US Army Corps of Engineers
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FIRST FIVE-YEAR REVIEW REPORT
FOR THE
SHALLOW LAND DISPOSAL AREA (SLDA) SITE
ARMSTRONG COUNTY, PENNSYLVANIA

Authorized under the
Formerly Utilized Sites Remedial Action Program (FUSRAP)

Prepared by:
Department of the Army
U.S. Army Corps of Engineers

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3 May 2022

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Table of Contents

Appendices

LIST OF ABBREVIATIONS & ACRONYMS

AEC	United States Atomic Energy Commission
Am-241	americium-241
ARAR	Applicable or Relevant and Appropriate Requirement
ARCO	Atlantic Richfield Company
B&W	Babcock & Wilcox Company
BWXT	BWX Technologies, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DCGL	Derived Concentration Guideline Level
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FUSRAP	Formerly Utilized Sites Action Program
FYR	Five-Year Review
MOU	Memorandum of Understanding
mrem/yr	millirem per year
NPL	National Priorities List
NRC	United States Nuclear Regulatory Commission
NUMEC	Nuclear Materials and Equipment Corporation
O&M	Operation and Maintenance
PA	Pennsylvania
PADEP	Pennsylvania Department of Environmental Protection
pCi/g	picoCurie per gram
pCi/L	picocurie per liter
Pu-238	plutonium-238
Pu-239	plutonium-239
Pu-241	plutonium-241
Ra-228	radium-228
RAO	Remedial Action Objectives
ROC	Radionuclide of Concern
ROD	Record of Decision
SLDA	Shallow Land Disposal Area
SNM	Special Nuclear Material
TAL	Target Analyte List
Th-232	thorium-232
TLD	thermoluminescent dosimeter
U-234	uranium-234
U-235	uranium-235
U-238	uranium-238
USACE	United States Army Corps of Engineers
UU/UE	Unlimited Use and Unrestricted Exposure

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Army Corps of Engineers (USACE) prepared this first FYR for the Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Action Program (FUSRAP) Site. In accordance with the FUSRAP Five-Year Review Policy [USACE 2020], the triggering action for a policy review of this non-National Priorities List (NPL) site is the on-site construction mobilization date for the remedial action (May 10, 2010). USACE prepared this policy FYR since, although the selected remedy will not leave FUSRAP-related contamination at the SLDA Site above levels that allow for unlimited use and unrestricted exposure (UU/UE), the remedial action will require five or more years to complete.

All areas of the SLDA FUSRAP Site were reviewed and addressed in this FYR.

The SLDA Site Five-Year Review was led by the USACE Project Engineer. Additional USACE participants included the following: Project Manager, Public Affairs Chief, Resident Engineer, Office Engineer, Health Physicists, Physical Security Specialist, GIS/Environmental Data Specialist, Environmental Engineers, and Environmental Toxicologist/Risk Assessor. The review began on July 19, 2021.

Site Background

Site Location and Description

The SLDA FUSRAP Site is located in Parks Township, Armstrong County, Pennsylvania, about 23 miles (38 kilometers) east-northeast of Pittsburgh, Pennsylvania (Figure 1 of Appendix B). The site is located on the east side of State Route 66 adjacent to Kiskimere Street and Mary Street. SLDA is currently owned by BWX Technologies, Inc. (BWXT) and is maintained under the United States Nuclear Regulatory Commission (NRC) license SNM-2001, Docket Number 070-3085.

The SLDA FUSRAP Site is approximately 44 acres (17.8 hectares), bounded by the community of Kiskimere to the southwest and vacant undeveloped land to the southeast and northeast. The former Parks Nuclear Fabrication Facility site, still owned by BWXT, is located adjacent to and northwest of the SLDA FUSRAP Site. The three buildings that comprised the Parks facility were decommissioned in 2000; the license was terminated, and the property released for unrestricted use in 2004.

The SLDA FUSRAP Site contains ten trenches estimated to contain 23,500 cubic yards (17,967 cubic meters) of contaminated soil and other waste materials. The total trench surface area is approximately 1.2 acres. The trenches are separated into two general areas: one area containing trenches 1 through 9 and a second area containing trench 10 (Figure 2 of Appendix B).

The site is currently vacant and surrounded by a security fence that is actively maintained. It's predominantly an open field, with wooded vegetation along most of the northeastern boundary and in the southeastern and southern corners. A small, intermittent stream, identified as Dry Run (Figure 2), collects surface runoff from the site and from several groundwater seeps along the hillside. A portion of the flow in Dry Run infiltrates through the coal mine spoils in the Trench 10 area and into the abandoned coal mines that underlie the majority of the site, including Trenches 1 through 9. The balance of Dry Run flow continues off-site, northwest to the Kiskiminetas River.

A review of site history indicates that, in the early 1900s, the Upper Freeport coal seam was deep mined beneath the majority of the site (southeast of the high wall). Subsurface mine voids and residual coal underlie the upper trenches at a depth of about 60 to 100 feet (18 to 31 meters) below ground surface. Later, coal was strip-mined where it outcropped at the northwestern end of the site. The eastern extent of the strip-mined area is referred to as the "high wall" and is characterized by a steep, wooded slope.

Land use surrounding the SLDA site is mixed, consisting of medium-sized residential communities and individual rural residences, small farms with croplands and pastures, idle farmland, forest lands, and light industrial areas. The closest community is Kiskimere, to the southwest, which includes residences that are located within several hundred feet of the SLDA.

Site History

In 1957, the Apollo Nuclear Fabrication Facility began operations in Apollo, Pennsylvania, under the United States Atomic Energy Commission (AEC) license No. SNM-145. From 1957 to 1962, the Apollo facility was used for small-scale production of high- and low-enriched uranium and thorium fuel. By 1963, most of the Apollo facility was dedicated to continuous production of uranium fuel and, throughout its operation, the facility converted low-enriched uranium hexafluoride to uranium dioxide, which was used as fuel for commercial nuclear power plants. In 1963, a second product line was added to produce high-enriched uranium fuel for U.S. Navy propulsion reactors. Other operations included analytical laboratories, scrap recovery, uranium storage, and research and development.

Between 1961 and 1970, Nuclear Materials and Equipment Corporation (NUMEC), who owned both the Apollo facility and the SLDA, buried process and other wastes from the Apollo plant at the SLDA Site. According to site records, these wastes were buried in accordance with AEC regulation 10 CFR 20.304, Disposal by Burial in Soil, which was subsequently rescinded in 1981. In 1967, NUMEC stock was bought by Atlantic Richfield Company (ARCO) and the use of the SLDA for radioactive waste disposal was discontinued in 1970. In 1971, the Babcock & Wilcox Company (B&W) acquired NUMEC. In 1997, BWXT assumed ownership of the SLDA.

Records indicate that the uranium-contaminated materials disposed of at the SLDA are present at various levels of enrichment, ranging from depleted to enriched. Analytical results from soil and leachate samples were consistent with the enriched uranium data reported in historical documents.

Based on reports prepared by ARCO/B&W, and discussions with individuals familiar with disposal operations at SLDA, the waste materials were placed into a series of pits that were constructed adjacent to one another. From geophysical surveys performed at the site, these pits appear as linear trenches and are depicted on site drawings as trenches. These geophysical anomalies were labeled as "trenches 1 through 10;" this numbering scheme was based partially on the sequential construction and use of each trench (1 being the oldest trench and 9 being the most recently constructed trench in the upper trench area). Trench 3 was actually a backfilled settling pond used during the exhumation of trenches 2, 4, and 5 in 1965. Trench 10 was excavated in coal strip mine spoils on the northwest side of the high wall and was used for disposal purposes throughout the 1960s and during 1970. As previously stated, disposal activities at the SLDA Site were reportedly terminated after 1970.

Documentation of radiological and chemical waste in the disposal trenches was not detailed and drawings of disposal areas were not located. The Nuclear Material Discard Reports that comprise the bulk of the waste disposal documentation list only the materials of interest at the time of disposal (uranium-235 (U-235), total uranium, and thorium). Any other information, such as the presence of specific metals, chemical compounds, or the waste-origin process, was qualitative.

BWXT held an NRC license (SNM-414) for their Parks Township operations facilities, which, until 1995, included the area now defined as the SLDA. In 1995, the SLDA Site was given a separate license (SNM-2001) in order to expedite decommissioning activities at the Parks facilities. Following findings of SLDA-related contamination on Parks facilities property during a confirmatory survey, BWXT was granted an amendment to SNM-2001 in March 2002. This amendment added an approximately 12-acre (4.9- hectare) area, which was formerly part of the SNM-414 license, to the southeastern edge of the SLDA. Under license SNM-2001, BWXT is required to properly maintain the site in order to ensure protection of workers and the public, and to eventually decommission the site in compliance with NRC regulations as part of its license termination activities.

In January 2002, Section 8143 of Public Law 107-117 instructed USACE to cleanup radioactive waste at the site under FUSRAP. The authority for this response action is found in Section 8143 of the Fiscal Year 2002 Defense Appropriations Act, Public Law 107-117, which, subject to subsections (b) through (e) of section 611 of Public Law 106-60 (113 Stat. 502; 10 U.S.C. 2701 note), directs the Secretary of the Army, acting through the Chief of Engineers to clean up radioactive waste at the SLDA Site under the Formerly Utilized Sites Remedial Action Program (FUSRAP). Any chemical contamination that is not co-mingled with radioactive waste cannot be addressed by USACE under FUSRAP by the authority provided in Section 8143 of Public Law 107-117.

USACE is the lead agency for this cleanup that will follow the remediation process outlined under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and will accomplish the cleanup consistent with the Memorandum of Understanding (MOU) between USACE and NRC dated July 5, 2001. The NRC issued a confirmatory order suspending the license (SNM-2001) on August 5, 2011, to enable USACE to accomplish the cleanup, and the license will be reinstated in accordance with Article III.N of that MOU upon successful cleanup completion.

SITE IDENTIFICATION		
Site Name: Shallow Land Disposal Area (SLDA)		
EPA ID: Not Applicable		
Region: Not Applicable	**State:** PA	**City/County:** Parks Township/Armstrong County
NPL Status: Non-NPL		
Multiple OUs? No	**Has the site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: Other Federal Agency ***[If "Other Federal Agency", enter Agency name]*:** United States Army Corps of Engineers		
Federal Project Manager: Tim Herald		
Author affiliation: United States Army Corps of Engineers, Pittsburgh District		
Review period: July 19, 2021 – May 20, 2022		
Date of site inspection: July 22, 2021		
Type of review: Policy		
Review number: 1		
Triggering action date: May 10, 2010		
Due date *(five years after triggering action date)*: May 10, 2015[1]		

[1] FYRs should be conducted either to meet the statutory mandate under CERCLA §121(c) or as a matter of policy. In the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 CFR §300.430(f)(4)(ii)], the FYR requirement in CERCLA §121(c) is triggered when remaining on-site hazardous substances, pollutants, or contaminants are above levels that allow for UU/UE. Since the selected remedy for the SLDA FUSRAP Site, once implemented, will not leave FUSRAP-related contamination above levels that allow for UU/UE, USACE is not required by CERCLA to conduct FYRs. However, in June of 2020, USACE issued a FUSRAP FYR policy [USACE 2020] that required USACE to conduct a policy FYR when remedial action will not leave FUSRAP-related contamination above levels that allow for UU/UE, but will require five or more year to implement. As a result of this FUSRAP FYR policy [USACE 2020], USACE initiated this policy FYR for the SLDA FUSRAP Site.

II. RESPONSE ACTION SUMMARY

Initial Response Actions

In 1965, NUMEC exhumed the contents of trenches 2, 4, and 5 to investigate discrepancies in the quantities and activities of uranium-containing wastes at SLDA. The materials removed from the trenches were placed on the ground south of the upper trenches and sorted. Some of the exhumed materials were placed back in the trenches in 1966, and the remainder was shipped off-site for disposal.

In 1986 and 1989, B&W completed soil remediation projects at the SLDA Site to remove surface soils found to contain uranium isotopes at activity levels above the NRC guideline of 30 picocuries per gram (pCi/g) for total uranium. There were no reports identified that describe the actual remediation work (e.g., excavation depths, volumes removed, etc.); however, confirmation sampling reports corresponding to each remediation project were reviewed.

Basis for Taking Action

The results of the human health baseline risk assessment indicate that the previously disposed of wastes within the trenches contain significant concentrations of radioactive contaminants, and these materials could pose a potential risk to human health in the future. The estimated annual dose to a hypothetical Subsistence Farmer from exposures to these materials exceeds decommissioning criteria established in 10 CFR 20.1402, Radiological Criteria for Unrestricted Use.

The response action addresses the following radionuclides that pose unacceptable risk in soil and waste at the SLDA FUSRAP Site: americium-241 (Am-241), plutonium-239 (Pu-239), plutonium-241 (Pu-241), radium-228 (Ra-228), thorium-232 (Th-232), uranium-234 (U-234), uranium-235 (U-235), and uranium-238 (U-238). Groundwater was determined not to be impacted and, therefore, no remedial action is necessary for groundwater.

Response Actions

The remedy selected for the SLDA FUSRAP Site is referred to as Alternative 5, Excavation, Treatment, and Off-site Disposal in the ROD [USACE 2007], as amended [USACE 2015]. Implementation of the Selected Remedy will involve excavation of radiologically contaminated soil and waste, off-site transportation, and disposal at an appropriate permitted/licensed disposal facility.

The remedial action objective (RAO) for the selected remedy is to prevent the external exposure to, and the ingestion and inhalation of radionuclides (U-234, U-235, U-238, Th-232, Ra-228, Pu-239, Pu-241, and Am-241) present in trench waste, surface and subsurface soil at the SLDA FUSRAP Site so that the total effective dose equivalent (TEDE) to an average member of the critical group (subsistence farmer), when combined with the potential dose due to the ingestion of radionuclides in groundwater, does not exceed 25 millirem per year (mrem/yr) and does not result in an unacceptable non-cancer risk (i.e., an HI of greater than 1) for uranium.

USACE determined that NRC standards for decommissioning of licensed facilities found in 10 CFR 20.1402, Radiological Criteria for Unrestricted Use, are relevant and appropriate for cleanup of radiological contamination at the SLDA FUSRAP Site. In compliance with these standards, USACE will:

1. Excavate radiologically contaminated soil and waste that exceed, excluding background, a Sum of Ratios (SOR) of 1, based on the wide area average Derived Concentration Guideline Levels (DCGLw), expressed in picocuries per gram (pCi/g), presented in Table 1. In addition, an elevated measurement criteria (DCGLemc) was developed to ensure no localized areas of elevated radioactivity will remain that could potentially produce an unacceptable risk. The DCGLw criteria will be applied as averages over a wide area, while the DCGLemc values will be applied to smaller areas as not-to-exceed, “hot-spot” criteria. Verification of compliance with soil cleanup goals will be demonstrated using guidance in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM).

2. Remove and dispose off site all impacted soil and waste excavated to achieve cleanup goals, as discussed in item 1 above, for the radionuclides of concern (ROCs).

Table 1: ROCs and Soil Cleanup Goals for the SLDA FUSRAP Site

Radionuclide	DCGLw (pCi/g) [(a)]	DCGLemc (pCi/g) per 100 square meters	Average Site Background Soil Concentrations (pCi/g)	
			Surface	Subsurface
Americium-241 (Am-241)	28	420	0.00	0.00
Plutonium-239 (Pu-239)	33	570	0.10	0.00
Plutonium-241 (Pu-241)	890	13,000	0.00	0.00
Radium-228 (Ra-228)	1.7	- [(b)]	-	-
Thorium-232 (Th-232)	1.4	5.3	1.1	1.5
Uranium-234 (U-234)	96	240	0.94	1.1
Uranium-235 (U-235)	35	111	0.1	0.12
Uranium-238 (U-238)	120	520	0.98	1.0

(a) These cleanup goals represent wide-area average activity levels above site background activity corresponding to 25 mrem/yr for a Subsistence Farmer scenario. These values were calculated using the RESRAD computer code and assume that the contamination is uniformly present over an area of 0.83 acres (3,350 square meters) to a depth of 13 feet (4 meters). These values correspond to the approximate area covered by Trenches 1 through 9 in the upper trench area, and the depth is the approximate depth of the trenches in this portion of the site If a mixture of radionuclides is present at a given location, then the SOR applies per MARSSIM. For example, using the DCGLw values for soil, the following SOR equation is obtained:

$$SOR = \frac{Ra\text{-}228}{1.7} + \frac{Am\text{-}241}{28} + \frac{Pu\text{-}241}{890} + \frac{Pu\text{-}239}{33} + \frac{Th\text{-}232}{1.4} + \frac{U\text{-}234}{96} + \frac{U\text{-}235}{35} + \frac{U\text{-}238}{120}$$

where SOR = sum of the ratios result
Ra-228 = net Ra-228 soil concentrations
Am-241 = net Am-241 soil concentrations
Pu-241 = net Pu-241 soil concentrations
Pu-239 = net Pu-239 soil concentrations
Th-232 = net Th-232 soil concentrations
U-234 = net U-234 soil concentrations
U-235 = net U-235 soil concentrations
U-238 = net U-238 soil concentrations
Net soil concentrations are above-background levels.

(b) Based on site-specific considerations, a DCGLemc for Ra-228 was not developed because it can be accounted for by assuming it is present at the same concentration as its parent nuclide, Th-232.

The Selected Remedy addresses the principal threat from ROCs at the site by removing radioactively contaminated soil and waste that may pose a future threat to the health of persons at the site. Implementation of this remedy will meet the unrestricted release criteria as defined in the ARAR. The Selected Remedy only addresses the radioactive contamination and does not address any other hazardous substances that may be present at the site, consistent with the authorization provided to USACE to conduct remedial action at this site under FUSRAP as specified in Section 8143 of Public Law 107-117. The determination of the need for and performance of response actions related to other releases of hazardous substances at this site are not within the authority of USACE under FUSRAP. It is the responsibility of other agencies and parties to undertake any other necessary response actions at the site.

Status of Implementation

The SLDA FUSRAP Site has not achieved construction completion. Implementation of the final remedy began in 2011 and remains ongoing.

As discussed in the ROD amendment [USACE 2015], NRC issued a confirmatory order suspending the license (SNM-2001)[2] on August 5, 2011 to enable USACE to accomplish the cleanup. Immediately following license abeyance, USACE began implementing the selected remedy, which involved the excavation of radiologically contaminated soil and debris, sorting of this material, packaging for off-site transportation, and disposal at an appropriately permitted, licensed disposal facility. Between August and September of 2011, USACE excavated approximately 3,300 tons of radiologically contaminated soil and debris from Trenches 2 and 3, which was subsequently disposed of at EnergySolutions' bulk waste facility in Clive, Utah. Excavation activities were suspended on September 30, 2011, and remediation activities have not resumed at the site to date[3]. In 2012, USACE performed decontamination and site restoration activities, and demobilized the remediation contractor from the SLDA FUSRAP Site.

Between 2012 and 2016, USACE re-solicited for a new remediation contract to implement the selected remedy and issued a ROD amendment [USACE 2015] to reflect the substantial increase in cost estimated to complete the remedy. In 2017, USACE awarded the new remediation contract for the SLDA FUSRAP Site. Between 2017 and 2019, USACE worked to resolve bid protests challenging the terms of the award. In 2019, the protests were successfully resolved and USACE issued a notice to proceed to begin preparing remediation work plans. Between 2019 and 2021, the new remediation contractor prepared remediation programmatic work plans and mobilized to the SLDA FUSRAP Site to continue ongoing operation and maintenance (O&M) activities. USACE is currently preparing remedial design documents, which are technical specifications that will be utilized to implement the selected remedy identified in the ROD [USACE 2007], as amended [USACE 2015].

USACE continues to maintain the SLDA FUSRAP Site in caretaker status while the NRC license remains suspended to enable USACE to accomplish the cleanup. The NRC license will be reinstated in accordance with Article III.N of that MOU upon successful cleanup completion.

<u>Operation & Maintenance</u>

Under license SNM-2001, BWXT is required to properly maintain the site in order to ensure protection of workers and the public, and to eventually decommission the site in compliance with NRC regulations as part of its license termination activities. NRC suspended the license in 2011 to enable USACE to accomplish the cleanup.

USACE has conducted an O&M Program at the SLDA FUSRAP Site to ensure protection of workers and the public since 2011. USACE routinely performs O&M activities at the SLDA FUSRAP Site in order to meet the following RAO identified in the ROD [USACE 2007], as amended [USACE 2015]:

"Prevent the external exposure to, and the ingestion and inhalation of radionuclides (U-234, U-235, U-238, Th-232, Ra-228, Pu-239, Pu-241, and Am-241) present in trench waste, surface and subsurface soil at the SLDA site so that the total effective dose equivalent (TEDE) to an average member of the critical group, when combined with the potential dose due to the ingestion of radionuclides in groundwater, does not exceed 25 mrem/yr and does not result in an unacceptable non-cancer risk (i.e., an HI of greater than 1) for uranium."

The RAO to prevent exposure to FUSRAP-related ROCs in soil and trench waste at the SLDA FUSRAP Site above levels that allow for UU/UE can be accomplished by reducing exposure, as well as reducing contaminant levels by implementing the selected remedy.

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[2] The NRC license will be reinstated in accordance with III.N of the MOU between USACE and NRC dated July 5, 2001 upon successful cleanup completion.

[3] Based upon the characterization of excavated materials in 2011, and new information obtained subsequent to the issuance of the ROD [USACE 2007], radionuclides other than those identified in Table 1 of this FYR Report may be present at SLDA. If radionuclides other than the ROCs listed in Table 1 of this FYR are discovered during remediation in significant quantities, USACE may evaluate and establish soil-based cleanup goals in addition to those already identified. USACE retained a site maintenance contractor in 2011 to continue ongoing operation and maintenance (O&M) of the SLDA Site while the NRC license (SNM-2001) remains suspended.

USACE conducts the following O&M activities at the SLDA FUSRAP Site to prevent exposure to FUSRAP-related ROCs in areas with the potential to pose unacceptable risk until the selected remedy can be fully implemented:

- Access controls (perimeter fencing, signage, and security guards);
- Environmental monitoring of perimeter air, groundwater, and surface water; and
- Site Maintenance (maintenance of grounds, perimeter fence, signage, roadways, infrastructure).

USACE will continue these O&M activities at the SLDA FUSRAP Site until the RAO has been attained (based largely upon post-excavation sampling and analysis) and residual concentrations of ROCs in soil will allow for unrestricted future use of the site (i.e., residuals are below the DCGLs specified in Table 1 of this FYR). Once this is accomplished, USACE will no longer need to manage an O&M Program at the SLDA FUSRAP Site in order to protect human health and the environment from FUSRAP-related ROCs.

The scope of the current SLDA O&M program are summarized below**:**

Soil and Trench Waste
USACE restricts site access with engineering controls (i.e., perimeter fencing with no trespassing signage) and security guards, and maintains site grounds to reduce exposure to ROCs in soil and trench waste.

Perimeter Air Monitoring
On-site perimeter and off-site locations are monitored for radionuclide concentrations in airborne particulates. Figure 3 (Appendix B) shows the locations of the eight (8) permanent perimeter air monitoring stations on the SLDA FUSRAP Site (i.e., SLDA-1 through SLDA-8) and one (1) off-site location (i.e., SLDA-9).

Air filters are collected weekly from each air monitoring station and screened on-site for gross alpha-beta activity. These weekly air filters are then composited each month and sent to an off-site laboratory for isotopic analysis of the following radionuclides: Am-241, Th-232, Pu-239/240, U-234, U-235, and U-238.

Perimeter Dosimetry
In addition, each of the eight (8) on-site perimeter air monitoring stations at the SLDA FUSRAP Site and two (2) off-site locations (residence and Leechburg-Gilpin Park) are equipped with a thermoluminescent dosimeter (TLD).

Groundwater
Each site groundwater monitoring well is screened in one of five groundwater-bearing zones (i.e., overburden, first shallow bedrock, second shallow bedrock, Upper Freeport coal, and deep bedrock) underlying the SLDA FUSRAP Site. Groundwater in the upper trench area (i.e., where Trenches 1-9 are located) flows predominately north to northwesterly in the overburden and first shallow bedrock zone, both northeasterly and southwesterly in the second bedrock zone due to a flow divide under the site, southerly to southeasterly in the Upper Freeport coal, and south-westerly in the deep bedrock zone. Groundwater surrounding Trench 10 appears to enter the Upper Freeport coal seam, which generally drains to the south and west. However, minor annual variations in the groundwater flow directions in the upper trench area and Trench 10 area are evident from year to year.

Although groundwater is not a media of concern at the SLDA FUSRAP Site, the USACE initiated annual sampling of site groundwater due to public concern about the potential for off-site migration of FUSRAP-related ROCs. USACE continues to collect annual unfiltered (total fraction) and field-filtered (dissolved fraction) groundwater samples from the on-site groundwater-monitoring well network and analyzes them for ROCs listed in the ROD [USACE 2007], as amended [USACE 2015] and 23 Target Analyte List (TAL) metals. Figure 4 (Appendix B) shows 2020 groundwater sample locations.

Static water levels are collected from the site wells, in advance of sampling, to confirm groundwater flow directions. Field parameters (temperature, pH, specific conductance, oxidation-reduction potential, turbidity, and dissolved oxygen) are collected during groundwater sampling activities to ensure the well is stable (i.e., truly representative of groundwater conditions) before collecting samples. Groundwater sample locations vary slightly from year to year. Occasionally there is insufficient groundwater yield available (i.e., not enough sample volume can be collected) in certain wells in order to perform the required analysis. In this case, contingency wells are substituted to maximize the groundwater sampling dataset.

Surface Water
Dry Run (Figure 2), which flows northwest to the off-site Kiskiminetas River, collects surface runoff from the SLDA FUSRAP site. Although surface water is not a media of concern at the SLDA FUSRAP Site, USACE typically collects annual unfiltered (total fraction) and field-filtered (dissolved fraction) surface water samples from one on-site and one off-site location and analyzes them for ROCs listed in the ROD [USACE 2007], as amended [USACE 2015] and 23 Target Analyte List (TAL) metals. Figure 4 (Appendix B) shows the 2020 location of the on-site surface water sample (SP-DR-01), a groundwater seep near Trenches 4 and 5. The off-site surface water sample (WS/SE-CR-06) is located near the intersection of Carnahan Run and River Road (State Route 66). Occasionally there is insufficient surface water yield available (i.e., not enough sample volume can be collected) in order to perform the required analysis or other considerations (e.g., off-site construction) that prevent sampling. In those instances, no surface water sample is collected. Historically, additional on-site surface water samples were collected, however, these locations were subsequently excluded from annual sampling since the site is no longer in active remediation, and therefore, no on-site discharge of treated wastewater is occurring.

III. PROGRESS SINCE THE LAST REVIEW

Not applicable. This is the first FYR for the SLDA FUSRAP Site.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

In July of 2021, USACE issued a press release and e-mailed a newsletter to the site mailing list and posted to the project website. The public notice announced the start of a FYR and invited the public to request an interview if there was interest in providing input for USACE consideration during this FYR. No public requests for an interview were received.

The results of this FYR will be summarized in a newsletter and the report will be made available on the SLDA project website located at: https://www.lrp.usace.army.mil/Missions/Planning-Programs-Project-Management/Key-Projects/Shallow-Land-Disposal-Area/.

During the FYR process, interviews were conducted via e-mail to document any perceived problems or successes with the selected remedy. Interview forms are provided in Appendix E. The interviewed parties and dates that feedback was received are listed in Table 2.

Table 2: Interviewed Parties for the SLDA FUSRAP Site Five-Year Review

Affiliation	Interviewee Title	Date
Santa Fe Protective Services, Inc.	Vice President	August 4, 2021
U.S. Department of Energy, Office of Environmental Mgmt.	Director, Office of Waste Disposal	August 4, 2021
Armstrong County Department of Public Safety	Director	August 25, 2021
Pennsylvania Department of Environmental Protection	Radiation Protection Manager	August 26, 2021
Office of Senator Bob Casey	Regional Representative	August 27, 2021
Jacobs Field Services, Inc.	Deputy Project Manager	August 30, 2021

Interviewees were asked general questions about their opinions relative to the selected remedy, site operations, impacts on the surrounding community, and how well informed they felt regarding the project and progress. Each interviewee was asked if they had any comments, suggestions, or recommendations regarding the site or its operations and administration. The results of these interviews are summarized below.

The overall impression of the SLDA FUSRAP Site was that it is a complex remediation project currently in the planning stage with USACE's first priorities being safety and security. Interviewees feel adequately to well informed about the site's progress, and look forward to the site moving towards active cleanup in the future. Although unaware of any negative impacts that site operations have had on the surrounding community, most interviewees acknowledged that the community is mainly concerned with safe and secure operations at the site. None of the interviewees were aware of any events or additional information (i.e., changes to land use, regulations, O&M requirements, etc.) that would call into question the protectiveness of the remedy to be implemented.

Data Review

Data collected as part of the current SLDA O&M program are summarized below**:**

Perimeter Air Monitoring
Air filters are collected weekly from each air monitoring station and screened on-site for gross alpha-beta activity. Gross alpha results are compared to a weighted air effluent concentration for Th-232 and its progeny through Ra-224 (i.e., 1E-05 picocuries per liter), calculated using the radionuclide-specific concentrations identified in 10 CFR 20, Appendix B, Table 2, since this is the most restrictive limit of the radionuclides measured. The gross alpha results, compared to the 10 CFR 20 air effluent criteria for the thorium chain, continue to trend below 10% of the annual air activity concentration.

These weekly air filters are then composited each month and sent to an off-site laboratory for isotopic analysis of the following radionuclides: Am-241, Th-232, Pu-239/240, U-234, U-235, and U-238. As shown in Figures 1 through 30 in Appendix G, results from perimeter air monitoring samples collected between calendar years 2015 and 2020 were consistent with results from off-site ambient air (SLDA-9) and consistently less than 10% of the air effluent limits found in Table 2 of 10 CFR 20, Appendix B, for all radionuclides measured.

The airborne effluent concentrations in Table 2 of 10 CFR 20, Appendix B, if inhaled or ingested continuously over the course of a year, would produce a total effective dose equivalent of 50 millirem (mrem), which is half of the annual radiation dose limit to protect members of the public. Both the gross alpha counting and isotopic specific data demonstrate that fugitive radioactive airborne emissions from the SLDA site do not expose members of the public to concentrations that yield an individual dose equivalent in excess of 10% of the airborne effluent concentrations specified in Table 2 of 10 CFR 20, Appendix B.

During the first remediation effort in 2011, USACE conducted breathing zone air sampling in the proximity of the active excavation for worker protection. Data from these portable air samplers demonstrated that no workers were exposed to airborne radioactivity in excess of regulatory limits.

Perimeter Dosimetry
As shown in Figures 31 through 35 in Appendix G, the resultant total effective dose from all external sources (i.e., natural and potential airborne effluents from the site) at eight (8) on-site and two (2) off-site TLDs is well below the 100 mrem per year (mrem/yr) radiation dose limit standard (10 CFR 20, Subpart D) to protect members of the public.

During the first remediation effort in 2011, USACE used TLDs to measure external radiation exposure to trained radiological workers who entered radiological control areas or handled radioactive materials. Data from these TLDs demonstrated that no workers were exposed to a total effective dose in excess of regulatory limits.

Groundwater
In support of this FYR, USACE conducted a statistical evaluation of radiological concentrations in site groundwater. Concentrations Am-241, Pu-238, Pu-239/240, Pu-241, Th-230, and total uranium, collected by USACE from 27 site groundwater monitoring wells between calendar years 2004 and 2020, were initially screened for the following data useability criteria:

- The total number of data points (n) for each monitoring well (i.e., sample size) is greater than or equal to (≥) six; and
- The number of detections for each monitoring well is ≥ a threshold of 80%.

Datasets that could not meet these two criteria were not evaluated further. As a result of this screening, the data sets for 11 monitoring wells for total Uranium activity were retained for statistical evaluation using the Mann-

Kendall trend test. Due to the geochemical properties of site groundwater (i.e., slightly low pH and positive redox potential), uranium is an excellent predictor of transport mobility of the radionuclides in groundwater.
Trends in total uranium were evaluated for a 90% confidence level (10% significance level or $\alpha = 0.1$) using the EPA ProUCL software v.5.1. There was one non-detect in the set of data for input into ProUCL identified for monitoring well PZ-01. Upon review of the values in the remainder of the data set, the non-detect value was replaced with a one-half detection limit surrogate of 0.029 picocuries per liter (pCi/L).
Table 3 summarizes the results of the statistical evaluation of total uranium activity in 11 SLDA FUSRAP Site groundwater monitoring wells. Figures 36 through 46 (Appendix G) illustrate output files associated with the statistical evaluation of total uranium activity in each of these 11 groundwater monitoring wells.

Table 3: Statistical Evaluation of Total Uranium Concentrations in SLDA FUSRAP Site Groundwater Monitoring Wells (Calendar Years 2004-2020)

Water Bearing Zone	Groundwater Monitoring Well	Hydraulic Position to Trenches	Sample Size (n)	Total Uranium Activity (µg/L)			Mann-Kendall (M-K) Trend Test		
				Minimum	Maximum	Mean	s	Tabulated p	M-K Trend Results
Overburden	PZ-01	D	6	0.029	0.326	0.131	-5	0.235	No trend identified
First Shallow Bedrock	MW-07	U/C	7	0.097	0.252	0.184	-11	0.068	Decreasing
	MW-09A	U	8	0.082	0.43	0.181	0	0.548	No trend identified
	MW-44	D	6	0.375	17.7	3.829	7	0.136	No trend identified
	MW-51	D	6	0.231	9.48	1.866	7	0.136	No trend identified
Second Shallow Bedrock	MW-33	U	8	0.187	0.663	0.364	-6	0.274	No trend identified
	MW-52	U	6	0.093	0.506	0.329	-3	0.36	No trend identified
Upper Freeport Coal	10L31	U	8	0.189	0.731	0.385	-10	0.138	No trend identified
	MW-03	D	6	0.153	3.81	1.67	-15	0.001	Decreasing
	MW-39	D	7	0.143	0.903	0.434	5	0.281	No trend identified
Deep Bedrock	MW-22	D	8	0.116	0.771	0.336	8	0.119	No trend identified

D = Groundwater monitoring well is located downgradient from waste disposal trenches.
U = Groundwater monitoring well is located upgradient from waste disposal trenches.
U/C = Groundwater monitoring well is located upgradient/cross gradient from waste disposal trenches.

S = If the s-value of the Mann-Kendall test is positive, then there is an increasing trend. A negative s-value means that there is a decreasing trend.
P = If the p-value of the Mann-Kendall test is lower than a 0.10 level of significance (for 90% confidence), then there is statistically significant evidence that a trend is present in the time series data.

Although some variability in the seasonality of the groundwater dataset was noted, total uranium concentrations in site groundwater wells are either decreasing over time (i.e., MW-07 and MW-03) or there was an insufficient dataset to determine if a trend exists with a 90% level of confidence (i.e., no trend was identified).

The 2020 Monitoring Report [USACE 2021] indicates that sample results are fairly consistent with past USACE findings and continue to demonstrate that groundwater is not a media of concern at the site. Although not an ARAR for the site, no FUSRAP-related radionuclides exceed the EPA MCLs or dose-based drinking water standards.

Surface Water
In support of this FYR, USACE reviewed concentrations Am-241, Pu-238, Pu-239/240, Pu-241, Th-230, and total uranium, collected by USACE from on-site surface water locations between calendar years 2004 and 2020. As shown in Table 6 of the 2020 Monitoring Report [USACE 2021], 2020 results are fairly consistent with past USACE findings and continue to demonstrate that surface water is not a media of concern at the site.

<u>Site Inspection</u>

The inspection of the site was conducted on July 22, 2021. In attendance were the Resident Engineer (Joseph Matis) and Office Engineer (Joshua Kinnear) from the USACE Resident Office at the SLDA Site.

The purpose of the inspection was to assess the current and future protectiveness of the selected remedy. The site inspection consisted of a site and perimeter visual inspection, photographing, and discussion of site inspection checklist items. Documentation of the site inspection, in the form of the site inspection checklist, is included as Appendix C to this report. A photographic log of the conditions observed during the site inspection is included as Appendix D to this report.

No issues were observed during the site inspection that could impact the current and/or future protectiveness of the remedy. Access to the SLDA FUSRAP Site is restricted by a perimeter fence and 24-hour security guard services (Photos 10-14, 17, 18). No trespassing signs are posted every 100 feet on the outside of the perimeter fence (Photo 17). No damage to the site perimeter fence or signage was observed during the site inspection. Air monitoring stations were found to be in good working order (Photos 1-9). All trench areas were well maintained, and grass covered with no evidence of erosion, holes, wet areas, or damage (Photos 21-24). Site infrastructure (15-16, and 19-20) and groundwater monitoring wells (Photos 25-26) were generally found to be in good working order. At the time of the site inspection, land use of the site (vacant) and its vicinity (mixed, consisting of small residential communities, individual rural residences, small farms with croplands and pastures, idle farmland, forested areas, and light industrial properties) are consistent with those identified in the ROD [USACE 2007], as amended [USACE 2015].

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

<u>Question A Summary:</u>

Yes, the selected remedy for the SLDA FUSRAP Site is currently being designed and will be executed in accordance with the requirements in the ROD [USACE 2007], as amended [USACE 2015]. Although the selected remedy has not been fully implemented, it is expected to be protective once complete. In the interim, USACE successfully restricts access to the site (i.e., perimeter fence, no trespassing signage, and security guards), and conducts routine environmental monitoring and operation and maintenance activities, to prevent exposure to FUSRAP-related ROCs in areas with the potential to pose unacceptable risk.

Remedial Action Performance

Remedial action activities completed to date include the 2011 partial excavation and off-site disposal of impacted soil from Trenches 2 and 3. No actual remediation was performed in Trench 9 [USACE 2013]. Under the current site condition and use, FUSRAP-related contamination poses no unacceptable risk to users of the site or the nearby community. Once remedial action activities resume at the site, soil cleanup levels are expected to be achieved in a reasonable timeframe.

System Operations/O&M

The O&M Program being implemented at the SLDA FUSRAP Site is working in a manner that is preventing, and will continue to prevent, exposure to FUSRAP-related ROCs in areas with the potential to pose unacceptable risk until RAOs are achieved through remedy implementation. Engineering controls, security guards, and grounds maintenance prevent exposure to ROCs in soil and trench waste. Environmental monitoring activities continue to demonstrate that ROCs are not migrating off-site at levels that would be considered not protective of human health or the environment. Once RAOs are achieved through remedy implementation, USACE will no longer need to manage an O&M Program at the SLDA FUSRAP Site since residual concentrations of ROCs in soil will allow for unrestricted future use of the site.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Question B Summary:
Yes, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection are still valid.

Changes in Standards and TBCs

The remedial actions at the site are dictated by ARAR-based federal soil cleanup goals (Table F-1 of Appendix F), referred to as derived concentration guideline levels (DCGLs). The soil cleanup goals for FUSRAP-related ROCs (Am-241, Pu-239, Pu-241, Ra-228, Th-232, U-234, U-235, and U-238) are still appropriately based on 10 CFR 20.1402, and there have been no updates to NRC's radiological criteria for unrestricted use regulation specified in 10 CFR 20.1402.

It was concluded from this review that no newly promulgated or modified requirements of federal or state environmental or facility-siting laws would change the protectiveness of the soil remedy being implemented at the SLDA Site.

Changes in Toxicity and Other Contaminant Characteristics

Contaminant characteristics have not changed in a way that would affect the protectiveness of the remedy. Although the toxicity factors (radiological dose conversion factors) used to develop soil cleanup goals to comply with 10 CFR 20.1402 have been updated since they were established in the ROD [USACE 2007], as amended [USACE 2015], these updates in radiological dose conversion factors (Tables F-2 and F-3 of Appendix F) would not affect the protectiveness of the remedy.

Changes in Risk Assessment Methods

Other radiological risk assessment methodological updates (discussed in Appendix F) would not substantially affect the development of soil cleanup goals, and therefore would not affect the protectiveness of the remedy.

Changes in Exposure Pathways

The site remains a secure and maintained vacant property with mixed surrounding land use that includes residential communities, small farms with croplands and pastures, idle farmland, forest lands, and light industrial areas. No changes to the exposure assumptions made at the time of the ROD [USACE 2007], as amended [USACE 2015], have occurred which would affect the protectiveness of the remedy.

Expected Progress Towards Meeting RAOs

The remedy is currently undergoing remedial design and progressing as expected towards meeting RAOs. There are no new site conditions that would impact RAOs and remedy protectiveness.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

At this time, USACE is not aware of any other information that would affect the protectiveness of the selected remedy identified in the ROD [USACE 2007] as amended [USACE 2015].

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
Site-Wide

Other findings
One interview recommendation by the Pennsylvania Department of Environmental Protection (PADEP) Clean Water Program was for USACE to review information that formed the basis of the August 13, 2010 approval letter (Appendix E) to ensure all information is still relevant and notify PADEP of any changes.

In accordance with Section 9621(e) of Title 42 to the United States Code (42 USC 1962), no Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely onsite, where such remedial action is selected and carried out in compliance with CERCLA. Therefore, a National Pollutant Discharge Elimination System (NPDES) permit is not required for the SLDA FUSRAP remediation project. However, USACE continues to meet substantive requirements of the Clean Water Act, including treatment standards and effluent limits, and provide these results to PADEP for informational purposes.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
Operable Unit: Site-Wide	*Protectiveness Determination:* Will be Protective	*Planned Addendum Completion Date:* Not Applicable
Protectiveness Statement: The remedy for the SLDA FUSRAP Site is expected to be protective of human health and the environment upon completion. In the interim, USACE restricts access to the site (i.e., perimeter fence, no trespassing signage, and security guards), and conducts routine environmental monitoring and operation and maintenance activities, to prevent exposure to FUSRAP-related ROCs in areas with the potential to pose unacceptable risk.		

VIII. NEXT REVIEW

The next five-year review report for the SLDA FUSRAP Site is required five years from the completion date of this review.

APPENDICES

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APPENDIX A - Reference List

United States Army Corps of Engineers (USACE) 2007. *Record of Decision for the Shallow Land Disposal Area Site, Parks Township, Armstrong County, Pennsylvania.* August.

USACE 2013. *Final Shallow Land Disposal Area Remedial Action Completion Report, Parks Township, Armstrong County, Pennsylvania.* July.

USACE 2015. *Record of Decision Amendment, Shallow Land Disposal Area, Parks Township, Pennsylvania.* December.

USACE 2020. *Formerly Utilized Sites Remedial Action Program (FUSRAP) Five-Year Review Policy.* June.

USACE 2021. *Groundwater and Surface Water Monitoring Data Release, 2020 Sampling Event, Shallow Land Disposal Area FUSRAP Site.* May.

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APPENDIX B – Figures

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APPENDIX B

Figures

Figure 1: Site Location Map

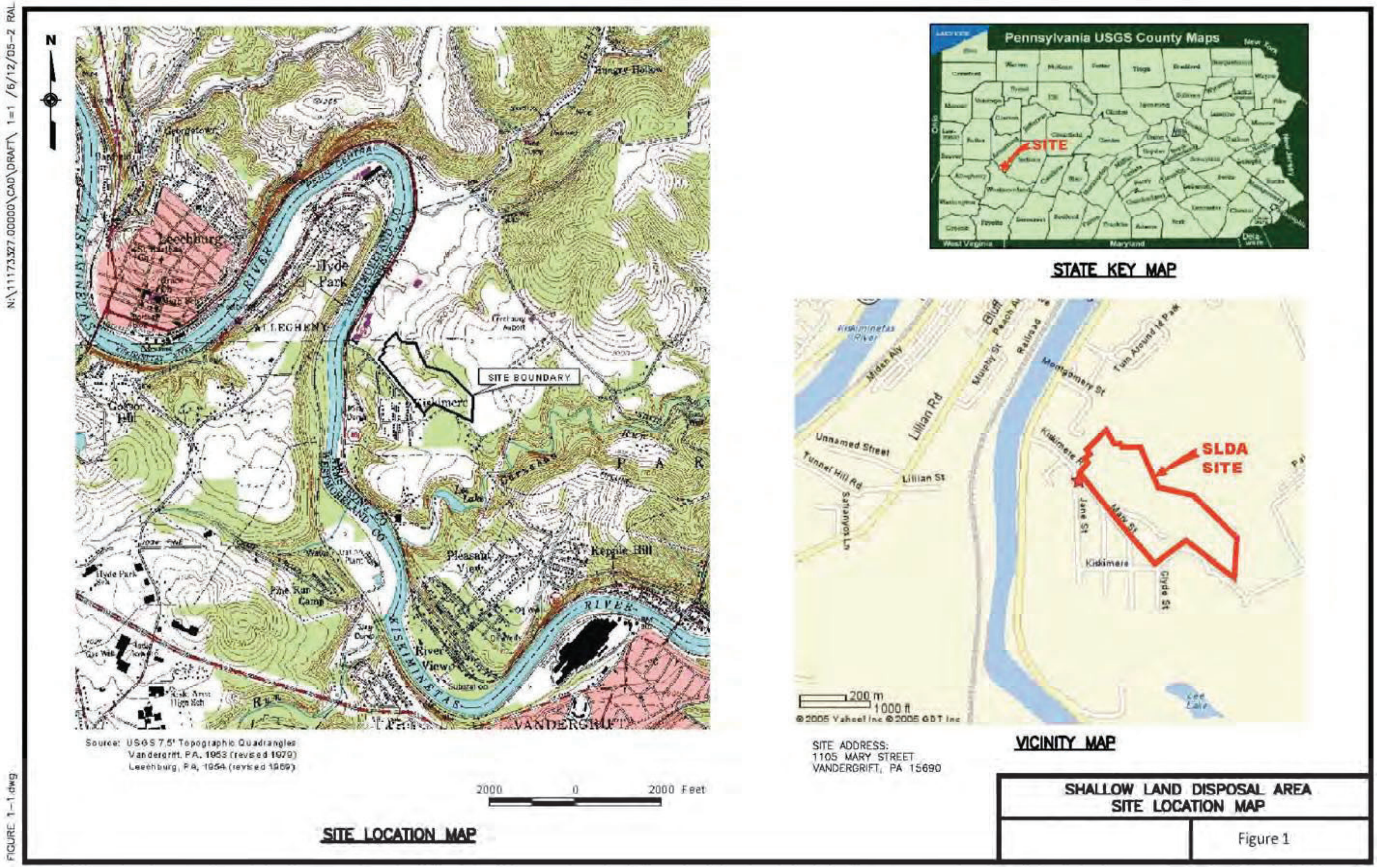


Figure 2: SLDA Site Plan

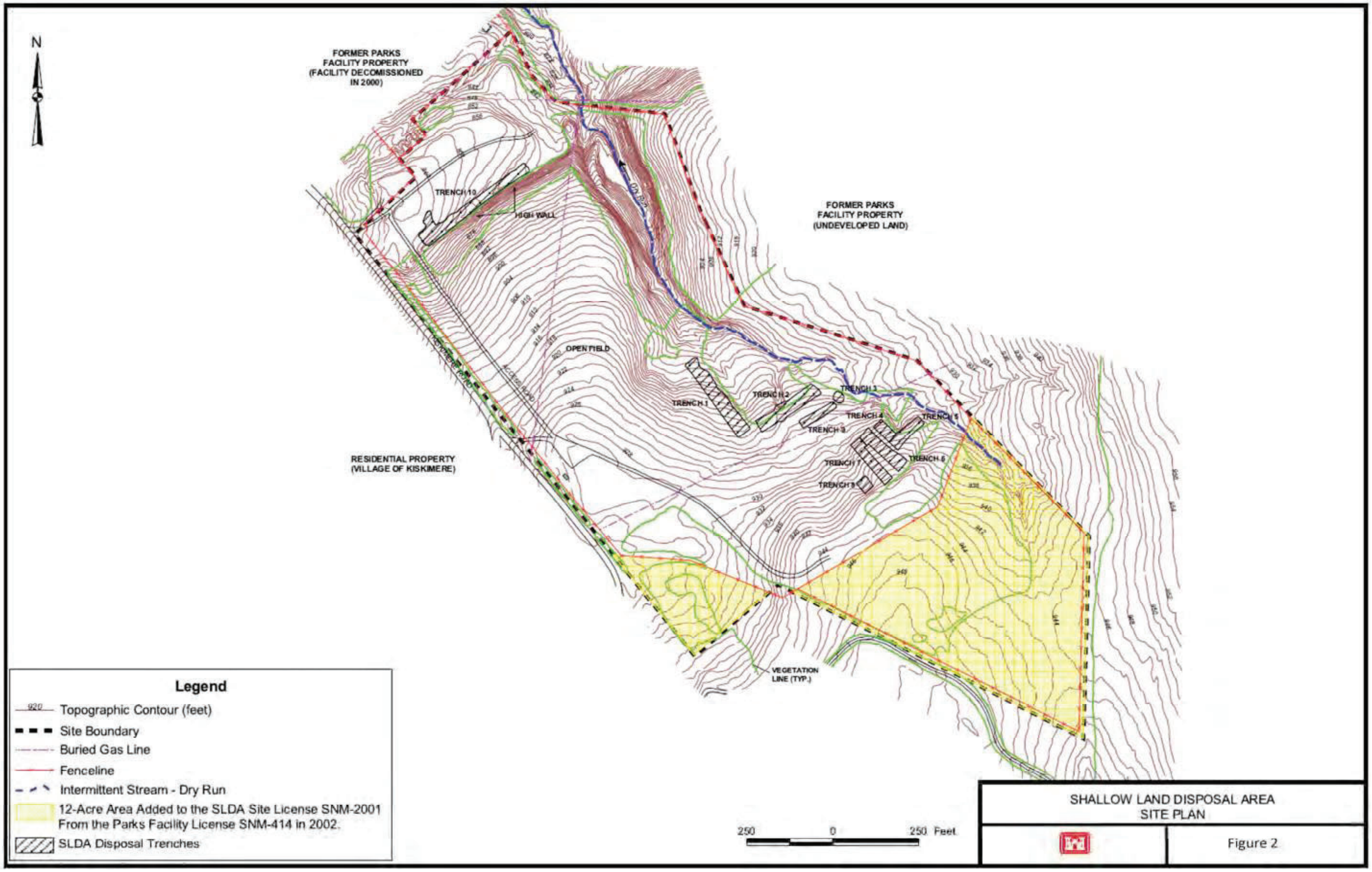


Figure 3: SLDA Perimeter Air Monitoring Station Locations

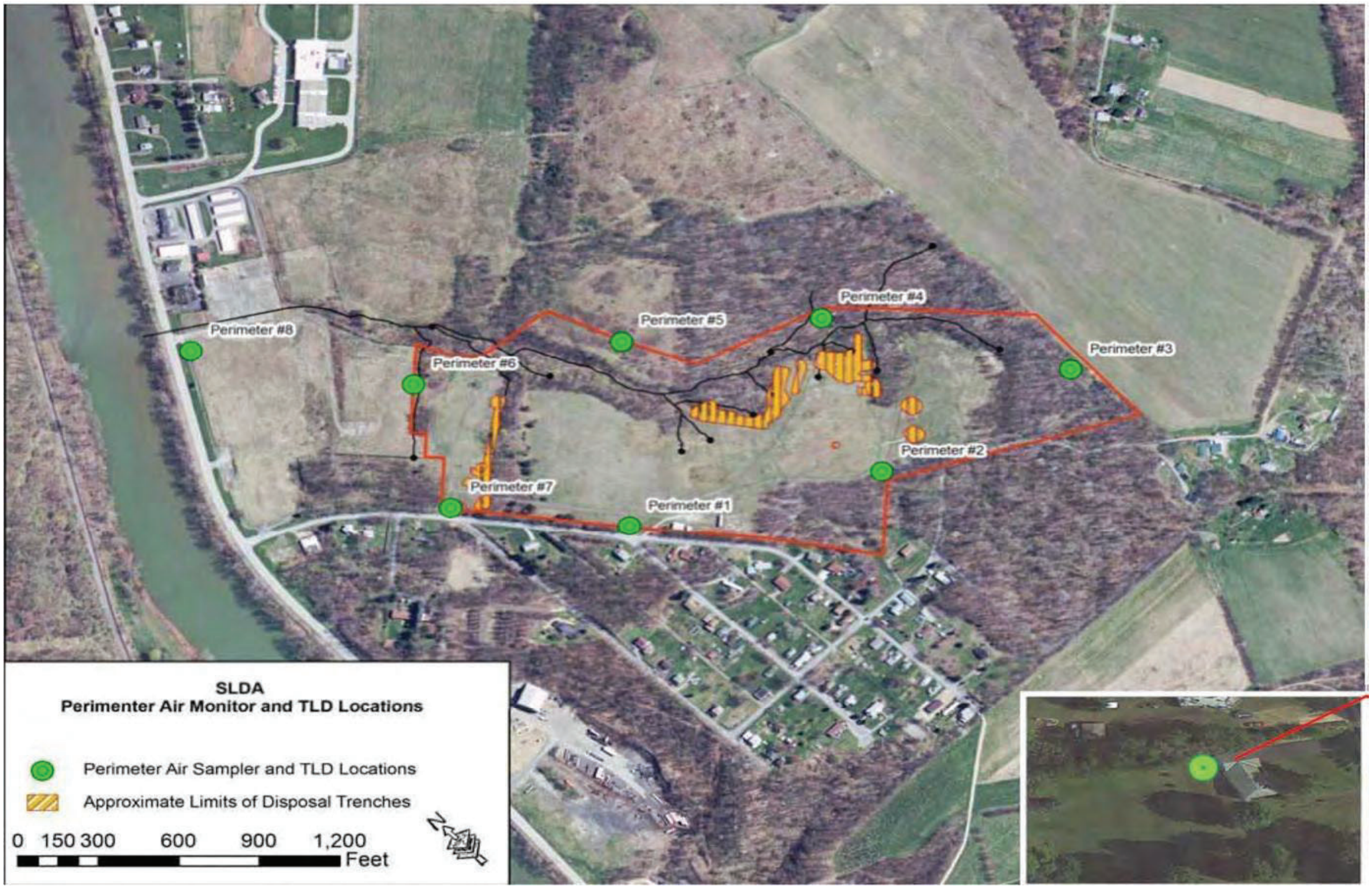
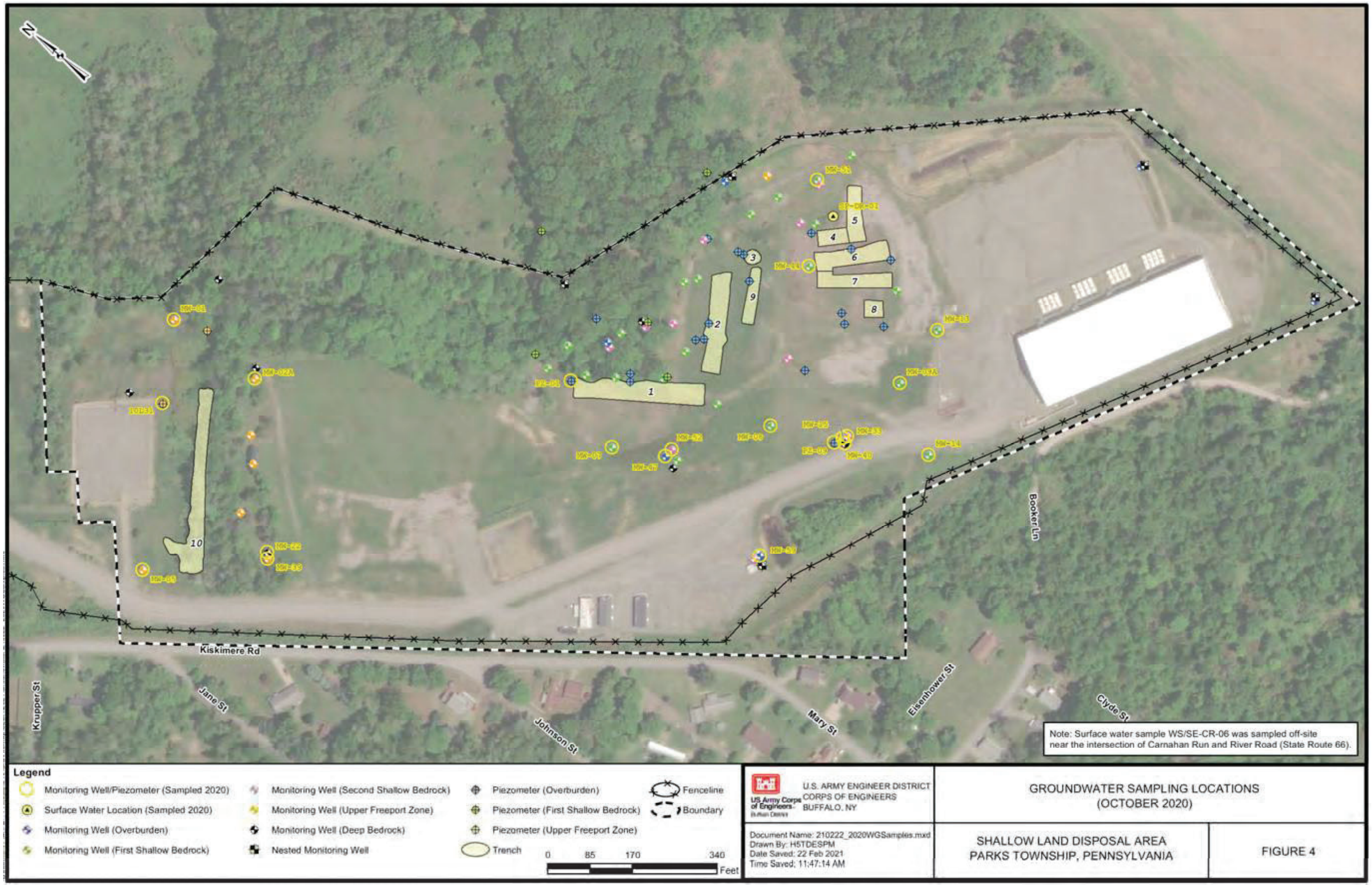


Figure 4: 2020 Groundwater Sampling Locations



APPENDIX C – Site Inspection Form

APPENDIX C

Site Inspection Form

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The Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: *SLDA FUSRAP Site*	**Date of inspection:** *July 22, 2021*
Location and Region: *Parks Township, Armstrong County, Pennsylvania*	**EPA ID:** *Not applicable*
Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*	**Weather/temperature:** *Sunny, calm, ~ 70°F*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☐ Monitored natural attenuation
☐ Access controls ☐ Groundwater containment
☐ Institutional controls ☐ Vertical barrier walls
☐ Groundwater pump and treatment ☐ Surface water collection and treatment
☒ Excavation, treatment, and off-site disposal of radiologically contaminated soil and debris that exceeds cleanup goals presented in the *Record of Decision for the Shallow Land Disposal Area Site (USACE 2007), as amended (USACE 2015).*

Attachments: ☐ Inspection team roster attached ☒ Site map attached (see Appendix B)

II. INTERVIEWS

☒ Interviews: See Section IV and Appendix E of this FYR Report

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: O&M is for overall site maintenance; there is no remediation O&M in progress.

2. Site-Specific Health and Safety Plan ☒ Readily available ☒ Up to date ☐ N/A

☒ Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A

Remarks: Copies of Site Health & Safety Plan and Emergency Response Plan are available on site (hard copy) and electronically by O&M contractor.

3. O&M and OSHA Training Records ☒ Readily available ☒ Up to date ☐ N/A

Remarks Training Records are maintained on site (hard copy) and electronically by O&M Contractor.

4. Permits and Service Agreements

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits_____________________	☐ Readily available	☐ Up to date	☒ N/A

Remarks_USACE continues to meet substantive requirements of the Clean Water Act, including treatment standards and effluent limits, and provide those results to PADEP for informational purposes.

5. Settlement Monument Records ☐ Readily available ☐ Up to date ☒ N/A

Remarks____

6. Groundwater Monitoring Records ☒ Readily available ☒ Up to date ☐ N/A

Remarks USACE issues an annual groundwater data monitoring release to the SLDA public website.

7. Discharge Compliance Records

☐ Air — ☐ Readily available ☐ Up to date ☒ N/A

☒ Water (effluent) — ☒ Readily available ☒ Up to date ☐ N/A

Remarks: Discharge records of effluent water from special events, i.e., annual groundwater sampling, are kept on site by O&M contractor.

8. Daily Access/Security Logs ☒ Readily available ☒ Up to date ☐ N/A

Remarks: Daily access and Security logs are maintained on site by the Security Contractor.

IV. O&M COSTS

1. O&M Organization

☐ State in-house ☐ Contractor for State

☐ PRP in-house ☐ Contractor for PRP

☐ Federal Facility in-house ☐ Contractor for Federal Facility

☒ Contractors for Federal Government (USACE): Jacobs Technology Inc. (O&M) and Santa Fe Protective Services, Inc. (Site Security)

2. O&M Cost Records

Contract costs and invoicing are tracked in USACE records.

☒ Readily available ☒ Up to date

☒ Funding mechanism/agreement in place

3. Unanticipated or Unusually High O&M Costs During Review Period

Describe costs and reasons: Not applicable

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. Fencing damaged ☐ Location shown on site map ☒ Gates secured ☒ N/A

Remarks: The SLDA FUSRAP Site is surrounded by a perimeter fence. No damage to the site perimeter fence was observed during the site inspection.

B. Other Access Restrictions

1. Signs and other security measures ☒ No Trespassing Signs ☒ Site Security ☐ N/A

Remarks: Access to the SLDA FUSRAP Site is restricted via a perimeter fence and 24-hour security guard services. No trespassing signs are posted every 100 feet to the outside of the perimeter fence.

C. General

1. Vandalism/trespassing ☐ Location shown on site map ☒ No vandalism evident

2. Land use changes on site ☒ Not Applicable

3. Land use changes off site ☒ Not Applicable

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. Roads damaged ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: Site access is provided via an asphalt road that is adequate for site activities.

B. Other Site Conditions

Remarks:	The SLDA site occupies approximately 44 acres (17.8 hectares) and is bounded by the community of Kiskimere to the southwest and vacant undeveloped land to the southeast and northeast. A seasonal stream called Dry Run meanders along the northeast side of the site. The site contains ten waste trenches (Trenches 1-10) and a material process building (MPB), along with various site trailers for USACE, O&M, and site security personnel. The former Parks Nuclear Fabrication Facility site is located adjacent to and northwest of the SLDA site. Land use within the vicinity of the SLDA site is mixed, consisting of small residential communities, individual rural residences, small farms with croplands and pastures, idle farmland, forested areas, and light industrial properties.
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The selected remedy required removal of soil and debris with radionuclide concentrations greater than cleanup goals identified in the Record of Decision (August 2007), as amended (December 2015), which are considered protective for unrestricted land use. Excavated soils and debris would be disposed at an off-site facility. The remedy is expected to be effective and function as design once fully implemented.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. Although not required as a component of the selected long-term remedy in the ROD (as amended), O&M activities are routinely performed at the SLDA Site to ensure short-term protectiveness (i.e., restrict exposure to and monitor ROCs above soil cleanup goals) until the long-term remedy is implemented. O&M activities that facilitate short-term protectiveness include, but are not limited to, grounds maintenance, perimeter fence, signage, and roadway inspections and repairs, site security, and perimeter air, groundwater, and surface water monitoring.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None

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APPENDIX D – Site Photographic Record

APPENDIX D

Site Photographic Record

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PHOTOGRAPHIC RECORD **Shallow Land Disposal Area**	
Photo No. 1 (22-July- 2021) Description: Air Monitoring Station 1	
Photo No. 2 (22- July- 2021) Description: Air Monitoring Station 2	

PHOTOGRAPHIC RECORD
Shallow Land Disposal Area

Photo No. 3 (22- July- 2021) Description: Air Monitoring Station 3	
Photo No. 4 (22- July- 2021) Description: Air Monitoring Station 4	

PHOTOGRAPHIC RECORD **Shallow Land Disposal Area**	
Photo No. 5 (22- July- 2021) Description: Air Monitoring Station 5	
Photo No. 6 (22- July- 2021) Description: Air Monitoring Station 6	

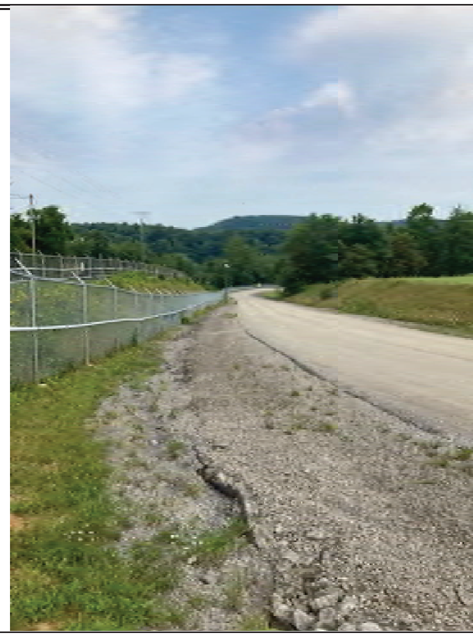
PHOTOGRAPHIC RECORD
Shallow Land Disposal Area

Photo No. 7 (22- July- 2021) Description: Air Monitoring Station 7	
Photo No. 8 (22- July- 2021) Description: Air Monitoring Station 8	

PHOTOGRAPHIC RECORD
Shallow Land Disposal Area

Photo No. 9 (22- July- 2021) Description: Off-Site Air Monitoring Station	
Photo No. 10 (22- July- 2021) Description: Fence line, road looking south	

PHOTOGRAPHIC RECORD
Shallow Land Disposal Area

Photo No. 11 (22- July- 2021) Description: Fence line, West perimeter looking north	
Photo No. 12 (22- July- 2021) Description: Front Gate	

PHOTOGRAPHIC RECORD Shallow Land Disposal Area	
Photo No. 13 (22- July- 2021) <u>Description</u>: Inner Gate looking south	
Photo No. 14 (22- July- 2021) <u>Description</u>: Inner Gate looking south With Guard Shack	

PHOTOGRAPHIC RECORD
Shallow Land Disposal Area

Photo No. 15 (22- July- 2021) Description: Material Process Building (MPB), North End	
Photo No. 16 (22- July- 2021) Description: Side of MPB with Air Handling Units in foreground	

PHOTOGRAPHIC RECORD
Shallow Land Disposal Area

Photo No. 17 (22- July- 2021) Description: No Trespassing sign: "No Trespassing Area Under 24 Hour Video Surveillance"	
Photo No. 18 (22- July- 2021) Description: Project Sign	

PHOTOGRAPHIC RECORD
Shallow Land Disposal Area

Photo No. 19 (22- July- 2021) <u>Description</u>: Site Trailers	
Photo No. 20 (22- July- 2021) <u>Description</u>: Site Trailers	

PHOTOGRAPHIC RECORD **Shallow Land Disposal Area**	
Photo No. 21 (22- July- 2021) Description: Trench 10	
Photo No. 22 (22- July- 2021) Description: Trench 10	

PHOTOGRAPHIC RECORD
Shallow Land Disposal Area

Photo No. 23 (22- July- 2021) Description: South end of trenches looking North	
Photo No. 24 (22- July- 2021) Description: Trenches 8&9 looking North	

PHOTOGRAPHIC RECORD
Shallow Land Disposal Area

Photo No. 25 (22- July- 2021) <u>Description</u>: Monitoring Well Cluster. MW 40, 15, &30	
Photo No. 26 (22- July- 2021) <u>Description</u>: Monitoring Well #5	

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APPENDIX E – Interviews

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INTERVIEW RECORD

Site Name: *Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Remedial Action Program (FUSRAP) Site*	**EPA ID No.:** *Not Applicable*
Subject: *First CERCLA Five-Year Review of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania*	**Time:** *2050* / **Date:** *8/4/2021*
Interview Type: *E-mail* **Location of Visit:** *Not applicable*	☒ Incoming ☐ Outgoing

Contact Made By

Name: *Joseph D. Hamrock*	**Title:** *Physical Security Specialist*	**Organization:** *U.S. Army Corps of Engineers Pittsburgh District*

Individual Contacted

Name: *Allen B. Bowser*	**Title:** Vice President	Affiliation: Santa Fe Protective Services, Inc
Telephone No: *775.434.4481* **E-Mail Address:** *abowser@santafeps.com*	**Street Address:** *P.O. Box 28275* **City, State, Zip:** *Santa Fe, NM 87592*	

Summary of USACE Selected Remedy

Excavation, treatment, and off-site disposal of radiologically contaminated soil and debris that exceed cleanup goals presented in the *Record of Decision (ROD) for the Shallow Land Disposal Area Site (August 2007), as amended (December 2015). The ROD and ROD Amendment are posted to the SLDA Project Website: https://www.lrp.usace.army.mil/Missions/Planning-Programs-Project-Management/Key-Projects/Shallow-Land-Disposal-Area/*

Summary of Responses

1. What is your involvement with the SLDA FUSRAP Site project?

   Corporate officer that oversees security operations for the Site and maintains regular and frequent communications with Corps of Engineers personnel and Site Security Lead.

2. What is your overall impression of the project (general sentiment)?

   Safety and security are the first priorities of the Site. The Corps and Site managers have implemented policies to ensure that it is safe, secure and well run!

3. What recommendations so you have for improving communications between the Corps of Engineers and your company?

   None! Communications are excellent between the Corps of Engineers officers, site employees, corporate office, and site contractors. The Army Corps of Engineers Security Specialist maintains regular and frequent communication with Santa Fe Protective Services Contract Manager and conducts regular visits with security officers keeping all informed and up to date on Site events, operations and progress.

INTERVIEW RECORD

Site Name: *Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Remedial Action Program (FUSRAP) Site*	**EPA ID No.:** *Not Applicable*	
Subject: *First CERCLA Five-Year Review of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania*	**Time:** *2050*	**Date:** *8/4/2021*

4. What effects have site operations had on the surrounding community?
As with any cleanup site, the community is concerned about the safe and secure operations at the Site.

5. *Do you have any comments, suggestions, or recommendations regarding the site or its operation and administration? If so, please give details.*
None. The Government runs a very safe and secure operation, holds all contractors to the highest level of performance and safe operations.

6. *Are you aware of any projected land use changes within or surrounding the SLDA FUSRAP Site? If so, please give details.*
N/A – not aware of any changes other than planned cleanup.

7. *Are you aware of any operational or physical security events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.*
Very rare security events, primarily involving local hunters getting too close to Government property.

8. *Are you aware of any changes to federal and/or state regulations, etc. or have any problems been encountered that may impact the protectiveness of, or may require changes to, the selected remedy identified in the ROD, as amended?*
Not currently.

9. Is there a continuous on-site O&M presence? If so, generally describe staff and activities (e.g., routine inspections, etc.).
The O&M contractor routinely runs the fans for the air handling system at the MPB, checks for any water infiltration inside the MPB; routinely starts and runs all of the site generators; takes swap samples of trailer interiors; repairs any maintenance issues; cuts grass and weeds in open fields areas and fence lines; maintains and repairs patrol trails caused by erosion; maintains daily contact with the security staff. Any snow and salting on the Site are outsourced. Mr. Hamrock (Corps security specialist) performs routine inspections of security duties and conducts regular inspections of records and logs. He maintains frequent contact with Santa Fe Protective Service employees. Security officers regularly clean and sanitize inside of security posts.

10. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, would they affect the protectiveness or effectiveness of the selected remedy as identified in the ROD, as amended? Please describe any potential changes and impacts.
Not aware of any significant changes.

INTERVIEW RECORD

Site Name: *Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Remedial Action Program (FUSRAP) Site*	**EPA ID No.:** *Not Applicable*

Subject: *First CERCLA Five-Year Review of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania*	**Time:** *11:30*	**Date:** *4 Aug 2021*

Interview Type: *E-mail* **Location of Visit:** *Not applicable*	☒ Incoming ☐ Outgoing

Contact Made By

Name: *Timothy J. Herald*	**Title:** *SLDA Project Manager*	**Organization:** *U.S. Army Corps of Engineers Pittsburgh District*

Individual Contacted

Name: *Douglas Tonkay*	**Title:** *Director, Office of Waste Disposal*	Affiliation: *U.S. Department of Energy, Office of Environmental Management*

Telephone No: *301-903-7212* **E-Mail Address:** *douglas.tonkay@em.doe.gov*	**Street Address:** *1000 Independence Ave., SW* **City, State, Zip:** *Washington, DC 20585*

Summary of USACE Selected Remedy

Excavation, treatment, and off-site disposal of radiologically contaminated soil and debris that exceed cleanup goals presented in the *Record of Decision (ROD) for the Shallow Land Disposal Area Site (August 2007), as amended (December 2015). The ROD and ROD Amendment are posted to the SLDA Project Website:* *https://www.lrp.usace.army.mil/Missions/Planning-Programs-Project-Management/Key-Projects/Shallow-Land-Disposal-Area/*

Summary of Responses

1. What is your involvement with the SLDA FUSRAP Site project?

   Principal Representative of the U.S. Department of Energy, Office of Environmental Management per terms of the 2014 Site-Specific Memorandum of Understanding (MOU) entered into by and among the U.S Army Corps of Engineers (USACE), the U.S. Department of Energy – Office of Environmental Management, the National Nuclear Security Administration, and the U.S. Nuclear Regulatory Commission for the purpose of articulating the cooperation of the parties relating to the remediation of radioactive wastes at SLDA.

2. What is your overall impression of the project (general sentiment)?

   No change. The project is preparing to restart following a period of replanning and contract acquisition. DOE-EM continues its support under the terms of the Site-Specific MOU referenced in question #1.

3. How informed do you feel about site activities and progress? What recommendations do you have for improving communications between the Corps of Engineers and your agency/company?

   The Corps of Engineers has kept DOE-EM adequately informed.

INTERVIEW RECORD

Site Name: *Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Remedial Action Program (FUSRAP) Site*	**EPA ID No.:** *Not Applicable*	
Subject: *First CERCLA Five-Year Review of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania*	**Time:** *11:30*	**Date:** *4 Aug 2021*

4. What effects have site operations had on the surrounding community?
   No opinion.

5. Do you have any comments, suggestions, or recommendations regarding the site or its operation and administration? If so, please give details.
   No.

6. Are you aware of any projected land use changes within or surrounding the SLDA FUSRAP Site? If so, please give details.
   No.

7. Are you aware of any operational or physical security events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.
   No.

8. Are you aware of any changes (to federal and/or state regulations, etc.) that may impact the protectiveness of the selected remedy identified in the ROD, as amended?
   Not aware of any changes.

INTERVIEW RECORD

Site Name: *Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Remedial Action Program (FUSRAP) Site*	**EPA ID No.:** *Not Applicable*
Subject: *First CERCLA Five-Year Review of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania*	**Time:** *0900* / **Date:** *25 Aug 2021*
Interview Type: *E-mail* **Location of Visit:** *Not applicable*	☒ Incoming ☐ Outgoing

Contact Made By

Name: *Timothy J. Herald*	**Title:** *SLDA Project Manager*	**Organization:** *U.S. Army Corps of Engineers Pittsburgh District*

Individual Contacted

Name: *Michael Mollick*	**Title:** Director	Affiliation: Armstrong Dept Public Safety
Telephone No: *724-548-3430* **E-Mail Address:** *msmollick@co.armstrong.pa.us*	**Street Address:** *131 Armsdale Road* **City, State, Zip:** *Kittanning, PA 16201*	

Summary of USACE Selected Remedy

Excavation, treatment, and off-site disposal of radiologically contaminated soil and debris that exceed cleanup goals presented in the *Record of Decision (ROD) for the Shallow Land Disposal Area Site (August 2007), as amended (December 2015). The ROD and ROD Amendment are posted to the SLDA Project Website: https://www.lrp.usace.army.mil/Missions/Planning-Programs-Project-Management/Key-Projects/Shallow-Land-Disposal-Area/*

Summary of Responses

1. What is your involvement with the SLDA FUSRAP Site project?

   I serve as the Armstrong County Emergency Manager. My role in this project thus far has been to gather data concerning first responders, serve as a liaison for the information gathering. Moving forward I anticipate a broader role coordinating local response to site emergencies, development of protocols for responders and working with project personnel for response coordination.

2. What is your overall impression of the project (general sentiment)?

   Currently in the pre-planning stage from my perspective. Seems to be thorough in the information gathering and sharing. The overall project is certainly needed for the area to restore the site to a usable condition.

3. How informed do you feel about site activities and progress? What recommendations do you have for improving communications between the Corps of Engineers and your agency/company?

   So farsite activities are limited to pre-planning and visits for future infrastructure development. I feel that I am being kept in the loop. Communication with Corps has been good so far. I receive a monthly email or phone call with an update. I have also had a face to face meeting with the security lead for the project.

INTERVIEW RECORD

Site Name: *Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Remedial Action Program (FUSRAP) Site*	**EPA ID No.:** *Not Applicable*	
Subject: *First CERCLA Five-Year Review of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania*	**Time:** *0900*	**Date:** *25 Aug 2021*

4. What effects have site operations had on the surrounding community?

   At current time, site operations have had no effects on the surrounding area. Operations are limited to site visit and engineering concepts.

5. Do you have any comments, suggestions, or recommendations regarding the site or its operation and administration? If so, please give details.

   No comments at this time.

6. Are you aware of any projected land use changes within or surrounding the SLDA FUSRAP Site? If so, please give details.

   I am not aware of any project land use changes surrounding the site.

7. Are you aware of any operational or physical security events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

   I am not aware of any security events for site

8. Are you aware of any changes (to federal and/or state regulations, etc.) that may impact the protectiveness of the selected remedy identified in the ROD, as amended?

   I am not aware of any changes to regulations as it pertains to the site.

INTERVIEW RECORD

Site Name: *Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Remedial Action Program (FUSRAP) Site*	**EPA ID No.:** *Not Applicable*
Subject: *First CERCLA Five-Year Review of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania*	**Time:** *1:00 pm* **Date:** *08/26/2021*
Interview Type: *E-mail* **Location of Visit:** *Not applicable*	☒ Incoming ☐ Outgoing

Contact Made By

Name: *Timothy J. Herald*	**Title:** *SLDA Project Manager*	**Organization:** *U.S. Army Corps of Engineers Pittsburgh District*

Individual Contacted

Name: *Bryan Werner*	**Title:** Radiation Protection Manager	Affiliation: Pennsylvania Bureau of Radiation Protection

Telephone No: **E-Mail Address:** *717-783-8979*	**Street Address:** **City, State, Zip:** *400 Market Street Harrisburg, PA 17101*

Summary of USACE Selected Remedy

Excavation, treatment, and off-site disposal of radiologically contaminated soil and debris that exceed cleanup goals presented in the *Record of Decision (ROD) for the Shallow Land Disposal Area Site (August 2007), as amended (December 2015). The ROD and ROD Amendment are posted to the SLDA Project Website: https://www.lrp.usace.army.mil/Missions/Planning-Programs-Project-Management/Key-Projects/Shallow-Land-Disposal-Area/*

Summary of Responses

1. What is your involvement with the SLDA FUSRAP Site project?

   The Department of Environmental Protection is involved at multiple levels. The Northwest Region of the PA Department of Environmental Protection Clean Water Program involvement includes oversight of any and all wastewater discharges from the site, including but not limited to compliance with the attached approval letter date August 13, 2010. The Bureau of Radiation Protection continues to perform routine monitoring of radiation doses around the perimeter of the site using passive dosimetry. Other parts of the Department continue to stay engaged as needed with USACE as needed.

2. What is your overall impression of the project (general sentiment)?

   This is a complex project that has spent a lot of time in the planning phases. We look forward to the site moving towards an active cleanup in the future.

INTERVIEW RECORD

Site Name: *Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Remedial Action Program (FUSRAP) Site*	**EPA ID No.:** *Not Applicable*	
Subject: *First CERCLA Five-Year Review of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania*	**Time:** *1:00 pm*	**Date:** *08/26/2021*

3. How informed do you feel about site activities and progress? What recommendations do you have for improving communications between the Corps of Engineers and your agency/company?

Adequately informed. USACE has provided occasional updates during the planning phase and is responsive when asked questions or for site status updates. In recent years USACE has worked with the DEP's Northwest Regional Office Clean Water Program regarding accumulated and stored groundwater,

4. What effects have site operations had on the surrounding community?

5. Do you have any comments, suggestions, or recommendations regarding the site or its operation and administration? If so, please give details.
None

6. Are you aware of any projected land use changes within or surrounding the SLDA FUSRAP Site? If so, please give details.
No

7. Are you aware of any operational or physical security events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.
No

8. Are you aware of any changes (to federal and/or state regulations, etc.) that may impact the protectiveness of the selected remedy identified in the ROD, as amended?

No. However, DEP recommends that the information (ex. discharge flow rates, receiving stream conditions, expected pollutants in the discharge(s), etc.) provided to DEP and formed the basis of the August 13, 2010 approval letter, be reviewed by the Corps to ensure that all the information is still applicable/relevant. DEP Clean Water Program should be notified of any changes of these or any other conditions at the site that have the potential to affect the 8/13/10 approval.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHWEST REGIONAL OFFICE

August 13, 2010

Mr. William J. Lenart BR-PM
U.S. Army Corps of Engineers
Pittsburgh District
2100 William S. Moorhead Fed. Building
1000 Liberty Avenue
Pittsburgh, PA 15222

Re: Shallow Land Disposal Area
Parks Township
~~Allegheny County~~ Armstrong

Dear Mr. Lenart:

The Department has reviewed the Shallow Land Disposal Area Sedimentation & Erosion Control Plan Narrative dated April 14, 2010 and has identified the following comments/concerns.

1. The discharges from Sediment Traps (1-6) and Sedimentation Ponds (1-2) must comply with the following effluent limitations and monitoring requirements. If additional samples are collected, the sample results must be reported to the Department.

Parameter	Effluent Limitations		Sample Frequency	Sample Type
	Average Monthly (mg/L)	Instantaneous Maximum (mg/L)		
Flow (MGD)	Monitor & Report	Monitor & Report	1/Week	Measured
Duration (hours)	Report Total Time		1/Week	NA
Total Suspended Solids	30	60	1/Week	Grab
pH (s.u.)	Between 6.0 and 9.0		1/Week	Grab
Chemical Oxygen Demand	Monitor & Report	Monitor & Report	1/Week	Grab
Oil & Grease	Monitor & Report	Monitor & Report	1/Week	Grab
Nitrate + Nitrite Nitrogen	Monitor & Report	Monitor & Report	1/Week	Grab
Aluminum (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Ammonia	Monitor & Report	Monitor & Report	1/Week	Grab
Antimony (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Arsenic (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Barium	Monitor & Report	Monitor & Report	1/Week	Grab
Benzene	Monitor & Report	Monitor & Report	1/Week	Grab
Beryllium (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Cadmium (Total)	Monitor & Report	Monitor & Report	1/Week	Grab

Chloride	Monitor & Report	Monitor & Report	1/Week	Grab
Copper (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Cyanide (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Dimethyl Phthalate	Monitor & Report	Monitor & Report	1/Week	Grab
Fluoride	Monitor & Report	Monitor & Report	1/Week	Grab
Iron (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Lead (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Magnesium (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Manganese	Monitor & Report	Monitor & Report	1/Week	Grab
Mercury (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Nickel (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
PCB – 1016	Monitor & Report	Monitor & Report	1/Week	Grab
PCB – 1221	Monitor & Report	Monitor & Report	1/Week	Grab
PCB – 1232	Monitor & Report	Monitor & Report	1/Week	Grab
PCB – 1242	Monitor & Report	Monitor & Report	1/Week	Grab
PCB – 1248	Monitor & Report	Monitor & Report	1/Week	Grab
PCB – 1254	Monitor & Report	Monitor & Report	1/Week	Grab
PCB – 1260	Monitor & Report	Monitor & Report	1/Week	Grab
Selenium (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Silver (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Toluene	Monitor & Report	Monitor & Report	1/Week	Grab
Trichloroethylene	Monitor & Report	Monitor & Report	1/Week	Grab
Zinc (Total)	Monitor & Report	Monitor & Report	1/Week	Grab
Americium – 241	Monitor & Report	Monitor & Report	1/Week	Grab
Plutonium – 239	Monitor & Report	Monitor & Report	1/Week	Grab
Plutonium – 241	Monitor & Report	Monitor & Report	1/Week	Grab
Radium – 228	Monitor & Report	Monitor & Report	1/Week	Grab
Thorium – 232	Monitor & Report	Monitor & Report	1/Week	Grab
Uranium – 234	Monitor & Report	Monitor & Report	1/Week	Grab
Uranium – 235	Monitor & Report	Monitor & Report	1/Week	Grab
Uranium - 238	Monitor & Report	Monitor & Report	1/Week	Grab

*Analytical results from the sampling event shall be summarized on the enclosed data reporting form and submitted to the Department. The results shall be submitted to this office within 28 days following the end of each calendar month. One copy of the summary must be sent to the Chief of the Operations Section, Water Management Program, and one copy to the Chief of the Permits Section, Water Management Program.

1. All discharges shall comply with a Total Suspended Solids effluent limitation of 30 mg/l monthly average and 60 mg/l daily maximum.

2. All contaminated soil shall be removed from the site and properly disposed in accordance with the Department's Rules and Regulations. Any contaminated soil stockpiled on site shall be placed on a 30 mil liner or equivalent and covered at all times. All storm water that comes into contact with the contaminated soil shall be collected and treated and/or hauled offsite.

3. Any sediment that accumulates in the sediment trap shall be treated as contaminated soil and shall be disposed in accordance with the Department's Rules and Regulations.

4. The owner/operator shall comply with Chapter 102 of the Department's rules and regulations relating to erosion control. The owner/operator shall also comply with the conditions pertaining to the ESC Plan contained in Attachment A.

5. The owner/operator shall be responsible for any impairment to water uses that occur as the result of these discharges. If any adverse affect results from these discharges, the Department reserves the right to require that these discharges be discontinued. If the owner/operator discovers any contaminated discharges occurring as a result of these activities, the owner/operator shall cease the discharges immediately.

6. All non-radiologically contaminated sludges and other solids collected in the sedimentation basins, waste material identified in the ESC Plan and excavated material shall be handled and/or disposed in compliance with the Solid Waste Management Act of 1980 (Act 97) and with 25 Pa. Code Chapters 261, 262, 263 and 264 (related to permits and requirements for landfilling and storage of hazardous sludge), 287, 291 and 299 (relating to residual waste generators) and 288 and 289 (relating to residual waste landfills and impoundments) and applicable federal regulations, the Federal Clean Water Act, RCRA and their amendments.

7. Oil bearing wastewaters shall at no time cause a film or sheen upon or discoloration of the waters of this Commonwealth or adjoining shoreline.

8. Qualified personnel shall conduct site compliance evaluations. Such evaluations shall include:

(a) Visual inspection and evaluation of areas contributing to a storm water discharge for evidence of, or the potential for, pollutants entering the drainage system.

(b) Measures to reduce pollutant loadings shall be evaluated to determine whether they are adequate and properly implemented in accordance with the terms of the permit or whether additional control measures are needed.

(c) Structural storm water management measures, sediment and erosion control measures, and other structural pollution prevention measures identified in the plan shall be observed to ensure that they are operating correctly.

(d) A visual inspection of equipment needed to implement the plan, such as spill response equipment, shall be made.

9. The implementation of the ESC Plan and the installation of the control structures shall be conducted under expert engineering supervision, competent inspection, and in accordance with plans, designs, and other data as herein approved or amended and within the conditions of this approval.

10. The responsibility for carrying out the conditions of this approval and the ESC Plan shall rest upon the owner/operator.

Any significant changes in the ESC plan must be reported to the Department in writing prior to implementation.

This authorization does not permit any discharge (storm water or non-storm water), which contains any pollutant that may cause or contribute to an impact on aquatic life or poses substantial hazard to human health or the environment due to its quantity or concentration.

Any violation of the conditions contained in this letter will subject the operator and all other involved parties to enforcement action and/or penalties under the Clean Streams Law of Pennsylvania, 35 P.S. Section 691.1, et seq., the Act of June 1937, P.L. 1987 *as amended*, including termination of this letter. Noncompliance with any condition of this authorization is grounds for enforcement action, termination, revocation or denial of this letter.

If you should have any questions, please feel free to contact Tom Joseph of my staff at 412.442.4336.

Sincerely,

Samuel C. Harper
Regional Manager
Water Management

Enclosure

cc: Janna Hummel – U.S. Army Corps of Engineers - (w/enclosure)
Chris Cramer – Armstrong Conservation District – (w/enclosure)

bcc: [illegible]r – (w/enclosure)
Operations Section – (w/enclosure)
T. Joseph – (w/enclosure)
M. Forbeck

SCH:TJJ:lmp

INTERVIEW RECORD

Site Name: *Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Remedial Action Program (FUSRAP) Site*	**EPA ID No.:** *Not Applicable*

Subject: *First CERCLA Five-Year Review of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania*	**Time:** *11AM*	**Date:** *8/27/21*

Interview Type: *E-mail* **Location of Visit:** *Not applicable*	☒ Incoming ☐ Outgoing

Contact Made By

Name: *Timothy J. Herald*	**Title:** *SLDA Project Manager*	**Organization:** *U.S. Army Corps of Engineers Pittsburgh District*

Individual Contacted

Name: *Grace Nelson*	**Title:** Regional Representative	Affiliation: Office of Senator Bob Casey

Telephone No: *412-803-7370* **E-Mail Address:** *grace_nelson@casey.senate.gov*	**Street Address:** *310 Grant St. Suite 2415* **City, State, Zip:** *Pittsburgh, PA 15219*

Summary of USACE Selected Remedy

Excavation, treatment, and off-site disposal of radiologically contaminated soil and debris that exceed cleanup goals presented in the *Record of Decision (ROD) for the Shallow Land Disposal Area Site (August 2007), as amended (December 2015). The ROD and ROD Amendment are posted to the SLDA Project Website: https://www.lrp.usace.army.mil/Missions/Planning-Programs-Project-Management/Key-Projects/Shallow-Land-Disposal-Area/*

Summary of Responses

1. What is your involvement with the SLDA FUSRAP Site project?

   As the representative for Senator Casey in Armstrong County, I engage with SLDA to monitor developments and brief the Senator and relevant staff on progress towards remediation.

2. What is your overall impression of the project (general sentiment)?

   SLDA is critical work deemed a high priority by surrounding communities being carried out with the utmost commitment to safety.

3. How informed do you feel about site activities and progress? What recommendations do you have for improving communications between the Corps of Engineers and your agency/company?
   USACE is proactive in communicating progress on the SLDA project, ensuring our office is fully aware of all developments and any potential issue items well in advance. Tim is a direct and effective point of contact for our staff and remains extremely accessible should we ever need additional information.

4. What effects have site operations had on the surrounding community?
   Given the sensitivity of the project, community scrutiny in the County and relevant communities is certainly present, but USACE has been effective in ensuring accessibility for additional questions from community members. USACE's proactive community outreach has also provided opportunities for meaningful engagement to ensure all stakeholders are informed.

INTERVIEW RECORD

Site Name: *Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Remedial Action Program (FUSRAP) Site*	**EPA ID No.:** *Not Applicable*	
Subject: *First CERCLA Five-Year Review of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania*	**Time:** *11AM*	**Date:** *8/27/21*

5. Do you have any comments, suggestions, or recommendations regarding the site or its operation and administration? If so, please give details.
   N/a
6. Are you aware of any projected land use changes within or surrounding the SLDA FUSRAP Site? If so, please give details.
   N/a
7. Are you aware of any operational or physical security events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.
   N/a
8. Are you aware of any changes (to federal and/or state regulations, etc.) that may impact the protectiveness of the selected remedy identified in the ROD, as amended?
   N/a

INTERVIEW RECORD

Site Name: *Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Remedial Action Program (FUSRAP) Site*	**EPA ID No.:** *Not Applicable*
Subject: *First CERCLA Five-Year Review of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania*	**Time:** *0730* / **Date:** *30 Aug 2021*
Interview Type: *E-mail* **Location of Visit:** *Not applicable*	☒ Incoming ☐ Outgoing

Contact Made By

Name: *Joseph B. Matis*	**Title:** *SLDA Resident Engineer*	**Organization:** *U.S. Army Corps of Engineers Pittsburgh District*

Individual Contacted

Name: *Elizabeth Anderson*	**Title:** Deputy PM	Affiliation: Jacobs
Telephone No: *508-277-8721* **E-Mail Address:** *Elizabeth.anderson@jacobs.com*	**Street Address:** *2992 River Road* **City, State, Zip:** *Vandergrift, PA 15690*	

Summary of USACE Selected Remedy

Excavation, treatment, and off-site disposal of radiologically contaminated soil and debris that exceed cleanup goals presented in the *Record of Decision (ROD) for the Shallow Land Disposal Area Site (August 2007), as amended (December 2015). The ROD and ROD Amendment are posted to the SLDA Project Website:* *https://www.lrp.usace.army.mil/Missions/Planning-Programs-Project-Management/Key-Projects/Shallow-Land-Disposal-Area/*

Summary of Responses

1. What is your involvement with the SLDA FUSRAP Site project?

   Jacobs is the prime contractor responsible for operation and maintenance, as well as remedial design and execution.

2. What is your overall impression of the project (general sentiment)?

   The project is well run, operations for current activities are well executed.

3. What recommendations so you have for improving communications between the Corps of Engineers and your company?

   Jacobs and USACE currently have weekly meetings to discuss the project and its progress. Jacobs and USACE field teams will increase communications as remedial activities increase.

4. What effects have site operations had on the surrounding community?

   The community in general is looking forward to having the remedial activities executed and completed.

INTERVIEW RECORD

Site Name: *Shallow Land Disposal Area (SLDA) Formerly Utilized Sites Remedial Action Program (FUSRAP) Site*	**EPA ID No.:** *Not Applicable*	
Subject: *First CERCLA Five-Year Review of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania*	**Time:** *0730*	**Date:** *30 Aug 2021*

5. Do you have any comments, suggestions, or recommendations regarding the site or its operation and administration? If so, please give details.
   No.

6. Are you aware of any projected land use changes within or surrounding the SLDA FUSRAP Site? If so, please give details.
   No.

7. Are you aware of any operational or physical security events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.
   No.

8. Are you aware of any changes to federal and/or state regulations, etc. or have any problems been encountered that may impact the protectiveness of, or may require changes to, the selected remedy identified in the ROD, as amended?

   No

9. Is there a continuous on-site O&M presence? If so, generally describe staff and activities (e.g., routine inspections, etc.).

   Yes. Current O&M activities include grass cutting, fence inspections and clearing when necessary. Continued checking of blowers and generators weekly. Weekly perimeter air monitoring checks and analysis.

10. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, would they affect the protectiveness or effectiveness of the selected remedy as identified in the ROD, as amended? Please describe any potential changes and impacts.
    No.

APPENDIX F – Applicable or Relevant and Appropriate Requirements, Risk and Toxicity Review

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APPENDIX F

ARAR, Risk, and Toxicity Review

APPENDIX F

EVALUATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND THE RISK AND TOXICITY BASIS FOR SOIL CLEANUP OBJECTIVES

OBJECTIVE

This evaluation was prepared to address Question B of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) five-year review (FYR), "Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?"

The Shallow Land Disposal Area (SLDA) is an approximately 44-acre site located in the Parks Township, Armstrong County, Pennsylvania, approximately 23 miles east-northeast of the City of Pittsburgh. The site is predominantly an open field, with wooded vegetation along most of the northeastern boundary and in the southeastern and southern corners. A small, intermittent stream, identified as Dry Run, collects surface runoff from the site and from several groundwater seeps along the hillside.

SLDA is currently owned by BWX Technologies, Inc. (BWXT) and is maintained under the United States Nuclear Regulatory Commission (NRC) license SNM-2001, Docket Number 070-3085. The SLDA Site contains ten trenches, estimated to contain 23,500 cubic yards of contaminated soil and other waste materials, underlain by subsurface mine voids and residual coal. The total trench surface area is approximately 1.2 acres. The trenches are separated into two general areas: one area containing trenches 1 through 9 and a second area containing trench 10. According to site records, these wastes were buried in accordance with AEC regulation 10 CFR 20.304, Disposal by Burial in Soil, which was subsequently rescinded in 1981.

Land use surrounding the SLDA site is mixed, consisting of medium-sized residential communities and individual rural residences, small farms with croplands and pastures, idle farmland, forest lands, and light industrial areas. The closest community is Kiskimere, to the southwest, which includes residences that are located within several hundred feet of the SLDA.

In January 2002, Section 8143 of Public Law 107-117 instructed USACE to cleanup radioactive waste at the site under FUSRAP. USACE is the lead agency for this cleanup that will follow the remediation process outlined under the CERCLA, and will accomplish the cleanup consistent with the 2001 memorandum of understanding (MOU) between the USACE and United States Nuclear Regulatory Commission (NRC) [USACE 2001]. The NRC issued a confirmatory order suspending the original license on August 5, 2011, to enable USACE to accomplish the cleanup, and the license will be reinstated in accordance with Article III.N of that MOU upon successful cleanup completion.

The remedy selected for the SLDA Site is referred to as Alternative 5, Excavation, Treatment, and Off-site Disposal in the ROD [USACE 2007], as amended [USACE 2015]. Implementation of the Selected Remedy will involve excavation of contaminated waste and soil, off-site transportation, and disposal at an appropriate permitted/licensed disposal facility.

EVALUATION

The following evaluation describes the results of, and methods used in, this first FYR to assess whether applicable or relevant and appropriate requirement (ARAR)-based cleanup standards, established in the ROD [USACE 2007] for the SLDA Site, as amended [USACE 2015] remain protective of human health and the environment.

Additionally, this appendix evaluates the risk and toxicity basis for the development of the soil cleanup objectives that were derived to comply with the ARARs listed below (Table F-1).

Section 8.2.2 of the ROD for the SLDA Site [USACE 2009] identified 10 Code of Federal Regulations (CFR) Part 20.1402 as an ARAR for the SLDA Site. This regulation establishes standards for the decommissioning of facilities licensed by the NRC to allow for license termination with unrestricted use,

This ARAR requires that the annual dose to an average member of the critical group not exceed 25 millirem per year (mrem/yr) and that the residual radioactivity be reduced to levels that are as low as reasonably achievable (ALARA). The critical group is "the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances." Based upon land use surrounding the SLDA Site, a subsistence farmer scenario was deemed appropriate as a reasonable future land use and for consideration as the “critical group” receptor for evaluating compliance with the ARAR.

This ARAR establishes the standard for measuring how much soil must be removed in order to render the site adequately protective.

The federal cleanup standards, referred to as derived concentration guideline levels (DCGLs), for americium, plutonium, radium, thorium, and uranium in soil, identified in Table 3 of the ROD [USACE 2007] and Table 1 of the ROD amendment [USACE 2015] for the SLDA Site, are listed in Table F-1 (below).

The remedy involves excavation and off-site disposal of radiologically contaminated soil and waste that exceed, excluding background, a sum of ratios (SOR) of 1 based upon the wide area average derived concentration guideline levels ($DCGL_w$). In addition, elevated measurement comparison criteria ($DCGL_{emc}$) were developed to ensure no localized areas of elevated radioactivity would remain that could potentially produce unacceptable risk.

The $DCGL_w$ criteria will be applied as averages over a wide area, while the $DCGL_{emc}$ values would be applied to smaller areas as not-to-exceed, “hot-spot” criteria.

Table F-1: Soil Cleanup Standards for the Shallow Land Disposal Area (SLDA) Site

Radionuclide	$DCGL_w$ (pCi/g)	$DCGL_{emc}$ (pCi/g)
Americium-241 (Am-241)	28	420
Plutonium-239 (Pu-239)	33	570
Plutonium-241 (Pu-241)	890	13,000
Radium-228 (Ra-228)	1.7	(a)
Thorium-232 (Th-232)	1.4	5.3
Uranium-234 (U-234)	96	240
Uranium-235 (U-235)	35	110
Uranium-238 (U-238)	120	520

Note 1: Standards for soil (in picocuries per gram [pCi/g]) are incremental to background.

(a) Based on site-specific considerations, a $DCGL_{emc}$ for Ra-228 was not developed because it can be accounted for by assuming it is present at the same concentration as its parent nuclide, Th-232. For this reason, the sum-of-the-ratios equations for both $DCGL_w$ and $DCGL_{emc}$ in the Final Status Survey Plan (FSSP) do not include Ra-228 separately.

ARAR EVALUATION

ARAR-based federal cleanup standards for uranium, plutonium, americium, and both thorium-232 and radium-228 in site soils identified in the SLDA ROD [USACE 2007] and amendment [USACE 2015] were compared to current standards to determine whether the ROD standards, established during the remedy selection, remain valid and protective of human health.

The SLDA Feasibility Study [USACE 2006], ROD [USACE 2007], and ROD amendment [USACE 2015] identified two potential ARARs for the cleanup of site contaminants: 10 CFR Sections 20.1402 and 1403. Both potential ARARs are properly promulgated federal requirements that provide cleanup standards or standards of control specifically addressing the hazardous substances at the SLDA site, however USACE is neither the site owner nor an NRC licensee. Therefore, the requirements are not legally applicable for a remediation conducted by USACE at the site; both are considered relevant and appropriate requirements for the hazardous substances at the site. Criteria in 10 CFR 20.1402 provide for unrestricted use for an average member of the critical group with a reasonably anticipated annual total effective dose equivalent of 25 mrem and that the residual radioactivity has been reduced to levels that are ALARA. Alternatively, criteria in 10 CFR 20.1403 provide for restricted use for an average member of the critical group to meet 25 mrem/year but with an anticipated dose up to 100 mrem/year if site controls are no longer effective.

The level of site cleanup under 10 CFR 20.1402 would be greater than that under 10 CFR 20.1403 as institutional controls are not required to limit the radiation dose to potential future receptors. Furthermore, the USACE evaluated restricted release alternatives and found that the SLDA site is not suitable for the design of a new disposal cell on the site [USACE 2006]. For these reasons, the selected remedial action involves excavation and removal of soil containing the ROCs at concentrations which create an unacceptable threat to human health as defined by 10 CFR 20.1402. This ARAR is relevant and appropriate to the remedy and establishes the standard for which soil must be removed to render the site adequately protective for unrestricted future use.

Additionally, other current federal and Pennsylvania state regulations were reviewed to determine if any newly promulgated or modified requirements contain substantive criteria pertaining to the hazardous substances or pollutants and contaminants or the circumstances of their release at the SLDA Site that would meet the definition of an ARAR, as defined in CERCLA or the National Oil and Hazardous Substances Contingency Plan (USEPA 1990). State requirements may be ARARs under CERCLA only if they are: (1) promulgated and of general applicability, (2) identified by the state in a timely manner, and (3) more stringent than federal standards. No additional federal or Pennsylvania state regulations were identified as potential ARARs for the selected remedy described in the SLDA Site ROD [2007] and amendment [USACE 2015].

There have also been no updates to the federal regulations specified in 10 CFR 20.1402. Therefore, the basis for the ARAR-driven soil cleanup standards for uranium, plutonium, americium and both thorium-232 and radium-228 shown in Table F-1 has not changed since the ROD [USACE 2007] and amendment [USACE 2015] were signed. The bases for standards as listed remain valid and protective of human health.

UPDATES SINCE INITIAL RISK ASSESSMENT

The dose-based cleanup criteria in the ROD [USACE 2007] and amendment [USACE 2015] were calculated for 25 mrem/year, per the ARAR, to a future subsistence farmer using the RESidual RADioactive materials (RESRAD) Onsite software. The RESRAD software was developed by Argonne National Laboratory (Argonne) and has been updated several times since the initial ROD in 2007 (current version 7.2) [Argonne 2016]. The most significant updates in this context involve the default dose conversion factor (DCF) libraries (e.g., effective radiological dose toxicity criteria) used to convert radionuclide intake (pCi) and external radioactivity exposure to an effective radiological dose rate (mrem/year) and the analogous cancer slope factor libraries used to calculate risk. The radiological DCF libraries from Federal Guidance Report (FGR) No. 11 (inhalation and ingestion) and FGR No. 12 (external exposure) [USEPA 1988 and 1993] were current at the time of cleanup criteria development.

The DCFs have since been updated by incorporating the following:

- Updated nuclear decay data for each of the 1,252 radionuclides addressed in International Commission on Radiological Protection (ICRP) Publication 107 (ICRP 2008);

- Age-specific ingestion dose coefficients for 888 radionuclides (all radionuclides in ICRP Publication 107 with a half-life $\geq$ 10 minutes, excluding noble gases), based on biokinetic and dosimetric models applied in FGR No. 13, Morbidity (USEPA 1999, ICRP 1996) and the updated nuclear decay data;

- Age-specific inhalation dose coefficients for each of the same 888 radionuclides inhaled as particulate aerosols with any user-specified distribution of particles that have sizes (within the bounds 0.0001–200 micrometers aerodynamic diameter) based on models in FGR No. 13 (USEPA1999, ICRP 1996) and the updated nuclear decay data;

- Age-specific inhalation dose coefficients for gas or vapor forms of selected radionuclides;

- External dose rate coefficients under various external exposure scenarios for each of the full set of 1,252 radionuclides based on models in FGR No. 12 (USEPA 1993) for adults and the updated nuclear decay data;

- Age-independent skin dose coefficients for each of the full set of 1,252 radionuclides based on the updated nuclear decay data.

These updated DCFs are included in the RESRAD software dose conversion library, Dose Coefficient File Package (DCFPAK) 3.02 [Argonne 2016]. Tables F-2 and F-3 compare the DCFs used at the time of the ROD with the updated, DCFPAK 3.02 version DCFs.

Table F-2: Comparison of Internal Radiological Dose Conversion Factors

DCF Source / Radionuclide	Inhalation (mrem/pCi)			Ingestion (mrem/pCi)		
	FGR No. 11	**DCFPAK 3.02 Default**	**Change from FGR 11 to DCFPAK 3.02**	**FGR No. 11**	**DCFPAK 3.02 Default**	**Change from FGR 11 to DCFPAK 3.02**
Ac-227+D	6.72E+00	6.46E-01	*-90%*	1.48E-02	1.61E-03	*-89%*
Am-241	4.44E-01	3.57E-01	*-20%*	3.64E-03	7.55E-04	*-79%*
Pa-231	1.28E+00	8.51E-01	*-34%*	1.06E-02	1.77E-03	*-83%*
Pu-239	4.29E-01	4.41E-01	*3%*	3.54E-03	9.29E-04	*-74%*
Pu-241+D	8.25E-03	8.46E-03	*2%*	7.16E-05	2.04E-05	*-71%*
Ra-228+D	5.08E-03	5.94E-02	*1070%*	1.44E-03	2.58E-03	*79%*
Th-228+D	3.45E-01	1.60E-01	*-54%*	8.09E-04	5.29E-04	*-35%*
Th-232	1.64E+00	4.07E-01	*-75%*	2.73E-03	8.55E-04	*-69%*
U-234	1.32E-01	3.48E-02	*-74%*	2.83E-04	1.83E-04	*-35%*
U-235+D	1.23E-01	3.13E-02	*-75%*	2.67E-04	1.74E-04	*-35%*
U-238+D	1.18E-01	2.98E-02	*-75%*	2.69E-04	1.78E-04	*-34%*

FGR No. 11 numbers were RESRAD default at time of the SLDA Site remedial investigation and ROD (2005, 2007) and were used for soil cleanup goal development.

DCFPAK 3.02 (highlighted) default values include ICRP 72 (adult) with ICRP 107 transformation chain database

Table F-3: Comparison of External Radiological Dose Conversion Factors

DCF Source	(mrem/year per pCi/g)			DCF Source	(mrem/year per pCi/g)			DCF Source	(mrem/year per pCi/g)		
	FGR No. 12	DCFPAK 3.02 Default	Change from FGR 12 to DCFPAK 3.02		FGR No. 12	DCFPAK 3.02 Default	Change from FGR 12 to DCFPAK 3.02		FGR No. 12	DCFPAK 3.02 Default	Change from FGR 12 to DCFPAK 3.02
Ac-225	6.37E-02	5.29E-02	*-17%*	**Pb-209**	7.73E-04	7.53E-04	*-3%*	**Rn-219**	3.08E-01	2.97E-01	*-4%*
Ac-227	4.95E-04	2.62E-04	*-47%*	**Pb-210**	2.45E-03	2.09E-03	*-15%*	**Rn-220**	2.30E-03	3.47E-03	*51%*
Ac-228	5.98E+00	5.04E+00	*-16%*	**Pb-211**	3.06E-01	3.68E-01	*20%*	**Rn-222**	2.35E-03	2.13E-03	*-10%*
Am-241	4.37E-02	3.72E-02	*-15%*	**Pb-212**	7.04E-01	6.31E-01	*-10%*	**Th-227**	5.21E-01	5.64E-01	*8%*
At-217	1.77E-03	1.19E-03	*-33%*	**Pb-214**	1.34E+00	1.26E+00	*-6%*	**Th-228**	7.94E-03	7.25E-03	*-9%*
At-218	5.85E-03	5.57E-05	*-99%*	**Po-210**	5.23E-05	5.64E-05	*8%*	**Th-229**	3.21E-01	2.88E-01	*-10%*
At-219	-	0.00E+00	-	**Po-211**	4.76E-02	4.71E-02	*-1%*	**Th-230**	1.21E-03	1.11E-03	*-9%*
Bi-210	3.61E-03	5.47E-03	*52%*	**Po-212**	0.00E+00	0.00E+00	-	**Th-231**	3.64E-02	3.25E-02	*-11%*
Bi-211	2.56E-01	2.41E-01	*-6%*	**Po-213**	0.00E+00	2.17E-04	-	**Th-232**	5.21E-04	4.78E-04	*-8%*
Bi-212	1.17E+00	6.26E-01	*-47%*	**Po-214**	5.14E-04	4.80E-04	*-7%*	**Th-234**	2.41E-02	2.32E-02	*-4%*
Bi-213	7.66E-01	6.87E-01	*-10%*	**Po-215**	1.02E-03	9.45E-04	*-7%*	**Tl-206**	-	1.28E-02	-
Bi-214	9.81E+00	9.14E+00	*-7%*	**Po-216**	1.04E-04	8.87E-05	*-15%*	**Tl-207**	1.98E-02	2.39E-02	*21%*
Bi-215	-	1.37E+00	-	**Po-218**	5.64E-05	9.23E-09	*-100%*	**Tl-208**	2.30E+01	2.17E+01	*-6%*
Fr-221	1.54E-01	1.33E-01	*-13%*	**Pu-239**	2.95E-04	2.77E-04	*-6%*	**Tl-209**	1.29E+01	1.29E+01	*0%*
Fr-223	1.98E-01	1.76E-01	*-11%*	**Pu-241**	5.90E-06	5.23E-06	*-11%*	**Tl-210**	0.00E+00	1.68E+01	-
Hg-206	-	6.13E-01	-	**Ra-223**	6.03E-01	5.79E-01	*-4%*	**U-233**	1.40E-03	9.19E-04	*-34%*
Np-237	7.79E-02	6.71E-02	*-14%*	**Ra-224**	5.12E-02	4.95E-02	*-3%*	**U-234**	4.02E-04	3.46E-04	*-14%*
Pa-231	1.91E-01	1.61E-01	*-16%*	**Ra-225**	1.10E-02	8.91E-03	*-19%*	**U-235**	7.21E-01	7.01E-01	*-3%*
Pa-233	1.02E+00	1.02E+00	*0%*	**Ra-226**	3.18E-02	3.18E-02	*0%*	**U-235m**	-	0.00E+00	-
Pa-234	1.16E+01	8.28E+00	*-28%*	**Ra-228**	0.00E+00	6.58E-05	-	**U-237**	5.31E-01	4.78E-01	*-10%*
Pa-234m	8.97E-02	1.26E-01	*40%*	**Rn-218**	-	4.26E-03	-	**U-238**	1.03E-04	1.71E-04	*66%*

FGR No. 11 numbers were RESRAD default at time of the SLDA Site remedial investigation and ROD (2005, 2007) and were used for soil cleanup goal development.

DCFPAK 3.02 (highlighted) default values include ICRP 72 (adult) with ICRP 107 transformation chain database

As indicated in Tables F-2 and F-3, the majority of DCFs have decreased since the time of the remedial investigation and initial ROD. Notable exceptions are the inhalation and ingestion DCFs for Ra-228 and its progeny (Ra-228+D), as well as the external DCFs for U-238 and the metastable isomer of protactimium-234 (Pa-234m). Although Ra-228 is considered a primary ROC for the SLDA site, it is anticipated to be in secular equilibrium with Th-232 at the time of final status survey and not independently present in significant quantities [USACE 2005, 2020]. Uranium-contaminated waste was actively disposed of at the SLDA site between 1961 and 1970 [USACE 2005], however sufficient time has passed for independent Ra-228 in excess of the intrinsic Th-232 to decay according to its 5.8-year half-life. Excess Ra-228 would have since decayed in wastes with initially higher concentrations of Ra-228 than Th-232, and in-growth over the proceeding period in wastes with initially lower concentrations of Ra-228 than Th-232 would have occurred such that, in either case, these two radionuclides are now anticipated to be in secular equilibrium. If additional waste characterization data during remediation supports the conclusion that Ra-228 and Th-232 are in secular equilibrium, Ra-228 will be dropped from the SOR calculation because its contribution is already accounted in the DCGL for Th-232 [USACE 2020].

External exposure to U-238 in context of the risk assessment includes photon emissions from U-238 as well as thorium-234 (Th-234), Pa-234m, and, in minor branching instances, Pa-234. Overall external DCFs considering all photon emissions per energy per intensity increased for both U-238 (66%) and Pa-234m (40%) and subtly decreased for Th-234 (-4%) from FGR 12 to DCFPAK 3.02. External contributions from U-238 itself are relatively negligible as the DCF is lower than that of Pa-234m by a factor of approximately 1000. Furthermore, the overall increase in external annual dose to potential future receptors attributable to Pa-234m is offset by a notable decrease of 34% in ingestion toxicity for U-238 and its progeny (U-238+D) from FGR 11 to DCFPAK 3.02 as illustrated in Table F-3. Pathway-specific dose modeling to potential future subsistence farmers indicate that a vast majority of the total dose from U-238 (> 78%) results from ingestion and more specifically the ingestion of plants and other produce [USACE 2005]. Therefore, it is anticipated that future annual dose from U-238 to a potential subsistence farmer in unrestricted site release would likely decrease consistently with other primary ROCs based on updated DCFs from the time of the initial ROD.

EXPOSURE ASSUMPTION EVALUATION

The exposure assessment used at the time of the ROD utilized a site-specific RESRAD model [Argonne, 2001] to calculate the eventual site DCGLs based on an annual total effective dose equivalent of 25 mrem above background to a subsistence farmer residing at the site. The values were calculated from the mean dose-to-source ratios of the peak doses over a 1,000-year period, i.e., “peak of the mean”, from the individual ROCs at the site using the probabilistic version of RESRAD, consistent with NRC decommissioning guidance [NRC 1999, 2000, 2002] at the time. NRC decommissioning guidance in NUREG 1757 Volume 1 (originally dated 2002) has been updated since the remedial investigation and eventual DCGL development, however major changes as applicable in this context focus predominately on restricted site release and alternative release criteria per 10 CFR 20.1403 [NRC 2006]. Since the selected remedial action is unrestricted release based on 10 CFR 20.1402, the intent of this guidance at the time of the DCGL development remains valid.

Additional NRC decommissioning guidance in NUREG 1757 Volume 2 (dated as draft for comment in 2020) has been updated with particular emphasis on the method of dose modeling used to develop the site DCGLs. Since the maximum future dose to a subsistence farmer is dependent on multiple pathways with potentially different peak exposure times as a result of independent or competing geophysical processes, the NRC generally holds the position that a single deterministic calculation using the mean environmental parameters is unlikely to result in the representative mean dose. [NRC 2020]. Rather the modeled "peak of the mean" annual dose from a probabilistic analysis utilizing site-realistic distributions for risk-sensitive parameters is considered appropriate to demonstrate 10 CFR 20.1402 dose criteria if the sensitive distributions are not overly broad indicative of risk dilution [NRC 2020]. Risk dilution typically occurs when an overly broad or all-inclusive distribution for a poorly defined geophysical parameter, such as radionuclide distribution coefficients, results in imprecise or excessively uncertain timing to peak exposure and an artificially underestimated peak dose.

Conversely, compliance with the 25 mrem/year cleanup standard incorporates a sum of the ratios for residual radionuclides relative to each respective DCGL. This indirectly assumes that the peak dose occurs at approximately the same time for each radionuclide which is not the case for the primary ROCs at the SLDA site [USACE 2005]. The modeled peak doses for uranium isotopes, the main site contaminants, are projected to occur many years in the future, however each separated by several hundred years: the peak doses are projected to occur at year 250, 550, and 1,000 for U-238, U-235, and U-234, respectively [USACE 2005]. Because these ROCs behave chemically identical in the environment, these discrepancies are largely sensitive to progeny ingrowth as determined by their fixed progeny half-lives rather than model variability in geophysical characteristics.

The peak doses for the other primary ROCs are modeled to occur in the near-term comparable to the duration since the waste was introduced to the site (0 to 100 years). The projected peak doses for Am-241, Pu-239, and Ra-228 occur in the very near-term, i.e., several years, which deters further evaluation of progeny ingrowth or environmental migration sensitivity [USACE 2005]. The peak dose for Pu-241 was expected to occur at approximately 60 years, comparable to the time of site remediation, at which point only 5.5% of the initial concentration remains present and Am-241 begins significantly growing into the impacted media [USACE 2005]. Finally, the peak dose for Th-232 is projected to occur at 90 years following significant Ra-228 ingrowth to secular equilibrium [USACE 2005]. Therefore, the total dose attributable to Th-232 for future subsistence farmer receptors also includes the contribution from Ra-228 at equal concentrations.

Reasonable projections of future land use and receptor exposures were incorporated to develop site-specific RESRAD input parameters to calculate the eventual site DCGLs per the ARAR. These final models additionally attained input and concurrence of the Pennsylvania Department of Environmental Protection (PADEP) [USACE 2005]. Table F-4 compares the receptor exposure scenario assumptions and intake parameters to RESRAD version 7.2, NRC guidance, and EPA Exposure Factor Handbook (EFH) counterparts, where applicable.

Table F-4: Exposure Scenario Assumptions and Intake Parameters

Parameter	**Variable**	**Unit(s)**	**SLDA DCGL Development**	**RESRAD v. 7.2 default**	**NRC NUREG/CR-5512 Volume 3 Default** [1]	**EPA Exposure Factor Handbook 95th percentile** [2]
Inhalation rate	IR_a	m^3/hr	0.98	0.95	1.2	0.82 [3]
Incidental ingestion of soil and sediment	IR_s	mg/d or mg/event	50	36.5	50	55.9 [4]
Incidental ingestion of surface water and groundwater	IR_w	mL/d or mL/event	-	-	-	-
Exposure time	ET	h/d	18.6	18	18.1	Not directly applicable
Exposure frequency	EF	d/yr or events/yr	365	365	365	Not directly applicable
Exposure duration	ED	yr	30	30	Not directly applicable	33 [5]
Ingestion of drinking water	IR_{dw}	L/d	1.3	1.4	2	2.6 [6]
Ingestion of produce	IR_p	kg/yr	133.4	174	177	774 [7]
Ingestion of beef and poultry	IR_{bp}	kg/yr	65.1	63	68	180 [8]
Ingestion of dairy products	IR_{dp}	L/yr	233	92	100	883 [9]
Ingestion of fish	IR_f	kg/yr	20.6	6.3	10	38 [10]

1. Default input parameters for the NRC dose modeling code, DandD, and as referenced as "NRC decommissioning guidance" during the SLDA remedial investigation [USACE 2005]
2. The EPA began releasing individual chapter updates since October 2017. The 95th percentile exposure parameters are provided to illustrate reasonable bounding conditions as appropriate for defining "reasonable maximum exposures" (RME) in the context of a formal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) risk assessment. It should be noted that common practice is not to consider each individual parameter at the 95th percentile such that the total exposure is representative of the reasonable maximum at the upper limit (i.e., 90th percentile, 95th percentile, etc.) [EPA XXX]. This is because some, or all, of the RME physically cannot be simultaneously true. Furthermore, the ARAR considers the "average member of the critical group" rather than the reasonable maximum.
3. Time weighted average to age 81 from EFH Table 6-1 (2011)
4. Time weighted average to age 81 from EFH Table 5-1 (2017)
5. From EFH Table 16-5 (2011)
6. All ages per capita from EFH Table 3-1 (2019)
7. All ages per capita for fruits and vegetables from EFH Table 9-1 (2018) and grains from EFH Table 12-1 (2018) incorporating a time weighted average across all ages of the 95th percentile weight from EFH Table 8-3 (2011)
8. All ages per capita from EFH Table 11-1 (2018) incorporating a time weighted average across all ages of the 95th percentile weight from EFH Table 8-3 (2011)
9. All ages per capita from EFH Table 11-1 (2018) incorporating a time weighted average across all ages of the 95th percentile weight from EFH Table 8-3 (2011)
10. All ages per capita from EFH Table 10-1 (2011) incorporating a time weighted average across all ages of the 95th percentile weight from EFH Table 8-3 (2011)

HUMAN RISK AND TOXICITY EVALUATION

The remedial investigation [USACE 2005] preliminary remediation goals and ROD [USACE 2007] and ROD amendment [USACE 2015] DCGLs captured in Table F-1 reflect an annual total effective dose equivalent of 25 mrem to a future subsistence farmer during an unrestricted site release. All internal dose contributions were calculated using site-specific probabilistic RESRAD models, as described, with the FGR 11 DCF library. Dose attributable to external exposures were accounted using FGR 12 DCFs. Although the toxicity criteria for developing effective doses from exposure to site ROCs have been updated, the use of the updated DCFPAK 3.02 library would result in similar to slightly less stringent soil cleanup goals as discussed in this appendix.

NRC guidance still recommends "peak of the mean" for DCGL development using probabilistic dose modeling software such as RESRAD assuming broad geophysical distributions do not induce risk dilution [NRC 2020]. The preferred use of site-specific and PADEP-reviewed input characteristics as well as stark peak dose projections in either the near term or many years in the future, depending on the ingrowth progeny half-lives, supports that the environmental considerations remain valid and appropriate for future receptors.

The modeled annual total effective dose equivalent per exposure pathway as determined in the sitewide risk assessment [USACE 2005] and utilized for DCGL development are provided per primary ROC in Table F-5. The primary exposure pathway for all ROCs is produce ingestion.

Table F-5: Pathway-Specific Doses (mrem/yr per pCi/g) to a Future Subsistence Farmer

Pathway	U-238	U-235	U-234	Th-232	Ra-228	Pu-239	Pu-241	Am-241
External Gamma Exposure	4.51E-02	2.30E-01	4.51E-03	4.70E+00	2.86E+00	8.98E-05	3.79E-04	1.33E-02
Inhalation of Particulates	9.85E-04	1.73E-03	1.10E-03	1.64E-02	1.68E-03	3.58E-03	1.10E-04	3.70E-03
Inhalation of Radon Decay Products	8.60E-05	0.00E+00	9.09E-02	1.03E-01	6.06E-02	0.00E+00	0.00E+00	0.00E+00
Soil Ingestion	3.81E-03	7.91E-03	4.05E-03	6.92E-02	2.13E-02	5.01E-02	1.53E-03	5.14E-02
Water Ingestion	1.52E-02	3.54E-02	1.75E-02	2.85E-03	9.50E-08	2.22E-03	3.57E-04	6.99E-02
Fish Ingestion	6.96E-03	2.15E-02	7.31E-03	1.83E-02	4.76E-08	3.26E-03	6.95E-04	4.84E-02
Produce Ingestion	***1.08E-01***	***4.25E-01***	***1.23E-01***	***1.18E+01***	***1.08E+01***	***6.98E-01***	***2.54E-02***	***7.20E-01***
Beef and Poultry Ingestion	1.05E-02	1.05E-02	1.12E-02	2.62E-01	2.37E-01	1.27E-02	2.55E-04	6.58E-03
Dairy Product Ingestion	2.11E-02	2.10E-02	2.32E-02	1.56E+00	1.50E+00	5.52E-04	3.75E-05	1.28E-03

The highlighted and bold font indicates the primary exposure pathway contributing the greatest modeled dose.

The previously derived soil concentration limits for uranium, plutonium, americium, and both thorium-232 and radium-232 remain consistent with current regulatory guidance and intent. Therefore, the cleanup goals for the selected soil remedy remain conservative and protective of human health for future receptors in unrestricted site release per the ARAR.

ECOLOGICAL RISK AND TOXICITY EVALUATION

The screening level ecological risk assessment (SLERA) at the SLDA site was completed in accordance with the stepwise process prescribed by the EPA to conduct ecological risk assessments (1997) and the DOE-STD-1153-2002, A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota (2002). Ecological exposure to ionizing radiation was assessed for one terrestrial (site-wide soil) and two aquatic (Dry Run surface water and Carnahan Run surface water) exposure units. Eight radionuclides were evaluated: Am-241, Pu-239, Pu-241, Ra-228, Th-232, U-234, U-235, and U-238. These radionuclides were also evaluated in the baseline risk assessment for human health. The maximum detected concentrations of these eight radionuclides were compared to the generic biota concentration guidelines (BCGs) that were delineated in DOE-STD-1153-2002. The BCGs are based on United States Department of Energy (DOE) biota dose rate criteria, derived from findings of the National Council on Radiation Protection and Measurements (NCRP) and the International Atomic Energy Agency (IAEA). The sum of ratios (SOR) approach was used to ensure that the dose limits protective of biota was not exceeded for exposure to multiple radionuclides. The SORs for each of the three exposure units were below 1, indicating that the biota dose limits were not exceeded in these exposure units and no adverse effects were expected to occur amongst ecological populations. The RI summarizes that "no unacceptable risks to potential ecological receptors are predicted to occur." The DOE technical standard has since been replaced by DOE-STD-1153-2019, however, there have been no changes to the BCGs for any of the eight radionuclides evaluated. The derivation of BCGs accounts for updates in exposure and radiation assessment methodologies. Additionally, the DOE biota dose limits have not changed since the RI was completed. As such, since there have been no changes to the BCGs and the biota dose limits, the results of the SLERA are still valid and there are no unacceptable ecological risks due to radiation at the SLDA site.

The chemical toxicity of uranium was also evaluated. The maximum detected concentration of uranium on-site was compared to the soil screening level for protection of terrestrial plants outlined in Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plans: 1997 Revision (Efroymson et al. 1997). While the maximum detected concentration of total uranium exceeded the soil screening level, the exposure point concentration did not. Exposure point concentrations provide a more reasonable estimation of the site-wide concentration that ecological receptors are expected to contact. It was concluded that total uranium presents no unacceptable risks to ecological receptors on-site. Since completion of the RI, USEPA Region 4 released Ecological Risk Assessment Supplemental Guidance in 2018 that presents an updated soil screening level for uranium based on protection of plants. This updated screening level, 25 mg/kg, is higher than the soil screening level used in the SLERA, 5 mg/kg, and it accounts for changes in both exposure factors and toxicity criteria. This change in soil screening level for uranium does not change the conclusion of the SLERA; there are no unacceptable ecological risks.

CONCLUSIONS

It was concluded from this review that no newly promulgated or modified requirements of federal or state environmental or facility-siting laws would change the protectiveness of the soil remedy being implemented at the SLDA Site. Additionally, a careful review of guidance and scientific updates since the ROD and ROD amendment suggest that the cleanup goals for the selected soil remedy remain conservative and protective of human health and the environment.

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APPENDIX G – Operation and Monitoring Data

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APPENDIX G

Operation and Monitoring Data

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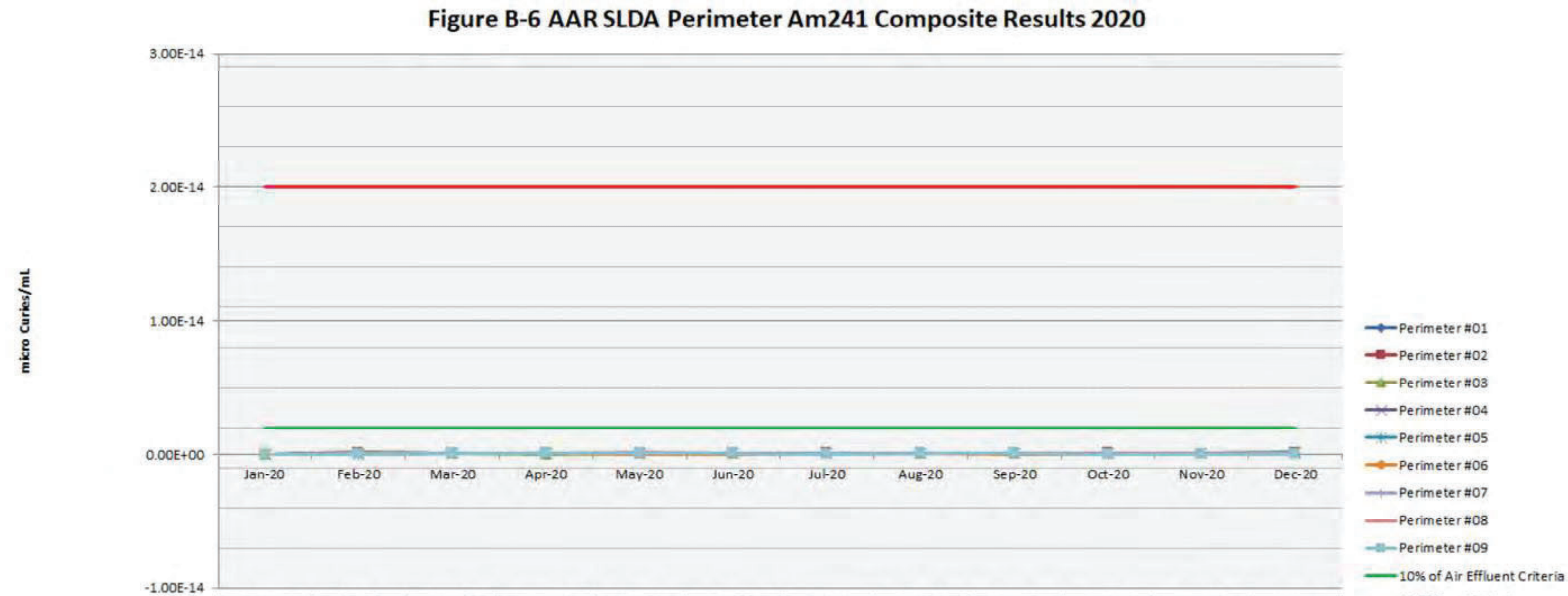
Operation and Monitoring Data

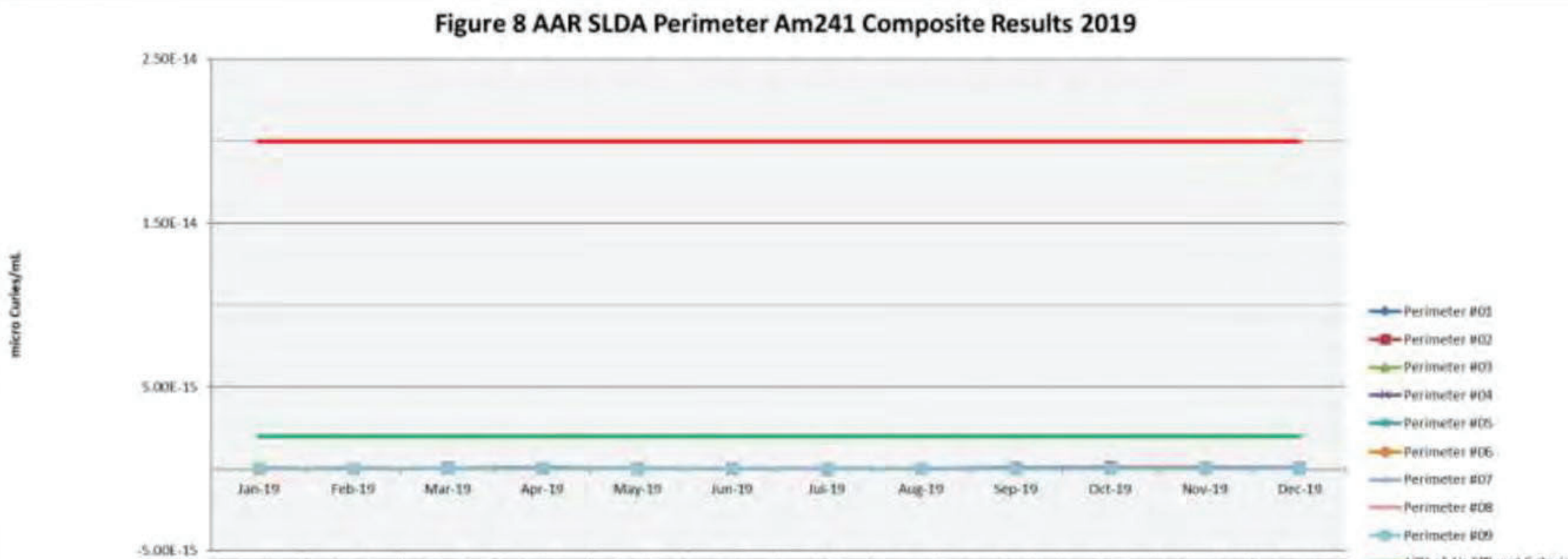
Figure 1: SLDA Perimeter Air Effluent Concentrations for Americium-241 (Calendar Year 2020)



	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
Perimeter #01	0.00E+00	1.51E-16	1.21E-16	3.84E-17	7.72E-17	9.35E-17	8.03E-17	7.54E-17	6.53E-17	3.27E-17	5.88E-17	1.04E-16
Perimeter #02	0.00E+00	1.13E-16	1.10E-16	4.19E-17	7.32E-17	9.69E-17	8.52E-17	4.80E-17	6.73E-17	8.51E-17	2.87E-17	6.95E-17
Perimeter #03	0.00E+00	1.23E-16	1.01E-16	2.59E-17	7.72E-17	8.52E-17	8.74E-17	7.07E-17	7.34E-17	9.41E-17	6.43E-17	2.04E-16
Perimeter #04	0.00E+00	8.23E-17	1.08E-16	4.89E-17	8.35E-17	1.05E-16	6.91E-17	6.75E-17	7.48E-17	8.57E-17	6.14E-17	9.68E-17
Perimeter #05	0.00E+00	3.55E-17	7.89E-17	7.49E-17	6.43E-17	7.46E-17	5.77E-17	5.83E-17	6.02E-17	5.58E-17	6.65E-17	2.02E-16
Perimeter #06	0.00E+00	4.65E-17	7.56E-17	7.93E-17	2.91E-17	2.35E-17	4.20E-17	8.54E-17	3.50E-17	3.26E-17	3.05E-17	2.13E-17
Perimeter #07	0.00E+00	6.78E-17	5.17E-17	8.04E-17	5.70E-17	5.04E-17	6.17E-17	8.81E-17	5.00E-17	6.02E-17	6.25E-17	6.71E-17
Perimeter #08	0.00E+00	5.14E-17	6.77E-17	6.70E-17	1.51E-16	6.61E-17	3.39E-17	9.38E-17	4.39E-17	5.41E-17	5.64E-17	4.41E-17
Perimeter #09	0.00E+00	3.49E-17	5.61E-17	6.31E-17	6.43E-17	3.78E-17	3.59E-17	8.38E-17	4.25E-17	2.18E-17	2.21E-17	3.61E-17
10% of Air Effluent Criteria	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15
Air Effluent Criteria	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14

NOTE: Isotopic data for January 2020 not reported due to laboratory error. A value of zero is used for calculational purposes only.

Figure 2: SLDA Perimeter Air Effluent Concentrations for Americium-241 (Calendar Year 2019)



	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
Perimeter #01	2.76E-17	1.85E-17	3.14E-17	1.21E-16	3.33E-17	4.21E-17	3.04E-17	3.27E-17	9.05E-17	1.04E-16	8.22E-17	8.63E-17
Perimeter #02	4.92E-17	3.14E-17	6.20E-17	9.88E-17	2.55E-17	4.44E-17	8.83E-18	3.59E-17	1.04E-16	1.24E-16	8.47E-17	8.66E-17
Perimeter #03	3.29E-17	4.52E-17	6.65E-17	1.01E-16	4.57E-17	4.83E-17	3.28E-17	1.96E-17	5.95E-17	9.05E-17	8.24E-17	7.68E-17
Perimeter #04	4.54E-17	5.37E-17	8.01E-17	1.02E-16	1.10E-17	3.76E-17	4.23E-17	5.10E-17	1.13E-16	8.99E-17	8.66E-17	8.57E-17
Perimeter #05	2.37E-17	4.09E-17	3.36E-17	7.89E-17	1.33E-17	3.33E-17	2.45E-17	2.13E-17	7.31E-17	5.41E-17	5.92E-17	6.54E-17
Perimeter #06	1.98E-17	3.16E-17	2.71E-17	5.04E-17	1.75E-17	4.60E-17	9.59E-18	4.38E-17	4.96E-17	4.31E-17	4.59E-17	6.79E-17
Perimeter #07	3.12E-17	5.59E-17	5.19E-17	6.56E-17	1.87E-17	4.22E-17	3.36E-17	6.93E-17	3.00E-17	3.59E-17	3.32E-17	4.15E-17
Perimeter #08	3.70E-17	1.09E-16	1.31E-17	3.43E-17	2.68E-17	4.90E-17	3.88E-17	5.74E-17	4.71E-17	7.33E-17	6.07E-17	5.81E-17
Perimeter #09	2.81E-17	4.06E-17	3.74E-17	6.53E-17	1.38E-17	6.66E-17	3.19E-17	3.86E-17	3.94E-17	3.25E-17	3.24E-17	4.22E-17
10% of Air Effluent Criteria	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15
Air Effluent Criteria	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14

Figure 3: SLDA Perimeter Air Effluent Concentrations for Americium-241 (Calendar Year 2018)

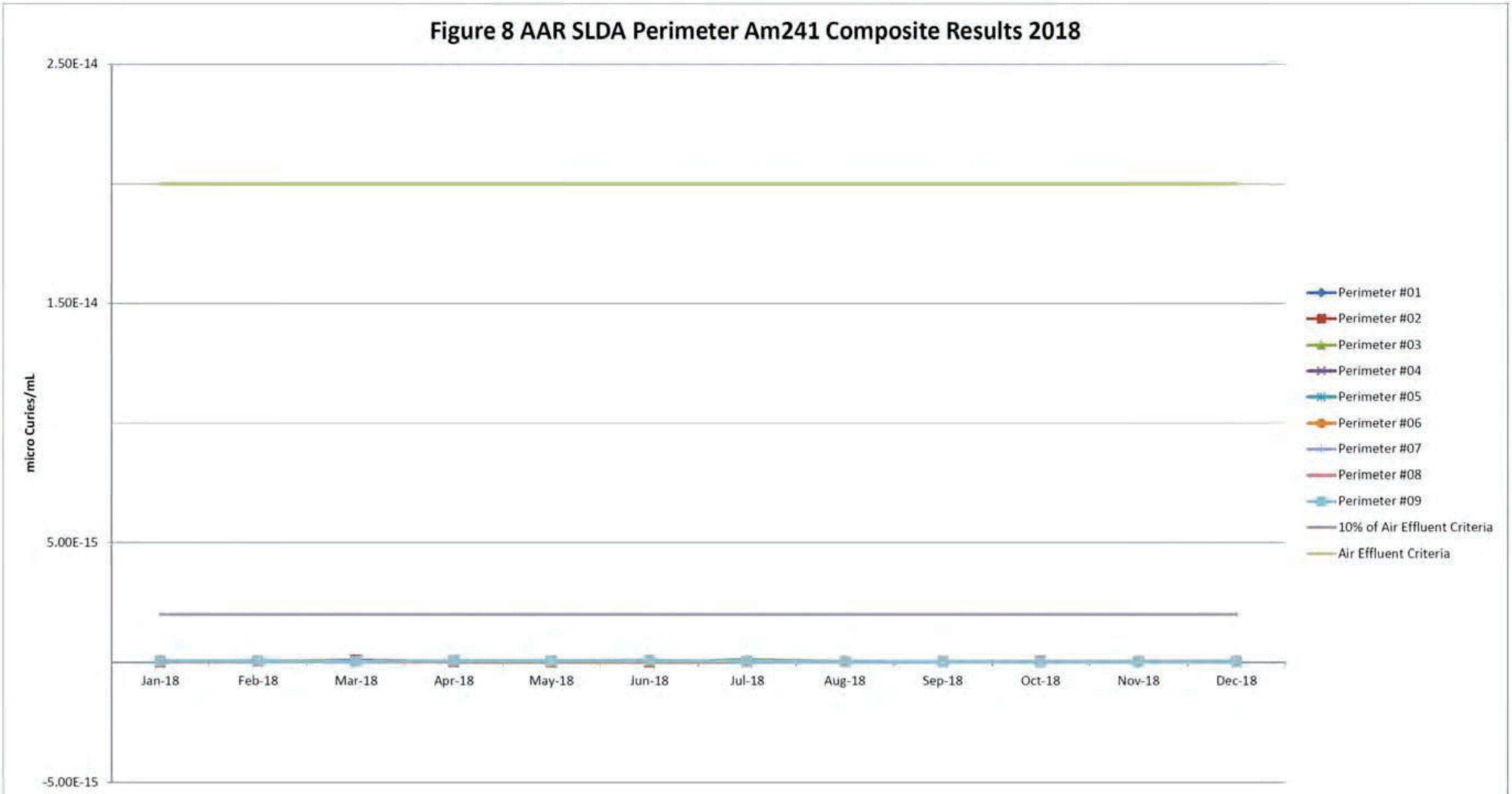


Figure 4: SLDA Perimeter Air Effluent Concentrations for Americium-241 (Calendar Year 2017)

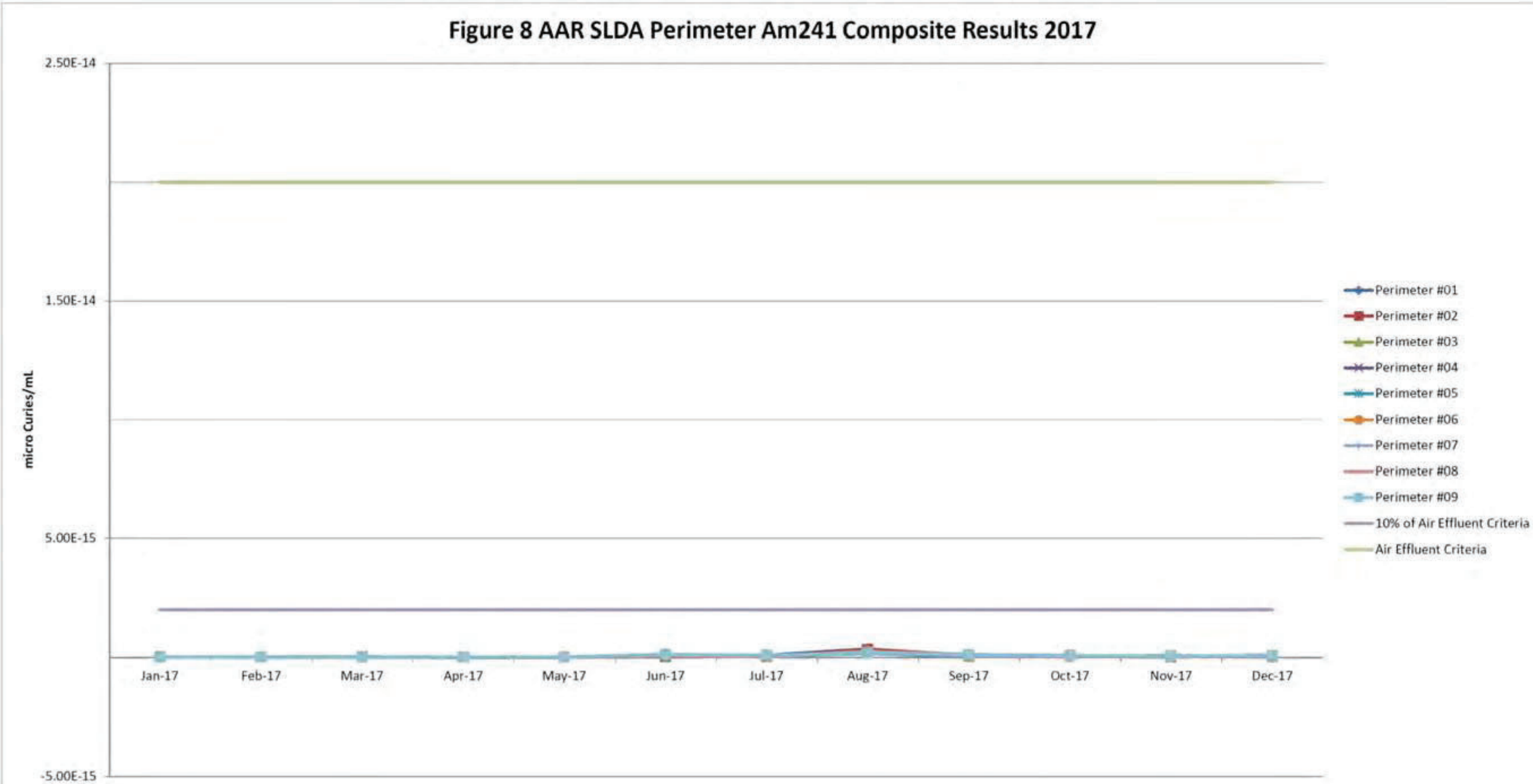


Figure 5: SLDA Perimeter Air Effluent Concentrations for Americium-241 (Calendar Year 2016)

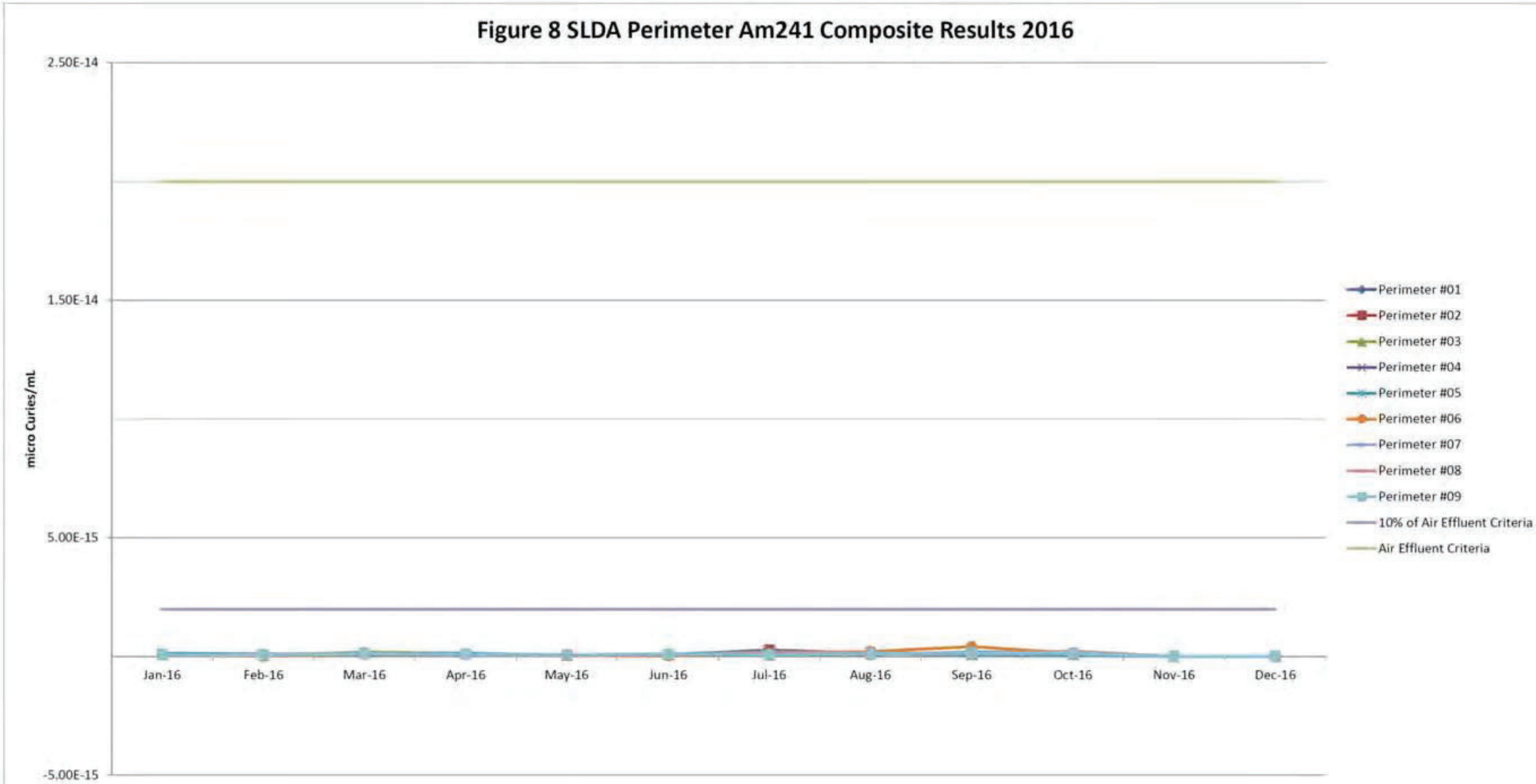
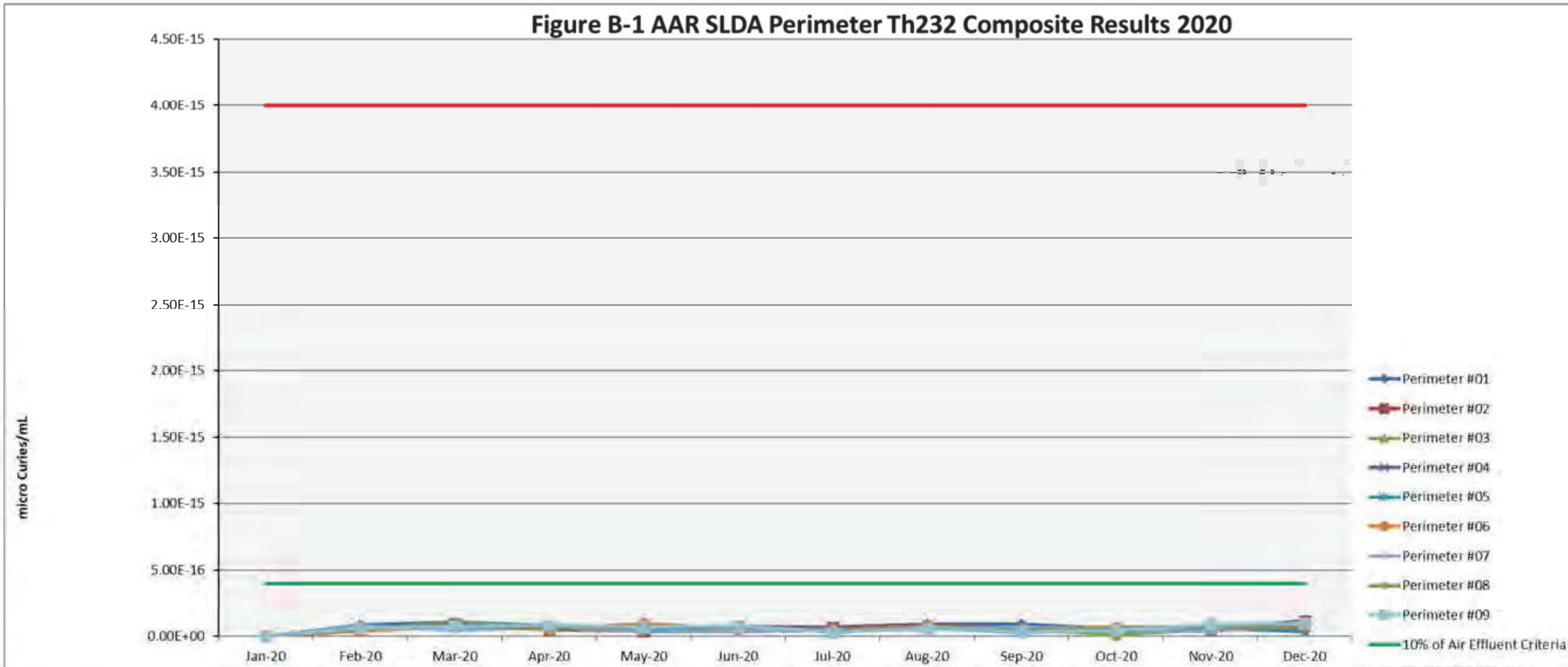


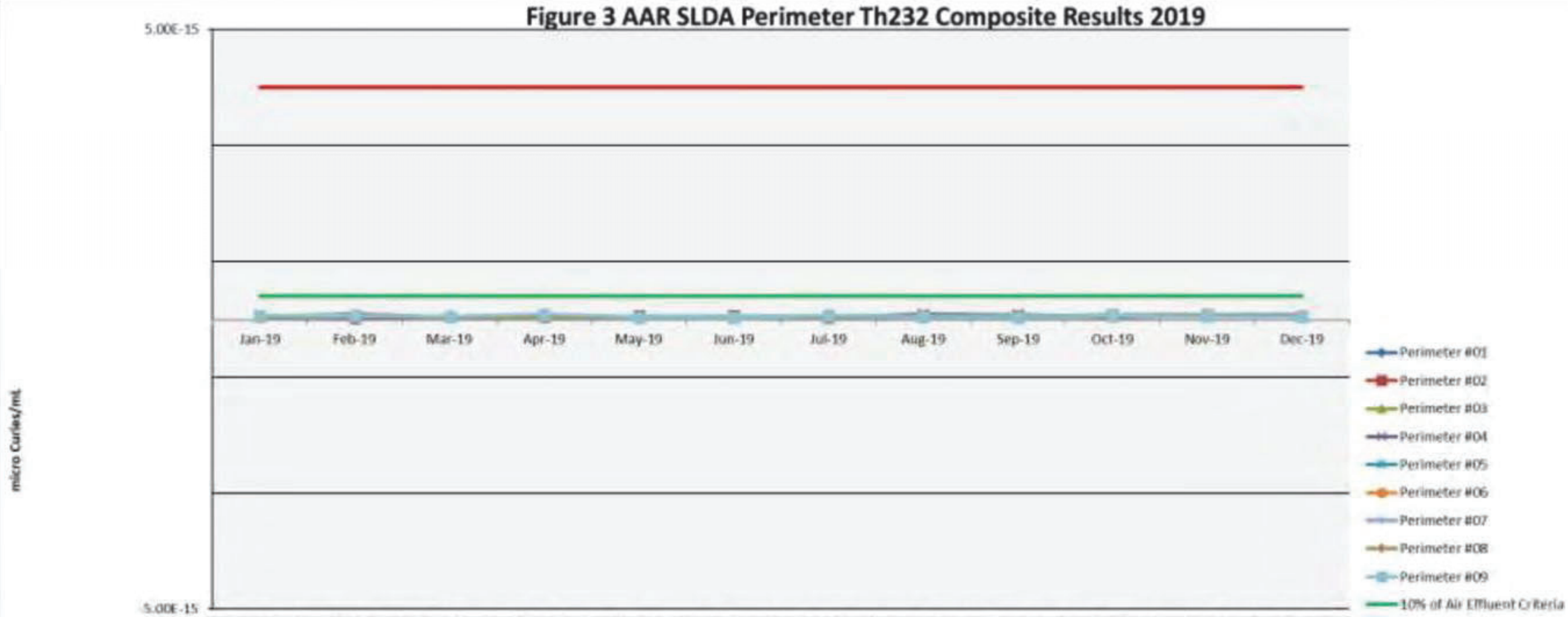
Figure 6: SLDA Perimeter Air Effluent Concentrations for Thorium-232 (Calendar Year 2020)



	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
Perimeter #01	0.00E+00	8.76E-17	1.06E-16	8.35E-17	4.45E-17	5.37E-17	6.83E-17	9.29E-17	9.32E-17	6.17E-17	6.63E-17	3.90E-17
Perimeter #02	0.00E+00	5.87E-17	9.25E-17	5.25E-17	4.07E-17	7.55E-17	6.67E-17	6.87E-17	4.64E-17	5.05E-17	5.69E-17	1.17E-16
Perimeter #03	0.00E+00	5.07E-17	1.11E-16	5.08E-17	5.36E-17	6.46E-17	6.41E-17	6.58E-17	5.56E-17	1.28E-17	5.41E-17	9.91E-17
Perimeter #04	0.00E+00	5.59E-17	9.74E-17	5.33E-17	4.18E-17	7.33E-17	6.95E-17	8.95E-17	6.01E-17	4.79E-17	6.47E-17	7.41E-17
Perimeter #05	0.00E+00	5.72E-17	8.80E-17	6.74E-17	7.18E-17	4.08E-17	4.60E-17	6.68E-17	3.41E-17	5.56E-17	7.03E-17	3.99E-17
Perimeter #06	0.00E+00	4.46E-17	7.50E-17	5.20E-17	9.86E-17	5.77E-17	5.18E-17	7.56E-17	5.88E-17	6.85E-17	6.90E-17	7.77E-17
Perimeter #07	0.00E+00	8.16E-17	5.02E-17	7.01E-17	3.85E-17	3.75E-17	4.75E-17	5.25E-17	6.98E-17	5.50E-17	3.90E-17	1.10E-16
Perimeter #08	0.00E+00	6.03E-17	8.89E-17	5.98E-17	6.76E-17	7.42E-17	4.96E-17	6.27E-17	4.88E-17	6.48E-17	7.53E-17	6.67E-17
Perimeter #09	0.00E+00	6.52E-17	7.55E-17	8.52E-17	7.25E-17	8.05E-17	3.11E-17	6.19E-17	3.70E-17	5.01E-17	8.87E-17	1.03E-16
10% of Air Effluent Criteria	4.00E-16	4.00E-16	4.00E-16	4.00E-16	4.00E-16	4.00E-16	4.00E-16	4.00E-16	4.00E-16	4.00E-16	4.00E-16	4.00E-16
Air Effluent Criteria	4.00E-15	4.00E-15	4.00E-15	4.00E-15	4.00E-15	4.00E-15	4.00E-15	4.00E-15	4.00E-15	4.00E-15	4.00E-15	4.00E-15

NOTE: Isotopic data for January 2020 not reported due to laboratory error. A value of zero is used for calculational purposes only.

Figure 7: SLDA Perimeter Air Effluent Concentrations for Thorium-232 (Calendar Year 2019)



	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
Perimeter #01	3.01E-17	1.22E-17	5.61E-17	5.49E-17	4.55E-17	4.37E-17	3.33E-17	6.28E-17	5.27E-17	7.42E-17	7.61E-17	7.05E-17
Perimeter #02	5.67E-17	2.90E-17	4.71E-17	6.35E-17	5.24E-17	5.45E-17	4.07E-17	5.65E-17	5.46E-17	6.66E-17	7.11E-17	5.06E-17
Perimeter #03	5.36E-17	8.80E-17	3.76E-17	6.72E-17	4.72E-17	4.19E-17	2.14E-17	6.77E-17	4.72E-17	7.65E-17	5.25E-17	4.80E-17
Perimeter #04	3.67E-17	8.78E-17	3.57E-17	4.89E-17	4.37E-17	4.35E-17	4.24E-17	9.33E-17	8.06E-17	3.95E-17	6.22E-17	7.25E-17
Perimeter #05	5.62E-17	7.77E-17	4.10E-17	4.32E-17	3.97E-17	4.89E-17	3.70E-17	6.08E-17	7.18E-17	5.63E-17	5.32E-17	6.52E-17
Perimeter #06	4.96E-17	6.92E-17	3.97E-17	4.05E-17	4.23E-17	4.30E-17	4.77E-17	5.28E-17	6.84E-17	5.38E-17	7.10E-17	4.92E-17
Perimeter #07	1.76E-17	5.62E-17	5.09E-17	4.91E-17	5.32E-17	4.69E-17	6.72E-17	5.76E-17	5.65E-17	5.21E-17	5.40E-17	6.26E-17
Perimeter #08	1.78E-17	7.72E-17	4.14E-17	6.03E-17	2.97E-17	3.56E-17	3.98E-17	5.93E-17	4.20E-17	5.01E-17	6.93E-17	6.19E-17
Perimeter #09	6.19E-17	5.81E-17	4.83E-17	8.36E-17	3.71E-17	2.93E-17	6.88E-17	4.46E-17	3.75E-17	6.24E-17	5.57E-17	4.96E-17
10% of Air Effluent Criteria	4E-16	4E-16	4E-16	4E-16	4E-16	4E-16	4E-16	4E-16	4E-16	4E-16	4E-16	4E-16
Air Effluent Criteria	4E-15	4E-15	4E-15	4E-15	4E-15	4E-15	4E-15	4E-15	4E-15	4E-15	4E-15	4E-15

Figure 8: SLDA Perimeter Air Effluent Concentrations for Thorium-232 (Calendar Year 2018)

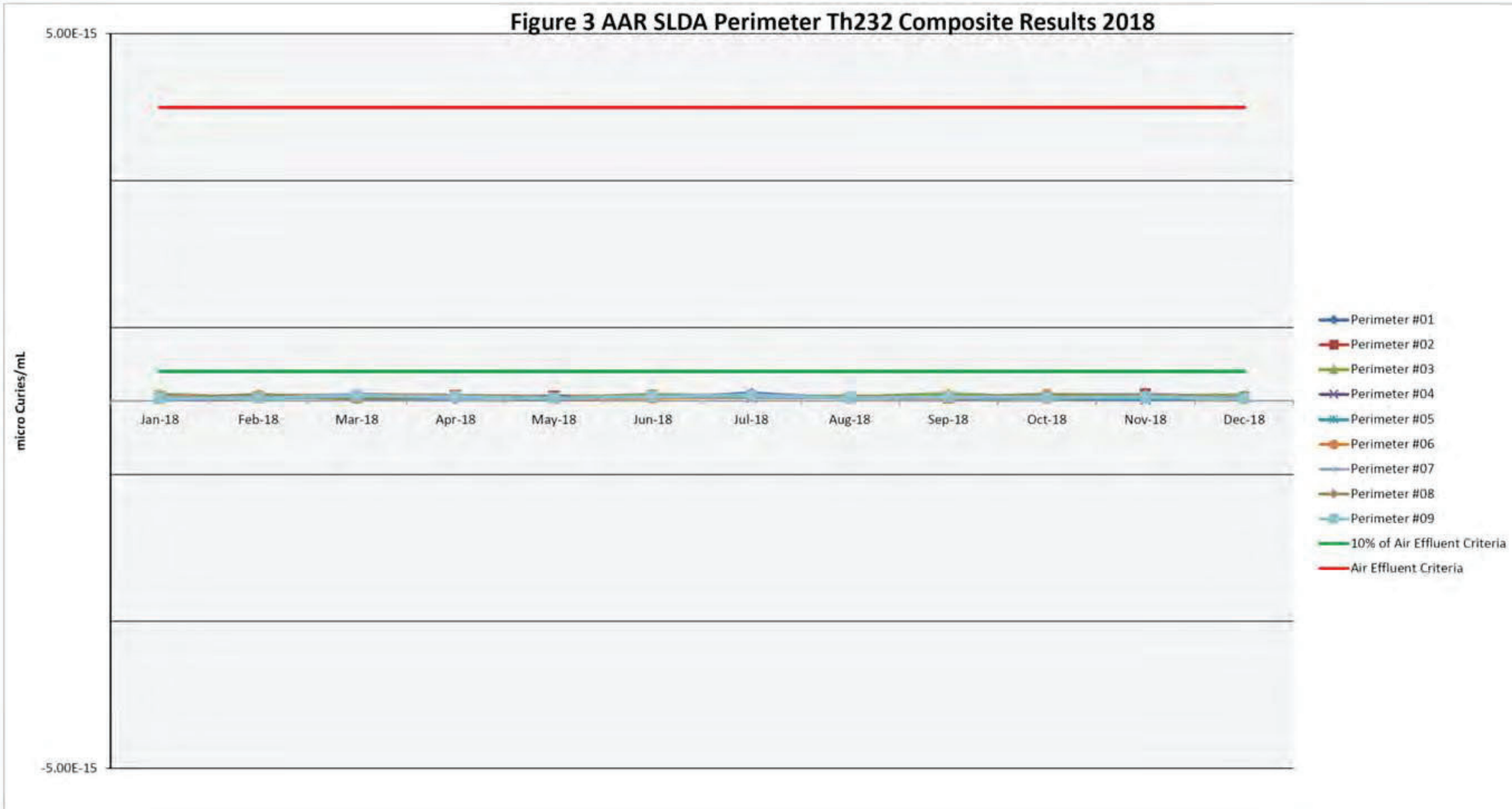


Figure 9: SLDA Perimeter Air Effluent Concentrations for Thorium-232 (Calendar Year 2017)

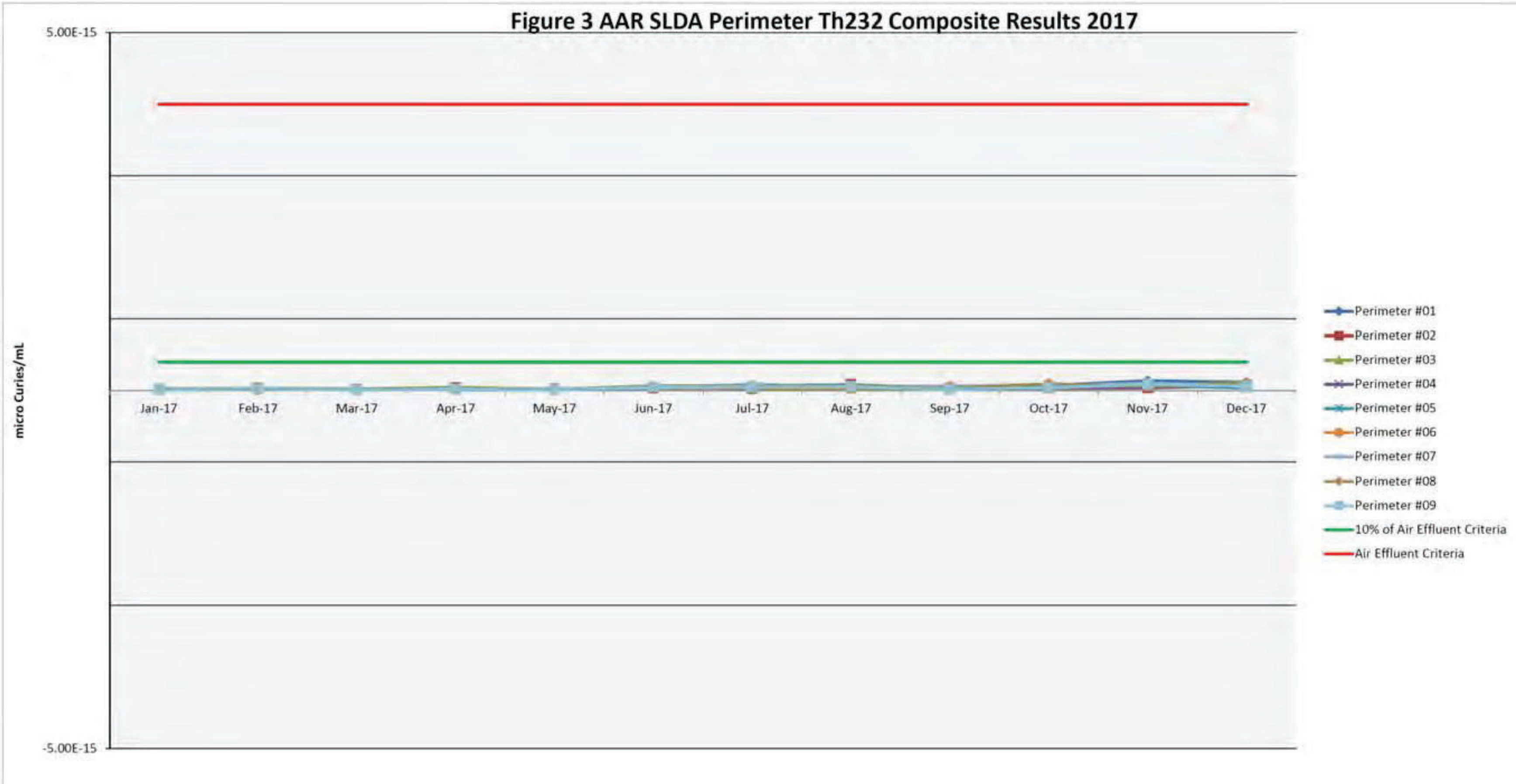


Figure 10: SLDA Perimeter Air Effluent Concentrations for Thorium-232 (Calendar Year 2016)

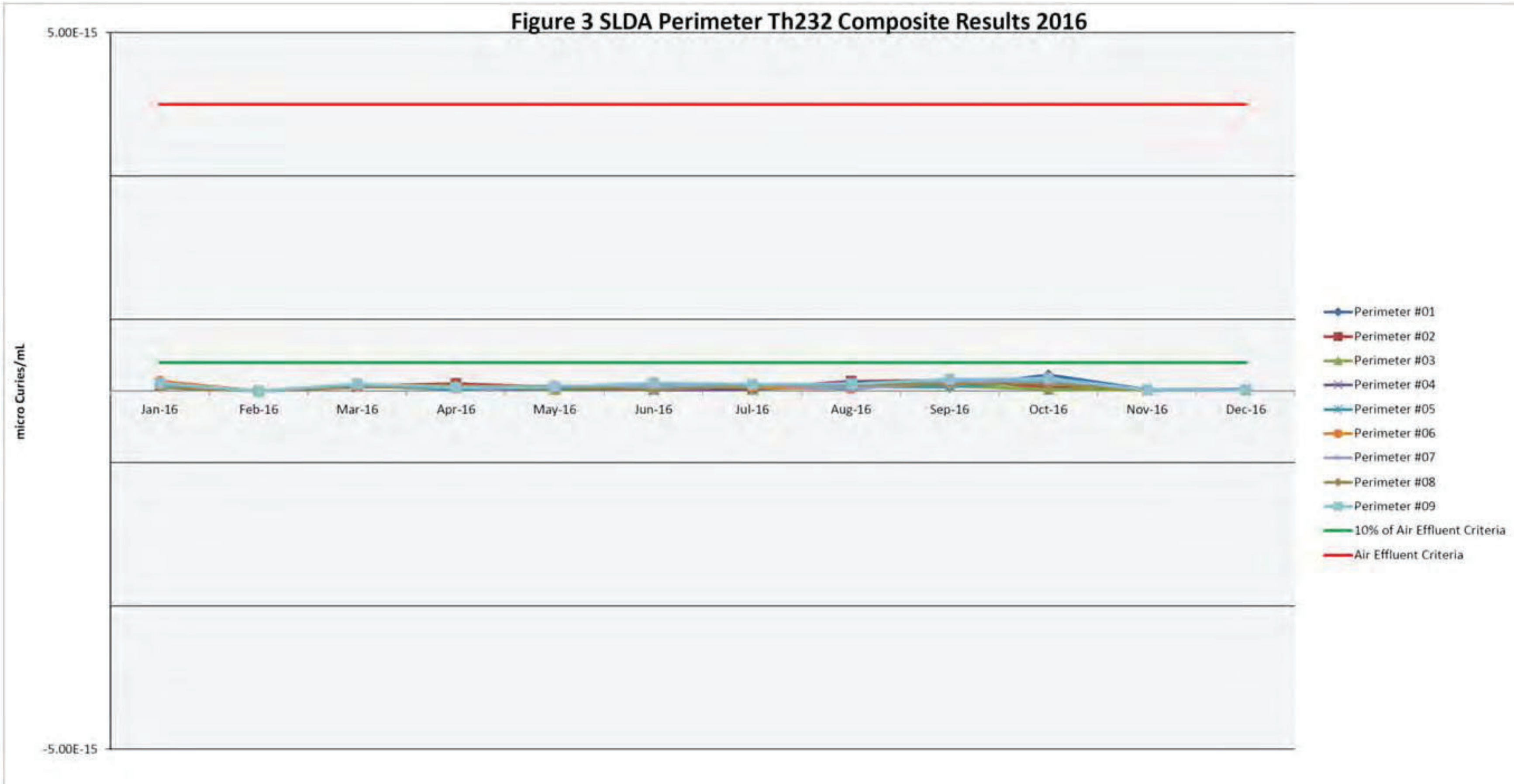
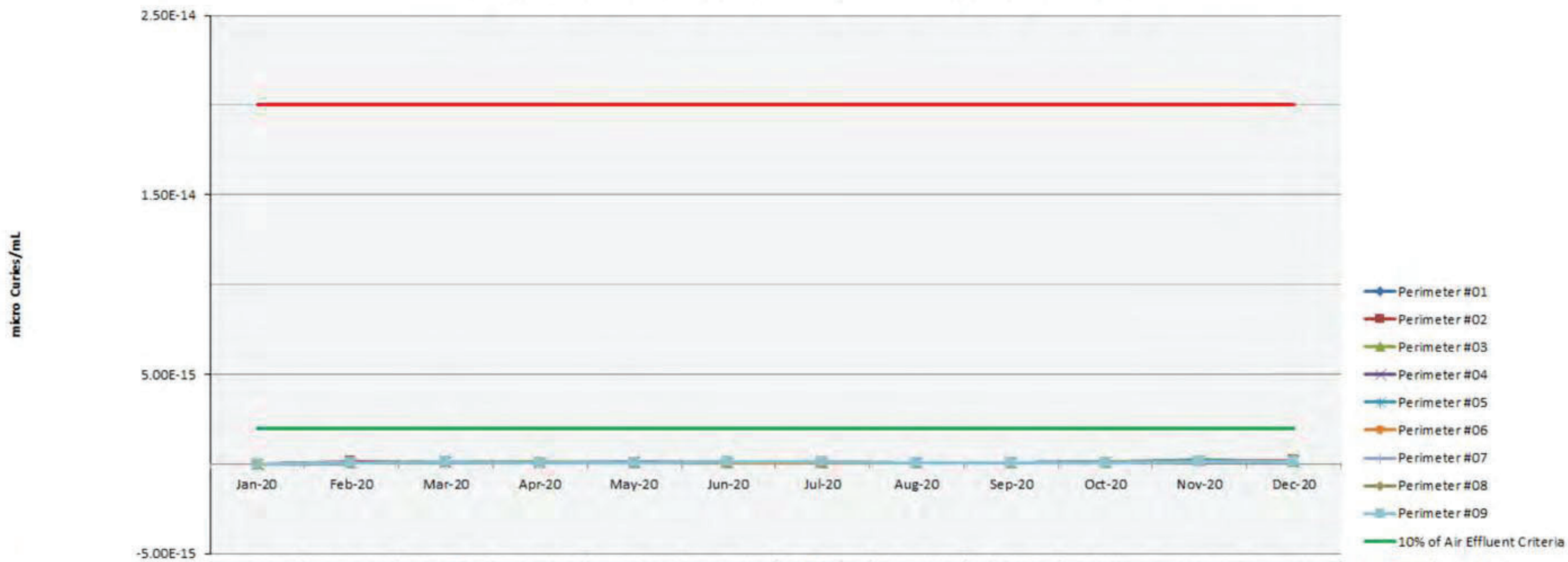


Figure 11: SLDA Perimeter Air Effluent Concentrations for Plutonium-239/240 (Calendar Year 2020)

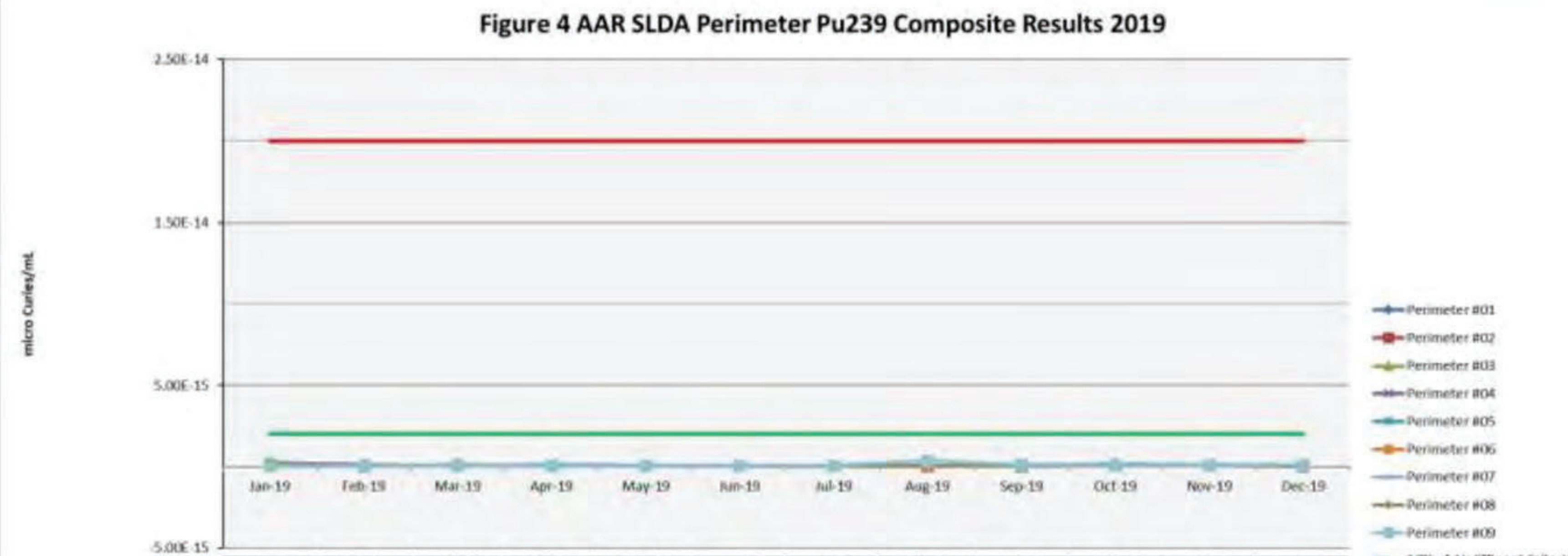
Figure B-2 AAR SLDA Perimeter Pu239 Composite Results 2020



	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
Perimeter #01	0.00E+00	6.26E-17	9.93E-17	2.57E-17	6.61E-17	9.04E-17	6.13E-17	6.17E-17	6.51E-17	1.03E-16	9.64E-17	1.30E-16
Perimeter #02	0.00E+00	9.39E-17	1.04E-16	7.65E-17	5.97E-17	3.56E-17	3.38E-17	5.82E-17	3.48E-17	6.52E-17	9.76E-17	1.72E-16
Perimeter #03	0.00E+00	7.07E-17	1.05E-16	1.51E-16	7.67E-17	5.51E-17	5.65E-17	7.29E-17	5.29E-17	8.66E-17	2.24E-16	1.39E-16
Perimeter #04	0.00E+00	7.45E-17	1.18E-16	5.69E-17	1.36E-16	8.11E-17	5.28E-17	4.16E-17	4.87E-17	9.11E-17	1.76E-16	1.71E-16
Perimeter #05	0.00E+00	6.54E-17	7.66E-17	7.40E-17	7.11E-17	5.36E-17	5.10E-17	5.04E-17	8.01E-17	9.26E-17	1.96E-16	1.43E-16
Perimeter #06	0.00E+00	5.88E-17	1.23E-16	5.87E-17	3.58E-17	5.82E-17	5.31E-17	4.82E-17	3.09E-17	7.45E-17	1.39E-16	1.83E-16
Perimeter #07	0.00E+00	5.33E-17	8.36E-17	3.65E-17	6.70E-17	1.07E-16	1.09E-16	8.26E-17	7.50E-17	7.11E-17	1.04E-16	1.42E-16
Perimeter #08	0.00E+00	8.54E-17	9.41E-17	6.81E-17	7.52E-17	1.27E-16	1.01E-16	6.66E-17	7.31E-17	1.26E-16	1.29E-16	1.26E-16
Perimeter #09	0.00E+00	7.89E-17	1.06E-16	4.52E-17	5.63E-17	1.05E-16	9.27E-17	7.00E-17	7.60E-17	7.46E-17	1.13E-16	1.08E-16
10% of Air Effluent Criteria	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15
Air Effluent Criteria	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14

NOTE: Isotopic data for January 2020 not reported due to laboratory error. A value of zero is used for calculational purposes only.

Figure 12: SLDA Perimeter Air Effluent Concentrations for Plutonium-239/240 (Calendar Year 2019)



	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
Perimeter #01	2.40E-16	4.80E-17	1.19E-17	4.13E-17	1.22E-17	3.67E-17	3.67E-17	5.60E-17	6.43E-17	1.55E-16	1.01E-16	7.14E-17
Perimeter #02	2.99E-17	2.62E-17	2.16E-17	5.96E-17	2.73E-17	2.15E-17	5.32E-17	5.19E-17	5.59E-17	8.34E-17	8.61E-17	4.97E-17
Perimeter #03	3.28E-17	3.69E-17	3.08E-17	3.44E-17	4.06E-17	3.29E-17	4.74E-17	4.71E-17	7.84E-17	7.88E-17	6.09E-17	5.22E-17
Perimeter #04	1.76E-16	9.02E-17	2.76E-17	1.12E-16	4.36E-17	3.71E-17	4.20E-17	5.44E-17	8.52E-17	6.21E-17	5.64E-17	3.35E-17
Perimeter #05	3.27E-17	3.51E-17	3.63E-17	9.84E-17	3.34E-17	7.03E-17	4.42E-17	6.74E-17	7.59E-17	4.32E-17	6.07E-17	7.28E-17
Perimeter #06	1.33E-16	2.05E-17	1.21E-16	4.09E-17	3.09E-17	4.70E-17	3.16E-17	2.71E-17	5.96E-17	8.05E-17	6.27E-17	6.71E-17
Perimeter #07	1.25E-16	3.08E-17	3.30E-17	3.62E-17	7.24E-17	2.84E-17	3.76E-17	5.46E-17	3.69E-17	5.89E-17	6.87E-17	4.48E-17
Perimeter #08	6.90E-17	5.56E-17	3.88E-17	5.20E-17	3.15E-17	5.18E-17	3.77E-17	6.86E-17	5.71E-17	7.69E-17	6.02E-17	6.92E-17
Perimeter #09	4.70E-17	1.17E-17	4.10E-17	3.93E-17	2.97E-17	5.48E-17	3.93E-17	3.56E-16	1.26E-16	9.25E-17	9.61E-17	8.52E-17
10% of Air Effluent Criteria	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15	2.00E-15
Air Effluent Criteria	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14	2.00E-14

Figure 13: SLDA Perimeter Air Effluent Concentrations for Plutonium-239/240 (Calendar Year 2018)

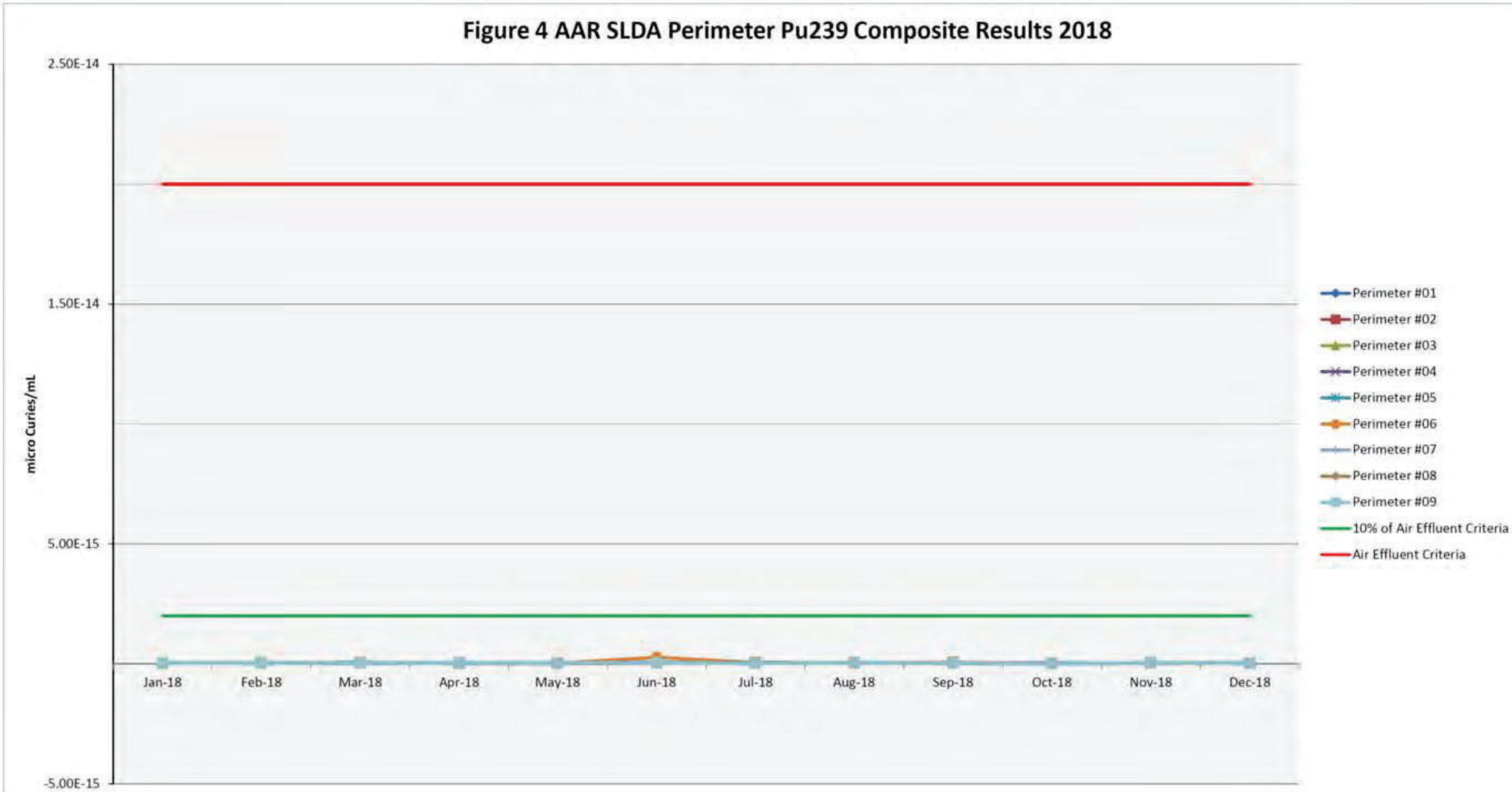


Figure 14: SLDA Perimeter Air Effluent Concentrations for Plutonium-239/240 (Calendar Year 2017)

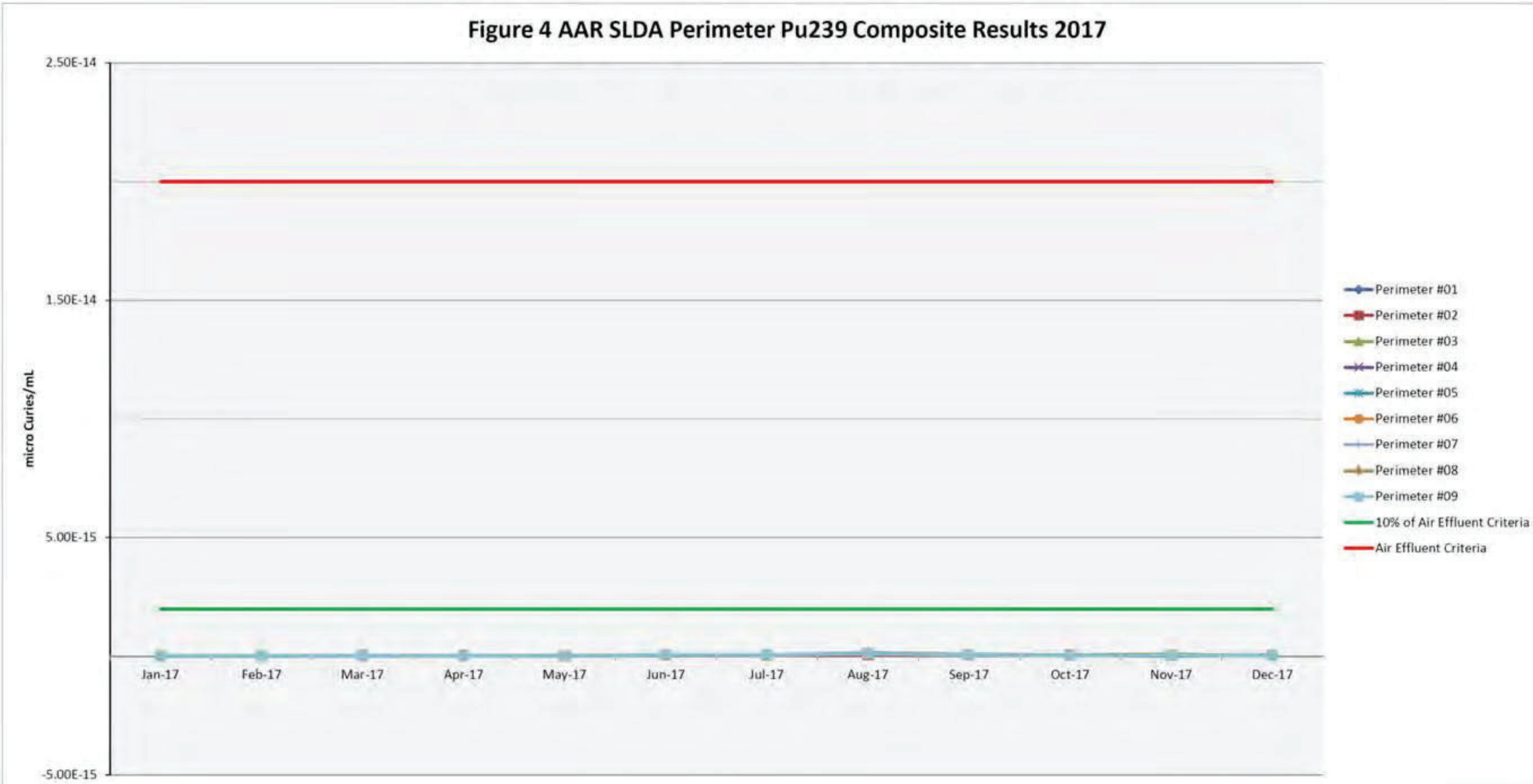


Figure 15: SLDA Perimeter Air Effluent Concentrations for Plutonium-239/240 (Calendar Year 2016)

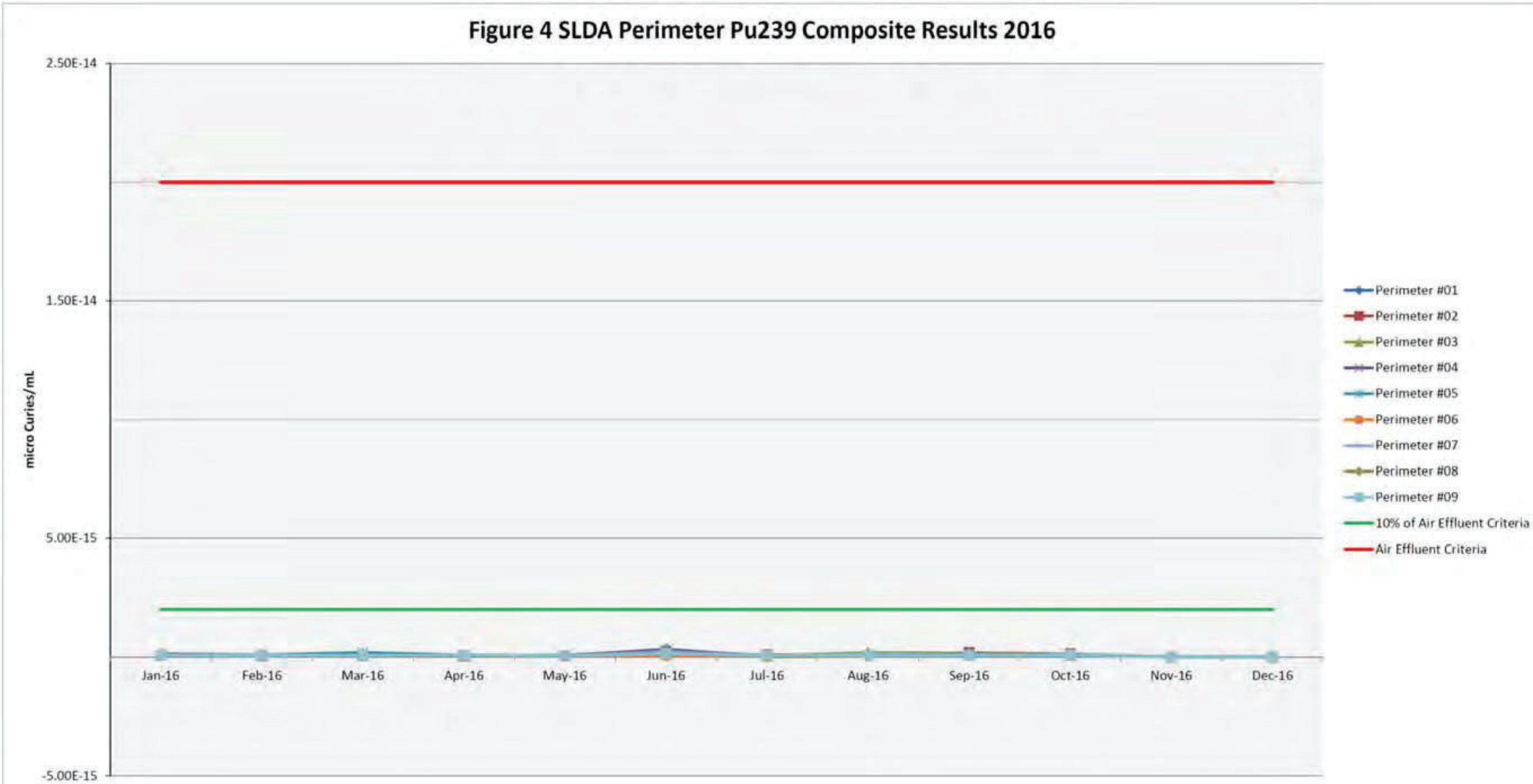
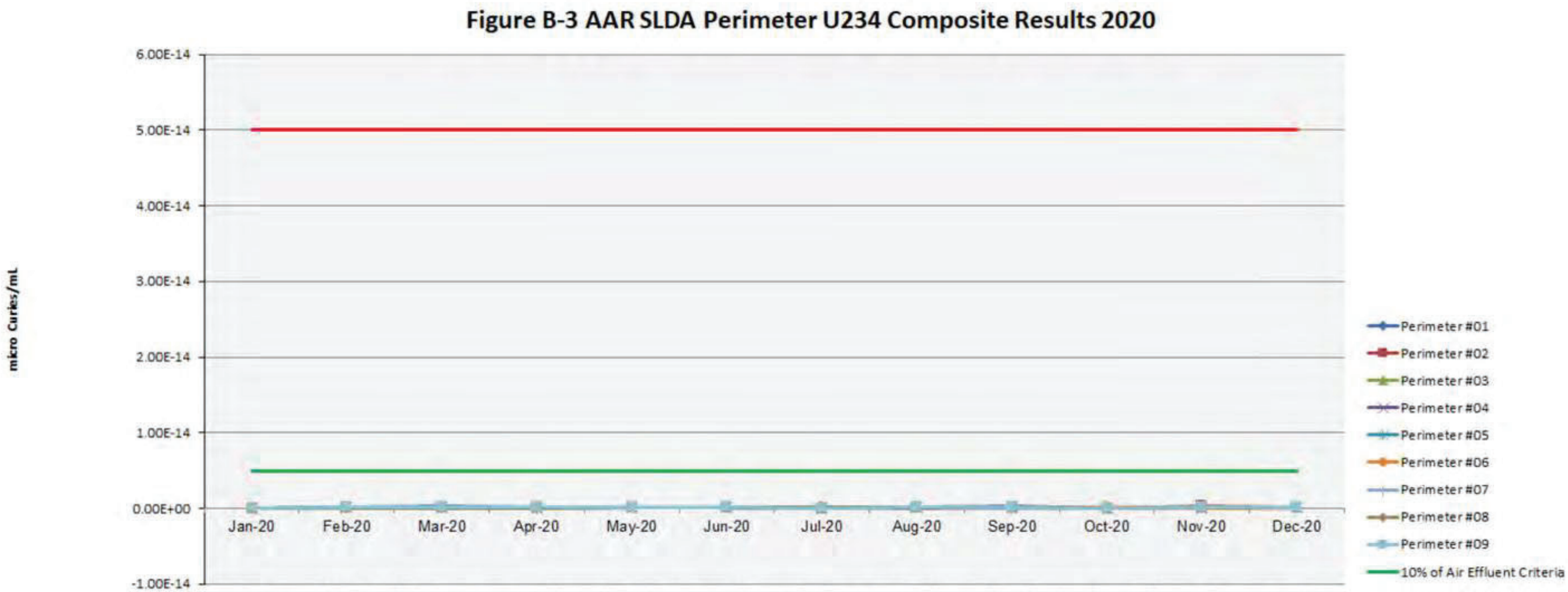


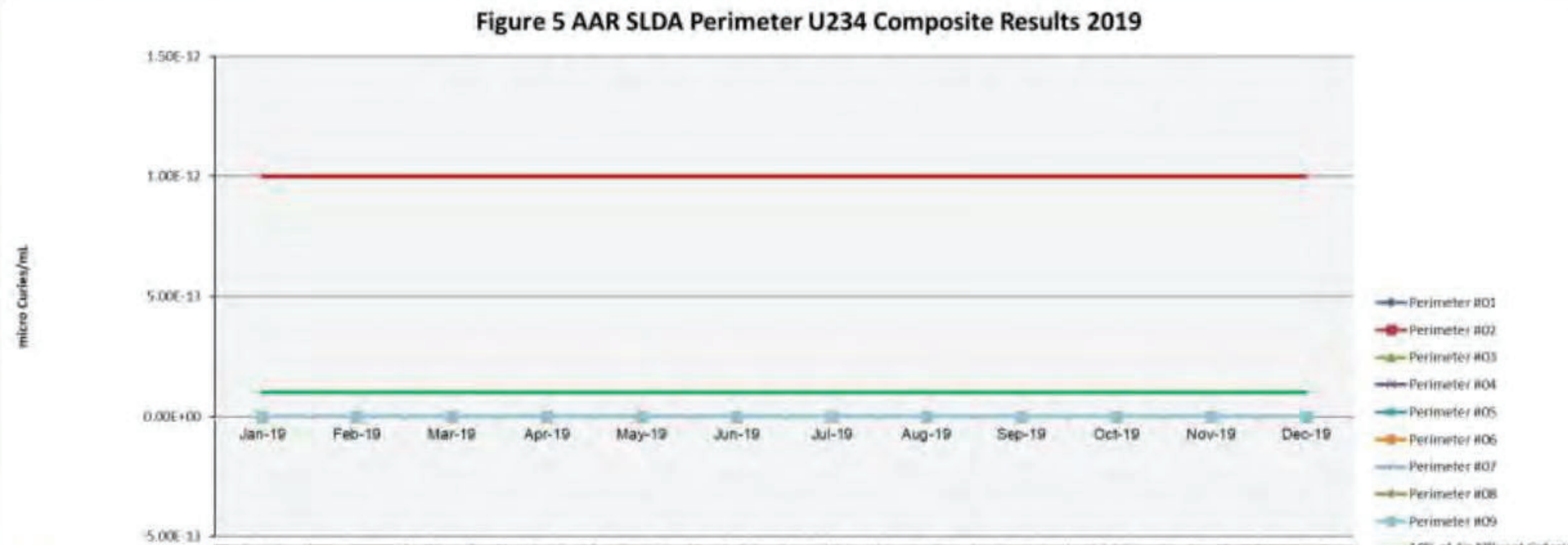
Figure 16: SLDA Perimeter Air Effluent Concentrations for Uranium-234 (Calendar Year 2020)



	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
Perimeter #01	0.00E+00	7.97E-17	2.34E-16	8.27E-17	7.14E-17	1.66E-16	5.78E-17	1.07E-16	7.82E-17	5.44E-17	1.71E-16	9.92E-17
Perimeter #02	0.00E+00	5.57E-17	1.08E-16	7.68E-17	7.76E-17	1.19E-16	6.04E-17	6.99E-17	8.98E-17	6.22E-17	2.42E-16	1.11E-16
Perimeter #03	0.00E+00	7.26E-17	1.07E-16	8.12E-17	1.07E-16	1.51E-16	7.03E-17	7.74E-17	9.58E-17	5.49E-17	1.74E-16	1.12E-16
Perimeter #04	0.00E+00	8.26E-17	9.10E-17	7.36E-17	7.47E-17	1.21E-16	5.89E-17	8.19E-17	2.33E-16	5.00E-17	6.36E-17	1.25E-16
Perimeter #05	0.00E+00	9.19E-17	1.44E-16	6.97E-17	1.11E-16	1.23E-16	7.53E-17	1.27E-16	5.56E-17	5.78E-17	9.40E-17	1.41E-16
Perimeter #06	0.00E+00	6.22E-17	8.99E-17	7.83E-17	1.12E-16	7.53E-17	7.12E-17	1.04E-16	6.47E-17	7.50E-17	7.04E-17	1.84E-16
Perimeter #07	0.00E+00	7.24E-17	1.26E-16	6.41E-17	8.08E-17	1.02E-16	5.13E-17	9.77E-17	6.46E-17	4.50E-17	1.43E-16	1.35E-16
Perimeter #08	0.00E+00	6.42E-17	5.96E-17	6.99E-17	9.08E-17	1.05E-16	9.67E-17	8.79E-17	1.01E-16	5.10E-17	1.77E-16	1.10E-16
Perimeter #09	0.00E+00	1.06E-16	1.51E-16	7.32E-17	1.06E-16	1.95E-16	5.30E-17	8.67E-17	9.48E-17	4.94E-17	1.72E-16	1.87E-16
10% of Air Effluent Criteria	5.00E-15	5.00E-15	5.00E-15	5.00E-15	5.00E-15	5.00E-15	5.00E-15	5.00E-15	5.00E-15	5.00E-15	5.00E-15	5.00E-15
Air Effluent Criteria	5.00E-14	5.00E-14	5.00E-14	5.00E-14	5.00E-14	5.00E-14	5.00E-14	5.00E-14	5.00E-14	5.00E-14	5.00E-14	5.00E-14

NOTE: Isotopic data for January 2020 not reported due to laboratory error. A value of zero is used for calculational purposes only.

Figure 17: SLDA Perimeter Air Effluent Concentrations for Uranium-234 (Calendar Year 2019)



	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
Perimeter #01	6.76E-17	3.91E-17	3.96E-17	7.62E-17	7.46E-17	8.44E-17	6.86E-17	1.67E-16	7.22E-17	1.13E-16	5.20E-17	9.70E-17
Perimeter #02	3.25E-17	5.60E-17	4.17E-17	7.40E-17	9.88E-17	5.96E-17	5.84E-17	1.22E-16	7.98E-17	7.67E-17	4.53E-17	1.00E-16
Perimeter #03	3.28E-17	6.90E-17	3.75E-17	9.08E-17	1.41E-16	9.76E-17	3.66E-17	6.50E-17	8.61E-17	8.96E-17	9.16E-17	1.83E-16
Perimeter #04	2.96E-17	7.66E-17	4.38E-17	5.56E-17	6.88E-17	7.39E-17	2.91E-17	1.55E-16	6.75E-17	8.68E-17	9.44E-17	8.32E-17
Perimeter #05	6.03E-17	8.14E-17	7.16E-17	1.03E-16	6.59E-17	7.65E-17	3.46E-17	7.05E-17	7.74E-17	8.27E-17	9.73E-17	1.23E-16
Perimeter #06	3.29E-17	5.98E-17	5.28E-17	1.14E-16	5.40E-17	8.35E-17	6.37E-17	6.90E-17	7.16E-17	6.24E-17	8.77E-17	5.82E-17
Perimeter #07	4.90E-17	7.47E-17	9.63E-17	1.53E-16	8.01E-17	1.03E-16	6.82E-17	1.06E-16	5.38E-17	4.65E-17	7.59E-17	7.04E-17
Perimeter #08	3.37E-17	5.07E-17	4.54E-17	7.10E-17	5.16E-17	7.14E-17	8.24E-17	6.70E-17	5.40E-17	7.86E-17	4.66E-17	9.12E-17
Perimeter #09	3.42E-17	5.25E-17	3.76E-17	6.35E-17	1.41E-16	5.80E-17	4.54E-17	1.17E-16	5.69E-17	7.22E-17	5.98E-17	6.54E-17
10% of Air Effluent Criteria	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13
Air Effluent Criteria	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12

Figure 18: SLDA Perimeter Air Effluent Concentrations for Uranium-234 (Calendar Year 2018)

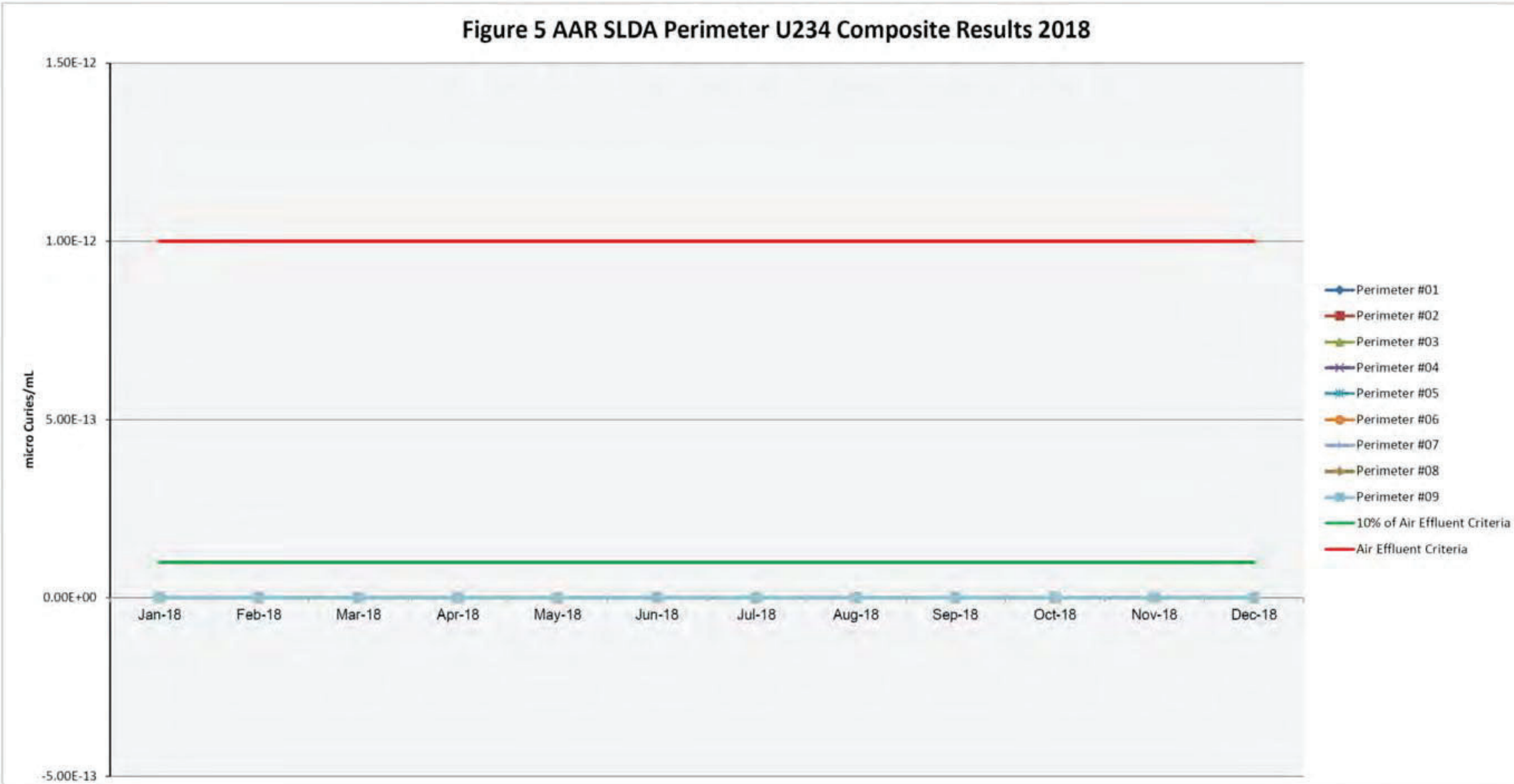


Figure 19: SLDA Perimeter Air Effluent Concentrations for Uranium-234 (Calendar Year 2017)

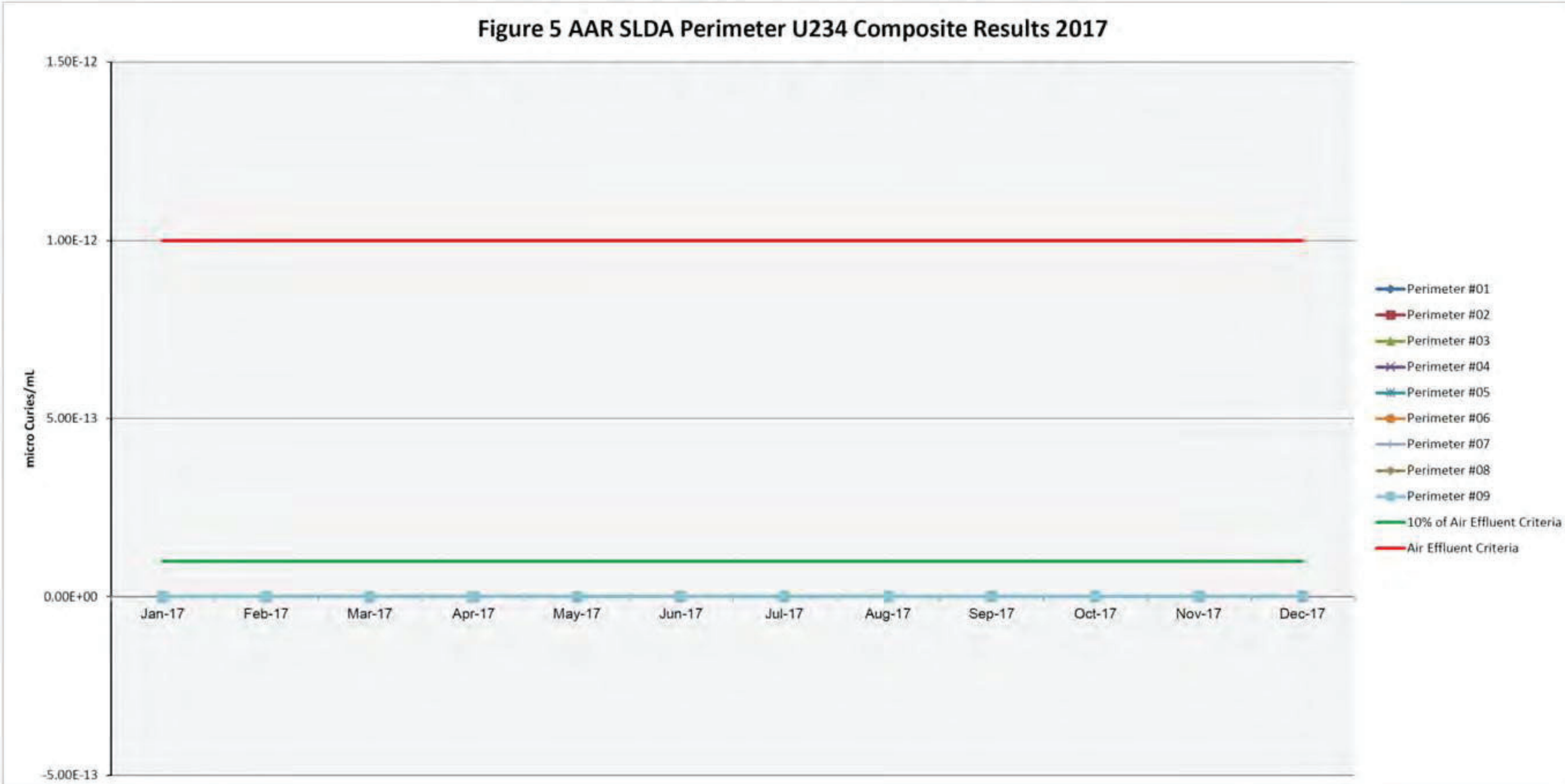


Figure 20: SLDA Perimeter Air Effluent Concentrations for Uranium-234 (Calendar Year 2016)

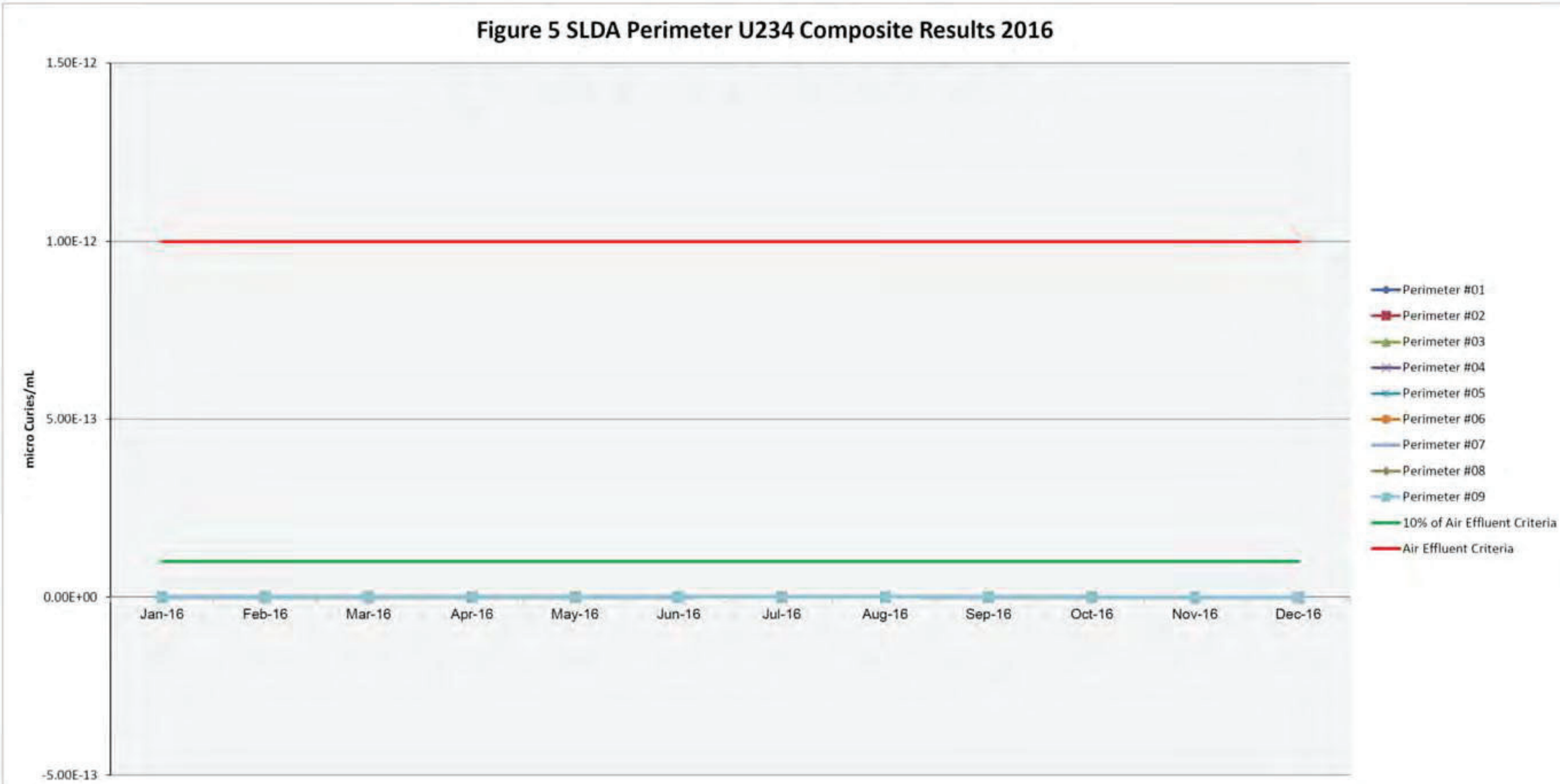
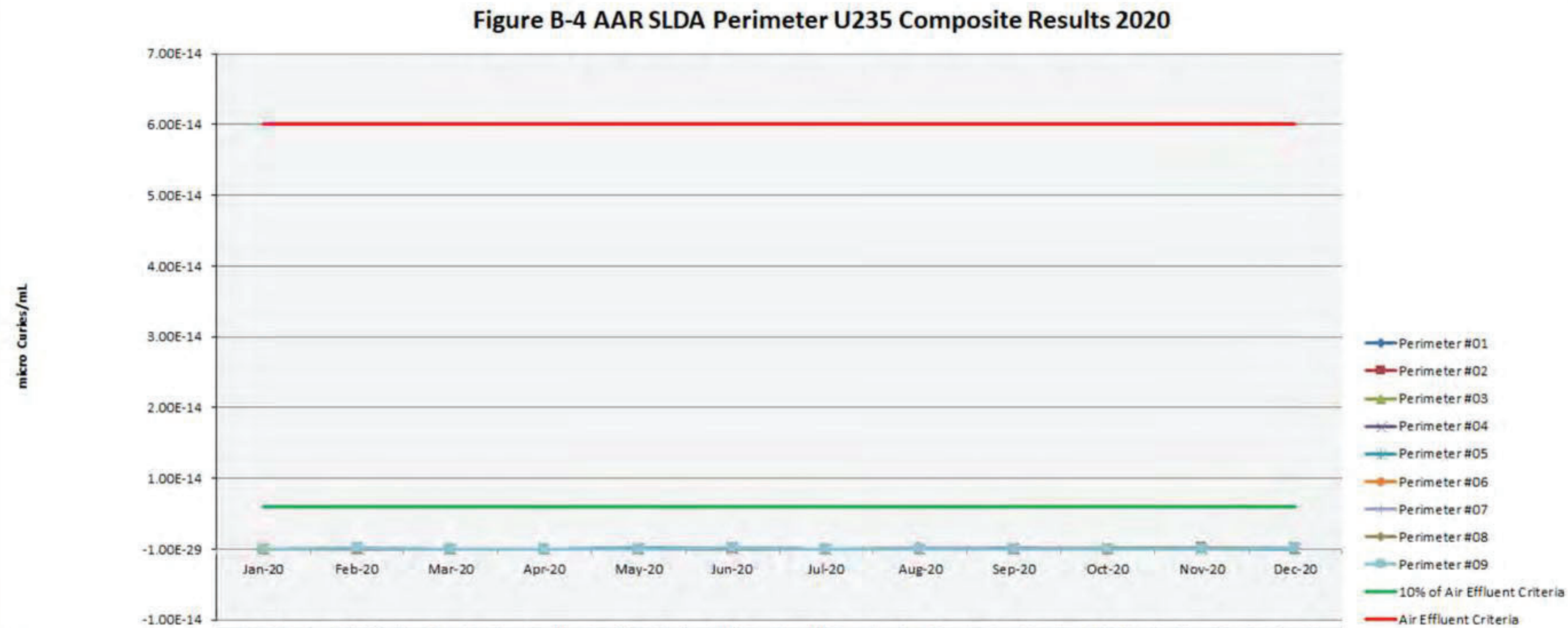


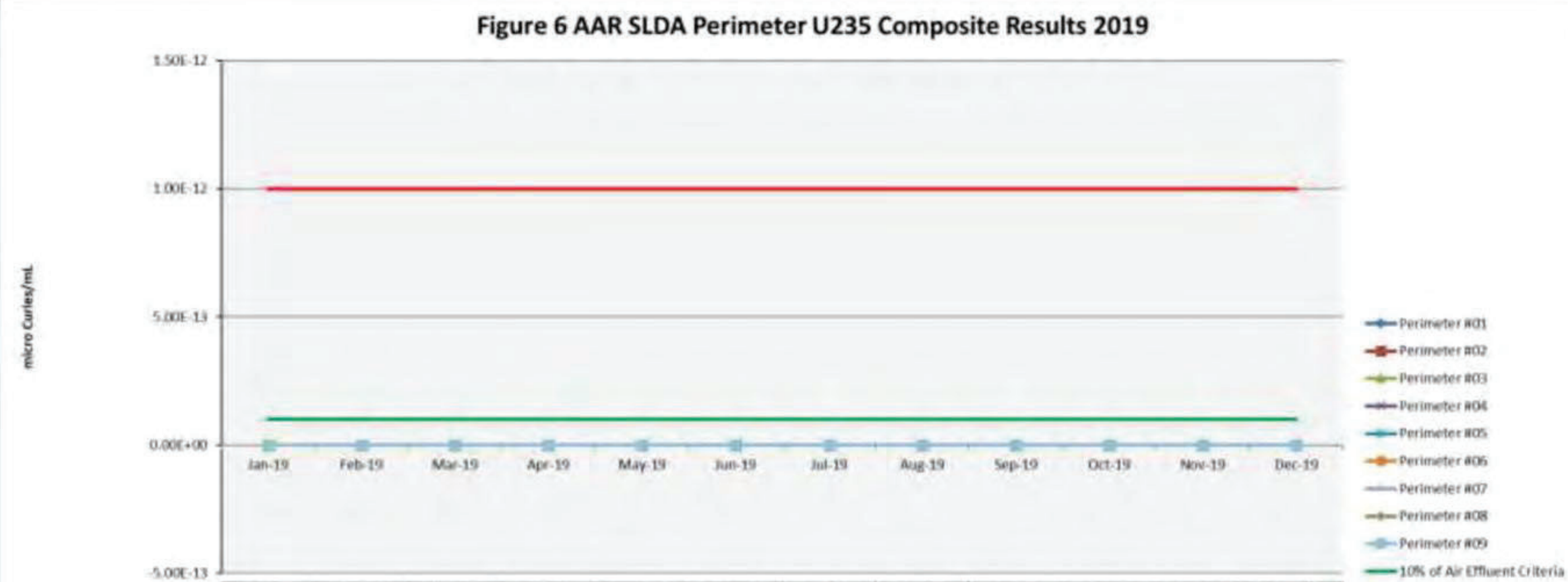
Figure 21: SLDA Perimeter Air Effluent Concentrations for Uranium-235 (Calendar Year 2020)



	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
Perimeter #01	0.00E+00	4.15E-17	3.99E-17	4.49E-17	6.61E-17	8.13E-17	3.08E-17	3.98E-17	4.73E-17	3.11E-17	8.05E-17	7.56E-17
Perimeter #02	0.00E+00	3.17E-17	1.87E-17	3.36E-17	3.25E-17	4.98E-17	2.86E-17	3.74E-17	5.26E-17	2.31E-17	1.38E-16	6.01E-17
Perimeter #03	0.00E+00	4.69E-17	5.03E-17	3.88E-17	4.92E-17	7.19E-17	3.36E-17	1.21E-17	3.08E-17	2.41E-17	1.07E-16	3.64E-17
Perimeter #04	0.00E+00	4.00E-17	2.24E-17	4.21E-17	4.43E-17	5.47E-17	2.58E-17	3.71E-17	8.96E-17	8.81E-18	1.91E-17	7.78E-17
Perimeter #05	0.00E+00	5.69E-17	1.96E-17	4.62E-17	6.62E-17	9.61E-17	1.26E-17	4.71E-17	1.47E-17	9.57E-18	3.89E-17	4.43E-17
Perimeter #06	0.00E+00	4.97E-17	1.88E-17	3.18E-17	4.66E-17	4.14E-17	2.37E-17	5.92E-17	3.58E-17	2.51E-17	6.34E-17	1.25E-16
Perimeter #07	0.00E+00	2.98E-17	1.97E-17	4.06E-17	5.22E-17	6.62E-17	9.68E-18	6.06E-17	2.74E-17	3.05E-17	6.87E-17	1.22E-16
Perimeter #08	0.00E+00	2.74E-17	3.47E-17	3.27E-17	4.07E-17	4.71E-17	3.17E-17	5.05E-17	2.14E-17	5.91E-17	1.12E-16	6.56E-17
Perimeter #09	0.00E+00	7.75E-17	2.62E-17	1.64E-17	5.61E-17	1.24E-16	3.01E-17	2.79E-17	3.18E-17	3.70E-17	5.21E-17	9.21E-17
10% of Air Effluent Criteria	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15
Air Effluent Criteria	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14

NOTE: Isotopic data for January 2020 not reported due to laboratory error. A value of zero is used for calculational purposes only.

Figure 22: SLDA Perimeter Air Effluent Concentrations for Uranium-235 (Calendar Year 2019)



	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
Perimeter #01	3.84E-17	8.13E-17	3.14E-17	4.33E-17	8.68E-18	7.67E-17	2.02E-17	1.66E-16	2.79E-17	8.29E-17	1.36E-17	3.69E-17
Perimeter #02	2.31E-17	3.97E-17	1.41E-17	1.65E-17	1.63E-17	1.84E-17	1.99E-17	9.16E-17	5.98E-17	3.36E-17	1.01E-17	5.07E-17
Perimeter #03	3.28E-17	2.33E-17	1.60E-17	4.45E-17	1.13E-17	6.72E-17	1.06E-17	5.34E-17	6.88E-17	4.16E-17	1.69E-17	1.10E-16
Perimeter #04	4.18E-17	8.88E-17	4.03E-17	5.93E-17	1.48E-17	3.71E-17	7.62E-18	7.76E-17	4.17E-17	3.80E-17	1.30E-17	1.54E-17
Perimeter #05	8.74E-18	2.84E-17	1.50E-17	1.94E-17	1.76E-17	5.87E-17	7.75E-18	4.26E-17	4.42E-17	4.34E-17	3.14E-17	6.61E-17
Perimeter #06	7.87E-18	2.55E-17	4.38E-17	8.19E-17	1.31E-17	6.61E-17	5.18E-17	4.49E-17	1.41E-17	1.23E-17	3.57E-17	1.02E-17
Perimeter #07	1.03E-17	2.61E-17	1.21E-17	6.81E-17	1.57E-17	6.38E-17	9.73E-18	3.08E-17	1.29E-17	5.40E-17	1.45E-17	1.47E-17
Perimeter #08	2.40E-17	4.54E-17	3.52E-17	1.86E-17	1.08E-17	1.60E-17	3.81E-17	5.31E-17	2.36E-17	4.86E-17	9.75E-18	5.66E-17
Perimeter #09	3.06E-17	7.68E-17	4.87E-17	4.51E-17	1.26E-17	5.92E-17	3.73E-17	1.93E-17	4.05E-17	5.84E-17	1.10E-17	2.69E-17
10% of Air Effluent Criteria	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13
Air Effluent Criteria	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12

Figure 23: SLDA Perimeter Air Effluent Concentrations for Uranium-235 (Calendar Year 2018)

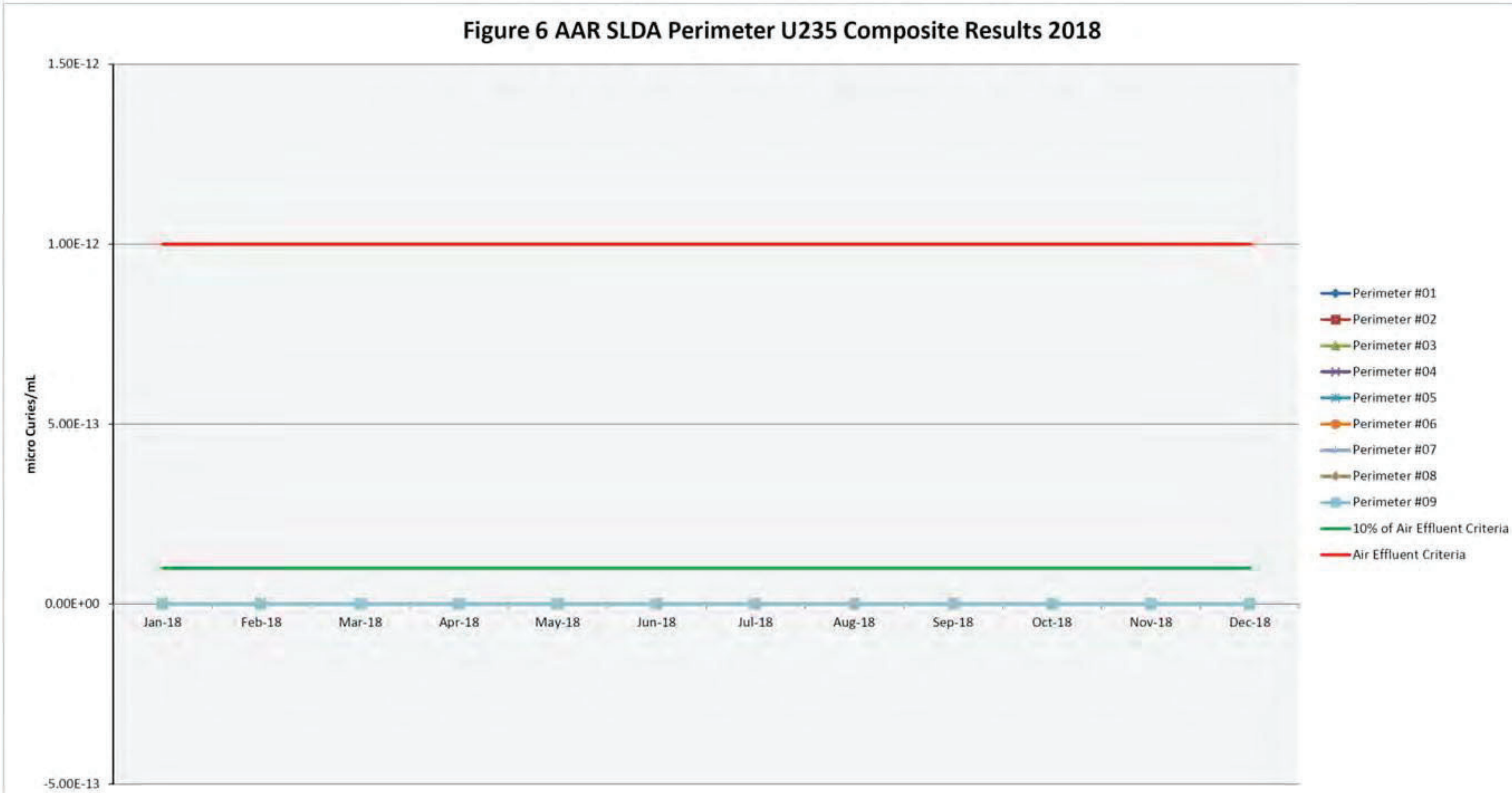


Figure 24: SLDA Perimeter Air Effluent Concentrations for Uranium-235 (Calendar Year 2017)

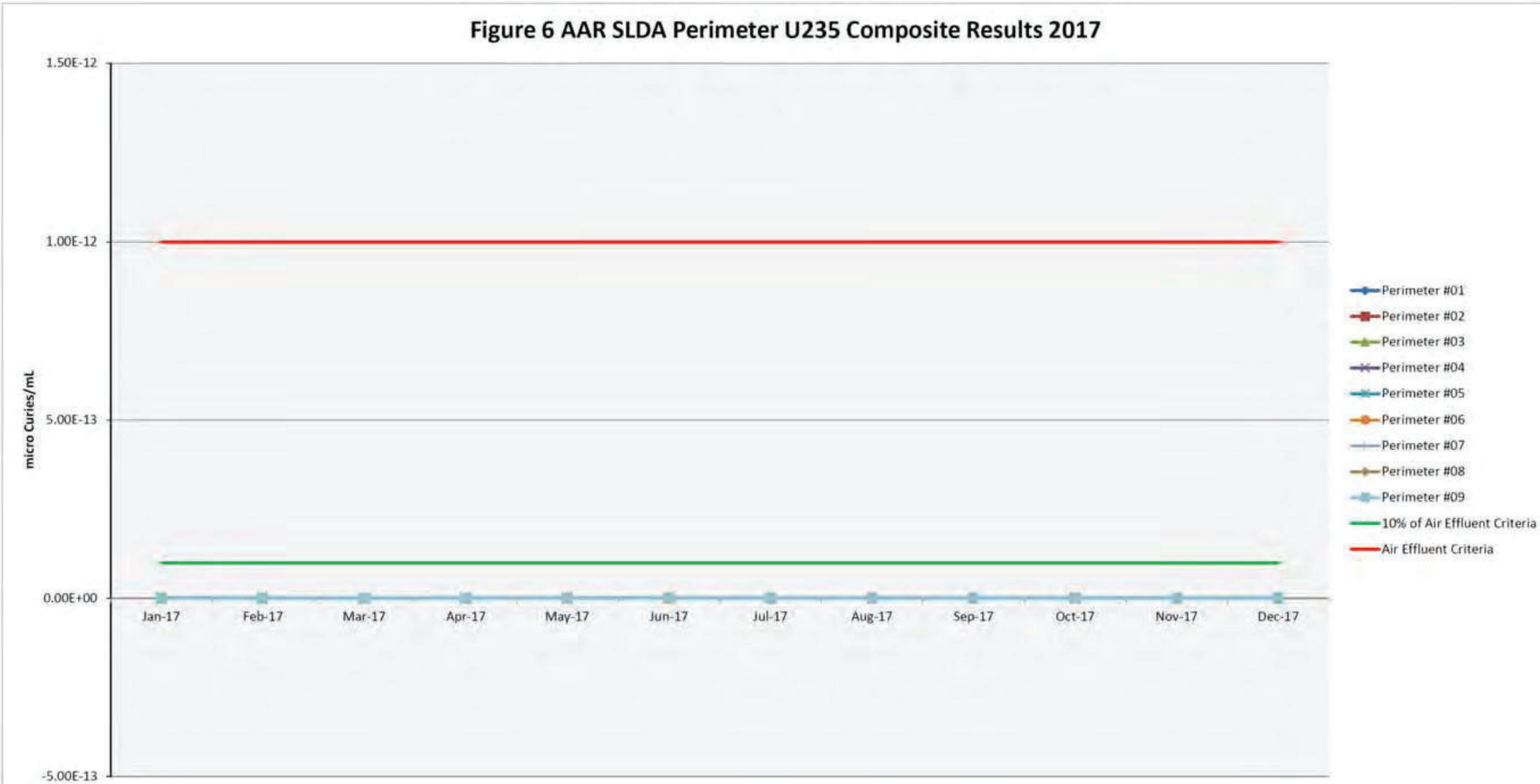


Figure 25: SLDA Perimeter Air Effluent Concentrations for Uranium-235 (Calendar Year 2016)

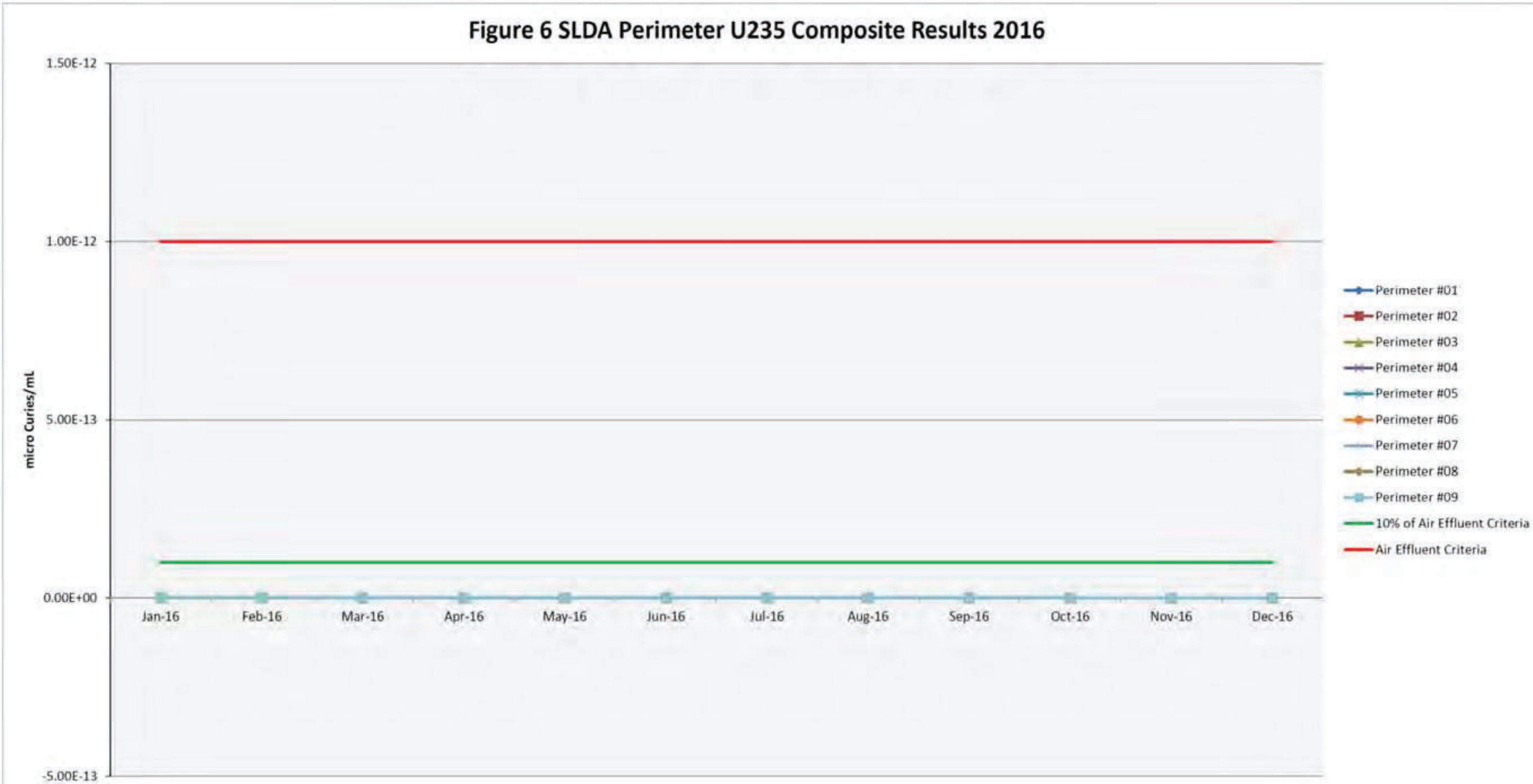
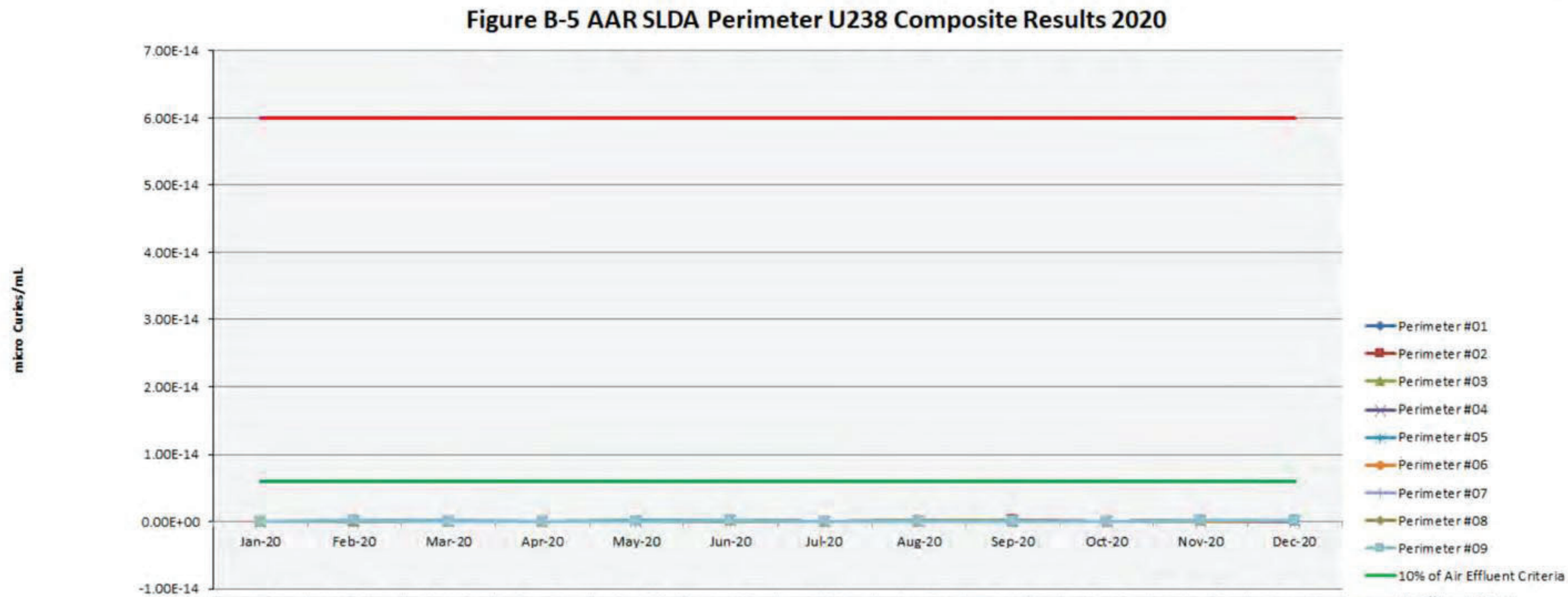


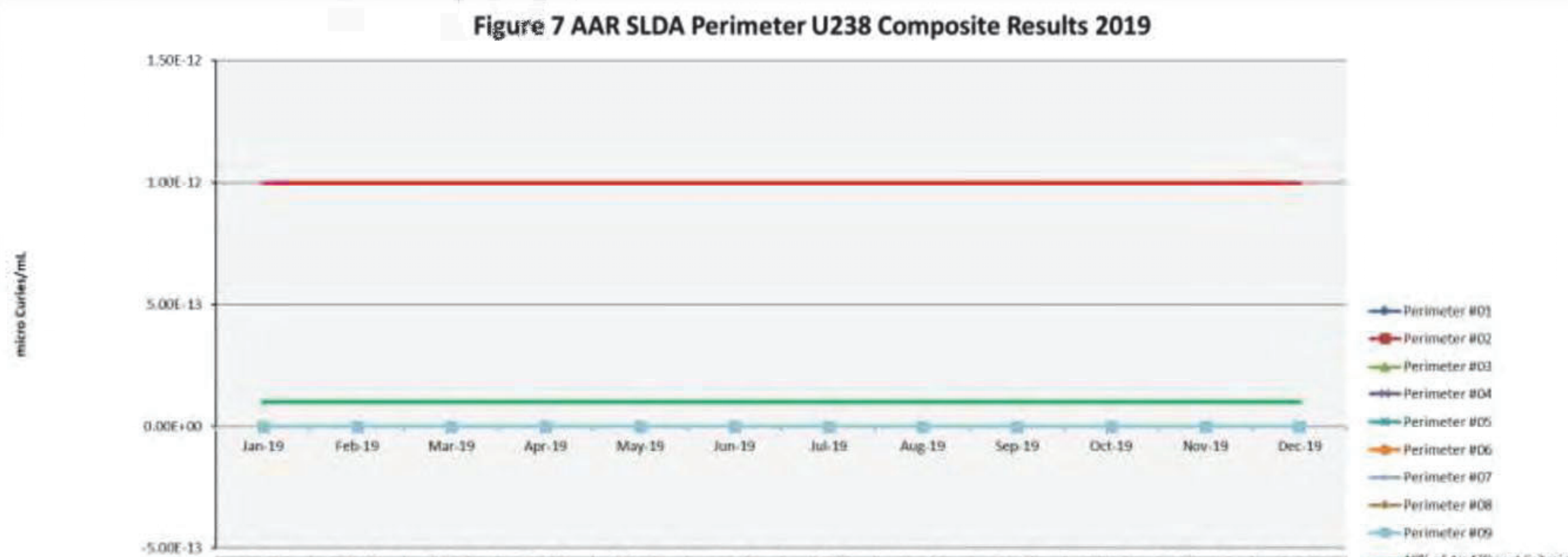
Figure 26: SLDA Perimeter Air Effluent Concentrations for Uranium-238 (Calendar Year 2020)



	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
Perimeter #01	0.00E+00	6.02E-17	8.03E-17	7.86E-17	8.16E-17	1.41E-16	4.33E-17	9.52E-17	6.83E-17	4.33E-17	1.95E-16	1.64E-16
Perimeter #02	0.00E+00	5.92E-17	7.16E-17	9.45E-17	8.94E-17	1.34E-16	5.03E-17	6.05E-17	1.07E-16	4.59E-17	2.65E-16	1.42E-16
Perimeter #03	0.00E+00	7.25E-17	9.80E-17	9.19E-17	1.14E-16	1.67E-16	6.16E-17	7.73E-17	9.28E-17	4.23E-17	1.88E-16	1.18E-16
Perimeter #04	0.00E+00	8.24E-17	9.67E-17	6.80E-17	8.01E-17	1.29E-16	5.43E-17	8.17E-17	1.38E-16	4.20E-17	6.01E-17	9.02E-17
Perimeter #05	0.00E+00	1.15E-16	1.32E-16	5.86E-17	1.22E-16	1.35E-16	6.95E-17	1.20E-16	1.02E-16	5.00E-17	1.13E-16	1.77E-16
Perimeter #06	0.00E+00	8.92E-17	9.48E-17	9.11E-17	8.41E-17	8.41E-17	6.17E-17	1.09E-16	4.98E-17	6.43E-17	9.10E-17	1.88E-16
Perimeter #07	0.00E+00	8.55E-17	1.10E-16	7.90E-17	7.27E-17	9.21E-17	6.73E-17	1.02E-16	5.34E-17	6.36E-17	1.20E-16	1.30E-16
Perimeter #08	0.00E+00	7.54E-17	7.44E-17	6.67E-17	7.82E-17	9.05E-17	7.05E-17	1.07E-16	1.07E-16	8.31E-17	1.98E-16	1.43E-16
Perimeter #09	0.00E+00	1.05E-16	9.99E-17	6.39E-17	8.11E-17	1.43E-16	5.29E-17	8.85E-17	7.78E-17	5.57E-17	1.43E-16	1.42E-16
10% of Air Effluent Criteria	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15	6.00E-15
Air Effluent Criteria	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14	6.00E-14

NOTE: Isotopic data for January 2020 not reported due to laboratory error. A value of zero is used for calculational purposes only.

Figure 27: SLDA Perimeter Air Effluent Concentrations for Uranium-238 (Calendar Year 2019)



	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
Perimeter #01	3.38E-17	7.00E-17	3.95E-17	8.03E-17	4.14E-17	7.43E-17	5.67E-17	2.15E-16	6.46E-17	1.30E-16	7.34E-17	8.41E-17
Perimeter #02	4.06E-17	8.75E-17	6.32E-17	4.86E-17	6.75E-17	5.19E-17	4.66E-17	1.87E-16	1.05E-16	8.14E-17	3.45E-17	1.02E-16
Perimeter #03	3.27E-17	7.99E-17	5.59E-17	8.03E-17	5.76E-17	9.74E-17	5.17E-17	8.41E-17	7.83E-17	7.61E-17	7.03E-17	2.68E-16
Perimeter #04	4.12E-17	6.60E-17	1.28E-17	1.04E-16	7.51E-17	6.51E-17	4.14E-17	1.44E-16	8.25E-17	9.30E-17	7.48E-17	7.34E-17
Perimeter #05	4.18E-17	1.08E-16	5.24E-17	6.64E-17	4.70E-17	9.21E-17	5.17E-17	7.49E-17	8.50E-17	9.21E-17	9.71E-17	1.16E-16
Perimeter #06	3.01E-17	7.53E-17	5.38E-17	1.18E-16	6.27E-17	7.85E-17	7.10E-17	6.89E-17	5.81E-17	6.78E-17	9.59E-17	4.20E-17
Perimeter #07	3.03E-17	7.70E-17	6.92E-17	1.39E-16	4.64E-17	9.84E-17	7.11E-17	8.20E-17	7.99E-17	5.66E-17	5.97E-17	7.49E-17
Perimeter #08	2.61E-17	7.02E-17	4.94E-17	1.00E-16	4.12E-17	8.08E-17	6.67E-17	1.08E-16	5.35E-17	7.50E-17	4.03E-17	6.79E-17
Perimeter #09	3.72E-17	1.07E-16	5.58E-17	7.92E-17	6.02E-17	6.87E-17	5.18E-17	9.64E-17	5.10E-17	8.47E-17	4.59E-17	6.33E-17
10% of Air Effluent Criteria	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13	1.00E-13
Air Effluent Criteria	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12	1.00E-12

Figure 28: SLDA Perimeter Air Effluent Concentrations for Uranium-238 (Calendar Year 2018)

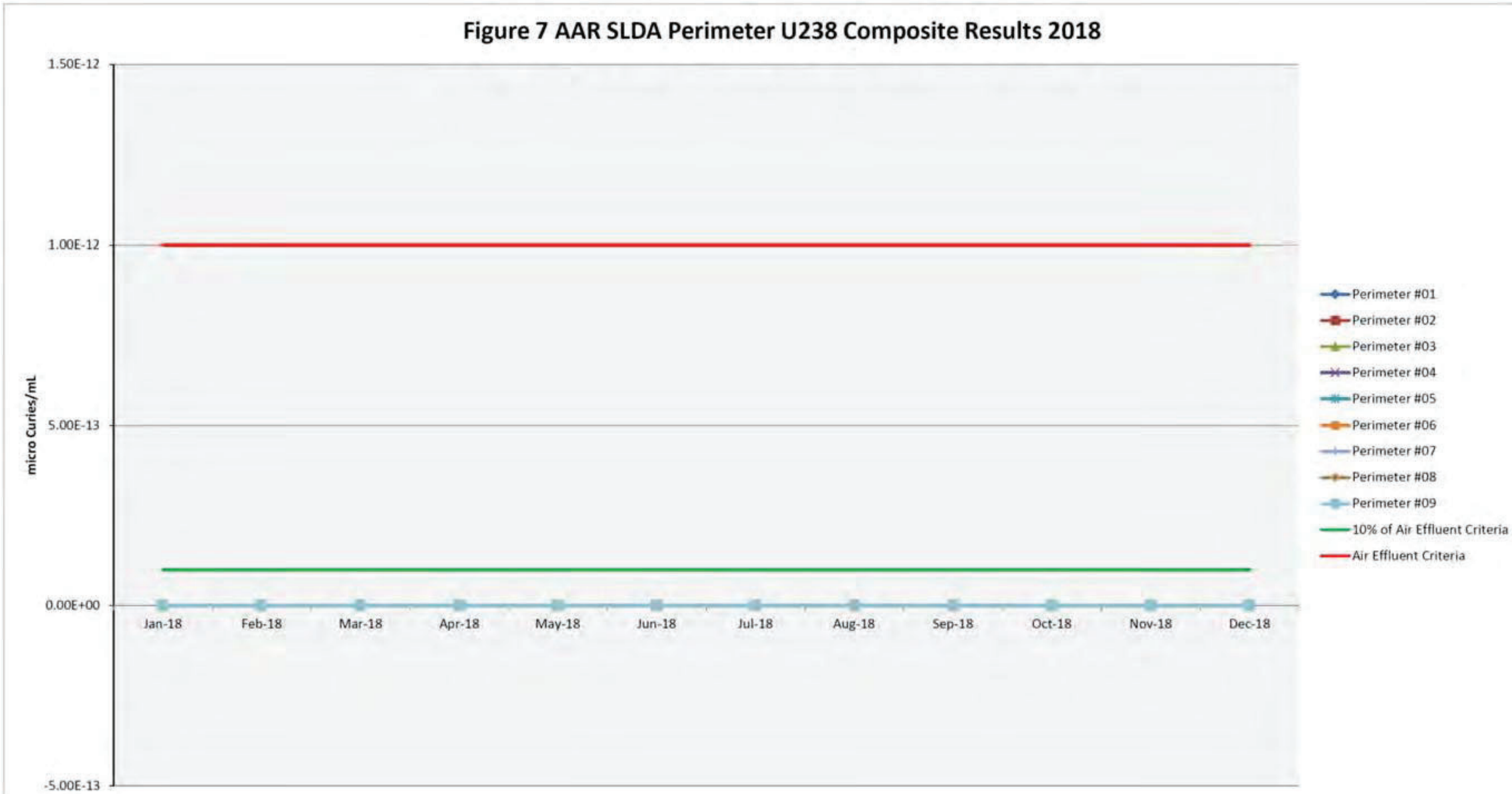


Figure 29: SLDA Perimeter Air Effluent Concentrations for Uranium-238 (Calendar Year 2017)

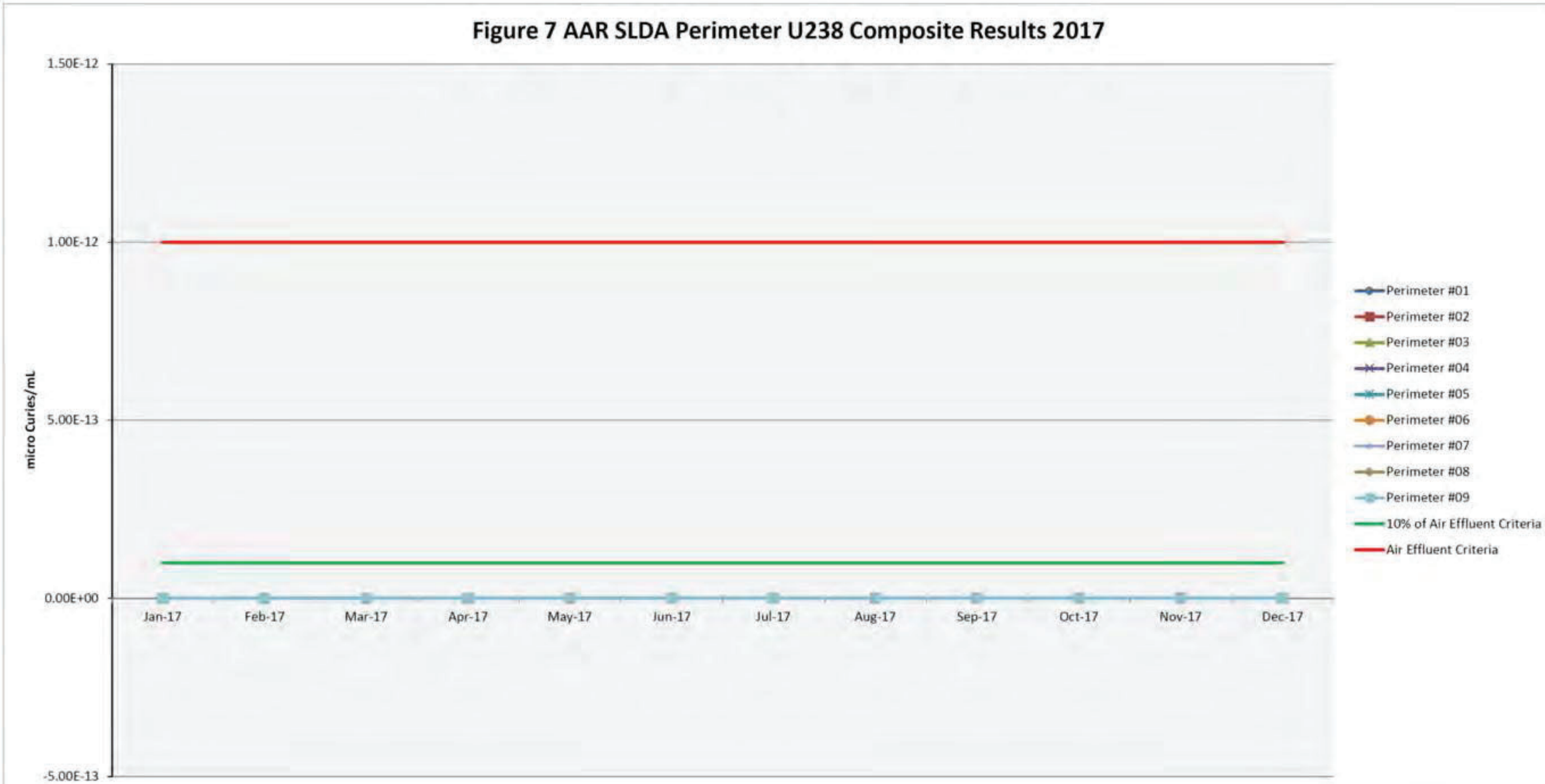


Figure 30: SLDA Perimeter Air Effluent Concentrations for Uranium-238 (Calendar Year 2016)

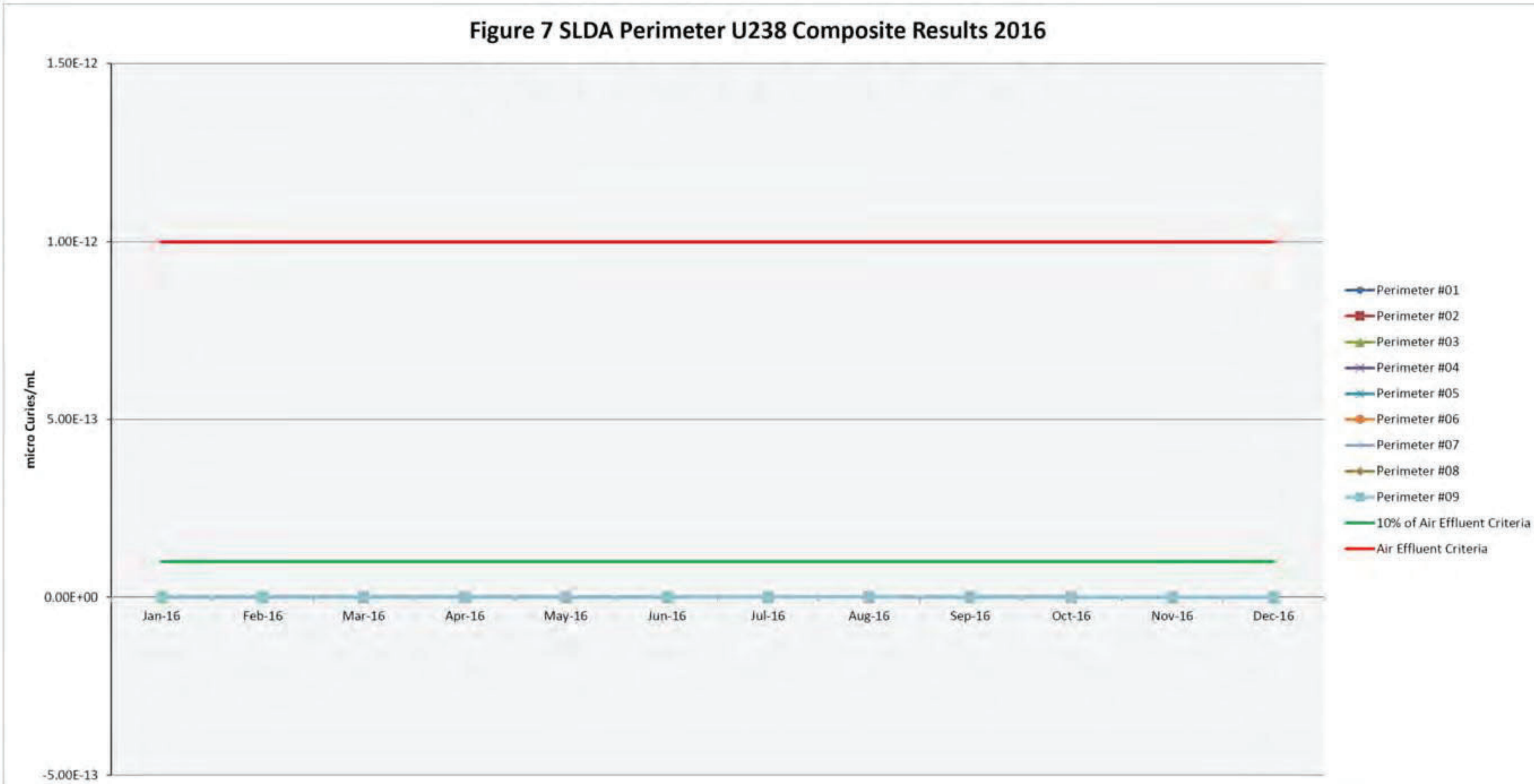


Figure 31: SLDA Ambient Dosimeter Results (Calendar Year 2020)

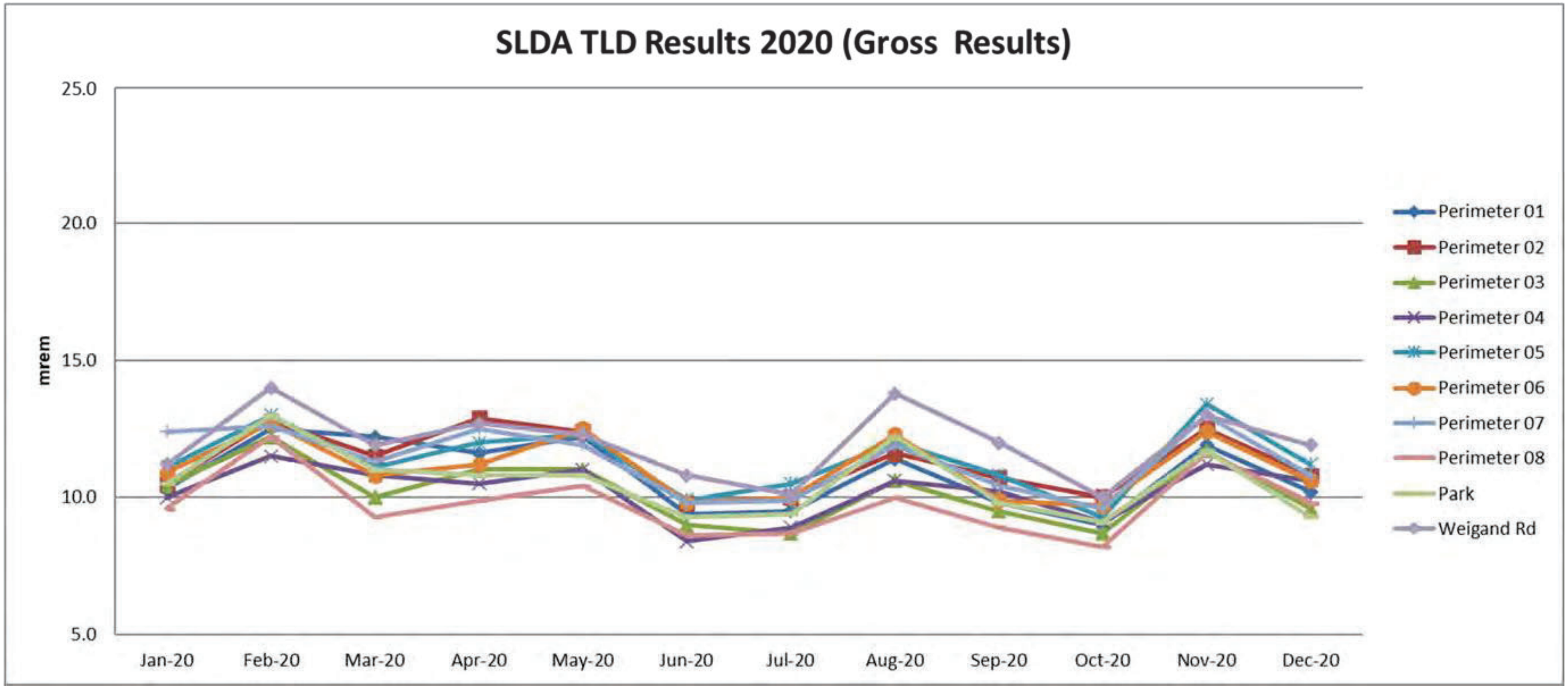


Figure 32: SLDA Ambient Dosimeter Results (Calendar Year 2019)

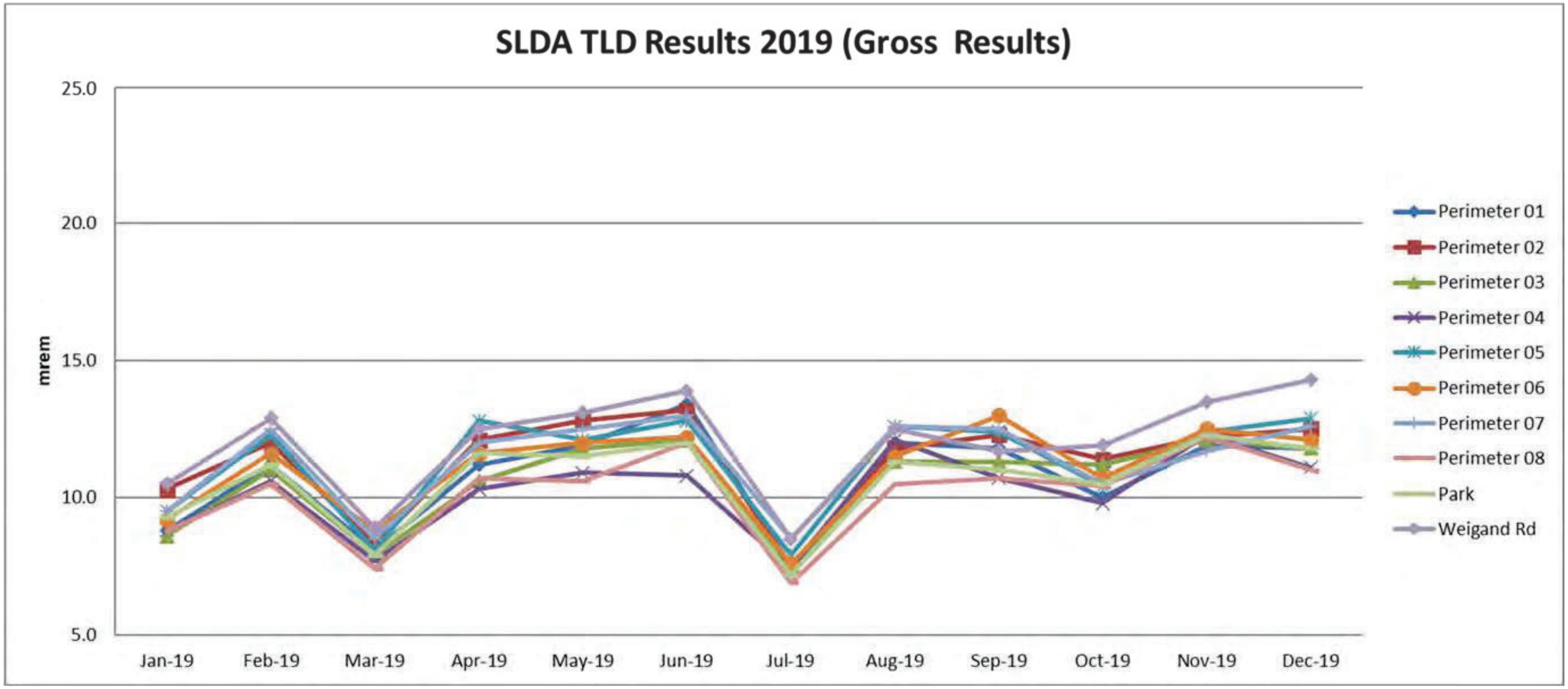


Figure 33: SLDA Ambient Dosimeter Results (Calendar Year 2018)

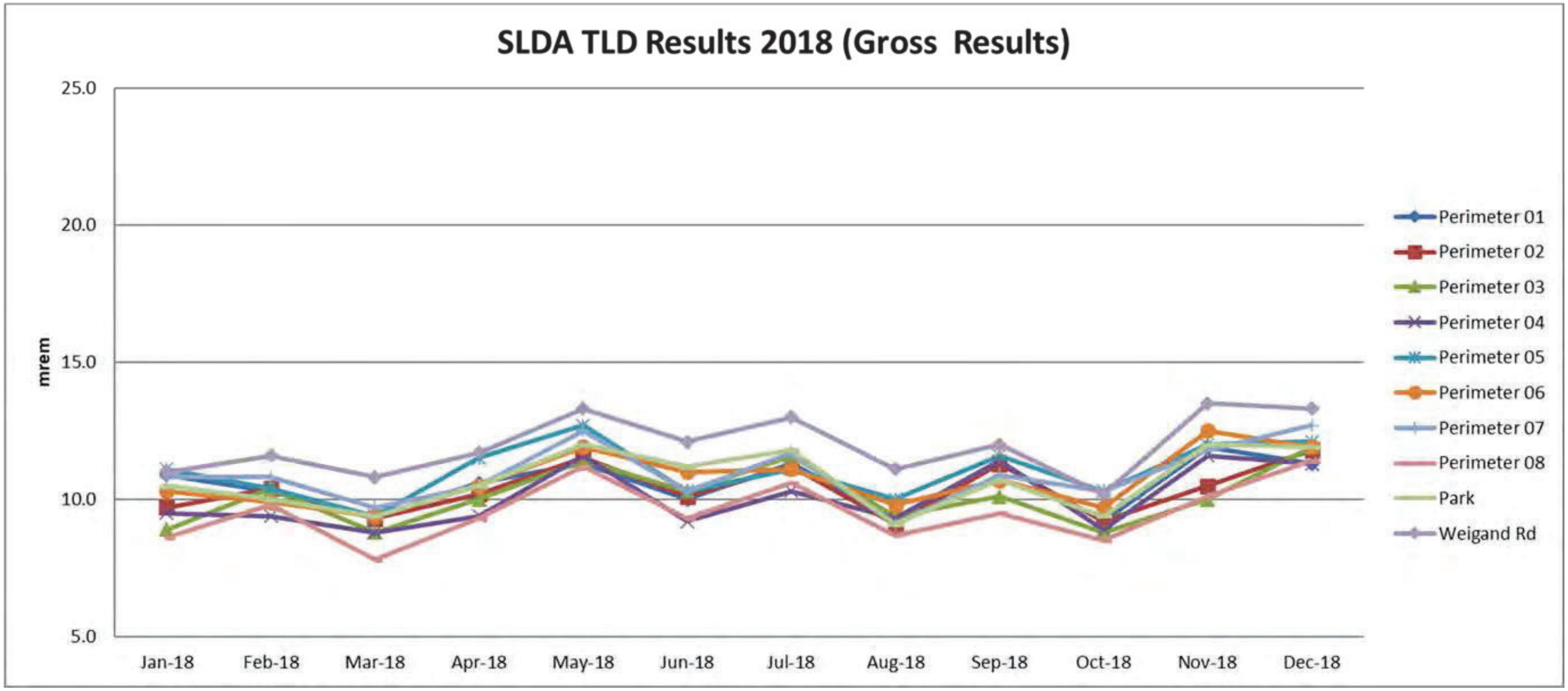


Figure 34: SLDA Ambient Dosimeter Results (Calendar Year 2017)

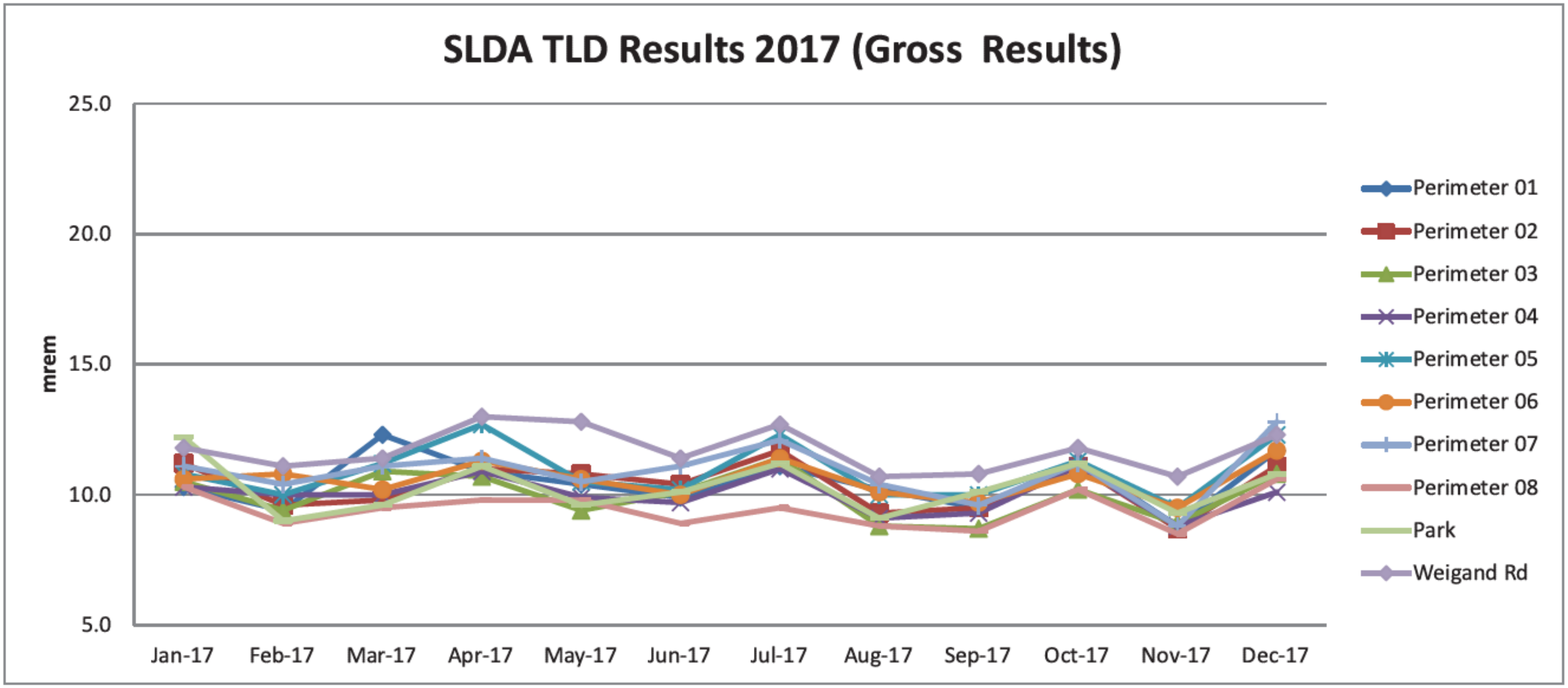


Figure 35: SLDA Ambient Dosimeter Results (Calendar Year 2016)

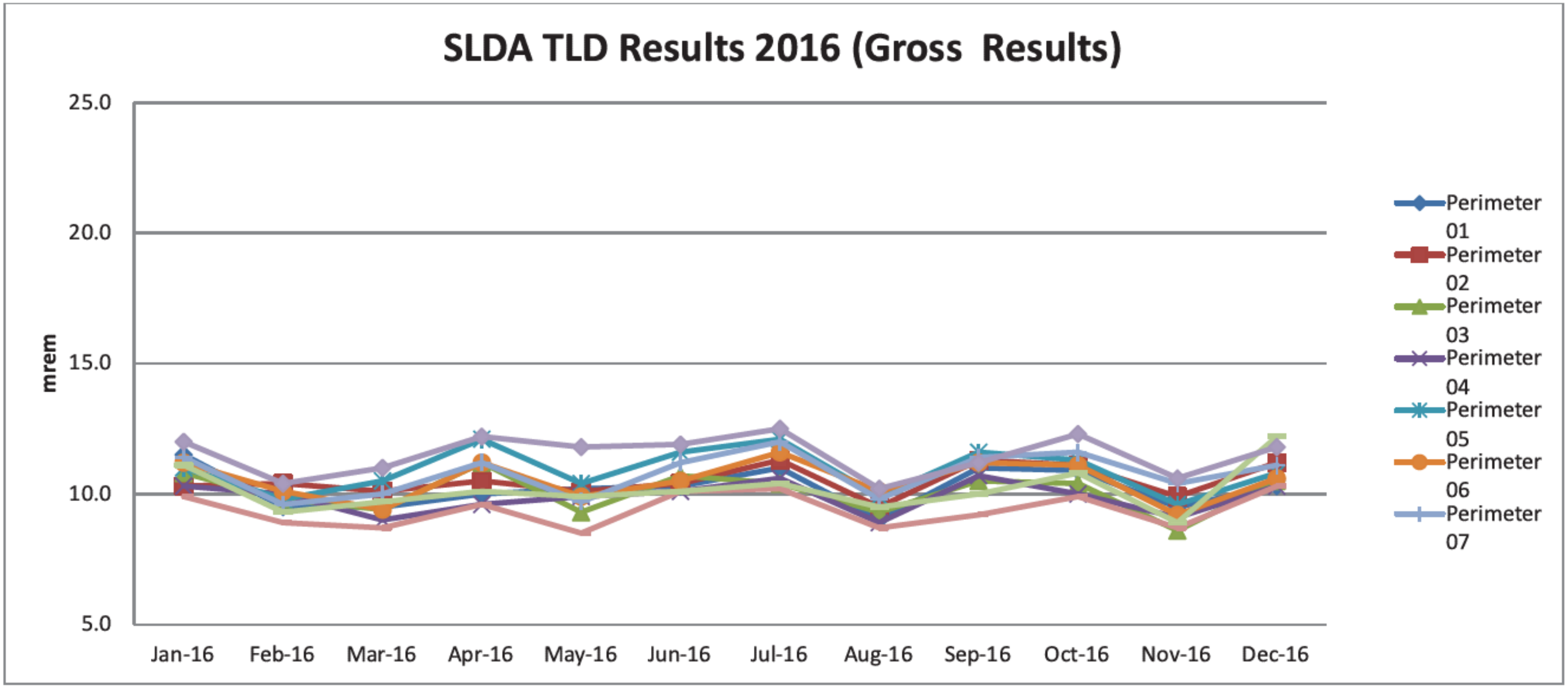


Figure 36: Mann-Kendall Statistical Evaluation of Total Uranium Activity in Groundwater Monitoring Well MW-07

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	ProUCL 5.111/4/2021 11:47:07 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.9
Level of Significance	0.1

MW-07	
General Statistics	
Number or Reported Events Not Used	0
Number of Generated Events	7
Number Values Reported (n)	7
Minimum	0.097
Maximum	0.252
Mean	0.184
Geometric Mean	0.174
Median	0.192
Standard Deviation	0.062
Coefficient of Variation	0.337
Mann-Kendall Test	
M-K Test Value (S)	-11
Tabulated p-value	0.068
Standard Deviation of S	6.658
Standardized Value of S	-1.502
Approximate p-value	0.0666

Statistically significant evidence of a decreasing trend at the specified level of significance.

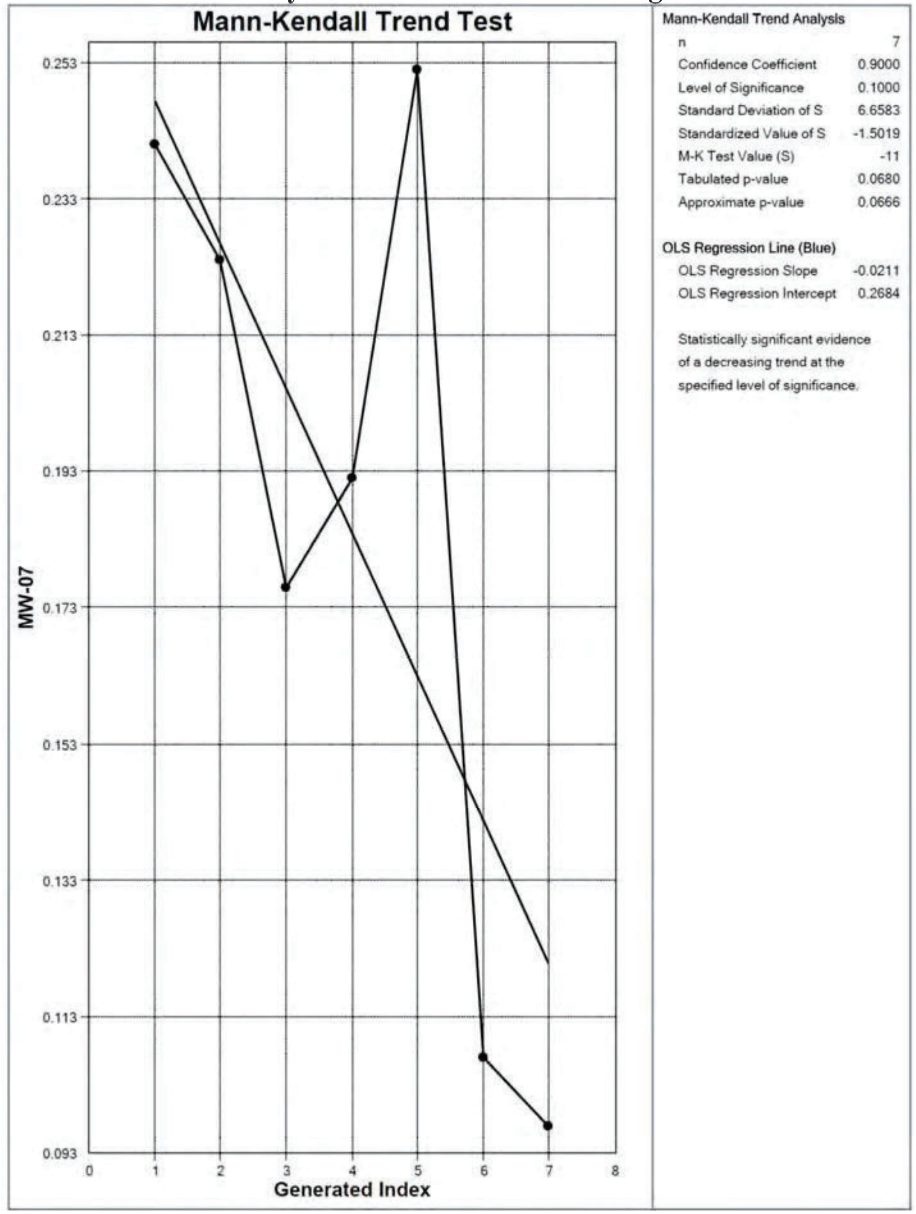
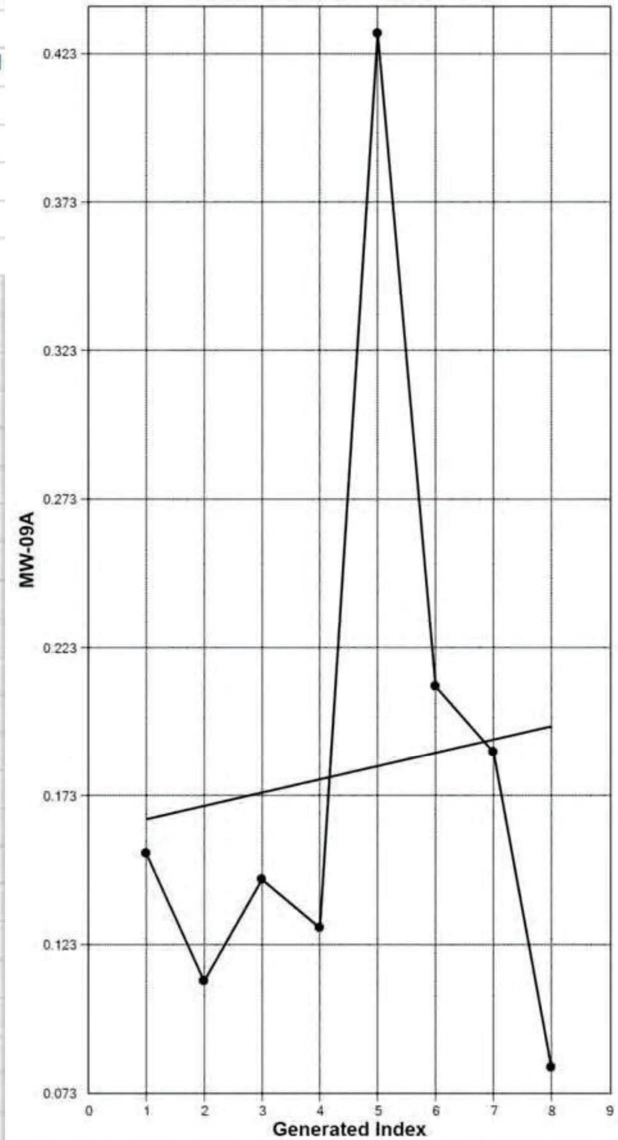


Figure 37: Mann-Kendall Statistical Evaluation of Total Uranium Activity in Groundwater Monitoring Well MW-09A

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	ProUCL 5.111/4/2021 11:47:57 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.9
Level of Significance	0.1

MW-09A	
General Statistics	
Number or Reported Events Not Used	0
Number of Generated Events	8
Number Values Reported (n)	8
Minimum	0.082
Maximum	0.43
Mean	0.181
Geometric Mean	0.161
Median	0.15
Standard Deviation	0.108
Coefficient of Variation	0.599
Mann-Kendall Test	
M-K Test Value (S)	0
Tabulated p-value	0.548
Standard Deviation of S	8.083
Standardized Value of S	N/A
Approximate p-value	N/A

Insufficient evidence to identify a significant trend at the specified level of significance.



Mann-Kendall Trend Analysis	
n	8
Confidence Coefficient	0.9000
Level of Significance	0.1000
Standard Deviation of S	8.0829
Standardized Value of S	
M-K Test Value (S)	0
Tabulated p-value	0.5480
Approximate p-value	
OLS Regression Line (Blue)	
OLS Regression Slope	0.0045
OLS Regression Intercept	0.1609

Insufficient statistical evidence of a significant trend at the specified level of significance.

Figure 38: Mann-Kendall Statistical Evaluation of Total Uranium Activity in Groundwater Monitoring Well MW-44

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	ProUCL 5.111/4/2021 11:54:36 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.9
Level of Significance	0.1

MW-44	
General Statistics	
Number or Reported Events Not Used	0
Number of Generated Events	6
Number Values Reported (n)	6
Minimum	0.375
Maximum	17.7
Mean	3.829
Geometric Mean	1.483
Median	1.315
Standard Deviation	6.816
Coefficient of Variation	1.78
Mann-Kendall Test	
M-K Test Value (S)	7
Tabulated p-value	0.136
Standard Deviation of S	5.323
Standardized Value of S	1.127
Approximate p-value	0.13

Insufficient evidence to identify a significant trend at the specified level of significance.

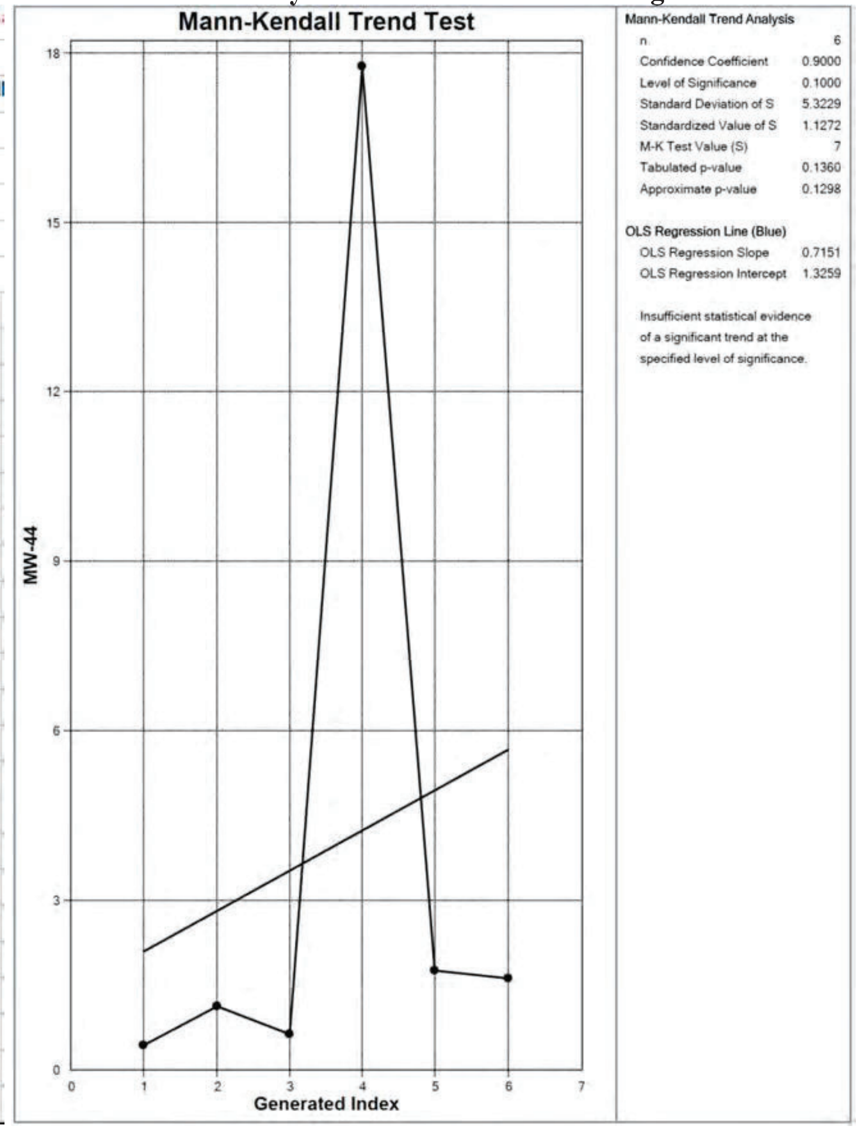


Figure 39: Mann-Kendall Statistical Evaluation of Total Uranium Activity in Groundwater Monitoring Well MW-51

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	ProUCL 5.111/4/2021 11:55:39 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.9
Level of Significance	0.1

MW-51

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	6
Number Values Reported (n)	6
Minimum	0.231
Maximum	9.48
Mean	1.866
Geometric Mean	0.568
Median	0.331
Standard Deviation	3.732
Coefficient of Variation	2.001

Mann-Kendall Test

M-K Test Value (S)	7
Tabulated p-value	0.136
Standard Deviation of S	5.323
Standardized Value of S	1.127
Approximate p-value	0.13

Insufficient evidence to identify a significant trend at the specified level of significance.

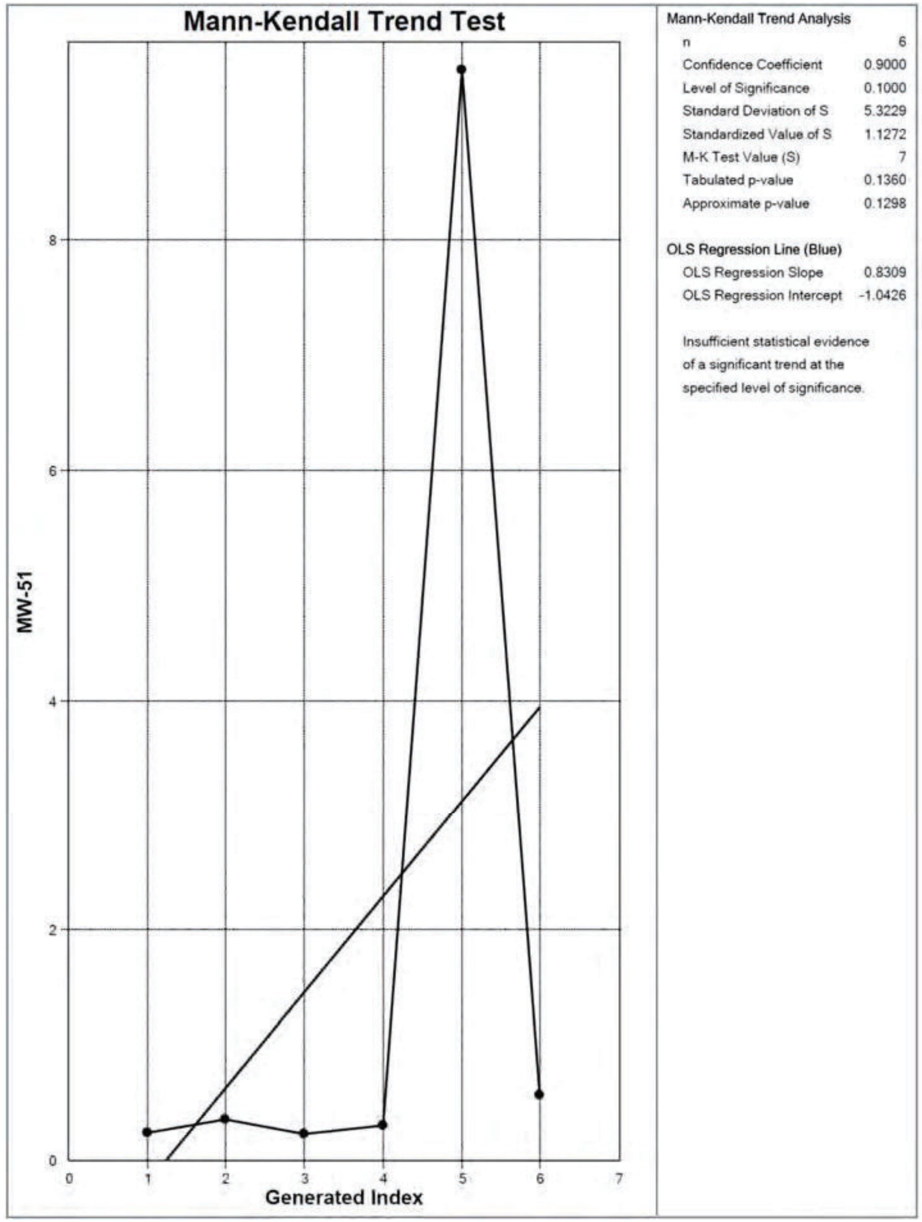


Figure 40: Mann-Kendall Statistical Evaluation of Total Uranium Activity in Groundwater Monitoring Well MW-33

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	ProUCL 5.111/4/2021 11:56:17 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.9
Level of Significance	0.1

MW-33

General Statistics	
Number or Reported Events Not Used	0
Number of Generated Events	8
Number Values Reported (n)	8
Minimum	0.187
Maximum	0.663
Mean	0.364
Geometric Mean	0.332
Median	0.335
Standard Deviation	0.169
Coefficient of Variation	0.464
Mann-Kendall Test	
M-K Test Value (S)	-6
Tabulated p-value	0.274
Standard Deviation of S	8.083
Standardized Value of S	-0.619
Approximate p-value	0.268

Insufficient evidence to identify a significant trend at the specified level of significance.

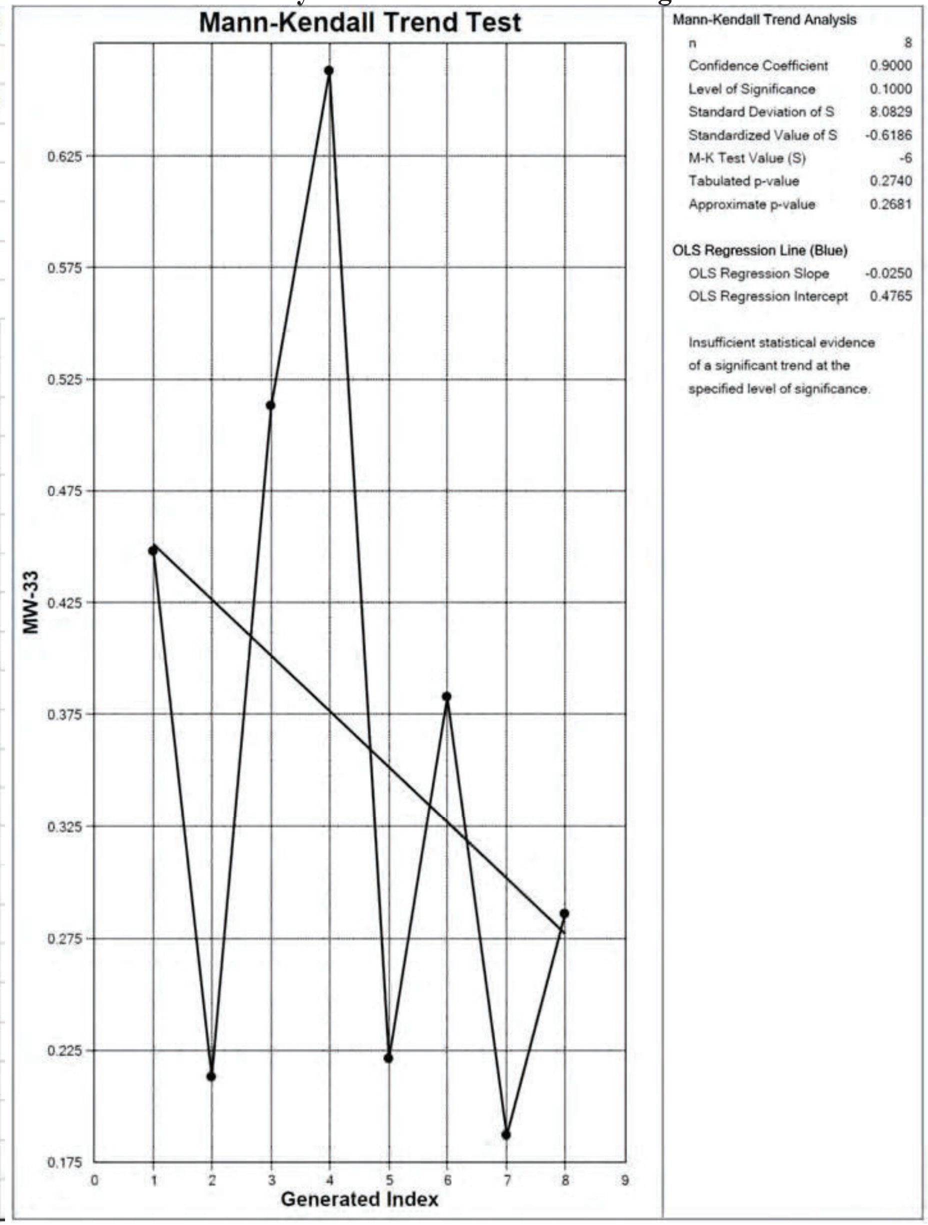


Figure 41: Mann-Kendall Statistical Evaluation of Total Uranium Activity in Groundwater Monitoring Well MW-52

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	ProUCL 5.111/4/2021 11:57:03 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.9
Level of Significance	0.1

MW-52	
General Statistics	
Number or Reported Events Not Used	0
Number of Generated Events	6
Number Values Reported (n)	6
Minimum	0.093
Maximum	0.506
Mean	0.329
Geometric Mean	0.283
Median	0.346
Standard Deviation	0.171
Coefficient of Variation	0.518
Mann-Kendall Test	
M-K Test Value (S)	-3
Tabulated p-value	0.36
Standard Deviation of S	5.323
Standardized Value of S	-0.376
Approximate p-value	0.354

Insufficient evidence to identify a significant trend at the specified level of significance.

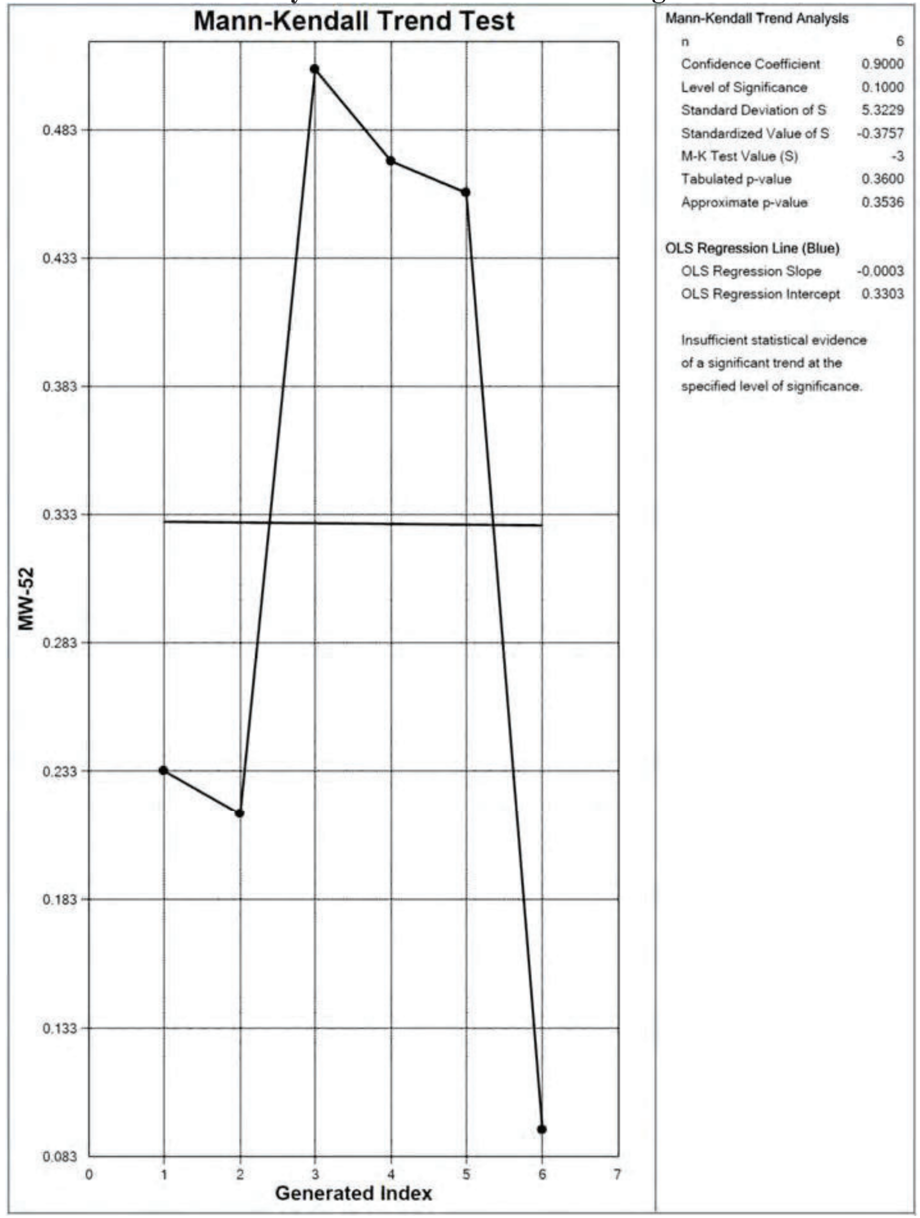
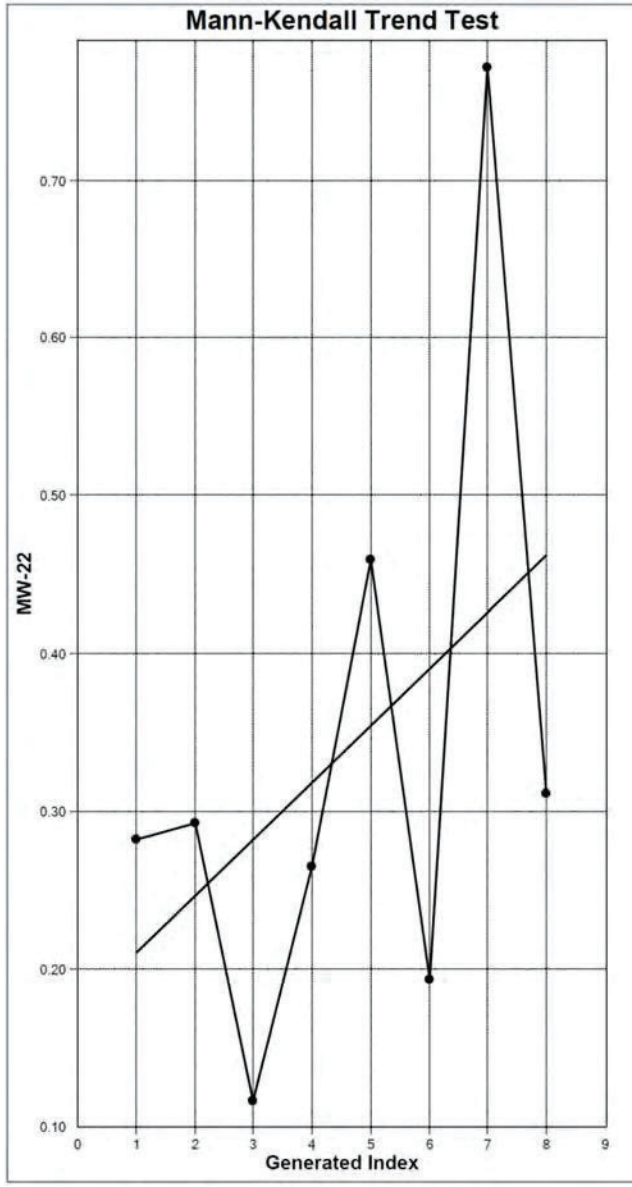


Figure 42: Mann-Kendall Statistical Evaluation of Total Uranium Activity in Groundwater Monitoring Well MW-22

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	ProUCL 5.111/4/2021 11:57:46 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.9
Level of Significance	0.1

MW-22	
General Statistics	
Number or Reported Events Not Used	0
Number of Generated Events	8
Number Values Reported (n)	8
Minimum	0.116
Maximum	0.771
Mean	0.336
Geometric Mean	0.293
Median	0.287
Standard Deviation	0.201
Coefficient of Variation	0.599
Mann-Kendall Test	
M-K Test Value (S)	8
Tabulated p-value	0.119
Standard Deviation of S	8.083
Standardized Value of S	0.866
Approximate p-value	0.193

Insufficient evidence to identify a significant trend at the specified level of significance.



Mann-Kendall Trend Analysis	
n	8
Confidence Coefficient	0.9000
Level of Significance	0.1000
Standard Deviation of S	8.0829
Standardized Value of S	0.8660
M-K Test Value (S)	8
Tabulated p-value	0.1190
Approximate p-value	0.1932
OLS Regression Line (Blue)	
OLS Regression Slope	0.0360
OLS Regression Intercept	0.1742

Insufficient statistical evidence of a significant trend at the specified level of significance.

Figure 43: Mann-Kendall Statistical Evaluation of Total Uranium Activity in Groundwater Piezometer PZ-01

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	ProUCL 5.111/4/2021 11:58:29 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.9
Level of Significance	0.1

PZ-01

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	6
Number Values Reported (n)	6
Minimum	0.029
Maximum	0.326
Mean	0.131
Geometric Mean	0.0982
Median	0.0965
Standard Deviation	0.109
Coefficient of Variation	0.829

Mann-Kendall Test

M-K Test Value (S)	-5
Tabulated p-value	0.235
Standard Deviation of S	5.323
Standardized Value of S	-0.751
Approximate p-value	0.226

Insufficient evidence to identify a significant trend at the specified level of significance.

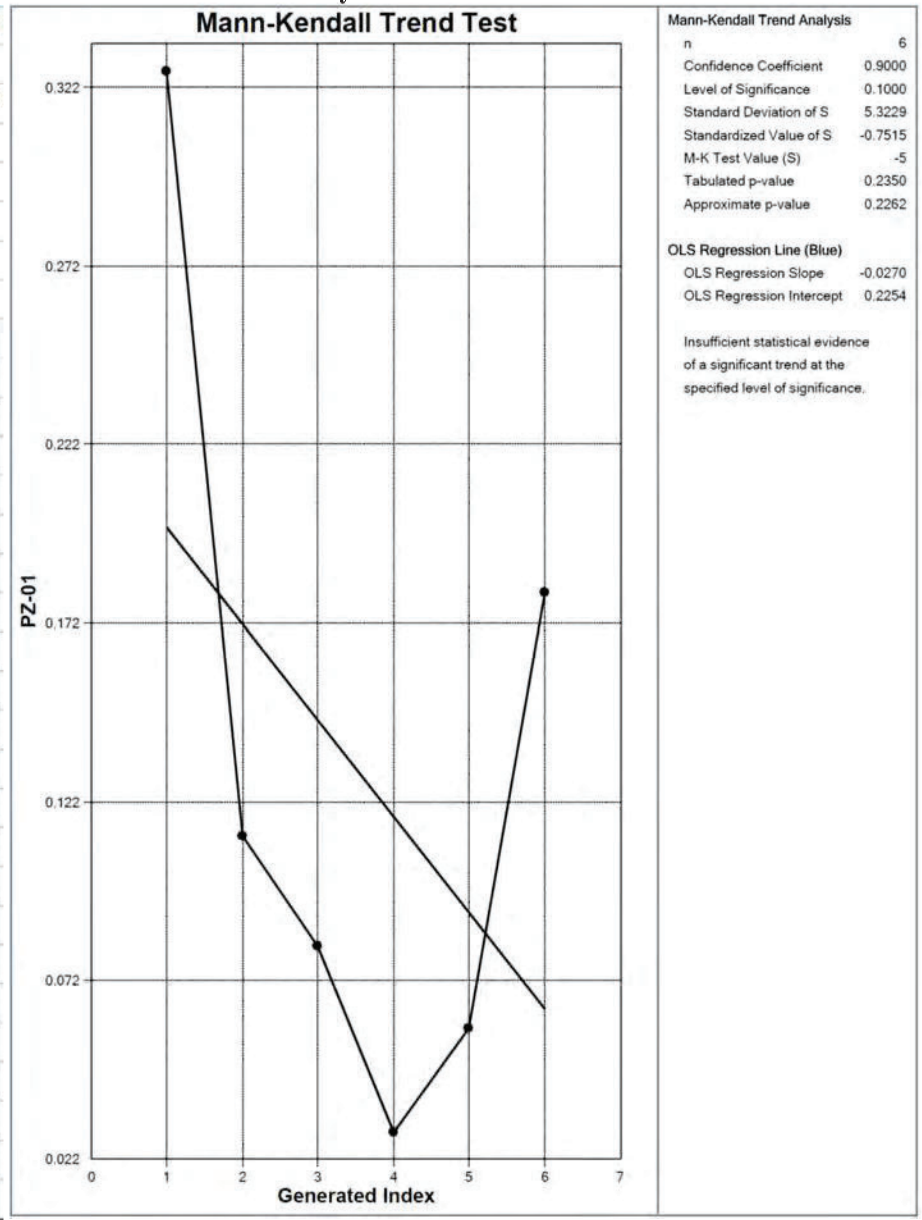


Figure 44: Mann-Kendall Statistical Evaluation of Total Uranium Activity in Groundwater Monitoring Well 10L31

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	ProUCL 5.111/4/2021 11:59:04 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.9
Level of Significance	0.1

10L31	
General Statistics	
Number or Reported Events Not Used	0
Number of Generated Events	8
Number Values Reported (n)	8
Minimum	0.189
Maximum	0.731
Mean	0.385
Geometric Mean	0.361
Median	0.368
Standard Deviation	0.157
Coefficient of Variation	0.407
Mann-Kendall Test	
M-K Test Value (S)	-10
Tabulated p-value	0.138
Standard Deviation of S	8.083
Standardized Value of S	-1.113
Approximate p-value	0.133

Insufficient evidence to identify a significant trend at the specified level of significance.

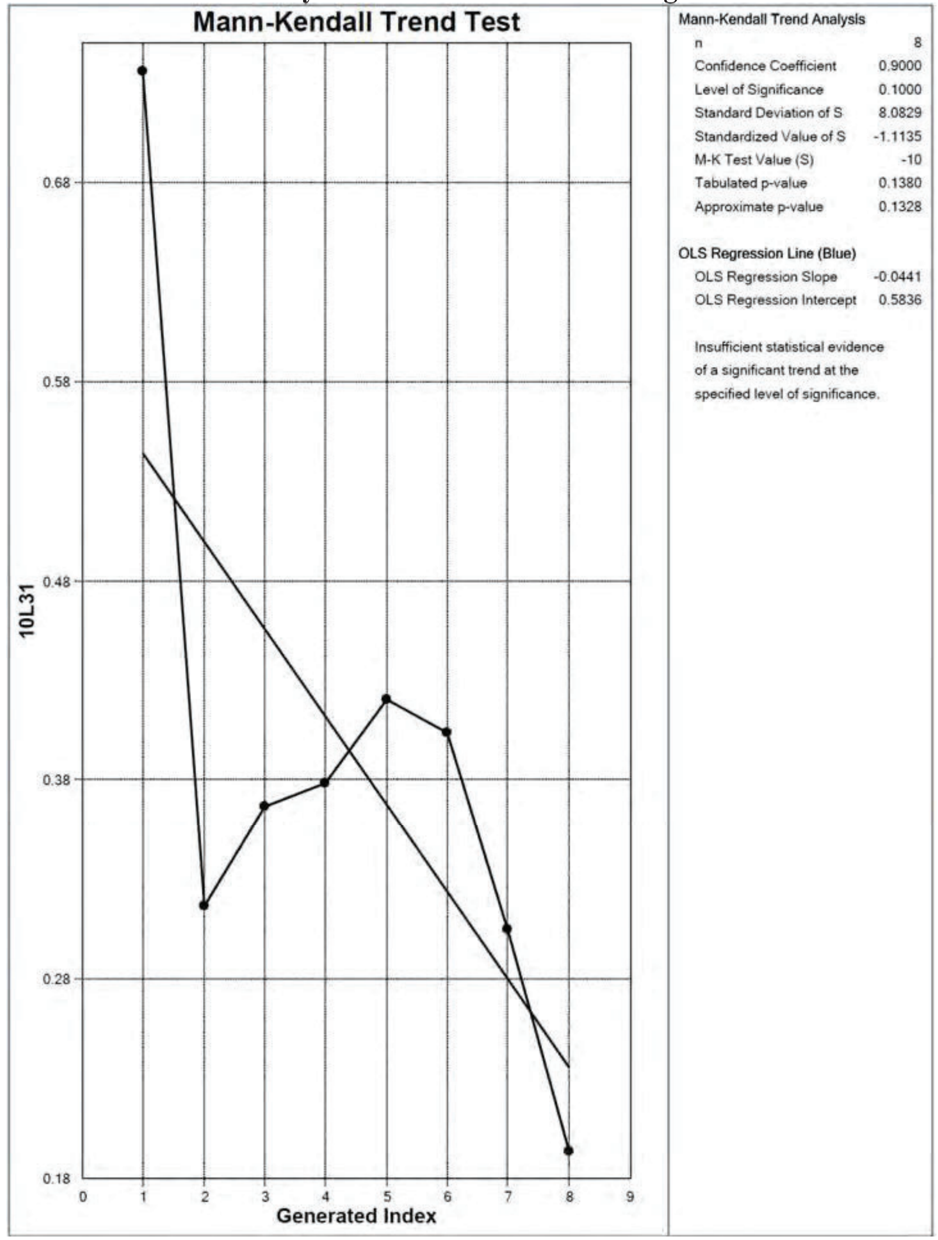


Figure 45: Mann-Kendall Statistical Evaluation of Total Uranium Activity in Groundwater Monitoring Well MW-03

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	ProUCL 5.111/4/2021 12:00:19 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.9
Level of Significance	0.1

MW-03

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	6
Number Values Reported (n)	6
Minimum	0.153
Maximum	3.81
Mean	1.67
Geometric Mean	1.17
Median	1.545
Standard Deviation	1.244
Coefficient of Variation	0.745

Mann-Kendall Test

M-K Test Value (S)	-15
Tabulated p-value	0.001
Standard Deviation of S	5.323
Standardized Value of S	-2.63
Approximate p-value	0.00427

Statistically significant evidence of a decreasing trend at the specified level of significance.

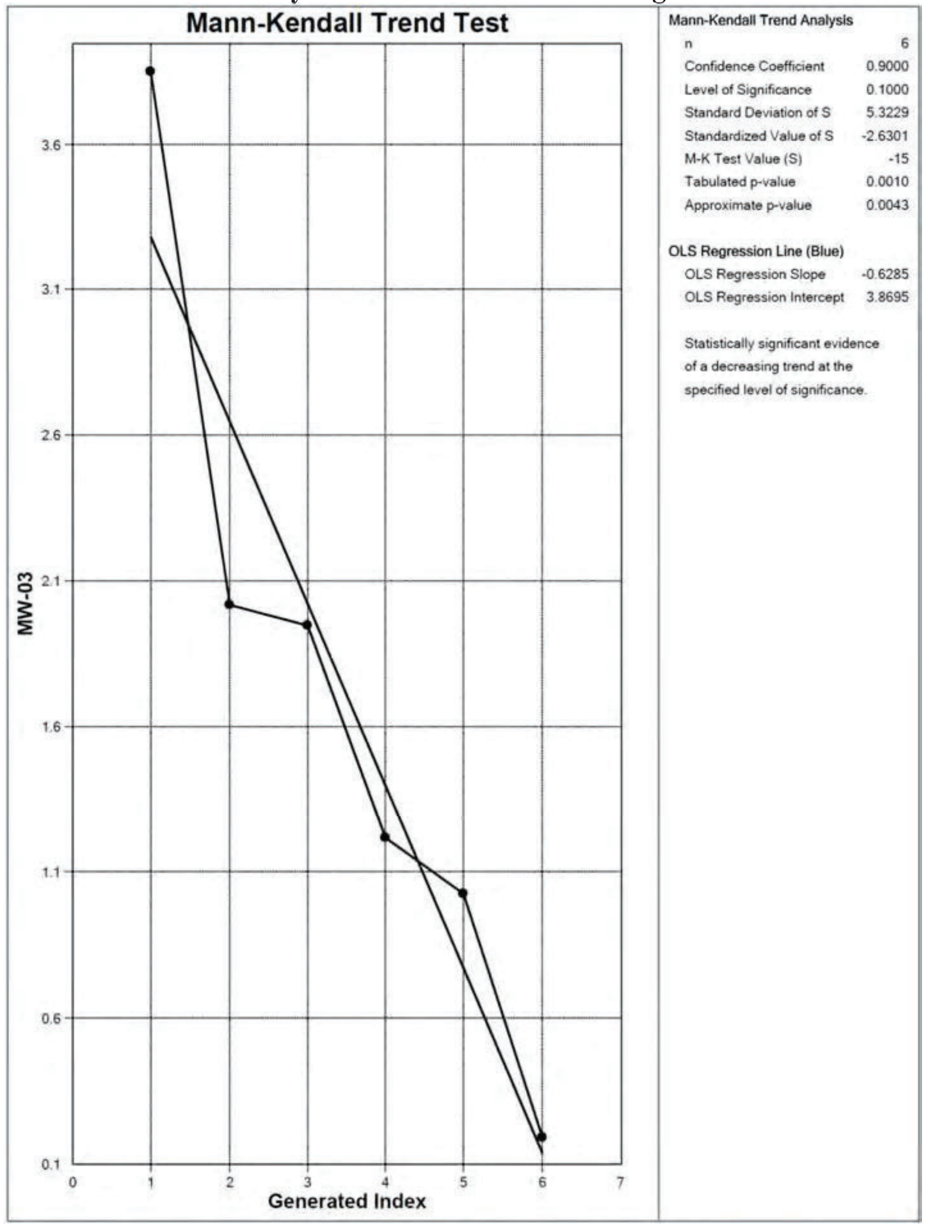


Figure 46: Mann-Kendall Statistical Evaluation of Total Uranium Activity in Groundwater Monitoring Well MW-39

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	ProUCL 5.111/4/2021 12:01:08 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.9
Level of Significance	0.1

MW-39	
General Statistics	
Number or Reported Events Not Used	0
Number of Generated Events	7
Number Values Reported (n)	7
Minimum	0.143
Maximum	0.903
Mean	0.434
Geometric Mean	0.37
Median	0.451
Standard Deviation	0.251
Coefficient of Variation	0.579
Mann-Kendall Test	
M-K Test Value (S)	5
Tabulated p-value	0.281
Standard Deviation of S	6.658
Standardized Value of S	0.601
Approximate p-value	0.274

Insufficient evidence to identify a significant trend at the specified level of significance.