areas identified as having elevated radiation levels in the 2014 aerial survey. A dose assessment will be conducted and the results compared to the dose limits in 10 CFR 20.1401 – Radiological Criteria for Unrestricted Use.

Walkover surveys will be performed in SA as defined in Table 1 of the FSDP in addition to On Center locations on the Western New York Nuclear Service Center (WNYNSC) and at background areas on the Cattaraugus Territory of the Seneca Nation of Indians.

For each Area, a course grid walkover survey (typically 20 to 30 meter spacing) will be conducted utilizing a 2" x 2" NaI gamma detector, coupled with a Ludlum 2241-2 scaler/ratemeter. The count rate signal from the Ludlum 2241-2 will be transferred to a GPS instrument, which will simultaneously log the GPS location and count rate. The logged data will be transferred to a computer to be displayed on a map and/or satellite image. After the GPS survey results are completed, they will be reviewed to determine if there are elevated locations above background. Elevated locations will be sampled as described in Section B.1.2 and static direct radiation levels will be collected. If elevated locations are not identified, random locations will be selected for survey and sampling on a grid pattern commensurate the shape of the area, as well as terrain and

related physical conditions. The minimum number of survey and sampling locations are subsequently described in Table 3 of the FSDP. Note that in locations where high-precision GPS data is not available, lower precision methods will be used to collect data, e.g., low-precision GPS, mobile phone tower locations, compass and string, etc.

Table 2 of the FSDP provides sub-area descriptions and provides reference for survey result comparison.

B.1.2 Soil Sampling

Soil sampling is described in Section 10 of the FSDP. The soil sampling network design and rationale are described in Section 2 of the FSDP and is focused on providing information for confirming (or not confirming) the areas identified as having elevated radiation levels in the 2014 aerial survey. A dose assessment will be conducted and the results compared to the dose limits in 10 CFR 20.1401 – Radiological Criteria for Unrestricted Use.

Soil sampling will be performed in Areas 1, 2, 3, 4, and 5 as defined in the FSDP in addition to On-Center areas on the Western New York Nuclear Service Center (WNYNSC) and on the Cattaraugus Territory of the Seneca Nation of Indians.

The total number of soil samples that will be collected for each area is as follows;

- 0 – 2,000 m^2 area – a minimum of four locations for each sub-area
- 2,001 – 10,000 m^2 area – a minimum of 15 locations for each sub-area
- >10,000 m^2 area – a minimum of 24 locations for each sub-area

Table 3 of the FSDP defines the soil sample locations, sample depth, number of different sample types (elevated, random, or confirmatory), and total samples to be collected.

B.2 Sampling Method Requirements

B.2.1 Sample Collection Procedures and Methods

Sampling will be conducted in accordance with project specific procedures to ensure that samples are collected in a standardized method and they represent site conditions. In addition, field guides may be used to provide specific and detailed direction to the field sampling teams. The procedures and guides discuss the sample container and collection requirements specific to GEL Laboratories where sample analysis will be performed. Documentation that will be delivered with samples includes sample labels and GEL provided chain-of-custody forms.

When possible, samples will be shipped to the laboratory via Federal Express or other direct delivery commercial carrier. Where permissible by the prescribed analytical method, if the samples must be held to accommodate the laboratory or field schedule, the samples will be stored under custody in a secure environment. Chain-of-custody shall be maintained from point of sampling through delivery to the analytical laboratory, and then within the laboratory in

accordance with the laboratory QA program.

B.2.2 Sampling Equipment

Sampling equipment required for the field program is listed in the project specific procedure. Field preparatory activities will include:

- reviewing the FSDP, QAPP, and pertinent procedures by all field personnel;
- holding a field planning meeting with field personnel to discuss the content of the FSDP, QAPP, Health and Safety Plan (HASP), and general logistics related to implementation of the field program, and;
- procuring and/or mobilizing field equipment and supplies
- Travel to the field

B.2.2.1 Walkover Surveys

Walkover surveys will be conducted using a 2" x 2" NaI gamma detector, coupled with a Ludlum Model 2241-2 scaler/ratemeter. Walk-over data are being collected to determine relative changes in gamma radiation levels over the survey unit. Walk-over data are non-critical data and will be used to aid in the identification of biased sample locations or verification of elevated area gamma radiation levels.

B.2.2.2 Soil Sampling

Soil samples from the 0 to 15 cm below grade will be collected using a tulip sampler, trowel, shovel, or other device that allow collection of sample by soil depth interval. The project specific procedure and/or guide will provide specific detail.

Soil samples from below 15 cm in depth will be using a weight driven 2" sampler, shovel, or similar device. The project specific procedure and/or guide will provide specific detail.

B.2.3 Support Facilities

The Bulk Storage Warehouse (BSW) located on the WNYNSC will be used to support survey and soil sampling activities including temporary storage of soil and sediment samples.

B.2.4 Corrective Action

The PFS is responsible for ensuring that samples are collected in accordance with the FSDP, QAPP, and the project specific procedures and for initiating and documenting corrective actions for any deviations from these documents. In cases where there are multiple field teams, a team lead will be appointed and will be responsible for ensuring compliance with field procedures. All

staff are responsible for informing the PFS of issues warranting corrective action and the PFS shall inform the PM and PQA/QCM.

B.2.5 Preparation and Decontamination of Sampling Equipment

B.2.5.1 Walkover Survey and Static Radiation Measurements

GPS equipment will be assembled and tested in accordance with manufacturer instructions and the project specific procedure. Operability checks of the Ludlum 2241-2 and the MicroRem, and Scaler Ratemeter instruments and temperature recording shall be performed at the beginning of each day, repeated at mid-day, and at the end of each day of operations.

B.2.5.2 Soil and Sediment Sampling

Equipment will be assembled and transported to the sampling location. All equipment will be checked for cleanliness (visible debris) and operability in accordance with the project specific procedure prior to use each day.

Soil sampling equipment will be thoroughly cleaned between each sampling location and at the end of each day. At the end of each day, the equipment will be rinsed with DI water and a 1 liter sample of the rinsate sent along with the soil samples as a rinsate blank to verify the effectiveness of the decontamination process. The rinsate blank will be analyzed in the same manner as the soil samples. A sample of unused DI water shall also be analyzed as a blank sample..

B.2.6 Selection and Preparation of Sample Containers and Sample Volumes

Soil samples will be collected and shipped in unused containers provided by GEL laboratories. A minimum of 1 liter of soil or sediment will be collected for each sample and in accordance with the project specific procedure.

B.2.7 Preservation and Holding Times

Sample preservation is not required for this project. Standard laboratory holding times will be applied unless quicker turnaround is necessary and authorized by the PM.

B.3 Sampling Handling & Custody

The following subsections describe the process that will be used to ensure that the integrity of the samples is maintained. This process is designed to ensure the custody and integrity of the samples begins at the time of sampling and continues through transport, sample receipt, preparation, analysis, and storage. The project specific procedure and/or field guide will provide specific instruction on sample handling and chain-of-custody.

B.3.1 Sample Packaging and Shipping

Samples will be packaged and shipped after collection and chain-of-custody maintained from point of sampling through shipping to the analytical laboratory.

B.3.4 Corrections to and Deviations from Documentation

If required, a single strikeout initialed and dated is required to document changes. The correct information should be entered in proximity to the erroneous entry. This method will be used on field logbooks, field sheets, and chain-of-custody records. Any deviations from the guidance documents (FSDP, QAPP, HASP, or project procedures/field guides) will be recorded in the appropriate field logbook. Significant deviations will additionally require approval by the NYSERDA Project Manager before the deviation is implemented.

B.3.5 Laboratory Custody Procedures and Documentation

Upon receipt at GEL Laboratories, each sample shipment will inspect the condition of the shipping container and the individual sample containers for integrity and signs of damage or tampering.. The enclosed chain-of-custody records will be cross-referenced with all of the samples in the shipment. GEL personnel will then sign these chain-of-custody records; a copy of each signed record will be provided to MJWTS and placed in the project file.

B.4 Analytical Method Requirements

B.4.1 Standard Analysis

All soil samples will be analyzed for gross alpha and beta and gamma spectroscopy in accordance with GEL Laboratories procedures. Table B.4.1 provides a full listing of analytical methods, applicable minimum detectable activities, and units for this project.

B.4.2 Expanded Analysis

Based upon initial sample results, information gathered in the field, and QA/QC requirements, selected samples will undergo full isotopic analysis.

Non-standard methods will not be used.

B.4.3 Corrective Action

The PM is responsible for initiating and documenting any corrective action related to analytical methods based on information provided by the analytical laboratory.

B.4.4 Turnaround Time

Standard laboratory turnaround times will be used unless project needs change.

Table B.4.1 Analytical Methods, MDC, and Units

Analytical Parameter	Method	MDC	Units
Gross Alpha	EPA 900.0 Mod*/SW 9310 Mod*	4	pCi/g
Gross Beta (Nonvolatile Beta)	EPA 900.0 Mod/SW 9310 Mod	10	
Gamma Scan (Cs-137, Ac-227, Co-60, Cd-113m, Eu-154, Pa-231, Ra-226, Ra-228, Sb-125, Sn-126)	DOE HASL 300 4.5.2.3/Ga-01-R	0.1 (Cs-137 Only)	pCi/g
Am-241,Cm-242,Cm-243/244, Cm-245/246	DOE HASL 300 Am-05-RC Mod	1	
C-14	EPA EERF C-01 Mod	2	pCi/g
I-129	DOE HASL 300 I-01	1	pCi/g
Np-237	DOE HASL 300	1	pCi/g
Analytical Parameter	**Method**	**MDC**	**Units**
Pu-238, 239/240	DOE HASL 300 Pu-11-RC Mod*	1	pCi/g
Pu-241	DOE HASL 300 Pu-11-RC Mod	15	pCi/g
Sr-90	EPA 905.0 Mod	2	pCi/g
Tc-99	DOE HASL 300 Tc-02-RC Mod	5	pCi/g
U-232	DOE HASL 300 U-02-RC Mod	1	pCi/g
U-233/234, U-235/236, U-238	DOE HASL 300 U-02-RC Mod	1	pCi/g
H-3	EPA 906.0 Mod	6	pCi/g
Th-229	DOE HASL 300 Th-01-RC Mod	1	pCi/g
Th-228, Th-230, Th-232	DOE HASL 300 Th-01-RC Mod	1	pCi/g

Radium 226 (20-day ingrowth)	DOEHASL 300 4.5.2.3/GA-01-R	1	pCi/g
Radium 228	DOEHASL 300 4.5.2.3/GA-01-R	3	pCi/g

* GEL Laboratories has modified their analytical methods based on their Performance Based Measurement System (PBMS) to permit the analysis of solids using liquid based consensus analytical methods.

B.5 Quality Control

B.5.1 Field Measurements

The field measurements that will be taken during the investigative activities addressed by this QAPP include a course grid walkover survey, static direct radiation level measurements, and; soil and sediments sampling.

The location of walk-over survey areas and sample locations shall be determined using maps and GPS and confirmed by team members prior to survey and/or sampling. Depth of samples shall also be confirmed by team members. The PFS or PM shall review field logs and data sheets daily

Field measurement equipment will be maintained and calibrated in accordance with the applicable project specific survey/sampling procedures and manufacturer requirements.

B.5.2 Field Quality Control Samples

B.5.2.1 Field Duplicates

Field duplicate samples will be collected at a rate of 1 per 20 (20 percent) of the soil samples collected for this project. They will be collected and handled in accordance with the project specific procedure and/or field guides. Soil duplicate samples will be collected at specific soil depth intervals and submitted as blind QC samples to the analytical laboratory for gross alpha, beta, and gamma spectroscopy analyses. A minimum of 2 samples from each sampling sub area will be submitted for full analysis. The field logbook will note at which locations, dates, and depths the field duplicates were collected.

Field duplicate results will not be used in the data validation process to determine data qualifiers or assess usability. Field duplicate results will be used to evaluate the overall precision of sample collection, field sample preparation, and laboratory analysis (total measurement of sample variability).

B.5.2.2 Equipment Rinsate Blanks

Once per each day of field sampling and following sampling equipment cleaning, the equipment will be rinsed with DI water and a 1 liter sample of the rinsate water will be sent as a blind

equipment rinsate blank to the analytical laboratory for gross alpha, beta, and gamma spectroscopy analyses.

B.5.3 Laboratory Quality Control Elements

Laboratory QC samples will include calibration verification checks, method blanks, laboratory control samples (LCS), carrier and tracer performance, matrix spike (MS) analyses, and laboratory duplicates as required by each analytical method. These QC elements are specific to each analytical laboratory method and are described in the GEL Laboratories QA manual and analytical methods.

B.6 Instrument/Equipment Testing, Inspection and Maintenance Requirements

To ensure that analytical data generated during project activities are reliable, all equipment and instruments will be inspected and maintained throughout the duration of the project. .

B.6.1 Field Equipment

All field instrumentation, sampling equipment, and accessories will be calibrated and maintained in accordance with the manufacturer's recommendations and the project specific procedure. All maintenance will be performed by qualified project personnel and will be documented in the field logbook.

Field personnel will be responsible for the condition of the equipment and for verifying that all equipment is clean and in good working order prior to use. Malfunctioning or damaged equipment must be repaired/replaced as soon as this condition becomes identified. All inspection and maintenance activities must be recorded in the field logbook. Any equipment removed from service for non-routine maintenance/repair will have a tag affixed to it indicating that the equipment is out of service and unsuitable for use. If the instrument is repaired in the field, the PFS will approve returning the instrument to service only after it undergoes a series of tests to verify that proper operating status has been restored.

B.6.2 Laboratory Equipment

All laboratory equipment will be calibrated and maintained in accordance with manufacturer's requirements and the GEL Laboratories QA Manual.

B.7 Instrument Calibration and Frequency

B.7.1 Radiation Measurement Equipment

The MicoRem meter, NaI gamma detector, and Ludlum Model 2241-2 scaler/ratemeter will be calibrated by a competent calibration laboratory and calibration status verified prior to use each day. All calibrations shall be NIST traceable. Operability checks and temperature measurement (using a NIST traceable thermometer) will be performed at the beginning of the

day, mid-day, and at the conclusion of daily operations. These checks will be reflected in the field logbook.

Pre-operational checks, including physical inspection and battery checks will be performed prior to use each day as well as standard source checks.

B.7.2 GPS Equipment

GPS units will be assembled and tested at the beginning of each day in accordance with manufacturer instructions.

B.8 Inspection/Acceptance Requirements for Supplies and Consumables

The condition and acceptability of supplies and consumables will be confirmed by field personnel prior to use. Sample containers will be inspected for cleanliness (ensure not previously used) and integrity prior to use.

B.9 Data Acquisition Requirements for Non-Direct Measurements

Non-direct measurements include information from logbooks, site documents, photographs, and data from other studies that can be used to augment the dataset collected under this project and assist in decision-making. All logbooks, data sheets, and photographs generated by MJWTS during field activities will be documented and maintained in the project file.

SECTION C – ASSESSMENT AND OVERSIGHT

C.1 Assessments and Response Actions

Due to the short duration of this project, assessment and oversight will be performed by the PM and PQA/QCM. Assessment will include verification that the FSDP, QAPP, and project specific procedures are being followed.

C.1.1 Sample Collection/Field Activity Assessment

The PFS will report to the PM on a daily basis regarding progress of the fieldwork and any QA/QC issues associated with field activities. The PFS will review all field logbooks at the end of each sampling day. Any deficiencies identified during the logbook review process will be communicated to the individual team members. If these deficiencies are severe (sample condition was compromised, information not properly recorded), the PFS will communicate these deficiencies to the PM and PQA/QCM.

C.1.2 Analytical Assessment

Project analytical processes will be assessed internally at GEL by the procedures described in the

GEL QA manual.

C.2 Reports to Management

Due to the short duration of this project, the PFS will perform daily briefs to the PM to discuss status of survey and sampling and activities, issue and issue resolution, and any significant QA/QC problems.

SECTION D – DATA VALIDATION AND USABILITY

D.1 Data Review, Verification, and Validation

The PDVS will validate all radiological analysis results. Level IV data validation will be performed in accordance with Evaluation of Radiochemical Data Usability (es/er/ms-5, 1997).