APPENDIX R

Data Usability Assessment Report

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Data Usability Assessment Report

Construction Completion Report for Soils Remediation

Landfill Operable Unit

Tonawanda Landfill Vicinity Property

March 2020

INTRODUCTION

The purpose of this data usability assessment report is to determine if the data quality objectives (DQOs) outlined in the Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP; Plexus, 2019c) were met. The assessment utilizes the findings of the validation performed on the data generated by Pace Analytical (Pace) of Mt. Joliet, Tennessee. During the project, Pace generated 81 Level IV data packages. In accordance with Worksheet #36 (Data Validation Procedures) of the UFP-QAPP, these data were validated by Environmental Data Quality, Inc. of Exton, Pennsylvania using United States Environmental Protection Agency (USEPA) Stage 2B data validation requirements. All radiological and chemical data were validated to these requirements, while, consistent with the UFP-QAPP, no geotechnical data were validated. In accordance with Worksheet #37 (Data Usability Assessment) of the UFP-QAPP, this assessment will include the following elements:

- Data Collection Assessment – determine whether the collected data are of the right type and quantity to support the environmental decision-making for the project;
- Data Quality Indicator (DQI) Evaluation – evaluate data quality indicators (precision, accuracy/bias, representativeness, comparability, completeness, and sensitivity); and
- Conclusions – describe how data quality issues will be addressed and how limitations of the use of the data will be handled.

DATA COLLECTION ASSESSMENT

The overall project objective was to implement the remedy selected in the Record of Decision (ROD) for the Landfill OU of the Tonawanda Landfill Vicinity Property (USACE, 2017). The DQOs for the project were presented on Worksheet #11 (Project/Data Quality Objectives) of the UFP-QAPP. They identified activities, information inputs, a study boundary, the analytic approach, and performance and acceptance criteria. The activity-specific data needs for these DQOs are summarized in **Table 1**.

Table 1. Activity-Specific Data Needs

Activity	Data Needs
Excavation of impacted soil above cleanup goals within the first 1.5 meters (5 feet) of the surface at eight excavation areas	**Confirmation Soil Samples** – radionuclides (radium-226 (Ra-226), thorium-230 (Th-230), uranium-238 (U-238) will be analyzed to determine if cleanup goals have been achieved.
Off-site disposal of impacted soil above cleanup goals at a permitted facility	**Intermodal Container Samples** – radionuclides (Ra-226, Isotopic Thorium, Isotopic Uranium) will be analyzed to determine if waste acceptance criteria compliance has been achieved.
Collection of surface water/groundwater from excavation areas for off-site disposal at the Town of Tonawanda POTW	**Wastewater samples** – radionuclides (Ra-226, Isotopic Thorium, Isotopic Uranium) and Priority Pollutants (except for asbestos and dioxins) will be analyzed to determine if collected water can be discharged to the POTW.
Collection of surface water/groundwater from excavation areas for on-site discharge to Two Mile Creek tributary[1]	**Wastewater samples** – radionuclides (Ra-226, Isotopic Thorium, Isotopic Uranium) will be analyzed to determine if collected water can be discharged to the Two Mile Creek tributary.

Table 1. Activity-Specific Data Needs

Activity	Data Needs
Restoration of excavated areas with clean backfill	**Backfill Samples** – radionuclides (Ra-226, Th-230, U-238), volatile organic compounds, semi-volatile organic compounds, target analyte list metals, polychlorinated biphenyls, pesticides, cyanide, and physical parameters (grain size, soil type, compaction) will be analyzed to determine if a given backfill source complies with the requirements of the scope of work.
Perimeter air monitoring	**Perimeter Air Monitoring Samples** – radionuclides (Ra-226, Th-230, U-238) will be analyzed when needed to evaluate dust control measures and to establish baseline conditions.
Gamma surveying	**Gamma Survey Samples** – radionuclides (Ra-226, Th-230, U-238) will be analyzed when needed to determine if contamination control measures are preventing the spread of contaminants of concern above cleanup goals.
1) Activity and data need added during the execution of the remedial action with approval from the USACE.	

The sampling procedures for the remedial action were presented on Worksheet #17 (Sampling Design and Rationale) of the UFP-QAPP, while the required frequency of sample collection was presented on Worksheet #18 (Sampling Locations and Methods). Sample collection was conducted by the Construction Quality Control Systems Manager (CQCSM), or field personnel under the supervision of the CQCSM, to ensure that all sampling activities were conducted in accordance with the UFP-QAPP. The samples collected by Plexus during the remedial action are provided by activity in **Table 2**. This table evaluates the sample quantities that were collected and the methodologies with which they were analyzed with respect to the requirements of the UFP-QAPP. The analytical methodologies were presented on Worksheet #12 (Measurement Performance Criteria) for chemical and radiological analyses and on Worksheet #19 & 30 (Sample Containers, Preservation, and Hold Times) for geotechnical analyses. The sampling frequency for all analyses (chemical, radiological, and geotechnical) were presented on Worksheet #18 (Sampling Locations and Methods) in the UFP-QAPP.

The quality control (QC) sampling requirements were presented on Worksheet #20 (Field QC Summary) in the UFP-QAPP. The QC samples (field duplicate (FD) and matrix spike (MS)/matrix spike duplicate (MSD)) collected by Plexus during the remedial action are provided by activity in **Table 3**. This table evaluates the QC sample quantities that were collected with respect to the requirements of the UFP-QAPP.

Table 2. Sample Quantities by Activity

Sample Type	Analytes	Methods Used	Required Frequency	Sample Quantity	Frequency and Methodology Requirements Met?
Confirmation	Ra-226, U-238	HASL Ga-01	1 per Excavation Decision Unit Layer (EDUL)	318	Yes/Yes – Every EDUL created during the remedial action sampled, and all samples analyzed by approved methodologies.
	Th-230	LANL ER200M			
IMC	Ra-226	HASL Ga-01	1 per 10 IMCs	34	Yes/Yes – 34 IMCs filled during the remedial action, and all samples analyzed by approved methodologies.
	Isotopic Uranium	ASTM D3972M			
	Isotopic Thorium	LANL ER200M			
Wastewater	Ra-226	HASL Ga-01	1 per 20,000 gallons[1] / 1 per 20,000 gallons but no more than 1 per day[2]	77	Yes/Yes – All wastewater discharges sampled as required, and all samples analyzed by approved methodologies.
	Isotopic Uranium	ASTM D3972M			
	Isotopic Thorium	LANL ER200M			
	Priority Pollutants	8260C, 8270D, 6020A, 8082A, 8081A, CN4500	1 every 6 months[1]	1	Yes/Yes – One sample collected in June 2019 and discharge to the POTW discontinued by September 2019, and sample analyzed by approved methodologies.
Backfill[3]	Ra-226, U-238	HASL Ga-01	1 per 1,000 cubic yards (CY)	4	Yes/Yes – Approximately 4,000 CY of backfill (road base and soil) used during the remedial action, and samples analyzed by approved methodologies
	Th-230	LANL ER200M			
	Grain Size, Soil Type, Compaction	ASTM D422, ASTM D2487, ASTM D698	1 per 1,000 CY	3	Yes/Yes – Of the 4,000 CY of backfill used, only 3,000 CY required testing, i.e., the 1,000 CY of road base was virgin stone, and samples approved by approved methodologies.
Perimeter Air	Ra-226, U-238	HASL Ga-01	Baseline, As Needed	2	Yes/Yes – Baseline samples collected in June 2019, and samples analyzed by approved methodologies.
	Th-230	LANL ER200M			
Gamma Survey	Ra-226, U-238	HASL Ga-01	As Needed	*	Yes/Yes – no minimum sampling quantity was established for this sample type, and no samples analyzed.
	Th-230	LANL ER200M			

1) Required frequency for discharging to the Town of Tonawanda POTW.

2) Required frequency for discharging to the Two Mile Creek tributary.

3) Chemical analyses were conducted by Ensol or not required, i.e., virgin stone provided by New Enterprise.

* No gamma survey samples were required.

Table 3. QC Sample Quantities by Activity

Sample Type	Analytes	Methods Used	Required Frequency		Sample Quantity			Frequency Requirements Met?
			FD	MS/MSD[1]	Primary	FD	MS/MSD	
Confirmation	Ra-226, U-238	HASL Ga-01	1 per 10 field samples	1 per 20 field samples	318	31	*	Yes – field duplicates collected at required frequency, and MS/MSD samples analyzed at required frequency.
	Th-230	LANL ER200M					18	
IMC	Ra-226	HASL Ga-01	1 per 10 field samples	1 per 20 field samples	34	4	*	Yes – field duplicates collected at required frequency, and MS/MSD samples analyzed at frequency.
	Isotopic Uranium	ASTM D3972M					8	
	Isotopic Thorium	LANL ER200M					7	
Wastewater	Ra-226	SM 7500 RaB M	1 per 10 field samples	1 per 20 field samples	77	5	4	No/Yes – field duplicates not collected at required frequency, and MS/MSD samples analyzed at required frequency.
	Isotopic Uranium	ASTM D3972M					11	
	Isotopic Thorium	LANL ER200M					12	
	Priority Pollutants	8260C, 8270D, 6020A, 8082A, 8081A, CN4500	1 per 10 field samples	1 per 20 field samples	1	**	***	Yes – field duplicates collected at required frequency, and MS/MSD samples analyzed at required frequency.
Backfill	Ra-226, U-238	HASL Ga-01	1 per 10 field samples	1 per 20 field samples	4	**	*	Yes – field duplicates collected at required frequency, and MS/MSD samples analyzed at required frequency.
	Th-230	LANL ER200M					***	
	Grain Size, Soil Type, Compaction	ASTM D422, ASTM D2487, ASTM D698	None	None	3	None	None	Yes – requirement met because no QC required.
Perimeter Air	Ra-226, U-238	HASL Ga-01	1 per 10 field samples	1 per 20 field samples	2	**	*	Yes – field duplicates collected at required frequency, and MS/MSD samples analyzed at required frequency.
	Th-230	LANL ER200M					***	
Gamma Survey	Ra-226, U-238	HASL Ga-01	1 per 10 field samples	1 per 20 field samples	****			Yes – requirement met because no gamma survey samples collected.
	Th-230	LANL ER200M						

* Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) were analyzed in lieu of MS/MSD analyses for method HASL Ga-01.

** No duplicate was collected because less than 10 primary samples were collected.

*** MS/MSD analyses requirement achieved through the use of unbiased sample material.

**** No gamma survey samples were required.

As shown in the preceding tables, the analytical methodology, quantity, and QC requirements defined in the UFP-QAPP were met with the following exception:

- Wastewater FD Sampling – an insufficient quantity of FD samples was collected for the quantity of primary wastewater samples (radiological only) that were collected.

The potential impact of this exception on data quality is evaluated in the data quality indicator (DQI) evaluation section, which is presented below.

DATA QUALITY INDICATOR EVALUATION

DQIs were evaluated for each analytical parameter against the measurement performance criteria identified in Worksheet #12 (Measurement Performance Criteria) of the UFP-QAPP. The evaluation was performed as outlined in the "Guide for Labeling Externally Validated Laboratory Analytical Data for Superfund Use," EPA-540-R-08-005. Results were validated or qualified according to general guidance provided in:

- USEPA National Functional Guidelines for Organic Superfund Methods Data Review, January 2017;
- USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (ISM02.4), January 2017;
- USEPA Multi-Agency Radiological Laboratory Analytical Protocols Manual, 2004;
- ANSI/ANS Validation of Radiological Data for Use in Waste Management and Environmental Remediation;
- UFP-QAPP; and
- Department of Defense Quality Systems Manual (DOD QSM) for Environmental Laboratories (Version 5.1), 2017.

The DQIs of precision, accuracy, representativeness, comparability, completeness, and sensitivity are discussed below:

Precision

Precision measures the reproducibility of measurements. It is strictly defined as the degree of reproducibility among independent measurements as the result of repeated application of the same process under prescribed similar conditions. The precision measurement is established using the relative percent difference (RPD) or replicate error ratio (RER) between the duplicate sample results and duplicate spikes. RPD is calculated as follows:

$$RPD = \text{absolute value } [(C1-C2)/\{(C1+C2)/2)\}] \times 100\%$$

Where:

C1 = concentration of primary sample

C2 = concentration of duplicate sample

For radiological parameters, the RER was also calculated and used to evaluate results in the range of the minimum detectable activity (MDA). RER is calculated as follows:

$$RER = \frac{|Sample - Duplicate|}{(Sample\ 2\sigma\ TPU + Duplicate\ 2\sigma\ TPU)}$$

The RPDs were calculated when both the parent and duplicate results exceeded the limit of detection (LOD)/MDA. Results with RPDs that exceeded the acceptance criteria defined in the UFP-QAPP were reviewed for qualification. Professional judgement was also used; the RER was used to evaluate precision and qualify results less than 5 times the MDA. Precision requirements were achieved for the project, except as noted below.

The field duplicate precision criteria were exceeded for the following duplicate pairs and analytes:

- Confirmation Soil – TLVP-ED-DU13-L3/TLVP-ED-DU13-L3-FD (Ra-226 and Th-230); TLVP-ED-DU13-L5/TLVP-ED-DU13-L5-FD (Ra-226 and Th-230); TLVP-ED-DU15-L1/TLVP-ED-DU15-L1-FD (Th-230); TLVP-EG-DU01-L2/TLVP-EG-DU01-L2-FD (Ra-226 and Th-230); TLVP-EG-DU01-L3/TLVP-EG-DU01-L3-FD (Ra-226 and Th-230); and TLVP-EG-DU5-L2/ TLVP-EG-DU5-L2-FD (Ra-226 and U-238).
- IMC – TLVP-IMC-25/TLVP-IMC-25-FD (Th-230); TLVP-IMC-27/TLVP-IMC-27-FD (Th-230, U-234, U-235, U-238); TLVP-IMC-28/TLVP-IMC-28-FD (Ra-226, Th-228, Th-230, Th-232, U-234, U-235, U-238); TLVP-IMC-29 and TLVP-IMC-29-FD (Ra-226, Th-230, Th-232, U-234, U-235, U-238).
- Wastewater – TLVP-WWA-34/TLVP-WWA-34-FD (Ra-226, U-235); TLVP-WWA-40/TLVP-WWA-40FD (Th-232); TLVP-WWA-56/TLVP-WWA-56-FD (U-235).

Precision criteria were exceeded for the MS/MSD analyses for one sample, TLVP-IMC-16 for Th-228 and Th-230. The criteria were also exceeded for TLVP-IMC-20 for Th-230. Results for these analytes are considered estimates.

The primary confirmation soil samples associated with the following field duplicates: TLVP-EG-DU6-L1-FD, TLVP-EG-DU6-L3-FD, and TLVP-EG-DU6-L4-FD, were included in different sample delivery groups. Therefore, the primary samples were prepared and digested in different batches than these field duplicates and their precision could not be evaluated.

An insufficient quantity of wastewater field duplicate (radiological only) samples was collected. 77 primary radiological samples were collected, which required the collection of at least 7 FDs. Five FDs were collected during the remedial action, a shortfall of two FDs. Given that five of seven required duplicates were collected and that wastewater sample precision was also evaluated using MS/MSD analyses, which achieved its precision goals with few exceptions, this shortfall is not anticipated to negatively affect the quality of the wastewater data set.

With the exception of the variances noted above, the precision indicators are within acceptable parameters. No systemic trends or biases were observed.

Accuracy

Accuracy is the statistical measurement of correctness and includes components of random error (variability due to imprecision) and systematic error. A measurement is accurate when the reported value does not differ from the true value or known concentration of the spike or standard. Analytical accuracy is measured by comparing the percent recovery or warning/control limits of analytes spiked into LCS/LCSD and MS/MSD samples to laboratory-established or method-established control limits. Tracer yields (for alpha spectroscopy) and calibration data (for priority pollutant analyses) are also used to evaluate accuracy. Accuracy requirements were achieved for the project, except as noted below:

- High recoveries for antimony, nickel, and zinc were obtained for the MS/MSD analysis of the only priority pollutants (TVLP-WWB-1) wastewater sample. The positive results for these analytes are considered biased high quantitative estimates, and may be lower than reported. Low recoveries for manganese and vanadium were obtained for the MS/MSD analysis of TVLP-WWB-1. The positive results for these analytes are considered biased low, and may be higher than reported. Barium, calcium, magnesium, potassium, and sodium results for TVLP-WWB-1 could not be evaluated based on MS/MSD results, the results for these analytes in TVLP-WWB-1 were higher than the amount of spike added.
- Low recoveries for tracer U-232 were obtained for the following wastewater samples: TLVP-WWA-2UF, TLVP-WWA-2TOTAL, TLVP-WWA-3, TLVP-WWA-4, TLVP-WWA-27, and TLVP-WWA-28. The isotopic uranium results for these samples are considered biased low quantitative estimates, and may be higher than reported.
- A low recovery for tracer Barium-133 was obtained for one wastewater sample: TLVP-WWA-38. Ra-226 for this sample is considered a biased low quantitative estimate, and it is marked with a "J" qualifier.
- High recoveries for U-234 and U-238 were obtained for 4 IMC MS/MSD analyses. The results for the parent samples are considered biased high quantitative estimates, and may be lower than reported.
- One wastewater MS/MSD analysis had a high recovery for U-238. The associated sample result for this analyte is considered biased high.
- A VOC trip blank was not submitted to the laboratory with the priority pollutants wastewater sample.

With the exception of the variances noted above, the accuracy indicators are within acceptable parameters. No systemic trends or biases were observed.

Representativeness

Representativeness is demonstrated through the review of sample documentation and the adherence to established laboratory protocols. Samples were collected by the CQCSM, or field personnel under their direct supervision, according to the procedures outlined in the UFP-QAPP. A detailed review was performed by project staff, including the CQCSM and project chemist, on the chain-of-custody forms, field data collection forms, and laboratory sample confirmation logs to ensure representativeness. Laboratory quality assurance/QC requirements, including laboratory SOPs, were included in the UFP-QAPP to ensure that the laboratory analytical results were representative of true field conditions. Based on the detailed review of sample documentation and the adherence to established laboratory protocols, all data are viewed to be representative of the project.

Comparability

Comparability is evaluated by ensuring that individual data collected during the investigation event is comparable or agrees with other data collected during the same mobilization/investigation or with other data collected during prior investigations. A review of the sampling, preparation, and analytical methods is performed to verify consistency between

data sets. The samples were collected, prepared, and analyzed in accordance with UFP-QAPP, and the laboratory SOPs it contains.

Completeness

Completeness is calculated as the ratio of usable data to all analytical data collected. For completeness requirements, usable results are all results not qualified with an "R" (rejected data) qualifier during data validation. The completeness goal, as defined in the UFP-QAPP, is 90% for each parameter. The following equation is used to calculate analytical completeness:

% Analytical Completeness =
*(number of non-rejected results / number of expected results) * 100*

All total of 2,484 data points (results) were generated across all media. No data were rejected; therefore, the calculated analytical completeness attained for this sampling event is 100% for all parameters.

Sensitivity

Sensitivity is evaluated by comparing the reporting limits to the project action limits. The instrument or method should provide an accurate analyte concentration that is not greater than the applicable screening criteria. The reporting requirement for DOD QSM is to report for compound/analyte results in three levels (high level – limit of quantitation (LOQ), middle level – limit of detection (LOD), and low level – detection level (DL)). As required by DOD QSM protocol, all compounds that were qualitatively identified at concentrations below their respective LOQ but above the DL, have been marked with "J" qualifiers to indicate that they are quantitative estimates. Non-detect results have been reported to the LOD.

Sensitivity for radiochemistry parameters was evaluated by examining the reported MDA. All sensitivity indicators were within acceptable parameters and no systematic trends or biases were observed.

CONCLUSIONS

One hundred percent of the data validated are suitable for their intended use, based on the deliverable items reviewed. No systematic accuracy or precision trends or biases were identified, and no sample results were rejected. Sample results that were qualified as estimated are usable for project decisions. Decisions based on results close to the LOD/MDA should be made with a degree of caution. The completeness goals for the number and type of samples required were met.