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# DATA VALIDATION SUMMARY REPORT

## 2ND FIVE-YEAR CERCLA REVIEW – SOIL SAMPLES

This report is a summary of the data validation and quality control (QC) review conducted for soil samples collected in October 2007 in support of the 2nd Five-Year CERCLA Review for the Monsanto Soda Springs Plant, located in Soda Springs, Idaho. This effort was completed on the behalf of Monsanto Elemental Phosphorous Plant. General Engineering Laboratories (GEL), located in Charleston, South Carolina, performed analyses on all primary, triplicate, and field blank samples. Sanford Cohen and Associates (SCA), located in Vienna, Virginia, was contracted to perform radionuclide analysis on quality assurance (QA) split samples. These laboratories were selected prior to sampling and are proficient in the analysis of radionuclides as requested by the United States Environmental Protection Agency (USEPA) Region 10 and the Idaho Department of Environmental Quality (IDEQ).

Data generated by GEL were validated as specified in the Quality Assurance Project Plan (QAPP) portion of the 2nd Five-Year CERCLA Review Work Plan (MWH, 2007), and as referenced in the *Final Work Plan for CERCLA Five-Year Review* (MWH, 2002). Radionuclide data were validated using applicable guidance specified in *Evaluation of Radiochemical Data Usability* (United States Department of Energy [USDOE], 1997b). Data validation reports were produced for each laboratory Sample Delivery Group (SDG), and are provided in Attachment A.

Soil samples were collected and submitted to GEL where they were homogenized and dried. In addition, 17 equipment rinsate and 17 source water blank samples were collected and submitted to GEL. Seventeen of the primary field samples were selected for triplicate and QA analyses. These samples were homogenized and split into four parts. One part of each sample was submitted to SCA for radionuclide analysis. The remaining three parts were identified as triplicate samples and analyzed by GEL. All sample submittals were made under chain-of-custody protocols.

GEL analyzed the primary samples for Radium-226 ($^{226}Ra$), Radium-228 ($^{228}Ra$), and Cesium-137 ($^{137}Cs$) by Environmental Measurements Laboratory (EML) Health and Safety Laboratory (HASL)-300 Manual, Section 4.5.2.3 (Ga-01-R: high resolution germanium detector gamma ray spectrometry) (USDOE, 1997a) and GEL's Standard Operating Procedure (SOP) GL-RAD-A-013 Rev #14. SCA analyzed the QA split samples for Radium-226 by EML HASL 300, Ga-01-R.

Data quality objectives (DQOs) are qualitative and quantitative statements that specify the quality of these data required to meet the goals of site investigation and/or to support decisions made in environmental management activities. Although analytical chemistry DQOs for the October 2007 sampling event were not specified in the Work Plan (MWH, 2007), chemical data generated from field samples are typically evaluated in terms of precision, accuracy, representativeness, completeness, and comparability. The results of laboratory quality control (QC) samples were evaluated against these parameters. QC sample results that fall outside the method- and laboratory-specified control criteria serve to signal unacceptable or biased data that may result in corrective action or qualification of data. The following is a summary review of these data, including data qualification that resulted from the data validation.

**Precision and Accuracy**

Precision is the degree of agreement among repeated measurements of the same characteristic under the same or similar conditions. Data precision indicates how consistent and reproducible the field sampling or analytical procedures have been. Precision was evaluated based on the results of QC samples collected in the field and created in the laboratory. The percent differences (or drift) calculated from continuing calibration verification (CCV) standards provided information on precision of the analytical system. The calculated relative percent differences (RPDs) for replicate field samples pairs provided information on precision of sampling and analytical procedures.

Accuracy is defined as the closeness of agreement between an observed value and an accepted reference value. Accuracy was evaluated based on recoveries from the laboratory control samples, and sample identification and quantitation assessments.

- All recoveries and RPDs for radionuclide QC sample analysis were within laboratory-established control limits.
- The radionuclide sample identification and quantitation criteria for reporting (that is, the detected activity as compared to the uncertainly and sample-specific minimum detectable activity [MDA] or concentration [MDC]) were acceptable, with the exceptions noted in each data validation report (GEL SDGs 195900, 195902, 196905, 195906, 195907, 195910, and 196017).
- The laboratory rejected three results (Cesium-137 in samples 101107SOMS4-13-0-C(5) and 101307SOMS3-119-1-C(5) and Radium-228 in sample 101307SOMS-100-0-C(5)) because the peaks in these sample did not meet acceptable gamma-spectrometer criteria.

**Representativeness**

Representative for radionuclide analysis was determined from the laboratory blank data. The normalized absolute difference (NAD) was calculated as follows:

$$\text{NAD} = \frac{\left|[\text{Sample}] - [\text{Blank}]\right|}{([\text{Uncertainty}_{\text{Sample}}{}^2 + \text{Uncertainty}_{\text{Blank}}{}^2)^{1/2}}$$

If the NAD were greater than 2.58, then the reported results were acceptable. If the NAD was less than 2.58 but greater than 1.96, then the data were qualified as estimated. If the NAD was less than 1.96 and the reported concentration were less than two times the uncertainty, then the radionuclide was considered not detected (flagged as UJ) at the reported concentration. Radium-226, Radium-228, and Cesium-137 results that were qualified because of method blank contamination are summarized in each data validation report.

All samples were analyzed within the recommended holding times for radionuclides analyses.

**Completeness**

All field samples, field blank samples, and QA Split samples were collected and analyzed as specified in the *Work Plan, Field Sampling Plan, Quality Assurance Program Plan, and Health and Safety Memoranda for the 2nd CERCLA Five-Year Review* (MWH, 2007). GEL's

laboratory data were complete for radionuclide analyses. SCA laboratory data were complete with the exception of back-up (raw) data in the laboratory report.

**Comparability**

Comparability is defined as the confidence with which one data set can be evaluated against another. On this project, comparability was assured by analyzing all samples according to the specified methods and procedures described in the *Work Plan, Field Sampling Plan, Quality Assurance Program Plan, and Health and Safety Memoranda for the 2nd CERCLA Five-Year Review* and via the analysis of QA Split samples. Table 1 provides the results of the QA split samples for Radium-226.

Of the 51 RPDs and 51 duplicate error ratios (see Table 1 for calculation) calculated for Radium-226 for the 17 sets of triplicate and QA Split samples, all but six were within the QAPP-defined acceptance criterion of 35 for duplicates. Three RPDs and two DERs calculated from the results of triplicate samples 101107SOMS4-16-1-C(5), 101107SOMS4-16-2-C(5), and 101107SOMS4-16-3-C(5) and QA Split sample 101107SOMS4-16-4-C(5) and one RPD calculated from the results of triplicate sample 100907SOMS3-99-2-C(5) and QA Split sample 100907SOMS3-99-4-C(5) were greater than 35. The triplicate and QA Split sample results for the 17 sets of soil samples indicate that the Radium-226 data were generally comparable.

**Summary of Data Quality**

Analytical data generated from soil samples collected in support of the 2$^{nd}$ Five-Year CERCLA Review for the Monsanto Soda Springs Plant were reviewed and validated according to the *USDOE Evaluation of Radiochemical Data Usability*. Except for the three rejected data, and all data are usable as qualified.

## References


MWH, 2002. *Final Field Sampling Plan for CERCLA Five-Year Review Soil and Sediment Investigation.* Monsanto Elemental Phosphorus Plant, Soda Springs, Idaho. Prepared by MWH for Monsanto.

MWH, 2007. *Work Plan, Field Sampling Plan, Quality Assurance Program Plan, and Health and Safety Memoranda for the 2nd CERCLA Five-Year Review*. Monsanto Elemental Phosphorus Plant, Soda Springs, Idaho. August.

United States Department of Energy (USDOE), 1997a Department of Energy, Environmental Measurements Laboratory, *Health and Safety Laboratory (HASL)-300 Manual,* Section 4.5.4 (Po-01-RC: alpha ray spectrometry), 28th Edition, February.

USDOE, 1997b. Department of Energy, *Evaluation of Radiochemical Data Usability*, es/er/ms-5, April.

## ATTACHMENT A

## DATA VALIDATION REPORTS

GEL SDG No. 195900 Radium-226
GEL SDG No. 195902 Radium-226
GEL SDG No. 195905 Radium-226
GEL SDG No. 195906 Radium-226
GEL SDG No. 195907 Radium-226
GEL SDG No. 195910 Radium-226
GEL SDG No. 196017 Radium-226

**TABLE 1**

**SUMMARY OF TRIPLICATE AND QA SPLIT SAMPLE RESULTS FOR RADIOLOGICAL PARAMETERS**
**2ND 5-YEAR CERCLA REVIEW_SOIL 2007**
**MONSANTO**
**(Page 1 of 3)**

| Sample Identification | Laboratory Identification | Sample Type | Chemical Parameter | Laboratory Result (pCi/g) | | | | Validation Result [a] | | Precision [b] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Result | Uncertainty | Qualifier | MDC | Qual | ReasonCode | RPD (<35) | DER (≤ 1.42) |
| 101107SOMS3-82-1-C(5) | 196017001 | TRIPLICATE | Radium-226 | 1.50 | 0.260 | | 0.149 | | C03 | 5.2 | 0.09 |
| 101107SOMS3-82-2-C(5) | 196017002 | TRIPLICATE | Radium-226 | 1.41 | 0.221 | | 0.127 | | C03 | 11 | 0.19 |
| 101107SOMS3-82-3-C(5) | 196017003 | TRIPLICATE | Radium-226 | 1.45 | 0.240 | | 0.117 | | C03 | 8.6 | 0.14 |
| 101107SOMS3-82-4-C(5) | MWW07-8022-11 | QA Split | Radium-226 | 1.58 | 0.389 | | 0.508 | | | | |
| 101507SOMKMBACK-5-1-C-(5) | 196017004 | TRIPLICATE | Radium-226 | 1.10 | 0.228 | | 0.154 | | C03 | 3.7 | 0.05 |
| 101507SOMKMBACK-5-2-C-(5) | 196017005 | TRIPLICATE | Radium-226 | 1.03 | 0.271 | | 0.154 | | C03 | 2.9 | 0.04 |
| 101507SOMKMBACK-5-3-C-(5) | 196017006 | TRIPLICATE | Radium-226 | 1.34 | 0.230 | | 0.108 | | C03 | 23 | 0.36 |
| 101507SOMKMBACK-5-4-C(5) | MWW07-8022-12 | QA Split | Radium-226 | 1.06 | 0.309 | | 0.406 | | | | |
| 101307SOMS3-119-1-C(5) | 196017007 | TRIPLICATE | Radium-226 | 1.29 | 0.201 | | 0.121 | | C03 | 18 | 0.29 |
| 101307SOMS3-119-2-C(5) | 196017008 | TRIPLICATE | Radium-226 | 1.25 | 0.197 | | 0.147 | | C03 | 15 | 0.24 |
| 101307SOMS3-119-3-C(5) | 196017009 | TRIPLICATE | Radium-226 | 1.26 | 0.213 | | 0.125 | | C03 | 15 | 0.24 |
| 101307SOMS3-119-4-C(5) | MWW07-8022-13 | QA Split | Radium-226 | 1.08 | 0.301 | | 0.384 | | | | |
| 101207SOMS3-89-1-C(5) | 196017010 | TRIPLICATE | Radium-226 | 4.16 | 0.456 | | 0.156 | | C03 | 6.3 | 0.20 |
| 101207SOMS3-89-2-C(5) | 196017011 | TRIPLICATE | Radium-226 | 4.57 | 0.522 | | 0.190 | | C03 | 3.1 | 0.10 |
| 101207SOMS3-89-3-C(5) | 196017012 | TRIPLICATE | Radium-226 | 3.49 | 0.393 | | 0.140 | | C03 | 24 | 0.76 |
| 101207SOMS3-89-4-C(5) | MWW07-8022-14 | QA Split | Radium-226 | 4.43 | 0.48 | | 0.354 | | | | |
| 101207SOMS3-47-1-C(5) | 196017013 | TRIPLICATE | Radium-226 | 2.68 | 0.347 | | 0.183 | | C03 | 6.1 | 0.15 |
| 101207SOMS3-47-2-C(5) | 196017014 | TRIPLICATE | Radium-226 | 2.72 | 0.339 | | 0.145 | | C03 | 4.7 | 0.12 |
| 101207SOMS3-47-3-C(5) | 196017015 | TRIPLICATE | Radium-226 | 3.02 | 0.397 | | 0.188 | | C03 | 5.8 | 0.14 |
| 101207SOMS3-47-4-C(5) | MWW07-8022-15 | QA Split | Radium-226 | 2.85 | 0.435 | | 0.467 | | | | |
| 101007SOMB-B-3-1-C(5) | 196017016 | TRIPLICATE | Radium-226 | 0.943 | 0.196 | | 0.121 | | C03 | 33 | 0.50 |
| 101007SOMB-B-3-2-C(5) | 196017017 | TRIPLICATE | Radium-226 | 1.11 | 0.245 | | 0.194 | | C03 | 17 | 0.26 |
| 101007SOMB-B-3-3-C(5) | 196017018 | TRIPLICATE | Radium-226 | 1.37 | 0.199 | | 0.121 | | C03 | 3.7 | 0.07 |
| 101007SOMB-B-3-4-C(5) | MWW07-8022-16 | QA Split | Radium-226 | 1.32 | 0.324 | | 0.399 | | | | |
| 101007SOMD-2-1-C(5) | 196017019 | TRIPLICATE | Radium-226 | 1.04 | 0.187 | | 0.124 | | C03 | 6.7 | 0.09 |
| 101007SOMD-2-2-C(5) | 196017020 | TRIPLICATE | Radium-226 | 1.15 | 0.173 | | 0.0855 | | C03 | 17 | 0.26 |
| 101007SOMD-2-3-C(5) | 196017021 | TRIPLICATE | Radium-226 | 1.15 | 0.197 | | 0.123 | | C03 | 17 | 0.25 |
| 101007SOMD-2-4-C(5) | MWW07-8022-07 | QA Split | Radium-226 | 0.973 | 0.299 | | 0.392 | | | | |
| 101107SOMS2-11-1-C(5) | 196017022 | TRIPLICATE | Radium-226 | 1.62 | 0.230 | | 0.114 | | C03 | 3.6 | 0.06 |
| 101107SOMS2-11-2-C(5) | 196017023 | TRIPLICATE | Radium-226 | 1.65 | 0.226 | | 0.119 | | C03 | 1.8 | 0.03 |
| 101107SOMS2-11-3-C(5) | 196017024 | TRIPLICATE | Radium-226 | 1.76 | 0.238 | | 0.127 | | C03 | 4.7 | 0.07 |
| 101107SOMS2-11-4-C(5) | MWW07-8022-08 | QA Split | Radium-226 | 1.68 | 0.483 | | 0.665 | | | | |
| 101107SOMS4-16-1-C(5) | 196017025 | TRIPLICATE | Radium-226 | 1.37 | 0.228 | | 0.131 | | C03 | **52** | 0.78 |
| 101107SOMS4-16-2-C(5) | 196017026 | TRIPLICATE | Radium-226 | 2.51 | 0.323 | | 0.124 | | C03 | **103** | **1.99** |
| 101107SOMS4-16-3-C(5) | 196017027 | TRIPLICATE | Radium-226 | 1.97 | 0.247 | | 0.136 | | C03 | **84** | **1.55** |
| 101107SOMS4-16-4-C(5) | MWW07-8022-09 | QA Split | Radium-226 | 0.804 | 0.283 | | 0.385 | | | | |

**TABLE 1**

**SUMMARY OF TRIPLICATE AND QA SPLIT SAMPLE RESULTS FOR RADIOLOGICAL PARAMETERS**
**2ND 5-YEAR CERCLA REVIEW_SOIL 2007**
**MONSANTO**
**(Page 2 of 3)**

| Sample Identification | Laboratory Identification | Sample Type | Chemical Parameter | Laboratory Result (pCi/g) | | | | Validation Result [a] | | Precision [b] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Result | Uncertainty | Qualifier | MDC | Qual | ReasonCode | RPD (<35) | DER (≤ 1.42) |
| 100907SOMS-15-1-C(5) | 196017028 | TRIPLICATE | Radium-226 | 6.40 | 0.673 | | 0.202 | | C03 | 15 | 0.52 |
| 100907SOMS-15-2-C(5) | 196017029 | TRIPLICATE | Radium-226 | 6.06 | 0.597 | | 0.161 | | C03 | 9.3 | 0.34 |
| 100907SOMS-15-3-C(5) | 196017030 | TRIPLICATE | Radium-226 | 6.54 | 0.674 | | 0.208 | | C03 | 17 | 0.60 |
| 100907SOMS-15-4-C(5) | MWW07-8022-10 | QA Split | Radium-226 | 5.52 | 0.51 | | 0.283 | | | | |
| 100907SOMS2-06-1-C(5) | 196017031 | TRIPLICATE | Radium-226 | 1.14 | 0.200 | | 0.114 | | C03 | 25 | 0.38 |
| 100907SOMS2-06-2-C(5) | 196017032 | TRIPLICATE | Radium-226 | 1.03 | 0.200 | | 0.146 | | C03 | **35** | 0.51 |
| 100907SOMS2-06-3-C(5) | 196017033 | TRIPLICATE | Radium-226 | 1.21 | 0.200 | | 0.139 | | C03 | 19 | 0.30 |
| 100907SOMS2-06-4-C(5) | MWW07-8022-05 | QA Split | Radium-226 | 1.47 | 0.387 | | 0.512 | | | | |
| 100907SOMS3-99-1-C(5) | 196017034 | TRIPLICATE | Radium-226 | 0.945 | 0.241 | | 0.144 | | C03 | 4.1 | 0.05 |
| 100907SOMS3-99-2-C(5) | 196017035 | TRIPLICATE | Radium-226 | 0.630 | 0.171 | | 0.148 | | C03 | **36** | 0.43 |
| 100907SOMS3-99-3-C(5) | 196017036 | TRIPLICATE | Radium-226 | 1.16 | 0.213 | | 0.157 | | C03 | 24 | 0.37 |
| 100907SOMS3-99-4-C(5) | MWW07-8022-06 | QA Split | Radium-226 | 0.907 | 0.269 | | 0.331 | | | | |
| 101307SOMS3-79-1-C(5) | 196017037 | TRIPLICATE | Radium-226 | 2.27 | 0.291 | | 0.126 | | C03 | 3.5 | 0.08 |
| 101307SOMS3-79-2-C(5) | 196017038 | TRIPLICATE | Radium-226 | 2.05 | 0.276 | | 0.139 | | C03 | 14 | 0.31 |
| 101307SOMS3-79-3-C(5) | 196017039 | TRIPLICATE | Radium-226 | 1.67 | 0.248 | | 0.144 | | C03 | 34 | 0.72 |
| 101307SOMS3-79-4-C(5) | MWW07-8022-01 | QA Split | Radium-226 | 2.35 | 0.404 | | 0.473 | | | | |
| 101307SOMS3-12-1-C(5) | 196017040 | TRIPLICATE | Radium-226 | 1.18 | 0.191 | | 0.108 | | C03 | 18 | 0.33 |
| 101307SOMS3-12-2-C(5) | 196017041 | TRIPLICATE | Radium-226 | 1.19 | 0.178 | | 0.126 | | C03 | 18 | 0.32 |
| 101307SOMS3-12-3-C(5) | 196017042 | TRIPLICATE | Radium-226 | 1.37 | 0.207 | | 0.111 | | C03 | 3.6 | 0.07 |
| 101307SOMS3-12-4-C(5) | MWW07-8022-02 | QA Split | Radium-226 | 1.42 | 0.315 | | 0.364 | | | | |
| 101307SOMS3-112-1-C(5) | 196017043 | TRIPLICATE | Radium-226 | 1.30 | 0.235 | | 0.158 | | C03 | 33 | 0.49 |
| 101307SOMS3-112-2-C(5) | 196017044 | TRIPLICATE | Radium-226 | 1.21 | 0.227 | | 0.118 | | C03 | 26 | 0.37 |
| 101307SOMS3-112-3-C(5) | 196017045 | TRIPLICATE | Radium-226 | 1.21 | 0.195 | | 0.133 | | C03 | 26 | 0.39 |
| 101307SOMS3-112-4-C(5) | MWW07-8022-03 | QA Split | Radium-226 | 0.929 | 0.301 | | 0.411 | | | | |
| 101207SOMS2-35-1-C(5) | 196017046 | TRIPLICATE | Radium-226 | 1.41 | 0.237 | | 0.123 | | C03 | 26 | 0.39 |
| 101207SOMS2-35-2-C(5) | 196017047 | TRIPLICATE | Radium-226 | 1.29 | 0.225 | | 0.162 | | C03 | 17 | 0.25 |
| 101207SOMS2-35-3-C(5) | 196017048 | TRIPLICATE | Radium-226 | 1.36 | 0.203 | | 0.124 | | C03 | 22 | 0.35 |
| 101207SOMS2-35-4-C(5) | MWW07-8022-17 | QA Split | Radium-226 | 1.09 | 0.334 | | 0.463 | | | | |
| 101307SOMS3-09-1-C(5) | 196017049 | TRIPLICATE | Radium-226 | 4.85 | 0.526 | | 0.151 | | C03 | 30 | 1.12 |
| 101307SOMS3-09-2-C(5) | 196017050 | TRIPLICATE | Radium-226 | 5.87 | 0.616 | | 0.145 | | C03 | 11 | 0.41 |
| 101307SOMS3-09-3-C(5) | 196017051 | TRIPLICATE | Radium-226 | 6.07 | 0.571 | | 0.135 | | C03 | 7.6 | 0.30 |
| 101307SOMS3-09-4-C(5) | MWW07-8022-04 | QA Split | Radium-226 | 6.55 | 0.551 | | 0.331 | | | | |

[a] The triplicate sample data were validated, but not the quality assurance (QA) split samples. The QA Split laboratory report did not contain sufficient back-up data to perform validation. Reason codes are defined in the individual validation reports.

**TABLE 1**

**SUMMARY OF TRIPLICATE AND QA SPLIT SAMPLE RESULTS FOR RADIOLOGICAL PARAMETERS**
**2ND 5-YEAR CERCLA REVIEW_SOIL 2007**
**MONSANTO**


| Sample Identification | Laboratory Identification | Sample Type | Chemical Parameter | Laboratory Result (pCi/g) | | | | Validation Result [a] | | Precision [b] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Result | Uncertainty | Qualifier | MDC | Qual | ReasonCode | RPD (<35) | DER (≤ 1.42) |

[b] The relative percent difference (RPD) and duplicate error ratio (DER) were calculated for each triplicate sample result against the associated QA Split sample result when both results were reported as detections (that is, not non-detected). An RPD or DER value that is bolded and boxed is above the acceptance criterion. The RDP and DER acceptance criteria are 35 and 1.42, respectively.

J - result is estimated because of one or more quality control results that are outside the acceptance limits
MDC - minimum detectable concentration
pCi/g - pico-Curries per gram
UJ - result is considered not detected at the laboratory-reported concentration. The non-detected value is considered estimated.

$$RPD = \frac{|(\text{Triplicate} - \text{QA Split})|}{(\text{Triplicate} + \text{QA Split})/2}$$

$$DER = \frac{|(\text{Triplicate} - \text{QA Split})|}{2 * (\text{Uncert}_{\text{Triplicate}}^{2} + \text{Uncert}_{\text{QA Split}}^{2})^{1/2}}$$

| | |
|---|---|
| **MWH Client:** | Monsanto Company |
| **MWH Project Name:** | CERCLA 2nd 5-Year Review |
| **MWH Project Number:** | 1010076.011701 |
| **Laboratory:** | GEL Laboratories, LLC (Charleston, SC) |
| **Data packages:** | Sample Delivery Group (SDG) Number 195900 |
| **Analytical Batches:** | 695965 and 695967 |
| **Method:** | Gamma Radium (Ra) 226 ($^{226}Ra$), $^{228}Ra$, and $^{137}Cs$ by EML HASL 300, 4.5.2.3 and per the laboratory's SOP GL-RAD-A-013 Rev #14 (a gamma spectrometry method). |
| **Guidance Documents:** | U.S. Department of Energy, *Evaluation of Radiochemical Data Usability*, es/er/ms-5, April 1997.<br><br>U.S. Department of Energy, Environmental Measurements Laboratory, *Health and Safety Laboratory (HASL)-300 Manual,* Section 4.5.2.3 (Ga-01-R: high resolution germanium detector gamma ray spectrometry), 28th Edition, February 1997. |
| **Modification:** | Data Flags and Reason Codes as specified in Appendix A of *Evaluation of Radiochemical Data Usability* (see Attachment A below) were used to qualify the data, with modification for the evaluation of laboratory duplicate (duplicate sample error ratio used instead of normalized absolute difference). |
| **Clarifications:** | Radiochemical tracers are referenced in the *Evaluation of Radiochemical Data Usability* guidance document, but are not applicable to gamma spectroscopy methods. Matrix spikes are also referenced, but were not used by GEL; data were not qualified because matrix spikes were not used. GEL did not provide calibration data. Results were not qualified, but sample results in the project database were populated with the applicable Reason Code (C03). |
| **Attachment A:** | Validation Flags and Reason Codes |
| **Attachment B:** | Validation Worksheet |

**Sample Cross Reference:**

| No. | Field Sample Identification | Date Collected | Laboratory Sample Identification |
|---|---|---|---|
| | | | |
| 1 | 101307SOMS-07-0-C(5) | 10/13/2007 | 195900001 |
| 2 | 101307SOMS3-19-0-C(5) | 10/13/2007 | 195900002 |
| 3 | 101307SOMS3-21-0-C(5) | 10/13/2007 | 195900003 |
| 4 | 101307SOMS2-29-0-C(5) | 10/13/2007 | 195900004 |
| 5 | 101307SOMS-14-0-C(5) | 10/13/2007 | 195900005 |
| 6 | 101307SOMS2-24-0-C(5) | 10/13/2007 | 195900006 |
| 7 | 101307SOMS3-23-0-C(5) | 10/13/2007 | 195900007 |
| 8 | 101307SOMS3-61-0-C(5) | 10/13/2007 | 195900010 |
| 9 | 101307SOMS3-22-0-C(5) | 10/13/2007 | 195900011 |
| 10 | 101307SOMS3-114-0-C(5) | 10/13/2007 | 195900012 |
| 11 | 101307SOMS3-101-0-C(5) | 10/13/2007 | 195900013 |
| 12 | 101307SOMS3-71-0-C(5) | 10/13/2007 | 195900014 |
| 13 | 101307SOMS-100-0-C(5) | 10/13/2007 | 195900016 |
| 14 | 101307SOMS3-25-0-C(5) | 10/13/2007 | 195900017 |
| 15 | 101307SOMS3-26-0-C(5) | 10/13/2007 | 195900018 |
| 16 | 101307SOMS3-88-0-C(5) | 10/13/2007 | 195900019 |
| 17 | 101307SOMS3-118-0-C(5) | 10/13/2007 | 195900020 |
| 18 | 101507SOMSKMBACK-6-0-C(5) | 10/15/2007 | 195900022 |
| 19 | 101207SOMS3-39-0-C(5) | 10/12/2007 | 195900023 |
| 20 | 101507SOMSKMBACK-7-0-C(5) | 10/15/2007 | 195900024 |
| 21 | 101307SOMS2-12-0-C(5) | 10/13/2007 | 195900025 |
| 22 | 101307SOMS2-7-0-C(5) | 10/13/2007 | 195900026 |
| 23 | 101307SOMS3-06-0-C(5) | 10/13/2007 | 195900027 |
| 24 | 101307SOMS3-53-0-C(5) | 10/13/2007 | 195900028 |
| 25 | 101307SOMS3-08-0-C(5) | 10/13/2007 | 195900030 |

## I. Chain-of-Custody Procedure, Sample Preservation, and Holding Time

_X__ Signatures on chain(s) and all samples accounted for
_X__ $^{226}Ra$, $^{228}Ra$, $^{137}Cs$: collected in HDPE (polyethylene) containers

A total of 25 soil samples were collected between October 12 and 15, 2007 in HDPE containers. All samples that were collected during this week were shipped in 11 coolers, and arrived at the laboratory on October 17, 2007. Sample chain-of-custody and laboratory receipt documentation appears intact. The 25 primary samples were prepared on October 23, 2007, and analyzed between November 1 and 5, 2007, 15 to 19 days into the 6-month laboratory-referenced holding time.

## II. Instrument Calibration

____ Confirm summary report includes: dates of calibration, geometry, count times for all analysis, number of counts for each standard, measured activity for all samples
____ Confirm matrix used in geometry standard
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate
____ Calibration points including efficiency, energy, and peak resolution

Initial calibration data were not assessed because none was provided in the data package.

## III. Calibration Verification

____ Tolerance chart or statistical control chart of the appropriate 20 efficiencies and 20 relevant peak energies with 3 F+/- limits
____ Resolution demonstration of relevant peak(s)
____ Listing of X/Y coordinates in constructing the control charts
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate
____ Geometries used in analysis

Calibration verification data were not assessed because none was provided in the data package.

## IV. Target Compound Identification and Quantitation

_X___ Confirm all samples less than MDC are qualified not detected (U)
_X___ Less than two times the uncertainty were reported by the laboratory as not detected (U)

All sample results that were either less than two times the uncertainty were reported by the laboratory as not detected (U), or were greater than two times the uncertainty and greater than the minimum detectable concentration (MDC), with the following exception:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result Minus 2*Uncert | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101307SOMS3-53-0-C(5) | 195900028 | $^{228}Ra$ | -0.094 | 0.704 | UJ | Q09 |

Result was flagged as not detected (UJ) at the reported concentration because it failed both the above "two times uncertainty" criterion and the blank criterion specified in Section V below.

Additionally, the laboratory qualified the following samples as footnoted:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|
| 101307SOMS-14-0-C(5) | 195900005 | $^{228}Ra$ | 0.530 UI [a] | UJ | Q02 |
| 101307SOMS3-23-0-C(5) | 195900007 | $^{228}Ra$ | 0.498 UI [a] | UJ | Q02 |
| 101307SOMS-100-0-C(5) | 195900016 | $^{228}Ra$ | 0.187 UI [b] | R | P03 |

[a] Data rejected due to low abundance.
[b] Data rejected due to high peak-width.

"Data rejected due to low abundance" is interpreted to be that there was positive interference at the target frequency that did not meet the qualitative criteria for the target isotope, so the observed result is treated as not detected (UJ). "Data rejected due to high peak-width" is interpreted to be a loss of resolution for the detected peak, so is considered rejected (R).

## V. Blanks

_X___ Method blank results < MDC

_X___ Calculate normalized absolute difference (NAD) =

$$|(\text{Sample} - \text{Blank})| / ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Blank}}]^{1/2})$$

_X___ If normalized absolute difference is > 2.58, no action necessary
_X___ If normalized absolute difference is between 1.96 and 2.58, qualify sample J
_____ If normalized absolute difference is less than 1.96, consider rejecting data

All normalized absolute differences (per above calculation) were greater than 2.58 for all sample results that were reportable (that is, reported as a detection above the MDC), with the following exceptions:

| Field Sample Identification | Laboratory Sample Identification | Parameter | NAD | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101307SOMS3-21-0-C(5) | 195900003 | $^{137}Cs$ | 2.14 | 0.129 | J | B01 |
| 101307SOMS3-71-0-C(5) | 195900014 | $^{137}Cs$ | 2.36 | 0.177 | J | B01 |
| 101307SOMS3-25-0-C(5) | 195900017 | $^{137}Cs$ | 2.35 | 0.227 | J | B01 |
| 101307SOMS3-26-0-C(5) | 195900018 | $^{137}Cs$ | 2.25 | 0.145 | J | B01 |
| 101307SOMS3-88-0-C(5) | 195900019 | $^{228}Ra$ | 2.01 | 0.928 | J | B01 |
| 101507SOMKBACK-6-0-C(5) | 195900022 | $^{137}Cs$ | 2.42 | 0.147 | J | B01 |
| 101307SOMS3-53-0-C(5) | 195900028 | $^{228}Ra$ | 1.73 | 0.704 | UJ | B01 |

## VI. Laboratory Duplicates

_X___ Must be analyzed for each batch or for every 20 samples
_X___ RPDs within the laboratory's control limits (RPD not calculated when one or both duplicate results are not detected)
_X___ Calculate the duplicate error ratio (DER)) =

$$|(\text{Sample} - \text{Duplicate})| / (2 * ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Duplicate}}]^{1/2}))$$

$$\text{DER} \leq 1.42$$

_____ If DER > 1.42, qualify sample J

The laboratory's laboratory duplicate criteria are: If duplicate activities are less than 5 times MDC, then the RPD should be less than 100%; if activities are greater than 5 times the MDC, the RPD should be less than 20%.

All RPDs and DERs associated with both laboratory duplicate pairs were within these criteria.

## VII. Laboratory Control Samples

_X___ Must be analyzed for each batch or for every 20 samples
_X___ Compare %R with lab control limits (75-125%)

All recoveries for each laboratory control samples were within control limits.

## VIII. Equipment and Water Blank Samples

A total of 17 equipment blanks and 17 water blanks were collected between October 9 and 15, 2007 for gamma spectrometry analysis, including analysis for $^{226}Ra$ and $^{137}Cs$ (see data validation report for GEL SDG 195907). All equipment blanks and water blanks were not detected for both $^{226}Ra$ and $^{137}Cs$.

## IX. Overall Assessment of Data

With the following exceptions, all quality control data associated with the field samples were within control limits. All other field results are usable as reported by the laboratory.

### Summary of Qualified Data:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/g)/Lab Flag | Data Validation Result/Flag | Reason Code |
|---|---|---|---|---|---|
| All sample results | | | | No flag | C03 |
| 101307SOMS-14-0-C(5) | 195900005 | $^{228}Ra$ | 0.530 UI | UJ | Q02 |
| 101307SOMS3-23-0-C(5) | 195900007 | $^{228}Ra$ | 0.498 UI | UJ | Q02 |
| 101307SOMS-100-0-C(5) | 195900016 | $^{228}Ra$ | 0.187 UI | R | P03 |
| 101307SOMS3-21-0-C(5) | 195900003 | $^{137}Cs$ | 0.129 | J | B01 |
| 101307SOMS3-71-0-C(5) | 195900014 | $^{137}Cs$ | 0.177 | J | B01 |
| 101307SOMS3-25-0-C(5) | 195900017 | $^{137}Cs$ | 0.227 | J | B01 |
| 101307SOMS3-26-0-C(5) | 195900018 | $^{137}Cs$ | 0.145 | J | B01 |
| 101307SOMS3-88-0-C(5) | 195900019 | $^{228}Ra$ | 0.928 | J | B01 |
| 101507SOMKBACK-6-0-C(5) | 195900022 | $^{137}Cs$ | 0.147 | J | B01 |
| 101307SOMS3-53-0-C(5) | 195900028 | $^{228}Ra$ | 0.704 | UJ | Q09,B01 |

# ATTACHMENT A
## Radiochemical Data Verification and Validation: Per Appendix A in *Evaluation of Radiochemical Data Usability, es/er/ms-5* USDOE April, 1995

| Flag | Definition |
|---|---|
| U | Nuclide considered not detected above the reported MDC or 2 times the uncertainty |
| J | Nuclide identified; the associated value is approximated |
| UJ | Nuclide not detected above the reported MDC or 2 times the uncertainty and a quality deficiency affects the data and impacts the uncertainty of the reported data |
| R | Result is not usable for its intended purpose |

| Reason Code | Definition |
|---|---|
| ***Method Blank*** | |
| B01 | Concentration of contaminant in the method blank at a level ≥ the qualification level |
| B02 | Method blank was not the same matrix as the analytical samples |
| B03 | Gross contamination exists |
| B04 | Blanks were not analyzed at the appropriate frequency |
| B05 | Sample not significantly different than radiochemical method blank |
| B06 | Blank data not reports |
| B07 | Other (describe in comments) |
| ***Calibration*** | |
| C01 | Initial calibration sequence was not followed as appropriate |
| C02 | Calibration was not performed at the appropriate frequency |
| C03 | Calibration data not reported |
| C04 | Calibration not performed |
| C05 | Chemical resolution criteria were not satisfied |
| C06 | Standard curve was established with fewer than the required number of standards |
| C07 | Instrumental system determined to be out of control |
| C08 | Other (describe in comments) |
| ***Laboratory Duplicate*** | |
| D01 | Significant difference between sample and duplicate |
| D02 | Laboratory duplicate was not analyzed at the appropriate frequency |
| D03 | Laboratory duplicate data was not reported |
| D04 | Other (describe in comments) |
| ***Evidentiary Concerns*** | |
| E01 | Custody of sample in question |
| E02 | Standard not traceable |
| E03 | Other (describe in comments) |
| ***General*** | |
| G01 | Professional judgment was used to qualify the data |
| G02 | Other (describe in comments) |
| ***Holding Times*** | |
| H01 | Holding times were exceeded |
| H02 | Holding times were grossly exceeded |
| H03 | Samples were not preserved properly |
| H04 | Other (describe in comments) |
| ***Laboratory Control Sample*** | |
| L01 | LCS recovery above upper control limit |
| L02 | LCS recovery below lower control limit |
| L03 | LCS was not analyzed at appropriate frequency |
| L04 | LCS not the same matrix as the analytical samples |

| Reason Code | Definition |
|---|---|
| L05 | LCS data not reported |
| L06 | Other (describe in comments) |
| ***Matrix Spike and MS/MSD*** | |
| M01 | MS recovery above upper control limit |
| M02 | MS recovery below lower control limit |
| M03 | MS not analyzed at the appropriate frequency |
| M04 | MS data not reported |
| M05 | Other (describe in comments) |
| ***Instrument Performance*** | |
| P01 | High background levels or a shift in the energy calibration were observed |
| P02 | Extraneous peaks were observed |
| P03 | Loss of resolution was observed |
| P04 | Peak-tailing or peak splitting that may result in inaccurate quantitation were observed |
| P05 | Instrument performance not analyzed at the appropriate frequency |
| P06 | Other (describe in comments) |
| ***Quantitation*** | |
| Q01 | Peak misidentified |
| Q02 | Target analyte affected by interfering peak |
| Q03 | Qualitative criteria were not satisfied |
| Q04 | Cross contamination occurred |
| Q05 | No raw data were provided to confirm Quantitation |
| Q06 | MDC > RDL |
| Q07 | Inappropriate aliquot sizes were used |
| Q08 | Sample result < MDC |
| Q09 | Sample result < 2s uncertainty |
| Q10 | Negative result |
| Q11 | Compounds were not adequately resolved |
| Q12 | Sample weight different from calibration geometry |
| Q13 | Sample weight greater than greatest weight on mass attenuation curve |
| Q14 | Other (describe in comments) |
| ***Radiochemical Yield*** | |
| Y01 | Radiochemical tracer yield was above the upper control limit |
| Y02 | Radiochemical tracer yield was below the lower control limit |
| Y03 | Radiochemical tracer yield was zero |
| Y04 | Radiochemical yield data was not present |
| Y05 | Other (describe in comments) |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195900**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDC | | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101307SOMS-07-0-C(5) | 195900001 | 1201446555 | SAMPLE | Cesium-137 | 0.312 | 0.069 | | 0.0703 | | 0.242 | 0.174 | 4.39 | 0.09 | | C03 |
| 101307SOMS-07-0-C(5) | 195900001 | 1201446555 | SAMPLE | Radium-226 | 1.79 | 0.240 | | 0.121 | | 1.669 | 1.310 | 7.18 | 0.16 | | C03 |
| 101307SOMS-07-0-C(5) | 195900001 | 1201446555 | SAMPLE | Radium-228 | 1.09 | 0.301 | | 0.223 | | 0.867 | 0.488 | 3.50 | 0.18 | | C03 |
| 101307SOMS3-19-0-C(5) | 195900002 | 1201446555 | SAMPLE | Cesium-137 | 0.385 | 0.0904 | | 0.0662 | | 0.319 | 0.204 | 4.18 | | | C03 |
| 101307SOMS3-19-0-C(5) | 195900002 | 1201446555 | SAMPLE | Radium-226 | 4.60 | 0.502 | | 0.146 | | 4.454 | 3.596 | 9.06 | | | C03 |
| 101307SOMS3-19-0-C(5) | 195900002 | 1201446555 | SAMPLE | Radium-228 | 1.08 | 0.372 | | 0.260 | | 0.820 | 0.336 | 2.82 | | | C03 |
| 101307SOMS3-21-0-C(5) | 195900003 | 1201446555 | SAMPLE | Cesium-137 | 0.129 | 0.0573 | | 0.0723 | | 0.057 | 0.014 | 2.14 | | J | B01,C03 |
| 101307SOMS3-21-0-C(5) | 195900003 | 1201446555 | SAMPLE | Radium-226 | 1.27 | 0.201 | | 0.125 | | 1.145 | 0.868 | 5.99 | | | C03 |
| 101307SOMS3-21-0-C(5) | 195900003 | 1201446555 | SAMPLE | Radium-228 | 1.64 | 0.344 | | 0.233 | | 1.407 | 0.952 | 4.65 | | | C03 |
| 101307SOMS2-29-0-C(5) | 195900004 | 1201446555 | SAMPLE | Cesium-137 | 0.602 | 0.106 | | 0.0799 | | 0.522 | 0.390 | 5.60 | | | C03 |
| 101307SOMS2-29-0-C(5) | 195900004 | 1201446555 | SAMPLE | Radium-226 | 1.98 | 0.276 | | 0.133 | | 1.847 | 1.428 | 6.96 | | | C03 |
| 101307SOMS2-29-0-C(5) | 195900004 | 1201446555 | SAMPLE | Radium-228 | 1.31 | 0.365 | | 0.262 | | 1.048 | 0.580 | 3.50 | | | C03 |
| 101307SOMS-14-0-C(5) | 195900005 | 1201446555 | SAMPLE | Cesium-137 | 0.314 | 0.0822 | | 0.0844 | | 0.230 | 0.150 | 3.73 | | | C03 |
| 101307SOMS-14-0-C(5) | 195900005 | 1201446555 | SAMPLE | Radium-226 | 8.82 | 0.873 | | 0.174 | | 8.646 | 7.074 | 10.05 | | | C03 |
| 101307SOMS-14-0-C(5) | 195900005 | 1201446555 | SAMPLE | Radium-228 | 0.00 | 0.372 | UI | 0.530 | | -0.530 | -0.744 | 0.04 | | UJ | Q02,C03 |
| 101307SOMS2-24-0-C(5) | 195900006 | 1201446555 | SAMPLE | Cesium-137 | 0.191 | 0.0586 | | 0.067 | | 0.124 | 0.074 | 3.12 | | | C03 |
| 101307SOMS2-24-0-C(5) | 195900006 | 1201446555 | SAMPLE | Radium-226 | 1.95 | 0.261 | | 0.128 | | 1.822 | 1.428 | 7.23 | | | C03 |
| 101307SOMS2-24-0-C(5) | 195900006 | 1201446555 | SAMPLE | Radium-228 | 1.38 | 0.304 | | 0.203 | | 1.177 | 0.772 | 4.40 | | | C03 |
| 101307SOMS3-23-0-C(5) | 195900007 | 1201446555 | SAMPLE | Cesium-137 | 0.248 | 0.0642 | | 0.058 | | 0.190 | 0.120 | 3.73 | | | C03 |
| 101307SOMS3-23-0-C(5) | 195900007 | 1201446555 | SAMPLE | Radium-226 | 1.15 | 0.237 | | 0.128 | | 1.022 | 0.676 | 4.63 | | | C03 |
| 101307SOMS3-23-0-C(5) | 195900007 | 1201446555 | SAMPLE | Radium-228 | 0.00 | 0.326 | UI | 0.498 | | -0.498 | -0.652 | 0.05 | | UJ | Q02,C03 |
| 101307SOMS3-61-0-C(5) | 195900010 | 1201446555 | SAMPLE | Cesium-137 | 0.243 | 0.0844 | | 0.0761 | | 0.167 | 0.074 | 2.81 | | | C03 |
| 101307SOMS3-61-0-C(5) | 195900010 | 1201446555 | SAMPLE | Radium-226 | 1.48 | 0.205 | | 0.124 | | 1.356 | 1.070 | 6.87 | | | C03 |
| 101307SOMS3-61-0-C(5) | 195900010 | 1201446555 | SAMPLE | Radium-228 | 1.35 | 0.334 | | 0.225 | | 1.125 | 0.682 | 3.93 | | | C03 |
| 101307SOMS3-22-0-C(5) | 195900011 | 1201446555 | SAMPLE | Cesium-137 | 0.208 | 0.0668 | | 0.0724 | | 0.136 | 0.074 | 3.01 | | | C03 |
| 101307SOMS3-22-0-C(5) | 195900011 | 1201446555 | SAMPLE | Radium-226 | 1.30 | 0.221 | | 0.125 | | 1.175 | 0.858 | 5.61 | | | C03 |
| 101307SOMS3-22-0-C(5) | 195900011 | 1201446555 | SAMPLE | Radium-228 | 1.23 | 0.342 | | 0.228 | | 1.002 | 0.546 | 3.50 | | | C03 |
| 101307SOMS3-114-0-C(5) | 195900012 | 1201446555 | SAMPLE | Cesium-137 | 0.278 | 0.0975 | | 0.0621 | | 0.216 | 0.083 | 2.80 | | | C03 |
| 101307SOMS3-114-0-C(5) | 195900012 | 1201446555 | SAMPLE | Radium-226 | 2.27 | 0.298 | | 0.143 | | 2.127 | 1.674 | 7.42 | | | C03 |
| 101307SOMS3-114-0-C(5) | 195900012 | 1201446555 | SAMPLE | Radium-228 | 1.19 | 0.375 | | 0.221 | | 0.969 | 0.440 | 3.09 | | | C03 |
| 101307SOMS3-101-0-C(5) | 195900013 | 1201446555 | SAMPLE | Cesium-137 | 4.90 | 0.358 | | 0.0883 | | 4.812 | 4.184 | 13.67 | | | C03 |
| 101307SOMS3-101-0-C(5) | 195900013 | 1201446555 | SAMPLE | Radium-226 | 3.13 | 0.354 | | 0.140 | | 2.990 | 2.422 | 8.67 | | | C03 |
| 101307SOMS3-101-0-C(5) | 195900013 | 1201446555 | SAMPLE | Radium-228 | 0.282 | 0.216 | U | 0.322 | | -0.040 | -0.150 | 1.19 | | | C03 |
| 101307SOMS3-71-0-C(5) | 195900014 | 1201446555 | SAMPLE | Cesium-137 | 0.177 | 0.0727 | | 0.059 | | 0.118 | 0.032 | 2.36 | | J | B01,C03 |
| 101307SOMS3-71-0-C(5) | 195900014 | 1201446555 | SAMPLE | Radium-226 | 2.16 | 0.270 | | 0.117 | | 2.043 | 1.620 | 7.76 | | | C03 |
| 101307SOMS3-71-0-C(5) | 195900014 | 1201446555 | SAMPLE | Radium-228 | 1.16 | 0.310 | | 0.227 | | 0.933 | 0.540 | 3.62 | | | C03 |
| 101307SOMS-100-0-C(5) | 195900016 | 1201446555 | SAMPLE | Cesium-137 | 2.12 | 0.191 | | 0.0471 | | 2.073 | 1.738 | 11.05 | | | C03 |
| 101307SOMS-100-0-C(5) | 195900016 | 1201446555 | SAMPLE | Radium-226 | 2.43 | 0.286 | | 0.106 | | 2.324 | 1.858 | 8.27 | | | C03 |
| 101307SOMS-100-0-C(5) | 195900016 | 1201446555 | SAMPLE | Radium-228 | 0.00 | 0.309 | UI | 0.187 | | -0.187 | -0.618 | 0.05 | | R | P03,C03 |
| 101307SOMS3-25-0-C(5) | 195900017 | 1201446555 | SAMPLE | Cesium-137 | 0.227 | 0.0944 | | 0.0831 | | 0.144 | 0.038 | 2.35 | | J | B01,C03 |
| 101307SOMS3-25-0-C(5) | 195900017 | 1201446555 | SAMPLE | Radium-226 | 1.54 | 0.227 | | 0.149 | | 1.391 | 1.086 | 6.50 | | | C03 |
| 101307SOMS3-25-0-C(5) | 195900017 | 1201446555 | SAMPLE | Radium-228 | 1.31 | 0.350 | | 0.260 | | 1.050 | 0.610 | 3.64 | | | C03 |
| 101307SOMS3-26-0-C(5) | 195900018 | 1201446555 | SAMPLE | Cesium-137 | 0.145 | 0.0617 | | 0.0813 | | 0.064 | 0.022 | 2.25 | | J | B01,C03 |
| 101307SOMS3-26-0-C(5) | 195900018 | 1201446555 | SAMPLE | Radium-226 | 1.19 | 0.219 | | 0.134 | | 1.056 | 0.752 | 5.17 | | | C03 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195900**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDC | | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101307SOMS3-26-0-C(5) | 195900018 | 1201446555 | SAMPLE | Radium-228 | 1.08 | 0.370 | | 0.291 | | 0.789 | 0.340 | 2.84 | | | C03 |
| 101307SOMS3-88-0-C(5) | 195900019 | 1201446555 | SAMPLE | Cesium-137 | 0.0433 | 0.095 | U | 0.146 | | -0.103 | -0.147 | 0.43 | | | C03 |
| 101307SOMS3-88-0-C(5) | 195900019 | 1201446555 | SAMPLE | Radium-226 | 13.9 | 1.36 | | 0.218 | | 13.682 | 11.180 | 10.19 | | | C03 |
| 101307SOMS3-88-0-C(5) | 195900019 | 1201446555 | SAMPLE | Radium-228 | 0.928 | 0.451 | | 0.507 | | 0.421 | 0.026 | 2.01 | | J | B01,C03 |
| 101307SOMS3-118-0-C(5) | 195900020 | 1201446555 | SAMPLE | Cesium-137 | 0.342 | 0.111 | | 0.079 | | 0.263 | 0.120 | 3.04 | | | C03 |
| 101307SOMS3-118-0-C(5) | 195900020 | 1201446555 | SAMPLE | Radium-226 | 2.10 | 0.276 | | 0.150 | | 1.950 | 1.548 | 7.38 | | | C03 |
| 101307SOMS3-118-0-C(5) | 195900020 | 1201446555 | SAMPLE | Radium-228 | 1.27 | 0.315 | | 0.293 | | 0.977 | 0.640 | 3.91 | | | C03 |
| 101507SOMKMBACK-6-0-C(5) | 195900022 | 1201446555 | SAMPLE | Cesium-137 | 0.147 | 0.058 | | 0.0627 | | 0.084 | 0.031 | 2.42 | | J | B01,C03 |
| 101507SOMKMBACK-6-0-C(5) | 195900022 | 1201446555 | SAMPLE | Radium-226 | 0.919 | 0.190 | | 0.122 | | 0.797 | 0.539 | 4.53 | | | C03 |
| 101507SOMKMBACK-6-0-C(5) | 195900022 | 1201446555 | SAMPLE | Radium-228 | 1.29 | 0.329 | | 0.236 | | 1.054 | 0.632 | 3.81 | | | C03 |
| 101207SOMS3-39-0-C(5) | 195900023 | 1201446555 | SAMPLE | Cesium-137 | 0.244 | 0.0701 | | 0.0864 | | 0.158 | 0.104 | 3.37 | | | C03 |
| 101207SOMS3-39-0-C(5) | 195900023 | 1201446555 | SAMPLE | Radium-226 | 1.14 | 0.192 | | 0.129 | | 1.011 | 0.756 | 5.60 | | | C03 |
| 101207SOMS3-39-0-C(5) | 195900023 | 1201446555 | SAMPLE | Radium-228 | 1.30 | 0.349 | | 0.271 | | 1.029 | 0.602 | 3.63 | | | C03 |
| 101507SOMKMBACK-7-0-C(5) | 195900024 | 1201446555 | SAMPLE | Cesium-137 | 0.320 | 0.072 | | 0.0624 | | 0.258 | 0.176 | 4.32 | | | C03 |
| 101507SOMKMBACK-7-0-C(5) | 195900024 | 1201446555 | SAMPLE | Radium-226 | 1.02 | 0.172 | | 0.0977 | | 0.922 | 0.676 | 5.53 | | | C03 |
| 101507SOMKMBACK-7-0-C(5) | 195900024 | 1201446555 | SAMPLE | Radium-228 | 1.21 | 0.290 | | 0.209 | | 1.001 | 0.630 | 4.03 | | | C03 |
| 101307SOMS2-12-0-C(5) | 195900025 | 1201446572 | SAMPLE | Cesium-137 | 0.559 | 0.0973 | | 0.0734 | | 0.486 | 0.364 | 5.40 | | | C03 |
| 101307SOMS2-12-0-C(5) | 195900025 | 1201446572 | SAMPLE | Radium-226 | 1.90 | 0.277 | | 0.157 | | 1.743 | 1.346 | 6.73 | | | C03 |
| 101307SOMS2-12-0-C(5) | 195900025 | 1201446572 | SAMPLE | Radium-228 | 1.39 | 0.369 | | 0.269 | | 1.121 | 0.652 | 3.69 | | | C03 |
| 101307SOMS2-7-0-C(5) | 195900026 | 1201446572 | SAMPLE | Cesium-137 | 0.272 | 0.079 | | 0.083 | | 0.189 | 0.114 | 3.10 | | | C03 |
| 101307SOMS2-7-0-C(5) | 195900026 | 1201446572 | SAMPLE | Radium-226 | 2.56 | 0.329 | | 0.148 | | 2.412 | 1.902 | 7.68 | | | C03 |
| 101307SOMS2-7-0-C(5) | 195900026 | 1201446572 | SAMPLE | Radium-228 | 1.17 | 0.337 | | 0.319 | | 0.851 | 0.496 | 3.39 | | | C03 |
| 101307SOMS3-06-0-C(5) | 195900027 | 1201446572 | SAMPLE | Cesium-137 | 0.317 | 0.0534 | | 0.0437 | | 0.273 | 0.210 | 5.02 | | | C03 |
| 101307SOMS3-06-0-C(5) | 195900027 | 1201446572 | SAMPLE | Radium-226 | 2.42 | 0.269 | | 0.0918 | | 2.328 | 1.882 | 8.84 | | | C03 |
| 101307SOMS3-06-0-C(5) | 195900027 | 1201446572 | SAMPLE | Radium-228 | 1.24 | 0.267 | | 0.178 | | 1.062 | 0.706 | 4.47 | | | C03 |
| 101307SOMS3-53-0-C(5) | 195900028 | 1201446572 | SAMPLE | Cesium-137 | 0.448 | 0.0952 | | 0.0932 | | 0.355 | 0.258 | 4.39 | | | C03 |
| 101307SOMS3-53-0-C(5) | 195900028 | 1201446572 | SAMPLE | Radium-226 | 1.95 | 0.272 | | 0.143 | | 1.807 | 1.406 | 7.04 | | | C03 |
| 101307SOMS3-53-0-C(5) | 195900028 | 1201446572 | SAMPLE | Radium-228 | 0.704 | 0.399 | | 0.249 | | 0.455 | -0.094 | 1.73 | | UJ | Q09,B01,C03 |
| 101307SOMS3-08-0-C(5) | 195900030 | 1201446572 | SAMPLE | Cesium-137 | 0.334 | 0.0779 | | 0.0875 | | 0.247 | 0.178 | 3.89 | | | C03 |
| 101307SOMS3-08-0-C(5) | 195900030 | 1201446572 | SAMPLE | Radium-226 | 2.65 | 0.297 | | 0.133 | | 2.517 | 2.056 | 8.79 | | | C03 |
| 101307SOMS3-08-0-C(5) | 195900030 | 1201446572 | SAMPLE | Radium-228 | 1.16 | 0.331 | | 0.234 | | 0.926 | 0.498 | 3.42 | | | C03 |
| MB | 1201446555 | 1201446555 | MB | Cesium-137 | 0.00177 | 0.0155 | U | 0.0267 | | | | | | | |
| MB | 1201446555 | 1201446555 | MB | Radium-226 | 0.0279 | 0.0509 | U | 0.070 | | | | | | | |
| MB | 1201446555 | 1201446555 | MB | Radium-228 | 0.0153 | 0.0614 | U | 0.100 | | | | | | | |
| 101307SOMS-07-0-C(5) | 1201446556 | 1201446555 | DUP | Cesium-137 | 0.293 | 0.0812 | | 0.0798 | | | | | | | |
| 101307SOMS-07-0-C(5) | 1201446556 | 1201446555 | DUP | Radium-226 | 1.91 | 0.277 | | 0.140 | | | | | | | |
| 101307SOMS-07-0-C(5) | 1201446556 | 1201446555 | DUP | Radium-228 | 1.26 | 0.354 | | 0.280 | | | | | | | |
| MB | 1201446572 | 1201446572 | MB | Cesium-137 | 0.0101 | 0.0297 | U | 0.029 | | | | | | | |
| MB | 1201446572 | 1201446572 | MB | Radium-226 | 0.0152 | 0.0403 | U | 0.0733 | | | | | | | |
| MB | 1201446572 | 1201446572 | MB | Radium-228 | -0.000673 | 0.0763 | U | 0.126 | | | | | | | |
| 101207SOMS2-26-0-C(5) | 1201446573 | 1201446572 | DUP | Cesium-137 | 1.12 | 0.142 | | 0.0851 | | | | | | | |
| 101207SOMS2-26-0-C(5) | 1201446573 | 1201446572 | DUP | Radium-226 | 1.98 | 0.259 | | 0.142 | | | | | | | |
| 101207SOMS2-26-0-C(5) | 1201446573 | 1201446572 | DUP | Radium-228 | 1.49 | 0.348 | | 0.235 | | | | | | | |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195900**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDC | | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101207SOMS2-26-0-C(5) | 195902001 | 1201446572 | SAMPLE | Cesium-137 | 1.24 | 0.164 | | 0.0794 | | | | | 0.28 | | |
| 101207SOMS2-26-0-C(5) | 195902001 | 1201446572 | SAMPLE | Radium-226 | 1.86 | 0.260 | | 0.145 | | | | | 0.16 | | |
| 101207SOMS2-26-0-C(5) | 195902001 | 1201446572 | SAMPLE | Radium-228 | 0.973 | 0.362 | | 0.281 | | | | | 0.51 | | |

| | |
|---|---|
| **MWH Client:** | Monsanto Company |
| **MWH Project Name:** | CERCLA 2nd 5-Year Review |
| **MWH Project Number:** | 1010076.011701 |
| **Laboratory:** | GEL Laboratories, LLC (Charleston, SC) |
| **Data packages:** | Sample Delivery Group (SDG) Number 195902 |
| **Analytical Batches:** | 695967 and 695969 |
| **Method:** | Gamma Radium (Ra) 226 ($^{226}Ra$), $^{228}Ra$, and $^{137}Cs$ by EML HASL 300, 4.5.2.3 and per the laboratory's SOP GL-RAD-A-013 Rev #14 (a gamma spectrometry method) |
| **Guidance Documents:** | U.S. Department of Energy, *Evaluation of Radiochemical Data Usability*, es/er/ms-5, April 1997.<br><br>U.S. Department of Energy, Environmental Measurements Laboratory, *Health and Safety Laboratory (HASL)-300 Manual,* Section 4.5.2.3 (Ga-01-R: high resolution germanium detector gamma ray spectrometry), 28th Edition, February 1997. |
| **Modification:** | Data Flags and Reason Codes as specified in Appendix A of *Evaluation of Radiochemical Data Usability* (see Attachment A below) were used to qualify the data, with modification for the evaluation of laboratory duplicate (duplicate sample error ratio used instead of normalized absolute difference). |
| **Clarifications:** | Radiochemical tracers are referenced in the *Evaluation of Radiochemical Data Usability* guidance document, but are not applicable to gamma spectroscopy methods. Matrix spikes are also referenced, but were not used by GEL; data were not qualified because matrix spikes were not used. GEL did not provide calibration data. Results were not qualified, but sample results in the project database were populated with the applicable Reason Code (C03). |
| **Attachment A:** | Validation Flags and Reason Codes |
| **Attachment B:** | Validation Worksheet |

**Sample Cross Reference:**

| No. | Field Sample Identification | Date Collected | Laboratory Sample Identification |
|---|---|---|---|
| | | | |
| 1 | 101207SOMS2-26-0-C(5) | 10/12/07 | 195902001 |
| 2 | 101207SOMS3-46-0-C(5) | 10/12/07 | 195902003 |
| 3 | 101207SOMS3-32-0-C(5) | 10/12/07 | 195902005 |
| 4 | 101207SOMS3-93-0-C(5) | 10/12/07 | 195902006 |
| 5 | 101207SOMS3-90-0-C(5) | 10/12/07 | 195902007 |
| 6 | 101207SOMS3-49-0-C(5) | 10/12/07 | 195902008 |
| 7 | 101207SOMS3-48-0-C(5) | 10/12/07 | 195902009 |
| 8 | 101207SOMS3-41-0-C(5) | 10/12/07 | 195902010 |
| 9 | 101207SOMS3-34-0-C(5) | 10/12/07 | 195902011 |
| 10 | 101207SOMS2-34-0-C(5) | 10/12/07 | 195902012 |
| 11 | 101207SOMSC-2-0-C(5) | 10/12/07 | 195902013 |
| 12 | 101207SOMS3-17-0-C(5) | 10/12/07 | 195902014 |
| 13 | 101207SOMS3-98-0-C(5) | 10/12/07 | 195902015 |
| 14 | 101207SOMS2-25-0-C(5) | 10/12/07 | 195902016 |
| 15 | 101207SOML1-05-0-C(5) | 10/12/07 | 195902017 |
| 16 | 101207SOMS3-44-0-C(5) | 10/12/07 | 195902018 |
| 17 | 101207SOMS3-43-0-C(5) | 10/12/07 | 195902019 |
| 18 | 101207SOMS3-42-0-C(5) | 10/12/07 | 195902020 |
| 19 | 101007SOMB-2-0-C(5) | 10/10/07 | 195902021 |
| 20 | 101007SOMS3-81-0-C(5) | 10/10/07 | 195902022 |
| 21 | 101007SOMS3-80-0-C(5) | 10/10/07 | 195902023 |
| 22 | 101007SOMB-1-0-C(5) | 10/10/07 | 195902024 |
| 23 | 101007SOMS2-17-0-C(5) | 10/10/07 | 195902025 |
| 24 | 101007SOMS3-115-0-C(5) | 10/10/07 | 195902026 |
| 25 | 101007SOMS2-02-0-C(5) | 10/10/07 | 195902027 |
| 26 | 101007SOMS3-105-0-C(5) | 10/10/07 | 195902028 |
| 27 | 101007SOMC-1-0-C(5) | 10/10/07 | 195902030 |

## I. Chain-of-Custody Procedure, Sample Preservation, and Holding Time

_X__ Signatures on chain(s) and all samples accounted for
_X__ $^{226}Ra$, $^{228}Ra$, $^{137}Cs$: collected in HDPE (polyethylene) containers

A total of 27 sediment samples were collected on October 10 and 12, 2007 in HDPE containers. All samples collected during this week were shipped in 11 coolers, and arrived at the laboratory on October 17, 2007. Sample chain-of-custody and laboratory receipt documentation appears intact. The 27 primary samples were analyzed on November 2 and 6, 2007, 23 to 25 days into the 6-month laboratory-referenced holding time.

## II. Instrument Calibration

____ Confirm summary report includes: dates of calibration, geometry, count times for all analysis, number of counts for each standard, measured activity for all samples
____ Confirm matrix used in geometry standard
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate

____ Calibration points including efficiency, energy, and peak resolution

Initial calibration data were not assessed because none was provided in the data package.

## III. Calibration Verification

____ Tolerance chart or statistical control chart of the appropriate 20 efficiencies and 20 relevant peak energies with 3 F+/- limits
____ Resolution demonstration of relevant peak(s)
____ Listing of X/Y coordinates in constructing the control charts
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate
____ Geometries used in analysis

Calibration verification data were not assessed because none was provided in the data package.

## IV. Target Compound Identification and Quantitation

_X___ Confirm all samples less than MDC are qualified not detected (U)
_X___ Less than two times the uncertainty were reported by the laboratory as not detected (U)

All sample results that were either less than two times the uncertainty were reported by the laboratory as not detected (U), or were greater than two times the uncertainty and greater than the minimum detectable concentration (MDC), with the following exception:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result Minus 2*Uncert | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101007SOMS3-81-0-C(5) | 195902022 | $^{228}Ra$ | -0.027 | 0.371 | J | Q09 |

Additionally, the laboratory qualified the following sample as footnoted:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|
| 101207SOMS3-34-0-C(5) | 195902011 | $^{137}Cs$ | 0.00 UI[a] | 0.00 U | Q02 |

[a] Data rejected due to no valid peak.

"Data rejected due to no valid peak" is interpreted to be that there was positive interference at the target frequency that did not meet the qualitative criteria for the target isotope, so the observed result is treated as not detected (UJ).

## V. Blanks

_X___ Method blank results < MDC
_X___ Calculate normalized absolute difference (NAD) =

$$|(\text{Sample} - \text{Blank})| / ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Blank}}]^{1/2})$$

_X___ If normalized absolute difference is > 2.58, no action necessary
_X___ If normalized absolute difference is between 1.96 and 2.58, qualify sample J
_____ If normalized absolute difference is less than 1.96, consider rejecting data

All normalized absolute differences (per above calculation) were greater than 2.58 for all sample results that were reportable (that is, reported as a detection above the MDC), with the following exceptions:

| Field Sample Identification | Laboratory Sample Identification | Parameter | NAD | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101207SOMS3-90-0-C(5) | 195902007 | $^{137}Cs$ | 2.51 | 0.233 | J | B01 |
| 101207SOMS3-49-0-C(5) | 195902008 | $^{228}Ra$ | 2.41 | 0.882 | J | B01 |
| 101207SOMS3-41-0-C(5) | 195902010 | $^{137}Cs$ | 2.04 | 0.0945 | J | B01 |
| 101207SOMSC-2-0-C(5) | 195902013 | $^{228}Ra$ | 2.57 | 1.20 | J | B01 |
| 101207SOMS3-17-0-C(5) | 195902014 | $^{137}Cs$ | 1.90 | 0.139 | J | B01 |
| 101007SOMB-2-0-C(5) | 195902021 | $^{228}Ra$ | 2.39 | 0.900 | J | B01 |
| 101007SOMS3-81-0-C(5) | 195902022 | $^{228}Ra$ | 2.00 | 0.371 | J | B01 |

## VI. Laboratory Duplicates

_X___ Must be analyzed for each batch or for every 20 samples
_X___ RPDs within the laboratory's control limits
_X___ Calculate the duplicate error ratio (DER)) =

$$|(\text{Sample} - \text{Duplicate})| / (2 * ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Duplicate}}]^{1/2}))$$

$$\text{DER} \leq 1.42$$

_____ If DER > 1.42, qualify sample J

The laboratory's laboratory duplicate criteria are: If duplicate activities are less than 5 times MDC, then the RPD should be less than 100%; if activities are greater than 5 times the MDC, the RPD should be less than 20%.

With the following exception, all RPDs and DERs associated with both laboratory duplicate pairs were within these criteria:

| Field Sample Identification | Laboratory Sample Identification | Parameter | RPD | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 100907SOMS3-67-0-C(5) | 195905001 | $^{137}Cs$ | 26 | 1.04 | None | None |

Although the RPD of 26 for this duplicate pair was greater than the control limit of 20, the DER of 0.61 was within control. The variance does not constitute a significant difference, so neither the primary sample results nor associated samples results were qualified.

## VII. Laboratory Control Samples

_X___ Must be analyzed for each batch or for every 20 samples
_X___ Compare %R with lab control limits (75-125%)

All recoveries for each laboratory control samples were within control limits.

## VIII. Equipment and Water Blank Samples

A total of 17 equipment blanks and 17 water blanks were collected between October 9 and 15, 2007 for gamma spectrometry analysis, including analysis for $^{226}Ra$ and $^{137}Cs$ (see data validation report for GEL SDG 195907). All equipment blanks and water blanks were not detected for both $^{226}Ra$ and $^{137}Cs$.

## IX. Overall Assessment of Data

With the following exceptions, all quality control data associated with the field samples were within control limits. All other field results are usable as reported by the laboratory.

### Summary of Qualified Data:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/g)/Lab Flag | Data Validation Result/Flag | Reason Code |
|---|---|---|---|---|---|
| All sample results | | | | No flag | C03 |
| 101207SOMS3-34-0-C(5) | 195902011 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |
| 101207SOMS3-90-0-C(5) | 195902007 | $^{137}Cs$ | 0.233 | J | B01 |
| 101207SOMS3-49-0-C(5) | 195902008 | $^{228}Ra$ | 0.882 | J | B01 |
| 101207SOMS3-41-0-C(5) | 195902010 | $^{137}Cs$ | 0.0945 | J | B01 |
| 101207SOMSC-2-0-C(5) | 195902013 | $^{228}Ra$ | 1.20 | J | B01 |
| 101207SOMS3-17-0-C(5) | 195902014 | $^{137}Cs$ | 0.139 | J | B01 |
| 101007SOMB-2-0-C(5) | 195902021 | $^{228}Ra$ | 0.900 | J | B01 |
| 101007SOMS3-81-0-C(5) | 195902022 | $^{228}Ra$ | 0.371 | J | Q09,B01 |

# ATTACHMENT A
## Radiochemical Data Verification and Validation: Per Appendix A in *Evaluation of Radiochemical Data Usability, es/er/ms-5* USDOE April, 1995

| Flag | Definition |
|---|---|
| U | Nuclide considered not detected above the reported MDC or 2 times the uncertainty |
| J | Nuclide identified; the associated value is approximated |
| UJ | Nuclide not detected above the reported MDC or 2 times the uncertainty and a quality deficiency affects the data and impacts the uncertainty of the reported data |
| R | Result is not usable for its intended purpose |

| Reason Code | Definition |
|---|---|
| ***Method Blank*** | |
| B01 | Concentration of contaminant in the method blank at a level ≥ the qualification level |
| B02 | Method blank was not the same matrix as the analytical samples |
| B03 | Gross contamination exists |
| B04 | Blanks were not analyzed at the appropriate frequency |
| B05 | Sample not significantly different than radiochemical method blank |
| B06 | Blank data not reports |
| B07 | Other (describe in comments) |
| ***Calibration*** | |
| C01 | Initial calibration sequence was not followed as appropriate |
| C02 | Calibration was not performed at the appropriate frequency |
| C03 | Calibration data not reported |
| C04 | Calibration not performed |
| C05 | Chemical resolution criteria were not satisfied |
| C06 | Standard curve was established with fewer than the required number of standards |
| C07 | Instrumental system determined to be out of control |
| C08 | Other (describe in comments) |
| ***Laboratory Duplicate*** | |
| D01 | Significant difference between sample and duplicate |
| D02 | Laboratory duplicate was not analyzed at the appropriate frequency |
| D03 | Laboratory duplicate data was not reported |
| D04 | Other (describe in comments) |
| ***Evidentiary Concerns*** | |
| E01 | Custody of sample in question |
| E02 | Standard not traceable |
| E03 | Other (describe in comments) |
| ***General*** | |
| G01 | Professional judgment was used to qualify the data |
| G02 | Other (describe in comments) |
| ***Holding Times*** | |
| H01 | Holding times were exceeded |
| H02 | Holding times were grossly exceeded |
| H03 | Samples were not preserved properly |
| H04 | Other (describe in comments) |
| ***Laboratory Control Sample*** | |
| L01 | LCS recovery above upper control limit |
| L02 | LCS recovery below lower control limit |
| L03 | LCS was not analyzed at appropriate frequency |
| L04 | LCS not the same matrix as the analytical samples |

| Reason Code | Definition |
|---|---|
| L05 | LCS data not reported |
| L06 | Other (describe in comments) |
| ***Matrix Spike and MS/MSD*** | |
| M01 | MS recovery above upper control limit |
| M02 | MS recovery below lower control limit |
| M03 | MS not analyzed at the appropriate frequency |
| M04 | MS data not reported |
| M05 | Other (describe in comments) |
| ***Instrument Performance*** | |
| P01 | High background levels or a shift in the energy calibration were observed |
| P02 | Extraneous peaks were observed |
| P03 | Loss of resolution was observed |
| P04 | Peak-tailing or peak splitting that may result in inaccurate quantitation were observed |
| P05 | Instrument performance not analyzed at the appropriate frequency |
| P06 | Other (describe in comments) |
| ***Quantitation*** | |
| Q01 | Peak misidentified |
| Q02 | Target analyte affected by interfering peak |
| Q03 | Qualitative criteria were not satisfied |
| Q04 | Cross contamination occurred |
| Q05 | No raw data were provided to confirm Quantitation |
| Q06 | MDC > RDL |
| Q07 | Inappropriate aliquot sizes were used |
| Q08 | Sample result < MDC |
| Q09 | Sample result < 2s uncertainty |
| Q10 | Negative result |
| Q11 | Compounds were not adequately resolved |
| Q12 | Sample weight different from calibration geometry |
| Q13 | Sample weight greater than greatest weight on mass attenuation curve |
| Q14 | Other (describe in comments) |
| ***Radiochemical Yield*** | |
| Y01 | Radiochemical tracer yield was above the upper control limit |
| Y02 | Radiochemical tracer yield was below the lower control limit |
| Y03 | Radiochemical tracer yield was zero |
| Y04 | Radiochemical yield data was not present |
| Y05 | Other (describe in comments) |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195902**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDC | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101207SOMS2-26-0-C(5) | 195902001 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 1.24 | 0.164 | | 0.0794 | 1.161 | 0.912 | 7.38 | 0.28 | | C03 |
| 101207SOMS2-26-0-C(5) | 195902001 | 695967 | 1201446572 | SAMPLE | Radium-226 | 1.86 | 0.260 | | 0.145 | 1.715 | 1.340 | 7.01 | 0.16 | | C03 |
| 101207SOMS2-26-0-C(5) | 195902001 | 695967 | 1201446572 | SAMPLE | Radium-228 | 0.973 | 0.362 | | 0.281 | 0.692 | 0.249 | 2.63 | 0.51 | | C03 |
| 101207SOMS3-46-0-C(5) | 195902003 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.349 | 0.0611 | | 0.0522 | 0.297 | 0.227 | 4.99 | | | C03 |
| 101207SOMS3-46-0-C(5) | 195902003 | 695967 | 1201446572 | SAMPLE | Radium-226 | 2.16 | 0.263 | | 0.100 | 2.060 | 1.634 | 8.06 | | | C03 |
| 101207SOMS3-46-0-C(5) | 195902003 | 695967 | 1201446572 | SAMPLE | Radium-228 | 1.02 | 0.269 | | 0.185 | 0.835 | 0.482 | 3.65 | | | C03 |
| 101207SOMS3-32-0-C(5) | 195902005 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.0133 | 0.0306 | U | 0.0478 | -0.035 | -0.048 | 0.08 | | | C03 |
| 101207SOMS3-32-0-C(5) | 195902005 | 695967 | 1201446572 | SAMPLE | Radium-226 | 1.44 | 0.177 | | 0.0777 | 1.362 | 1.086 | 7.85 | | | C03 |
| 101207SOMS3-32-0-C(5) | 195902005 | 695967 | 1201446572 | SAMPLE | Radium-228 | 0.586 | 0.193 | | 0.144 | 0.442 | 0.200 | 2.83 | | | C03 |
| 101207SOMS3-93-0-C(5) | 195902006 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.351 | 0.0838 | | 0.0871 | 0.264 | 0.183 | 3.83 | | | C03 |
| 101207SOMS3-93-0-C(5) | 195902006 | 695967 | 1201446572 | SAMPLE | Radium-226 | 1.41 | 0.212 | | 0.131 | 1.279 | 0.986 | 6.46 | | | C03 |
| 101207SOMS3-93-0-C(5) | 195902006 | 695967 | 1201446572 | SAMPLE | Radium-228 | 1.68 | 0.368 | | 0.227 | 1.453 | 0.944 | 4.47 | | | C03 |
| 101207SOMS3-90-0-C(5) | 195902007 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.233 | 0.0837 | | 0.0845 | 0.149 | 0.066 | 2.51 | | J | B01,C03 |
| 101207SOMS3-90-0-C(5) | 195902007 | 695967 | 1201446572 | SAMPLE | Radium-226 | 1.35 | 0.237 | | 0.129 | 1.221 | 0.876 | 5.55 | | | C03 |
| 101207SOMS3-90-0-C(5) | 195902007 | 695967 | 1201446572 | SAMPLE | Radium-228 | 1.23 | 0.314 | | 0.281 | 0.949 | 0.602 | 3.81 | | | C03 |
| 101207SOMS3-49-0-C(5) | 195902008 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.383 | 0.107 | | 0.0615 | 0.322 | 0.169 | 3.36 | | | C03 |
| 101207SOMS3-49-0-C(5) | 195902008 | 695967 | 1201446572 | SAMPLE | Radium-226 | 1.26 | 0.182 | | 0.106 | 1.154 | 0.896 | 6.68 | | | C03 |
| 101207SOMS3-49-0-C(5) | 195902008 | 695967 | 1201446572 | SAMPLE | Radium-228 | 0.882 | 0.358 | | 0.205 | 0.677 | 0.166 | 2.41 | | J | B01,C03 |
| 101207SOMS3-48-0-C(5) | 195902009 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.470 | 0.131 | | 0.0928 | 0.377 | 0.208 | 3.42 | | | C03 |
| 101207SOMS3-48-0-C(5) | 195902009 | 695967 | 1201446572 | SAMPLE | Radium-226 | 0.788 | 0.190 | | 0.145 | 0.643 | 0.408 | 3.98 | | | C03 |
| 101207SOMS3-48-0-C(5) | 195902009 | 695967 | 1201446572 | SAMPLE | Radium-228 | 1.02 | 0.350 | | 0.321 | 0.699 | 0.320 | 2.85 | | | C03 |
| 101207SOMS3-41-0-C(5) | 195902010 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.0945 | 0.0288 | | 0.0408 | 0.054 | 0.037 | 2.04 | | J | B01,C03 |
| 101207SOMS3-41-0-C(5) | 195902010 | 695967 | 1201446572 | SAMPLE | Radium-226 | 1.16 | 0.169 | | 0.0823 | 1.078 | 0.822 | 6.59 | | | C03 |
| 101207SOMS3-41-0-C(5) | 195902010 | 695967 | 1201446572 | SAMPLE | Radium-228 | 1.15 | 0.238 | | 0.166 | 0.984 | 0.674 | 4.60 | | | C03 |
| 101207SOMS3-34-0-C(5) | 195902011 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.00 | 0.044 | UI | 0.0486 | -0.049 | -0.088 | 0.19 | | UJ | Q02,C03 |
| 101207SOMS3-34-0-C(5) | 195902011 | 695967 | 1201446572 | SAMPLE | Radium-226 | 0.972 | 0.157 | | 0.0843 | 0.888 | 0.658 | 5.90 | | | C03 |
| 101207SOMS3-34-0-C(5) | 195902011 | 695967 | 1201446572 | SAMPLE | Radium-228 | 0.952 | 0.246 | | 0.153 | 0.799 | 0.460 | 3.70 | | | C03 |
| 101207SOMS2-34-0-C(5) | 195902012 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 2.37 | 0.217 | | 0.0722 | 2.298 | 1.936 | 10.77 | | | C03 |
| 101207SOMS2-34-0-C(5) | 195902012 | 695967 | 1201446572 | SAMPLE | Radium-226 | 1.93 | 0.248 | | 0.123 | 1.807 | 1.434 | 7.62 | | | C03 |
| 101207SOMS2-34-0-C(5) | 195902012 | 695967 | 1201446572 | SAMPLE | Radium-228 | 1.40 | 0.329 | | 0.202 | 1.198 | 0.742 | 4.15 | | | C03 |
| 101207SOMSC-2-0-C(5) | 195902013 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.311 | 0.0983 | | 0.0963 | 0.215 | 0.114 | 2.93 | | | C03 |
| 101207SOMSC-2-0-C(5) | 195902013 | 695967 | 1201446572 | SAMPLE | Radium-226 | 0.986 | 0.242 | | 0.150 | 0.836 | 0.502 | 3.96 | | | C03 |
| 101207SOMSC-2-0-C(5) | 195902013 | 695967 | 1201446572 | SAMPLE | Radium-228 | 1.20 | 0.460 | | 0.286 | 0.914 | 0.280 | 2.57 | | J | B01,C03 |
| 101207SOMS3-17-0-C(5) | 195902014 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.139 | 0.0608 | | 0.0711 | 0.068 | 0.017 | 1.90 | | J | B01,C03 |
| 101207SOMS3-17-0-C(5) | 195902014 | 695967 | 1201446572 | SAMPLE | Radium-226 | 2.35 | 0.276 | | 0.129 | 2.221 | 1.798 | 8.37 | | | C03 |
| 101207SOMS3-17-0-C(5) | 195902014 | 695967 | 1201446572 | SAMPLE | Radium-228 | 0.982 | 0.320 | | 0.247 | 0.735 | 0.342 | 2.99 | | | C03 |
| 101207SOMS3-98-0-C(5) | 195902015 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.434 | 0.102 | | 0.090 | 0.344 | 0.230 | 3.99 | | | C03 |
| 101207SOMS3-98-0-C(5) | 195902015 | 695967 | 1201446572 | SAMPLE | Radium-226 | 1.26 | 0.252 | | 0.168 | 1.092 | 0.756 | 4.88 | | | C03 |
| 101207SOMS3-98-0-C(5) | 195902015 | 695967 | 1201446572 | SAMPLE | Radium-228 | 1.50 | 0.401 | | 0.264 | 1.236 | 0.698 | 3.68 | | | C03 |
| 101207SOMS2-25-0-C(5) | 195902016 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.213 | 0.053 | | 0.0537 | 0.159 | 0.107 | 3.34 | | | C03 |
| 101207SOMS2-25-0-C(5) | 195902016 | 695967 | 1201446572 | SAMPLE | Radium-226 | 1.33 | 0.195 | | 0.0954 | 1.235 | 0.940 | 6.60 | | | C03 |
| 101207SOMS2-25-0-C(5) | 195902016 | 695967 | 1201446572 | SAMPLE | Radium-228 | 1.25 | 0.265 | | 0.203 | 1.047 | 0.720 | 4.54 | | | C03 |
| 101207SOML1-05-0-C(5) | 195902017 | 695967 | 1201446572 | SAMPLE | Cesium-137 | 0.391 | 0.0801 | | 0.0558 | 0.335 | 0.231 | 4.46 | | | C03 |
| 101207SOML1-05-0-C(5) | 195902017 | 695967 | 1201446572 | SAMPLE | Radium-226 | 1.09 | 0.171 | | 0.0954 | 0.995 | 0.748 | 6.12 | | | C03 |
| 101207SOML1-05-0-C(5) | 195902017 | 695967 | 1201446572 | SAMPLE | Radium-228 | 1.16 | 0.270 | | 0.158 | 1.002 | 0.620 | 4.14 | | | C03 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195902**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDC | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101207SOMS3-44-0-C(5) | 195902018 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.318 | 0.0873 | | 0.0785 | 0.240 | 0.143 | 3.49 | | | C03 |
| 101207SOMS3-44-0-C(5) | 195902018 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.31 | 0.201 | | 0.133 | 1.177 | 0.908 | 5.61 | | | C03 |
| 101207SOMS3-44-0-C(5) | 195902018 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.33 | 0.309 | | 0.266 | 1.064 | 0.712 | 4.34 | | | C03 |
| 101207SOMS3-43-0-C(5) | 195902019 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.228 | 0.0627 | | 0.0601 | 0.168 | 0.103 | 3.37 | | | C03 |
| 101207SOMS3-43-0-C(5) | 195902019 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.22 | 0.167 | | 0.106 | 1.114 | 0.886 | 6.00 | | | C03 |
| 101207SOMS3-43-0-C(5) | 195902019 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.26 | 0.303 | | 0.182 | 1.078 | 0.654 | 4.19 | | | C03 |
| 101207SOMS3-42-0-C(5) | 195902020 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.224 | 0.0735 | | 0.0509 | 0.173 | 0.077 | 2.88 | | | C03 |
| 101207SOMS3-42-0-C(5) | 195902020 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.20 | 0.173 | | 0.0945 | 1.106 | 0.854 | 5.75 | | | C03 |
| 101207SOMS3-42-0-C(5) | 195902020 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.19 | 0.268 | | 0.195 | 0.995 | 0.654 | 4.44 | | | C03 |
| 101007SOMB-2-0-C(5) | 195902021 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.831 | 0.135 | | 0.072 | 0.759 | 0.561 | 6.05 | | | C03 |
| 101007SOMB-2-0-C(5) | 195902021 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.13 | 0.201 | | 0.131 | 0.999 | 0.728 | 4.81 | | | C03 |
| 101007SOMB-2-0-C(5) | 195902021 | 695969 | 1201446575 | SAMPLE | Radium-228 | 0.900 | 0.394 | | 0.315 | 0.585 | 0.112 | 2.39 | | J | B01,C03 |
| 101007SOMS3-81-0-C(5) | 195902022 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.746 | 0.101 | | 0.0488 | 0.697 | 0.544 | 7.17 | | | C03 |
| 101007SOMS3-81-0-C(5) | 195902022 | 695969 | 1201446575 | SAMPLE | Radium-226 | 0.568 | 0.142 | | 0.0939 | 0.474 | 0.284 | 2.99 | | | C03 |
| 101007SOMS3-81-0-C(5) | 195902022 | 695969 | 1201446575 | SAMPLE | Radium-228 | 0.371 | 0.199 | | 0.141 | 0.230 | -0.027 | 2.00 | | J | Q09,B01,C03 |
| 101007SOMS3-80-0-C(5) | 195902023 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 2.19 | 0.240 | | 0.0724 | 2.118 | 1.710 | 9.07 | | | C03 |
| 101007SOMS3-80-0-C(5) | 195902023 | 695969 | 1201446575 | SAMPLE | Radium-226 | 0.952 | 0.230 | | 0.149 | 0.803 | 0.492 | 3.60 | | | C03 |
| 101007SOMS3-80-0-C(5) | 195902023 | 695969 | 1201446575 | SAMPLE | Radium-228 | 0.780 | 0.246 | | 0.280 | 0.500 | 0.288 | 3.23 | | | C03 |
| 101007SOMB-1-0-C(5) | 195902024 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.249 | 0.0647 | | 0.0684 | 0.181 | 0.120 | 3.58 | | | C03 |
| 101007SOMB-1-0-C(5) | 195902024 | 695969 | 1201446575 | SAMPLE | Radium-226 | 0.874 | 0.187 | | 0.120 | 0.754 | 0.500 | 3.89 | | | C03 |
| 101007SOMB-1-0-C(5) | 195902024 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.31 | 0.313 | | 0.254 | 1.056 | 0.684 | 4.22 | | | C03 |
| 101007SOMS2-17-0-C(5) | 195902025 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.289 | 0.0921 | | 0.0603 | 0.229 | 0.105 | 3.02 | | | C03 |
| 101007SOMS2-17-0-C(5) | 195902025 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.01 | 0.218 | | 0.123 | 0.887 | 0.574 | 4.01 | | | C03 |
| 101007SOMS2-17-0-C(5) | 195902025 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.19 | 0.332 | | 0.227 | 0.963 | 0.526 | 3.65 | | | C03 |
| 101007SOMS3-115-0-C(5) | 195902026 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.914 | 0.125 | | 0.0724 | 0.842 | 0.664 | 7.17 | | | C03 |
| 101007SOMS3-115-0-C(5) | 195902026 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.02 | 0.199 | | 0.129 | 0.891 | 0.622 | 4.36 | | | C03 |
| 101007SOMS3-115-0-C(5) | 195902026 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.12 | 0.314 | | 0.221 | 0.899 | 0.492 | 3.63 | | | C03 |
| 101007SOMS2-02-0-C(5) | 195902027 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.504 | 0.0932 | | 0.0526 | 0.451 | 0.318 | 5.22 | | | C03 |
| 101007SOMS2-02-0-C(5) | 195902027 | 695969 | 1201446575 | SAMPLE | Radium-226 | 0.597 | 0.159 | | 0.0944 | 0.503 | 0.279 | 2.92 | | | C03 |
| 101007SOMS2-02-0-C(5) | 195902027 | 695969 | 1201446575 | SAMPLE | Radium-228 | 0.638 | 0.233 | | 0.193 | 0.445 | 0.172 | 2.82 | | | C03 |
| 101007SOMS3-105-0-C(5) | 195902028 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 1.81 | 0.202 | | 0.0853 | 1.725 | 1.406 | 8.89 | | | C03 |
| 101007SOMS3-105-0-C(5) | 195902028 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.23 | 0.221 | | 0.143 | 1.087 | 0.788 | 4.86 | | | C03 |
| 101007SOMS3-105-0-C(5) | 195902028 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.21 | 0.353 | | 0.218 | 0.992 | 0.504 | 3.50 | | | C03 |
| 101007SOMC-1-0-C(5) | 195902030 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.268 | 0.0877 | | 0.0739 | 0.194 | 0.093 | 2.93 | | | C03 |
| 101007SOMC-1-0-C(5) | 195902030 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.16 | 0.199 | | 0.130 | 1.030 | 0.762 | 4.98 | | | C03 |
| 101007SOMC-1-0-C(5) | 195902030 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.43 | 0.341 | | 0.259 | 1.171 | 0.748 | 4.24 | | | C03 |
| MB | 1201446572 | 695967 | 1201446572 | MB | Cesium-137 | 0.0101 | 0.0297 | U | 0.029 | | | | | | |
| MB | 1201446572 | 695967 | 1201446572 | MB | Radium-226 | 0.0152 | 0.0403 | U | 0.0733 | | | | | | |
| MB | 1201446572 | 695967 | 1201446572 | MB | Radium-228 | -0.000673 | 0.0763 | U | 0.126 | | | | | | |
| 101207SOMS2-26-0-C(5) | 1201446573 | 695967 | 1201446572 | DUP | Cesium-137 | 1.12 | 0.142 | | 0.0851 | | | | | | |
| 101207SOMS2-26-0-C(5) | 1201446573 | 695967 | 1201446572 | DUP | Radium-226 | 1.98 | 0.259 | | 0.142 | | | | | | |
| 101207SOMS2-26-0-C(5) | 1201446573 | 695967 | 1201446572 | DUP | Radium-228 | 1.49 | 0.348 | | 0.235 | | | | | | |
| LCS | 1201446574 | 695967 | 1201446572 | LCS | Americium-241 | 87 | 1.13 | | 0.481 | | | | | | |
| LCS | 1201446574 | 695967 | 1201446572 | LCS | Cesium-137 | 99 | 0.538 | | 0.132 | | | | | | |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195902**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDC | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| LCS | 1201446574 | 695967 | 1201446572 | LCS | Cobalt-60 | 101 | 0.733 | | 0.115 | | | | | | |
| MB | 1201446575 | 695969 | 1201446575 | MB | Cesium-137 | 0.00187 | 0.0238 | U | 0.0395 | | | | | | |
| MB | 1201446575 | 695969 | 1201446575 | MB | Radium-226 | 0.0459 | 0.102 | U | 0.0753 | | | | | | |
| MB | 1201446575 | 695969 | 1201446575 | MB | Radium-228 | -0.0668 | 0.0912 | U | 0.139 | | | | | | |
| 100907SOMS3-67-0-C(5) | 1201446576 | 695969 | 1201446575 | DUP | Cesium-137 | 0.799 | 0.132 | | 0.0662 | | | | 0.61 | | |
| 100907SOMS3-67-0-C(5) | 1201446576 | 695969 | 1201446575 | DUP | Radium-226 | 1.13 | 0.190 | | 0.123 | | | | 0.05 | | |
| 100907SOMS3-67-0-C(5) | 1201446576 | 695969 | 1201446575 | DUP | Radium-228 | 1.31 | 0.317 | | 0.244 | | | | 0.26 | | |
| LCS | 1201446577 | 695969 | 1201446575 | LCS | Americium-241 | 83 | 1.01 | | 0.450 | | | | | | |
| LCS | 1201446577 | 695969 | 1201446575 | LCS | Cesium-137 | 95 | 0.510 | | 0.129 | | | | | | |
| LCS | 1201446577 | 695969 | 1201446575 | LCS | Cobalt-60 | 96 | 0.683 | | 0.104 | | | | | | |
| 100907SOMS3-67-0-C(5) | 195905001 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 1.04 | 0.145 | | 0.0815 | | | | | | |
| 100907SOMS3-67-0-C(5) | 195905001 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.16 | 0.202 | | 0.131 | | | | | | |
| 100907SOMS3-67-0-C(5) | 195905001 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.08 | 0.297 | | 0.267 | | | | | | |

| | | |
|---|---|---|
| Dupl RPD= | Cesium-137 | 10 |
| | Radium-226 | -6 |
| | Radium-228 | -42 |

| | | |
|---|---|---|
| Dupl RPD= | Cesium-137 | -26 |
| | Radium-226 | -3 |
| | Radium-228 | 19 |

| | |
|---|---|
| **MWH Client:** | Monsanto Company |
| **MWH Project Name:** | CERCLA 2nd 5-Year Review |
| **MWH Project Number:** | 1010076.011701 |
| **Laboratory:** | GEL Laboratories, LLC (Charleston, SC) |
| **Data packages:** | Sample Delivery Group (SDG) Number 195905 |
| **Analytical Batches:** | 695969, 695970, and 695971 |
| **Method:** | Gamma Radium (Ra) 226 ($^{226}Ra$), $^{228}Ra$, and $^{137}Cs$ by EML HASL 300, 4.5.2.3 and per the laboratory's SOP GL-RAD-A-013 Rev #14 (a gamma spectrometry method) |
| **Guidance Documents:** | U.S. Department of Energy, *Evaluation of Radiochemical Data Usability*, es/er/ms-5, April 1997.<br><br>U.S. Department of Energy, Environmental Measurements Laboratory, *Health and Safety Laboratory (HASL)-300 Manual,* Section 4.5.2.3 (Ga-01-R: high resolution germanium detector gamma ray spectrometry), 28th Edition, February 1997. |
| **Modification:** | Data Flags and Reason Codes as specified in Appendix A of *Evaluation of Radiochemical Data Usability* (see Attachment A below) were used to qualify the data, with modification for the evaluation of laboratory duplicate (duplicate sample error ratio used instead of normalized absolute difference). |
| **Clarifications:** | Radiochemical tracers are referenced in the *Evaluation of Radiochemical Data Usability* guidance document, but are not applicable to gamma spectroscopy methods. Matrix spikes are also referenced, but were not used by GEL; data were not qualified because matrix spikes were not used. GEL did not provide calibration data. Results were not qualified, but sample results in the project database were populated with the applicable Reason Code (C03). |
| **Attachment A:** | Validation Flags and Reason Codes |
| **Attachment B:** | Validation Worksheet |

**Sample Cross Reference:**

| No. | Field Sample Identification | Date Collected | Laboratory Sample Identification |
|---|---|---|---|
| | | | |
| 1 | 100907SOMS3-67-0-C(5) | 10/09/07 | 195905001 |
| 2 | 100907SOMS-08-0-C(5) | 10/09/07 | 195905002 |
| 3 | 100907SOMS3-63-0-C(5) | 10/09/07 | 195905003 |
| 4 | 101107SOMS2-10-0-C(5) | 10/11/07 | 195905004 |
| 5 | 101107SOMS4-15-0-C(5) | 10/11/07 | 195905005 |
| 6 | 101007SOMS4-3-0-C(5) | 10/10/07 | 195905006 |
| 7 | 100907SOMS3-59-0-C(5) | 10/09/07 | 195905007 |
| 8 | 101107SOMS4-18-0-C(5) | 10/11/07 | 195905009 |
| 9 | 100907SOMS3-60-0-C(5) | 10/09/07 | 195905010 |
| 10 | 101007SOMS4-6-0-C(5) | 10/10/07 | 195905011 |
| 11 | 101007SOMS2-14-0-C(5) | 10/10/07 | 195905012 |
| 12 | 100907SOMS3-77-0-C(5) | 10/09/07 | 195905013 |
| 13 | 101007SOMS-03-0-C(5) | 10/10/07 | 195905014 |
| 14 | 100907SOMSN-05-0-C(5) | 10/09/07 | 195905015 |
| 15 | 100907SOMS3-73-0-C(5) | 10/09/07 | 195905016 |
| 16 | 100907SOMS3-69-0-C(5) | 10/09/07 | 195905018 |
| 17 | 101107SOMS3-87-0-C(5) | 10/11/07 | 195905019 |
| 18 | 100907SOMS3-78-0-C(5) | 10/09/07 | 195905020 |
| 19 | 101007SOMS-10-0-C(5) | 10/10/07 | 195905021 |
| 20 | 101007SOMS3-52-0-C(5) | 10/10/07 | 195905022 |
| 21 | 101007SOMS4-10-0-C(5) | 10/10/07 | 195905023 |
| 22 | 101007SOMS3-04-0-C(5) | 10/10/07 | 195905024 |
| 23 | 101007SOMS-09-0-C(5) | 10/10/07 | 195905025 |
| 24 | 101007SOMS3-14-0-C(5) | 10/10/07 | 195905026 |
| 25 | 101007SOMS2-13-0-C(5) | 10/10/07 | 195905027 |
| 26 | 100907SOMS3-62-0-C(5) | 10/09/07 | 195905028 |
| 27 | 101007SOMS3-51-0-C(5) | 10/10/07 | 195905029 |
| 28 | 100907SOMS2-01-0-C(5) | 10/09/07 | 195905030 |
| 29 | 101007SOMS4-1-0-C(5) | 10/10/07 | 195905031 |
| 30 | 101007SOMS2-5-0-C(5) | 10/10/07 | 195905032 |
| 31 | 101007SOMS2-6-0-C(5) | 10/10/07 | 195905033 |
| 32 | 101007SOMS2-011-0-C(5) | 10/10/07 | 195905034 |
| 33 | 101007SOMS3-02-0-C(5) | 10/10/07 | 195905035 |

Note: Samples designated as QA Split Samples were reported in GEL SDG Nos. 196017 and 196021.

## I. Chain-of-Custody Procedure, Sample Preservation, and Holding Time

_X__ Signatures on chain(s) and all samples accounted for
_X__ $^{226}Ra$, $^{228}Ra$, $^{137}Cs$: collected in HDPE (polyethylene) containers

A total of 33 soil samples were collected between October 9 and 11, 2007 in HDPE containers. All samples collected during this week were shipped in 11 coolers, and arrived at the laboratory on October 17, 2007. Sample chain-of-custody and laboratory receipt documentation appears intact. The 33 primary samples were prepared on October

23, 2007 and analyzed between October 31 and November 2, 2007, 22 to 24 days into the 6-month laboratory-referenced holding time.

## II. Instrument Calibration

____ Confirm summary report includes: dates of calibration, geometry, count times for all analysis, number of counts for each standard, measured activity for all samples
____ Confirm matrix used in geometry standard
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate
____ Calibration points including efficiency, energy, and peak resolution

Initial calibration data were not assessed because none was provided in the data package.

## III. Calibration Verification

____ Tolerance chart or statistical control chart of the appropriate 20 efficiencies and 20 relevant peak energies with 3 F+/- limits
____ Resolution demonstration of relevant peak(s)
____ Listing of X/Y coordinates in constructing the control charts
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate
____ Geometries used in analysis

Calibration verification data were not assessed because none was provided in the data package.

## IV. Target Compound Identification and Quantitation

_X___ Confirm all samples less than MDC are qualified not detected (U)
_X___ Less than two times the uncertainty were reported by the laboratory as not detected (U)

All sample results that were either less than two times the uncertainty were reported by the laboratory as not detected (U), or were greater than two times the uncertainty and greater than the minimum detectable concentration (MDC), with the following exceptions:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result Minus 2*Uncert | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101107SOMS2-10-0-C(5) | 195905004 | $^{228}Ra$ | -0.339 | 0.779 | UJ | Q09 |
| 100907SOMS3-59-0-C(5) | 195905007 | $^{137}Cs$ | -0.035 | 0.129 | UJ | Q09 |
| 100907SOMS3-73-0-C(5) | 195905016 | $^{226}Ra$ | -0.152 | 0.160 | UJ | Q09 |
| 101007SOMS4-10-0-C(5) | 195905023 | $^{137}Cs$ | -0.026 | 0.0953 | UJ | Q09 |
| 101007SOMS3-04-0-C(5) | 195905024 | $^{228}Ra$ | -0.479 | 0.511 | UJ | Q09 |
| 101007SOMS3-14-0-C(5) | 195905026 | $^{137}Cs$ | -0.010 | 0.188 | UJ | Q09 |
| 101007SOMS3-51-0-C(5) | 195905029 | $^{137}Cs$ | -0.056 | 0.176 | UJ | Q09 |
| 101007SOMS2-6-0-C(5) | 195905033 | $^{137}Cs$ | -0.017 | 0.144 | UJ | Q09 |
| 101007SOMS2-011-0-C(5) | 195905034 | $^{137}Cs$ | -0.025 | 0.197 | UJ | Q09 |

Results were flagged as not detected (UJ) at the reported concentrations because they failed both the above “two times uncertainty” criterion and the blank criterion specified in Section V below.

## V. Blanks

_X___ Method blank results < MDC
_X___ Calculate normalized absolute difference (NAD) =

$$|(\text{Sample} - \text{Blank})| / ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Blank}}]^{1/2})$$

_X___ If normalized absolute difference is > 2.58, no action necessary
_X___ If normalized absolute difference is between 1.96 and 2.58, qualify sample J
_____ If normalized absolute difference is less than 1.96, consider rejecting data

All normalized absolute differences (per above calculation) were greater than 2.58 for all sample results that were reportable (that is, reported as a detection above the MDC), with the following exceptions:

| Field Sample Identification | Laboratory Sample Identification | Parameter | NAD | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 100907SOMS-08-0-C(5) | 195905002 | $^{137}Cs$ | 2.13 | 0.171 | J | B01 |
| 101107SOMS2-10-0-C(5) | 195905004 | $^{228}Ra$ | 1.49 | 0.779 | UJ | B01 |
| 100907SOMS3-59-0-C(5) | 195905007 | $^{137}Cs$ | 1.49 | 0.129 | UJ | B01 |
| 101107SOMS4-18-0-C(5) | 195905009 | $^{228}Ra$ | 2.57 | 0.582 | J | B01 |
| 100907SOMS3-60-0-C(5) | 195905010 | $^{137}Cs$ | 2.55 | 0.269 | J | B01 |
| 101007SOMS4-6-0-C(5) | 195905011 | $^{137}Cs$ | 1.97 | 0.152 | J | B01 |
| 101007SOMS2-14-0-C(5) | 195905012 | $^{137}Cs$ | 2.00 | 0.211 | J | B01 |
| 101007SOMS-03-0-C(5) | 195905014 | $^{137}Cs$ | 2.32 | 0.212 | J | B01 |
| 100907SOMSN-05-0-C(5) | 195905015 | $^{137}Cs$ | 1.83 | 0.148 | J | B01 |
| 100907SOMS3-73-0-C(5) | 195905016 | $^{226}Ra$ | 0.59 | 0.160 | UJ | B01 |
| 100907SOMS3-69-0-C(5) | 195905018 | $^{137}Cs$ | 2.53 | 0.193 | J | B01 |
| 101007SOMS-10-0-C(5) | 195905021 | $^{228}Ra$ | 2.34 | 1.18 | J | B01 |
| 101007SOMS3-52-0-C(5) | 195905022 | $^{137}Cs$ | 2.26 | 0.194 | J | B01 |
| 101007SOMS4-10-0-C(5) | 195905023 | $^{137}Cs$ | 0.96 | 0.0953 | UJ | B01 |
| 101007SOMS3-04-0-C(5) | 195905024 | $^{228}Ra$ | 0.94 | 0.511 | UJ | B01 |
| 101007SOMS-09-0-C(5) | 195905025 | $^{137}Cs$ | 1.83 | 0.189 | J | B01 |
| 101007SOMS3-14-0-C(5) | 195905026 | $^{137}Cs$ | 1.53 | 0.188 | UJ | B01 |
| 101007SOMS2-13-0-C(5) | 195905027 | $^{137}Cs$ | 1.68 | 0.146 | J | B01 |
| 101007SOMS3-51-0-C(5) | 195905029 | $^{137}Cs$ | 1.22 | 0.176 | UJ | B01 |
| 100907SOMS2-01-0-C(5) | 195905030 | $^{228}Ra$ | 1.92 | 0.399 | J | B01 |
| 101007SOMS2-6-0-C(5) | 195905033 | $^{137}Cs$ | 1.69 | 0.144 | UJ | B01 |
| 101007SOMS2-011-0-C(5) | 195905034 | $^{137}Cs$ | 1.72 | 0.197 | UJ | B01 |
| 101007SOMS2-011-0-C(5) | 195905034 | $^{228}Ra$ | 2.16 | 0.991 | J | B01 |
| 101007SOMS3-02-0-C(5) | 195905035 | $^{137}Cs$ | 2.14 | 0.196 | J | B01 |

## VI. Laboratory Duplicates

_X___ Must be analyzed for each batch or for every 20 samples
_X___ RPDs within the laboratory's control limits (RPD not calculated when one or both duplicate results are not detected)
_X___ Calculate the duplicate error ratio (DER)) =

$$|(\text{Sample} - \text{Duplicate})| / (2 * ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Duplicate}}]^{1/2}))$$

$$\text{DER} \leq 1.42$$

_____ If DER > 1.42, qualify sample J

The laboratory's laboratory duplicate criteria are: If duplicate activities are less than 5 times MDC, then the RPD should be less than 100%; if activities are greater than 5 times the MDC, the RPD should be less than 20%.

With the following exception, all RPDs and DERs associated with both laboratory duplicate pairs were within these criteria:

| Field Sample Identification | Laboratory Sample Identification | Parameter | RPD | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 100907SOMS3-67-0-C(5) | 195905001 | $^{137}Cs$ | 26 | 1.04 | None | None |

Although the RPD of 26 for this duplicate pair was greater than the control limit of 20, the DER of 0.61 was within control. The variance does not constitute a significant difference, so neither the primary sample results nor associated samples results were qualified.

## VII. Laboratory Control Samples

_X___ Must be analyzed for each batch or for every 20 samples
_X___ Compare %R with lab control limits (75-125%)

All recoveries for each laboratory control samples were within control limits.

## VIII. Equipment and Water Blank Samples

A total of 17 equipment blanks and 17 water blanks were collected between October 9 and 15, 2007 for gamma spectrometry analysis, including analysis for $^{226}Ra$ and $^{137}Cs$ (see data validation report for GEL SDG 195907). All equipment blanks and water blanks were not detected for both $^{226}Ra$ and $^{137}Cs$.

## IX. Overall Assessment of Data

With the following exceptions, all quality control data associated with the field samples were within control limits. All other field results are usable as reported by the laboratory.

**Summary of Qualified Data:**

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/g)/Lab Flag | Data Validation Result/Flag | Reason Code |
|---|---|---|---|---|---|
| All sample results | | | | No flag | C03 |
| 100907SOMS-08-0-C(5) | 195905002 | $^{137}Cs$ | 0.171 | J | B01 |
| 101107SOMS2-10-0-C(5) | 195905004 | $^{228}Ra$ | 0.779 | UJ | Q09,B01 |
| 100907SOMS3-59-0-C(5) | 195905007 | $^{137}Cs$ | 0.129 | UJ | Q09,B01 |
| 101107SOMS4-18-0-C(5) | 195905009 | $^{228}Ra$ | 0.582 | J | B01 |
| 100907SOMS3-60-0-C(5) | 195905010 | $^{137}Cs$ | 0.269 | J | B01 |
| 101007SOMS4-6-0-C(5) | 195905011 | $^{137}Cs$ | 0.152 | J | B01 |
| 101007SOMS2-14-0-C(5) | 195905012 | $^{137}Cs$ | 0.211 | J | B01 |
| 101007SOMS-03-0-C(5) | 195905014 | $^{137}Cs$ | 0.212 | J | B01 |

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/g)/Lab Flag | Data Validation Result/Flag | Reason Code |
|---|---|---|---|---|---|
| 100907SOMSN-05-0-C(5) | 195905015 | $^{137}Cs$ | 0.148 | J | B01 |
| 100907SOMS3-73-0-C(5) | 195905016 | $^{226}Ra$ | 0.160 | UJ | Q09,B01 |
| 100907SOMS3-69-0-C(5) | 195905018 | $^{137}Cs$ | 0.193 | J | B01 |
| 101007SOMS-10-0-C(5) | 195905021 | $^{228}Ra$ | 1.18 | J | B01 |
| 101007SOMS3-52-0-C(5) | 195905022 | $^{137}Cs$ | 0.194 | J | B01 |
| 101007SOMS4-10-0-C(5) | 195905023 | $^{137}Cs$ | 0.0953 | UJ | Q09,B01 |
| 101007SOMS3-04-0-C(5) | 195905024 | $^{228}Ra$ | 0.511 | UJ | Q09,B01 |
| 101007SOMS-09-0-C(5) | 195905025 | $^{137}Cs$ | 0.189 | J | B01 |
| 101007SOMS3-14-0-C(5) | 195905026 | $^{137}Cs$ | 0.188 | UJ | Q09,B01 |
| 101007SOMS2-13-0-C(5) | 195905027 | $^{137}Cs$ | 0.146 | J | B01 |
| 101007SOMS3-51-0-C(5) | 195905029 | $^{137}Cs$ | 0.176 | UJ | Q09,B01 |
| 100907SOMS2-01-0-C(5) | 195905030 | $^{228}Ra$ | 0.399 | J | B01 |
| 101007SOMS2-6-0-C(5) | 195905033 | $^{137}Cs$ | 0.144 | UJ | Q09,B01 |
| 101007SOMS2-011-0-C(5) | 195905034 | $^{137}Cs$ | 0.197 | UJ | Q09,B01 |
| 101007SOMS2-011-0-C(5) | 195905034 | $^{228}Ra$ | 0.991 | J | B01 |
| 101007SOMS3-02-0-C(5) | 195905035 | $^{137}Cs$ | 0.196 | J | B01 |

# ATTACHMENT A
## Radiochemical Data Verification and Validation: Per Appendix A in *Evaluation of Radiochemical Data Usability, es/er/ms-5* USDOE April, 1995

| Flag | Definition |
|---|---|
| U | Nuclide considered not detected above the reported MDC or 2 times the uncertainty |
| J | Nuclide identified; the associated value is approximated |
| UJ | Nuclide not detected above the reported MDC or 2 times the uncertainty and a quality deficiency affects the data and impacts the uncertainty of the reported data |
| R | Result is not usable for its intended purpose |

| Reason Code | Definition |
|---|---|
| ***Method Blank*** | |
| B01 | Concentration of contaminant in the method blank at a level ≥ the qualification level |
| B02 | Method blank was not the same matrix as the analytical samples |
| B03 | Gross contamination exists |
| B04 | Blanks were not analyzed at the appropriate frequency |
| B05 | Sample not significantly different than radiochemical method blank |
| B06 | Blank data not reports |
| B07 | Other (describe in comments) |
| ***Calibration*** | |
| C01 | Initial calibration sequence was not followed as appropriate |
| C02 | Calibration was not performed at the appropriate frequency |
| C03 | Calibration data not reported |
| C04 | Calibration not performed |
| C05 | Chemical resolution criteria were not satisfied |
| C06 | Standard curve was established with fewer than the required number of standards |
| C07 | Instrumental system determined to be out of control |
| C08 | Other (describe in comments) |
| ***Laboratory Duplicate*** | |
| D01 | Significant difference between sample and duplicate |
| D02 | Laboratory duplicate was not analyzed at the appropriate frequency |
| D03 | Laboratory duplicate data was not reported |
| D04 | Other (describe in comments) |
| ***Evidentiary Concerns*** | |
| E01 | Custody of sample in question |
| E02 | Standard not traceable |
| E03 | Other (describe in comments) |
| ***General*** | |
| G01 | Professional judgment was used to qualify the data |
| G02 | Other (describe in comments) |
| ***Holding Times*** | |
| H01 | Holding times were exceeded |
| H02 | Holding times were grossly exceeded |
| H03 | Samples were not preserved properly |
| H04 | Other (describe in comments) |
| ***Laboratory Control Sample*** | |
| L01 | LCS recovery above upper control limit |
| L02 | LCS recovery below lower control limit |
| L03 | LCS was not analyzed at appropriate frequency |
| L04 | LCS not the same matrix as the analytical samples |

| Reason Code | Definition |
|---|---|
| L05 | LCS data not reported |
| L06 | Other (describe in comments) |
| ***Matrix Spike and MS/MSD*** | |
| M01 | MS recovery above upper control limit |
| M02 | MS recovery below lower control limit |
| M03 | MS not analyzed at the appropriate frequency |
| M04 | MS data not reported |
| M05 | Other (describe in comments) |
| ***Instrument Performance*** | |
| P01 | High background levels or a shift in the energy calibration were observed |
| P02 | Extraneous peaks were observed |
| P03 | Loss of resolution was observed |
| P04 | Peak-tailing or peak splitting that may result in inaccurate quantitation were observed |
| P05 | Instrument performance not analyzed at the appropriate frequency |
| P06 | Other (describe in comments) |
| ***Quantitation*** | |
| Q01 | Peak misidentified |
| Q02 | Target analyte affected by interfering peak |
| Q03 | Qualitative criteria were not satisfied |
| Q04 | Cross contamination occurred |
| Q05 | No raw data were provided to confirm Quantitation |
| Q06 | MDC > RDL |
| Q07 | Inappropriate aliquot sizes were used |
| Q08 | Sample result < MDC |
| Q09 | Sample result < 2s uncertainty |
| Q10 | Negative result |
| Q11 | Compounds were not adequately resolved |
| Q12 | Sample weight different from calibration geometry |
| Q13 | Sample weight greater than greatest weight on mass attenuation curve |
| Q14 | Other (describe in comments) |
| ***Radiochemical Yield*** | |
| Y01 | Radiochemical tracer yield was above the upper control limit |
| Y02 | Radiochemical tracer yield was below the lower control limit |
| Y03 | Radiochemical tracer yield was zero |
| Y04 | Radiochemical yield data was not present |
| Y05 | Other (describe in comments) |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195905**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Typ | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 100907SOMS3-67-0-C(5) | 195905001 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 1.04 | 0.145 | | 0.0815 | 0.959 | 0.750 | 7.06 | 0.61 | | C03 |
| 100907SOMS3-67-0-C(5) | 195905001 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.16 | 0.202 | | 0.131 | 1.029 | 0.756 | 4.92 | 0.05 | | C03 |
| 100907SOMS3-67-0-C(5) | 195905001 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.08 | 0.297 | | 0.267 | 0.813 | 0.486 | 3.69 | 0.26 | | C03 |
| 100907SOMS-08-0-C(5) | 195905002 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.171 | 0.0757 | | 0.067 | 0.104 | 0.020 | 2.13 | | J | B01,C03 |
| 100907SOMS-08-0-C(5) | 195905002 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.23 | 0.203 | | 0.123 | 1.107 | 0.824 | 5.21 | | | C03 |
| 100907SOMS-08-0-C(5) | 195905002 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.17 | 0.330 | | 0.229 | 0.941 | 0.510 | 3.61 | | | C03 |
| 100907SOMS3-63-0-C(5) | 195905003 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.255 | 0.0842 | | 0.0579 | 0.197 | 0.087 | 2.89 | | | C03 |
| 100907SOMS3-63-0-C(5) | 195905003 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.08 | 0.181 | | 0.109 | 0.971 | 0.718 | 4.98 | | | C03 |
| 100907SOMS3-63-0-C(5) | 195905003 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.22 | 0.341 | | 0.225 | 0.995 | 0.538 | 3.65 | | | C03 |
| 101107SOMS2-10-0-C(5) | 195905004 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 1.03 | 0.147 | | 0.102 | 0.928 | 0.736 | 6.90 | | | C03 |
| 101107SOMS2-10-0-C(5) | 195905004 | 695969 | 1201446575 | SAMPLE | Radium-226 | 5.18 | 0.581 | | 0.192 | 4.988 | 4.018 | 8.70 | | | C03 |
| 101107SOMS2-10-0-C(5) | 195905004 | 695969 | 1201446575 | SAMPLE | Radium-228 | 0.779 | 0.559 | | 0.416 | 0.363 | -0.339 | 1.49 | | UJ | Q09,B01,C03 |
| 101107SOMS4-15-0-C(5) | 195905005 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 1.49 | 0.157 | | 0.0774 | 1.413 | 1.176 | 9.37 | | | C03 |
| 101107SOMS4-15-0-C(5) | 195905005 | 695969 | 1201446575 | SAMPLE | Radium-226 | 2.41 | 0.284 | | 0.126 | 2.284 | 1.842 | 7.83 | | | C03 |
| 101107SOMS4-15-0-C(5) | 195905005 | 695969 | 1201446575 | SAMPLE | Radium-228 | 0.903 | 0.303 | | 0.233 | 0.670 | 0.297 | 3.06 | | | C03 |
| 101007SOMS4-3-0-C(5) | 195905006 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.277 | 0.0633 | | 0.0549 | 0.222 | 0.150 | 4.07 | | | C03 |
| 101007SOMS4-3-0-C(5) | 195905006 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.26 | 0.184 | | 0.0921 | 1.168 | 0.892 | 5.77 | | | C03 |
| 101007SOMS4-3-0-C(5) | 195905006 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.30 | 0.279 | | 0.179 | 1.121 | 0.742 | 4.66 | | | C03 |
| 100907SOMS3-59-0-C(5) | 195905007 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.129 | 0.0818 | | 0.0793 | 0.050 | -0.035 | 1.49 | | UJ | Q09,B01,C03 |
| 100907SOMS3-59-0-C(5) | 195905007 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.23 | 0.252 | | 0.135 | 1.095 | 0.726 | 4.36 | | | C03 |
| 100907SOMS3-59-0-C(5) | 195905007 | 695969 | 1201446575 | SAMPLE | Radium-228 | 1.19 | 0.349 | | 0.291 | 0.899 | 0.492 | 3.48 | | | C03 |
| 101107SOMS4-18-0-C(5) | 195905009 | 695969 | 1201446575 | SAMPLE | Cesium-137 | 0.0594 | 0.0441 | U | 0.0827 | -0.023 | -0.029 | 1.15 | | | C03 |
| 101107SOMS4-18-0-C(5) | 195905009 | 695969 | 1201446575 | SAMPLE | Radium-226 | 1.67 | 0.215 | | 0.129 | 1.541 | 1.240 | 6.82 | | | C03 |
| 101107SOMS4-18-0-C(5) | 195905009 | 695969 | 1201446575 | SAMPLE | Radium-228 | 0.582 | 0.235 | | 0.281 | 0.301 | 0.112 | 2.57 | | J | B01,C03 |
| 100907SOMS3-60-0-C(5) | 195905010 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.269 | 0.088 | | 0.0876 | 0.181 | 0.093 | 2.55 | | J | B01,C03 |
| 100907SOMS3-60-0-C(5) | 195905010 | 695970 | 1201446578 | SAMPLE | Radium-226 | 1.64 | 0.260 | | 0.145 | 1.495 | 1.120 | 5.85 | | | C03 |
| 100907SOMS3-60-0-C(5) | 195905010 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.20 | 0.367 | | 0.288 | 0.912 | 0.466 | 2.99 | | | C03 |
| 101007SOMS4-6-0-C(5) | 195905011 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.152 | 0.0531 | | 0.0738 | 0.078 | 0.046 | 1.97 | | J | B01,C03 |
| 101007SOMS4-6-0-C(5) | 195905011 | 695970 | 1201446578 | SAMPLE | Radium-226 | 0.993 | 0.204 | | 0.113 | 0.880 | 0.585 | 4.30 | | | C03 |
| 101007SOMS4-6-0-C(5) | 195905011 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.57 | 0.363 | | 0.220 | 1.350 | 0.844 | 3.97 | | | C03 |
| 101007SOMS2-14-0-C(5) | 195905012 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.211 | 0.0849 | | 0.0812 | 0.130 | 0.041 | 2.00 | | J | B01,C03 |
| 101007SOMS2-14-0-C(5) | 195905012 | 695970 | 1201446578 | SAMPLE | Radium-226 | 0.993 | 0.225 | | 0.131 | 0.862 | 0.543 | 3.94 | | | C03 |
| 101007SOMS2-14-0-C(5) | 195905012 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.35 | 0.348 | | 0.234 | 1.116 | 0.654 | 3.53 | | | C03 |
| 100907SOMS3-77-0-C(5) | 195905013 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.807 | 0.0973 | | 0.0477 | 0.759 | 0.612 | 7.57 | | | C03 |
| 100907SOMS3-77-0-C(5) | 195905013 | 695970 | 1201446578 | SAMPLE | Radium-226 | 0.777 | 0.151 | | 0.100 | 0.677 | 0.475 | 4.26 | | | C03 |
| 100907SOMS3-77-0-C(5) | 195905013 | 695970 | 1201446578 | SAMPLE | Radium-228 | 0.701 | 0.205 | | 0.145 | 0.556 | 0.291 | 2.73 | | | C03 |
| 101007SOMS-03-0-C(5) | 195905014 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.212 | 0.0715 | | 0.0695 | 0.143 | 0.069 | 2.32 | | J | B01,C03 |
| 101007SOMS-03-0-C(5) | 195905014 | 695970 | 1201446578 | SAMPLE | Radium-226 | 1.63 | 0.202 | | 0.121 | 1.509 | 1.226 | 7.30 | | | C03 |
| 101007SOMS-03-0-C(5) | 195905014 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.51 | 0.337 | | 0.241 | 1.269 | 0.836 | 4.07 | | | C03 |
| 100907SOMSN-05-0-C(5) | 195905015 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.148 | 0.0559 | | 0.0641 | 0.084 | 0.036 | 1.83 | | J | B01,C03 |
| 100907SOMSN-05-0-C(5) | 195905015 | 695970 | 1201446578 | SAMPLE | Radium-226 | 1.14 | 0.184 | | 0.118 | 1.022 | 0.772 | 5.45 | | | C03 |
| 100907SOMSN-05-0-C(5) | 195905015 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.17 | 0.294 | | 0.199 | 0.971 | 0.582 | 3.52 | | | C03 |
| 100907SOMS3-73-0-C(5) | 195905016 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.759 | 0.112 | | 0.0707 | 0.688 | 0.535 | 6.25 | | | C03 |
| 100907SOMS3-73-0-C(5) | 195905016 | 695970 | 1201446578 | SAMPLE | Radium-226 | 0.160 | 0.156 | | 0.113 | 0.047 | -0.152 | 0.59 | | UJ | Q09,B01,C03 |
| 100907SOMS3-73-0-C(5) | 195905016 | 695970 | 1201446578 | SAMPLE | Radium-228 | 0.178 | 0.192 | U | 0.317 | -0.139 | -0.206 | 0.63 | | | C03 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195905**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Typ | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 100907SOMS3-69-0-C(5) | 195905018 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.193 | 0.0557 | | 0.0507 | 0.142 | 0.082 | 2.53 | | J | B01,C03 |
| 100907SOMS3-69-0-C(5) | 195905018 | 695970 | 1201446578 | SAMPLE | Radium-226 | 0.999 | 0.154 | | 0.0931 | 0.906 | 0.691 | 5.49 | | | C03 |
| 100907SOMS3-69-0-C(5) | 195905018 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.10 | 0.285 | | 0.154 | 0.946 | 0.530 | 3.39 | | | C03 |
| 101107SOMS3-87-0-C(5) | 195905019 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.281 | 0.0682 | | 0.0589 | 0.222 | 0.145 | 3.32 | | | C03 |
| 101107SOMS3-87-0-C(5) | 195905019 | 695970 | 1201446578 | SAMPLE | Radium-226 | 1.34 | 0.234 | | 0.138 | 1.202 | 0.872 | 5.22 | | | C03 |
| 101107SOMS3-87-0-C(5) | 195905019 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.08 | 0.293 | | 0.261 | 0.819 | 0.494 | 3.25 | | | C03 |
| 100907SOMS3-78-0-C(5) | 195905020 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.274 | 0.056 | | 0.0545 | 0.220 | 0.162 | 3.76 | | | C03 |
| 100907SOMS3-78-0-C(5) | 195905020 | 695970 | 1201446578 | SAMPLE | Radium-226 | 1.05 | 0.176 | | 0.0993 | 0.951 | 0.698 | 5.19 | | | C03 |
| 100907SOMS3-78-0-C(5) | 195905020 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.15 | 0.330 | | 0.192 | 0.958 | 0.490 | 3.14 | | | C03 |
| 101007SOMS-10-0-C(5) | 195905021 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.366 | 0.108 | | 0.129 | 0.237 | 0.150 | 2.98 | | | C03 |
| 101007SOMS-10-0-C(5) | 195905021 | 695970 | 1201446578 | SAMPLE | Radium-226 | 6.46 | 0.712 | | 0.191 | 6.269 | 5.036 | 8.94 | | | C03 |
| 101007SOMS-10-0-C(5) | 195905021 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.18 | 0.472 | | 0.375 | 0.805 | 0.236 | 2.34 | | J | B01,C03 |
| 101007SOMS3-52-0-C(5) | 195905022 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.194 | 0.0652 | | 0.0703 | 0.124 | 0.064 | 2.26 | | J | B01,C03 |
| 101007SOMS3-52-0-C(5) | 195905022 | 695970 | 1201446578 | SAMPLE | Radium-226 | 1.30 | 0.187 | | 0.109 | 1.191 | 0.926 | 6.16 | | | C03 |
| 101007SOMS3-52-0-C(5) | 195905022 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.51 | 0.316 | | 0.193 | 1.317 | 0.878 | 4.30 | | | C03 |
| 101007SOMS4-10-0-C(5) | 195905023 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.0953 | 0.0606 | | 0.0643 | 0.031 | -0.026 | 0.96 | | UJ | Q09,B01,C03 |
| 101007SOMS4-10-0-C(5) | 195905023 | 695970 | 1201446578 | SAMPLE | Radium-226 | 0.905 | 0.157 | | 0.112 | 0.793 | 0.591 | 4.87 | | | C03 |
| 101007SOMS4-10-0-C(5) | 195905023 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.21 | 0.349 | | 0.223 | 0.987 | 0.512 | 3.15 | | | C03 |
| 101007SOMS3-04-0-C(5) | 195905024 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 1.14 | 0.159 | | 0.116 | 1.024 | 0.822 | 6.84 | | | C03 |
| 101007SOMS3-04-0-C(5) | 195905024 | 695970 | 1201446578 | SAMPLE | Radium-226 | 9.60 | 0.971 | | 0.186 | 9.414 | 7.658 | 9.80 | | | C03 |
| 101007SOMS3-04-0-C(5) | 195905024 | 695970 | 1201446578 | SAMPLE | Radium-228 | 0.511 | 0.495 | | 0.456 | 0.055 | -0.479 | 0.94 | | UJ | Q09,B01,C03 |
| 101007SOMS-09-0-C(5) | 195905025 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.189 | 0.0811 | | 0.0596 | 0.129 | 0.027 | 1.83 | | J | B01,C03 |
| 101007SOMS-09-0-C(5) | 195905025 | 695970 | 1201446578 | SAMPLE | Radium-226 | 1.70 | 0.229 | | 0.109 | 1.591 | 1.242 | 6.81 | | | C03 |
| 101007SOMS-09-0-C(5) | 195905025 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.44 | 0.375 | | 0.200 | 1.240 | 0.690 | 3.54 | | | C03 |
| 101007SOMS3-14-0-C(5) | 195905026 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.188 | 0.0989 | | 0.0607 | 0.127 | -0.010 | 1.53 | | UJ | Q09,B01,C03 |
| 101007SOMS3-14-0-C(5) | 195905026 | 695970 | 1201446578 | SAMPLE | Radium-226 | 1.15 | 0.216 | | 0.115 | 1.035 | 0.718 | 4.78 | | | C03 |
| 101007SOMS3-14-0-C(5) | 195905026 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.45 | 0.316 | | 0.200 | 1.250 | 0.818 | 4.13 | | | C03 |
| 101007SOMS2-13-0-C(5) | 195905027 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.146 | 0.0615 | | 0.0531 | 0.093 | 0.023 | 1.68 | | J | B01,C03 |
| 101007SOMS2-13-0-C(5) | 195905027 | 695970 | 1201446578 | SAMPLE | Radium-226 | 1.22 | 0.192 | | 0.102 | 1.118 | 0.836 | 5.64 | | | C03 |
| 101007SOMS2-13-0-C(5) | 195905027 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.29 | 0.238 | | 0.188 | 1.102 | 0.814 | 4.60 | | | C03 |
| 100907SOMS3-62-0-C(5) | 195905028 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.294 | 0.0735 | | 0.0749 | 0.219 | 0.147 | 3.29 | | | C03 |
| 100907SOMS3-62-0-C(5) | 195905028 | 695970 | 1201446578 | SAMPLE | Radium-226 | 0.747 | 0.173 | | 0.139 | 0.608 | 0.401 | 3.65 | | | C03 |
| 100907SOMS3-62-0-C(5) | 195905028 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.34 | 0.301 | | 0.255 | 1.085 | 0.738 | 3.97 | | | C03 |
| 101007SOMS3-51-0-C(5) | 195905029 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.176 | 0.116 | | 0.092 | 0.084 | -0.056 | 1.22 | | UJ | Q09,B01,C03 |
| 101007SOMS3-51-0-C(5) | 195905029 | 695970 | 1201446578 | SAMPLE | Radium-226 | 1.01 | 0.280 | | 0.139 | 0.871 | 0.450 | 3.28 | | | C03 |
| 101007SOMS3-51-0-C(5) | 195905029 | 695970 | 1201446578 | SAMPLE | Radium-228 | 1.20 | 0.411 | | 0.283 | 0.917 | 0.378 | 2.70 | | | C03 |
| 100907SOMS2-01-0-C(5) | 195905030 | 695970 | 1201446578 | SAMPLE | Cesium-137 | 0.0167 | 0.0276 | U | 0.0493 | -0.033 | -0.039 | 0.28 | 0.16 | | C03 |
| 100907SOMS2-01-0-C(5) | 195905030 | 695970 | 1201446578 | SAMPLE | Radium-226 | 0.514 | 0.110 | | 0.0846 | 0.429 | 0.294 | 3.43 | 0.34 | | C03 |
| 100907SOMS2-01-0-C(5) | 195905030 | 695970 | 1201446578 | SAMPLE | Radium-228 | 0.399 | 0.136 | | 0.139 | 0.260 | 0.127 | 1.92 | 0.53 | J | B01,C03 |
| 101007SOMS4-1-0-C(5) | 195905031 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.253 | 0.076 | | 0.0736 | 0.179 | 0.101 | 3.15 | | | C03 |
| 101007SOMS4-1-0-C(5) | 195905031 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.13 | 0.190 | | 0.107 | 1.023 | 0.750 | 5.83 | | | C03 |
| 101007SOMS4-1-0-C(5) | 195905031 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.58 | 0.340 | | 0.251 | 1.329 | 0.900 | 4.60 | | | C03 |
| 101007SOMS2-5-0-C(5) | 195905032 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.179 | 0.0583 | | 0.0581 | 0.121 | 0.062 | 2.81 | | | C03 |
| 101007SOMS2-5-0-C(5) | 195905032 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.62 | 0.209 | | 0.101 | 1.519 | 1.202 | 7.59 | | | C03 |
| 101007SOMS2-5-0-C(5) | 195905032 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.41 | 0.283 | | 0.169 | 1.241 | 0.844 | 4.86 | | | C03 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195905**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Typ | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101007SOMS2-6-0-C(5) | 195905033 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.144 | 0.0807 | | 0.0728 | 0.071 | -0.017 | 1.69 | | UJ | Q09,B01,C03 |
| 101007SOMS2-6-0-C(5) | 195905033 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.43 | 0.212 | | 0.124 | 1.306 | 1.006 | 6.63 | | | C03 |
| 101007SOMS2-6-0-C(5) | 195905033 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.22 | 0.285 | | 0.216 | 1.004 | 0.650 | 4.21 | | | C03 |
| 101007SOMS2-011-0-C(5) | 195905034 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.197 | 0.111 | | 0.140 | 0.057 | -0.025 | 1.72 | | UJ | Q09,B01,C03 |
| 101007SOMS2-011-0-C(5) | 195905034 | 695971 | 1201446581 | SAMPLE | Radium-226 | 4.85 | 0.566 | | 0.235 | 4.615 | 3.718 | 8.58 | | | C03 |
| 101007SOMS2-011-0-C(5) | 195905034 | 695971 | 1201446581 | SAMPLE | Radium-228 | 0.991 | 0.475 | | 0.450 | 0.541 | 0.041 | 2.16 | | J | B01,C03 |
| 101007SOMS3-02-0-C(5) | 195905035 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.196 | 0.0874 | | 0.084 | 0.112 | 0.021 | 2.14 | | J | B01,C03 |
| 101007SOMS3-02-0-C(5) | 195905035 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.33 | 0.230 | | 0.141 | 1.189 | 0.870 | 5.73 | | | C03 |
| 101007SOMS3-02-0-C(5) | 195905035 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.17 | 0.355 | | 0.276 | 0.894 | 0.460 | 3.32 | | | C03 |
| MB | 1201446575 | 695969 | 1201446575 | MB | Cesium-137 | 0.00187 | 0.0238 | U | 0.0395 | | | | | | |
| MB | 1201446575 | 695969 | 1201446575 | MB | Radium-226 | 0.0459 | 0.102 | U | 0.0753 | | | | | | |
| MB | 1201446575 | 695969 | 1201446575 | MB | Radium-228 | -0.0668 | 0.0912 | U | 0.139 | | | | | | |
| 100907SOMS3-67-0-C(5) | 1201446576 | 695969 | 1201446575 | DUP | Cesium-137 | 0.799 | 0.132 | | 0.0662 | | | | | | |
| 100907SOMS3-67-0-C(5) | 1201446576 | 695969 | 1201446575 | DUP | Radium-226 | 1.13 | 0.190 | | 0.123 | | | | | | |
| 100907SOMS3-67-0-C(5) | 1201446576 | 695969 | 1201446575 | DUP | Radium-228 | 1.31 | 0.317 | | 0.244 | | | | | | |
| MB | 1201446578 | 695970 | 1201446578 | MB | Cesium-137 | 0.0287 | 0.0333 | U | 0.0616 | | | | | | |
| MB | 1201446578 | 695970 | 1201446578 | MB | Radium-226 | 0.0582 | 0.0749 | U | 0.128 | | | | | | |
| MB | 1201446578 | 695970 | 1201446578 | MB | Radium-228 | 0.0296 | 0.136 | U | 0.252 | | | | | | |
| 100907SOMS2-01-0-C(5) | 1201446579 | 695970 | 1201446578 | DUP | Cesium-137 | 0.00 | 0.0436 | UI | 0.049 | | | | | | |
| 100907SOMS2-01-0-C(5) | 1201446579 | 695970 | 1201446578 | DUP | Radium-226 | 0.393 | 0.139 | | 0.106 | | | | | | |
| 100907SOMS2-01-0-C(5) | 1201446579 | 695970 | 1201446578 | DUP | Radium-228 | 0.156 | 0.182 | U | 0.265 | | | | | | |
| MB | 1201446581 | 695971 | 1201446581 | MB | Cesium-137 | 0.0016 | 0.0243 | U | 0.0423 | | | | | | |
| MB | 1201446581 | 695971 | 1201446581 | MB | Radium-226 | -0.0364 | 0.0625 | U | 0.101 | | | | | | |
| MB | 1201446581 | 695971 | 1201446581 | MB | Radium-228 | -0.0635 | 0.109 | U | 0.170 | | | | | | |
| 101207SOMS3-27-0-C(5) | 195906001 | 695971 | 1201446581 | PRIMARY | Cesium-137 | 0.225 | 0.0882 | | 0.0615 | | | | 0.22 | | |
| 101207SOMS3-27-0-C(5) | 195906001 | 695971 | 1201446581 | PRIMARY | Radium-226 | 1.10 | 0.172 | | 0.118 | | | | 0.28 | | |
| 101207SOMS3-27-0-C(5) | 195906001 | 695971 | 1201446581 | PRIMARY | Radium-228 | 1.26 | 0.297 | | 0.202 | | | | 0.19 | | |
| 101207SOMS3-27-0-C(5) | 1201446582 | 695971 | 1201446581 | DUP | Cesium-137 | 0.274 | 0.0657 | | 0.079 | | | | | | |
| 101207SOMS3-27-0-C(5) | 1201446582 | 695971 | 1201446581 | DUP | Radium-226 | 1.25 | 0.207 | | 0.124 | | | | | | |
| 101207SOMS3-27-0-C(5) | 1201446582 | 695971 | 1201446581 | DUP | Radium-228 | 1.08 | 0.382 | | 0.280 | | | | | | |

| | | |
|---|---|---|
| Dupl RPD= | Cesium-137 | 26 |
| | Radium-226 | 2.6 |
| | Radium-228 | -19 |

| | | |
|---|---|---|
| Dupl RPD= | Cesium-137 | NDs |
| | Radium-226 | 27 |
| | Radium-228 | 88 |

| | | |
|---|---|---|
| Dupl RPD= | Cesium-137 | -20 |
| | Radium-226 | -13 |
| | Radium-228 | 15 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195905**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Typ | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 100907SOMS-08-0-C(5) | 195905002 | Cesium-13 | 2.13 | 0.171 | | | | | | | | | | | | |
| 101107SOMS2-10-0-C(5) | 195905004 | Radium-22 | 1.49 | 0.779 | | | | | | | | | | | | |
| 100907SOMS3-59-0-C(5) | 195905007 | Cesium-13 | 1.49 | 0.129 | | | | | | | | | | | | |
| 101107SOMS4-18-0-C(5) | 195905009 | Radium-22 | 2.57 | 0.582 | | | | | | | | | | | | |
| 100907SOMS3-60-0-C(5) | 195905010 | Cesium-13 | 2.55 | 0.269 | | | | | | | | | | | | |
| 101007SOMS4-6-0-C(5) | 195905011 | Cesium-13 | 1.97 | 0.152 | | | | | | | | | | | | |
| 101007SOMS2-14-0-C(5) | 195905012 | Cesium-13 | 2.00 | 0.211 | | | | | | | | | | | | |
| 101007SOMS-03-0-C(5) | 195905014 | Cesium-13 | 2.32 | 0.212 | | | | | | | | | | | | |
| 100907SOMSN-05-0-C(5) | 195905015 | Cesium-13 | 1.83 | 0.148 | | | | | | | | | | | | |
| 100907SOMS3-73-0-C(5) | 195905016 | Radium-22 | 0.59 | 0.160 | | | | | | | | | | | | |
| 100907SOMS3-69-0-C(5) | 195905018 | Cesium-13 | 2.53 | 0.193 | | | | | | | | | | | | |
| 101007SOMS-10-0-C(5) | 195905021 | Radium-22 | 2.34 | 1.18 | | | | | | | | | | | | |
| 101007SOMS3-52-0-C(5) | 195905022 | Cesium-13 | 2.26 | 0.194 | | | | | | | | | | | | |
| 101007SOMS4-10-0-C(5) | 195905023 | Cesium-13 | 0.96 | 0.0953 | | | | | | | | | | | | |
| 101007SOMS3-04-0-C(5) | 195905024 | Radium-22 | 0.94 | 0.511 | | | | | | | | | | | | |
| 101007SOMS-09-0-C(5) | 195905025 | Cesium-13 | 1.83 | 0.189 | | | | | | | | | | | | |
| 101007SOMS3-14-0-C(5) | 195905026 | Cesium-13 | 1.53 | 0.188 | | | | | | | | | | | | |
| 101007SOMS2-13-0-C(5) | 195905027 | Cesium-13 | 1.68 | 0.146 | | | | | | | | | | | | |
| 101007SOMS3-51-0-C(5) | 195905029 | Cesium-13 | 1.22 | 0.176 | | | | | | | | | | | | |
| 100907SOMS2-01-0-C(5) | 195905030 | Radium-22 | 1.92 | 0.399 | | | | | | | | | | | | |
| 101007SOMS2-6-0-C(5) | 195905033 | Cesium-13 | 1.69 | 0.144 | | | | | | | | | | | | |
| 101007SOMS2-011-0-C(5) | 195905034 | Cesium-13 | 1.72 | 0.197 | | | | | | | | | | | | |
| 101007SOMS2-011-0-C(5) | 195905034 | Radium-22 | 2.16 | 0.991 | | | | | | | | | | | | |
| 101007SOMS3-02-0-C(5) | 195905035 | Cesium-13 | 2.14 | 0.196 | | | | | | | | | | | | |

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|---|---|
| **MWH Client:** | Monsanto Company |
| **MWH Project Name:** | CERCLA 2nd 5-Year Review |
| **MWH Project Number:** | 1010076.011701 |
| **Laboratory:** | GEL Laboratories, LLC (Charleston, SC) |
| **Data packages:** | Sample Delivery Group (SDG) Number 195906 |
| **Analytical Batches:** | 695971 and 695972 |
| **Method:** | Gamma Radium (Ra) 226 ($^{226}Ra$), $^{228}Ra$, and $^{137}Cs$ by EML HASL 300, 4.5.2.3 and per the laboratory's SOP GL-RAD-A-013 Rev #14 (a gamma spectrometry method) |
| **Guidance Documents:** | U.S. Department of Energy, *Evaluation of Radiochemical Data Usability*, es/er/ms-5, April 1997.<br><br>U.S. Department of Energy, Environmental Measurements Laboratory, *Health and Safety Laboratory (HASL)-300 Manual,* Section 4.5.2.3 (Ga-01-R: high resolution germanium detector gamma ray spectrometry), 28th Edition, February 1997. |
| **Modification:** | Data Flags and Reason Codes as specified in Appendix A of *Evaluation of Radiochemical Data Usability* (see Attachment A below) were used to qualify the data, with modification for the evaluation of laboratory duplicate (duplicate sample error ratio used instead of normalized absolute difference). |
| **Clarifications:** | Radiochemical tracers are referenced in the *Evaluation of Radiochemical Data Usability* guidance document, but are not applicable to gamma spectroscopy methods. Matrix spikes are also referenced, but were not used by GEL; data were not qualified because matrix spikes were not used. GEL did not provide calibration data. Results were not qualified, but sample results in the project database were populated with the applicable Reason Code (C03). |
| **Attachment A:** | Validation Flags and Reason Codes |
| **Attachment B:** | Validation Worksheet |

**Sample Cross Reference:**

| No. | Field Sample Identification | Date Collected | Laboratory Sample Identification |
|---|---|---|---|
| | | | |
| 1 | 101207SOMS3-27-0-C(5) | 10/12/07 | 195906001 |
| 2 | 101107SOMS3-36-0-C(3) | 10/11/07 | 195906002 |
| 3 | 101207SOMS3-31-0-C(5) | 10/12/07 | 195906003 |
| 4 | 101207SOMS3-97-0-C(5) | 10/12/07 | 195906004 |
| 5 | 101207SOMS2-22-0-C(5) | 10/12/07 | 195906005 |
| 6 | 101007SOME-2-0-C(5) | 10/10/07 | 195906007 |
| 7 | 101207SOMS3-28-0-C(5) | 10/12/07 | 195906008 |
| 8 | 101307SOMF-1-0-C(5) | 10/13/07 | 195906010 |
| 9 | 101307SOMF-2-0-C(5) | 10/13/07 | 195906011 |
| 10 | 101307SOMA-1-0-C(5) | 10/13/07 | 195906012 |
| 11 | 101307SOMBACK-3-0-C(5) | 10/13/07 | 195906013 |
| 12 | 101207SOMS3-38-0-C(5) | 10/12/07 | 195906014 |
| 13 | 101207SOMS2-04-0-C(5) | 10/12/07 | 195906015 |
| 14 | 101307SOMG-1-0-C(5) | 10/13/07 | 195906016 |
| 15 | 101307SOMBACK-1-0-C(5) | 10/13/07 | 195906017 |
| 16 | 101307SOMA-2-0-C(5) | 10/13/07 | 195906018 |
| 17 | 101207SOMS3-40-0-C(5) | 10/12/07 | 195906019 |
| 18 | 101307SOMBACK-2-0-C(5) | 10/13/07 | 195906020 |
| 19 | 101207SOMS3-95-0-C(5) | 10/12/07 | 195906021 |
| 20 | 101207SOMS3-33-0-C(5) | 10/12/07 | 195906022 |
| 21 | 101207SOMS3-35-0-C(5) | 10/12/07 | 195906023 |
| 22 | 101207SOMS3-107-0-C(5) | 10/12/07 | 195906024 |
| 23 | 101207SOMS3-29-0-C(5) | 10/12/07 | 195906026 |
| 24 | 101207SOMS3-96-0-C(5) | 10/12/07 | 195906027 |
| 25 | 101207SOML1-06-0-C(5) | 10/12/07 | 195906028 |
| 26 | 101307SOMS3-94-0-C(5) | 10/13/07 | 195906029 |
| 27 | 101307SOMS3-66-0-C(5) | 10/13/07 | 195906030 |

## I. Chain-of-Custody Procedure, Sample Preservation, and Holding Time

_X__ Signatures on chain(s) and all samples accounted for
_X__ $^{226}Ra$, $^{228}Ra$, $^{137}Cs$: collected in HDPE (polyethylene) containers

A total of 27 soil samples were collected between October 11 and 13, 2007 in HDPE containers. All samples collected during this week were shipped in 11 coolers, and arrived at the laboratory on October 17, 2007. Sample chain-of-custody and laboratory receipt documentation appears intact. The 27 primary samples were prepared on October 23, 2007 and analyzed on October 31 and November 1 2007, 18 to 22 days into the 6-month laboratory-referenced holding time.

## II. Instrument Calibration

____ Confirm summary report includes: dates of calibration, geometry, count times for all analysis, number of counts for each standard, measured activity for all samples
____ Confirm matrix used in geometry standard
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate

____ Calibration points including efficiency, energy, and peak resolution

Initial calibration data were not assessed because none was provided in the data package.

## III. Calibration Verification

____ Tolerance chart or statistical control chart of the appropriate 20 efficiencies and 20 relevant peak energies with 3 F+/- limits
____ Resolution demonstration of relevant peak(s)
____ Listing of X/Y coordinates in constructing the control charts
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate
____ Geometries used in analysis

Calibration verification data were not assessed because none was provided in the data package.

## IV. Target Compound Identification and Quantitation

_X___ Confirm all samples less than MDC are qualified not detected (U)
_X___ Less than two times the uncertainty were reported by the laboratory as not detected (U)

All sample results that were either less than two times the uncertainty were reported by the laboratory as not detected (U), or were greater than two times the uncertainty and greater than the minimum detectable concentration (MDC), with the following exceptions:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result Minus 2*Uncert | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101307SOMA-2-0-C(5) | 195906018 | $^{137}Cs$ | -0.028 | 0.158 | UJ | Q09 |
| 101207SOMS3-107-0-C(5) | 195906024 | $^{137}Cs$ | -0.003 | 0.157 | UJ | Q09 |

Results were flagged as not detected (UJ) at the reported concentrations because they failed both the above "two times uncertainty" criterion and the blank criterion specified in Section V below.

Additionally, the laboratory qualified the following sample as footnoted:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|
| 101307SOMA-1-0-C(5) | 195906012 | $^{137}Cs$ | 0.00 UI [a] | UJ | Q02 |

[a] Data rejected due to no valid peak.

"Data rejected due to no valid peak" is interpreted to be that there was positive interference at the target frequency that did not meet the qualitative criteria for the target isotope, so the observed result is treated as not detected (UJ).

## V. Blanks

_X___ Method blank results < MDC
_X___ Calculate normalized absolute difference (NAD) =

$$|(\text{Sample} - \text{Blank})| / ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Blank}}]^{1/2})$$

_X___ If normalized absolute difference is > 2.58, no action necessary
_X___ If normalized absolute difference is between 1.96 and 2.58, qualify sample J
_____ If normalized absolute difference is less than 1.96, consider rejecting data

All normalized absolute differences (per above calculation) were greater than 2.58 for all sample results that were reportable (that is, reported as a detection above the MDC), with the following exceptions:

| Field Sample Identification | Laboratory Sample Identification | Parameter | NAD | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101207SOMS3-27-0-C(5) | 195906001 | $^{137}Cs$ | 2.44 | 0.0882 | J | B01 |
| 101107SOMS3-36-0-C(3) | 195906002 | $^{228}Ra$ | 2.17 | 0.430 | J | B01 |
| 101207SOMS3-31-0-C(5) | 195906003 | $^{137}Cs$ | 2.29 | 0.0906 | J | B01 |
| 101307SOMF-1-0-C(5) | 195906010 | $^{137}Cs$ | 2.15 | 0.0577 | J | B01 |
| 101307SOMA-2-0-C(5) | 195906018 | $^{137}Cs$ | 1.65 | 0.0931 | UJ | B01 |
| 101207SOMS3-33-0-C(5) | 195906022 | $^{228}Ra$ | 2.50 | 0.258 | J | B01 |
| 101207SOMS3-107-0-C(5) | 195906024 | $^{137}Cs$ | 1.90 | 0.0799 | UJ | B01 |
| 101307SOMS3-66-0-C(5) | 195906030 | $^{137}Cs$ | 2.45 | 0.0722 | J | B01 |

## VI. Laboratory Duplicates

_X___ Must be analyzed for each batch or for every 20 samples
_X___ RPDs within the laboratory's control limits (RPD not calculated when one or both duplicate results are not detected)
_X___ Calculate the duplicate error ratio (DER)) =

$$|(\text{Sample} - \text{Duplicate})| / (2 * ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Duplicate}}]^{1/2}))$$

$$\text{DER} \leq 1.42$$

_____ If DER > 1.42, qualify sample J

The laboratory's laboratory duplicate criteria are: If duplicate activities are less than 5 times MDC, then the RPD should be less than 100%; if activities are greater than 5 times the MDC, the RPD should be less than 20%.

All RPDs and DERs associated with both laboratory duplicate pairs were within these criteria.

## VII. Laboratory Control Samples

_X___ Must be analyzed for each batch or for every 20 samples
_X___ Compare %R with lab control limits (75-125%)

All recoveries for each laboratory control samples were within control limits.

## VIII. Equipment and Water Blank Samples

A total of 17 equipment blanks and 17 water blanks were collected between October 9 and 15, 2007 for gamma spectrometry analysis, including analysis for $^{226}Ra$ and $^{137}Cs$ (see data validation report for GEL SDG 195907). All equipment blanks and water blanks were not detected for both $^{226}Ra$ and $^{137}Cs$.

## IX. Overall Assessment of Data

With the following exceptions, all quality control data associated with the field samples were within control limits. All other field results are usable as reported by the laboratory.

**Summary of Qualified Data:**

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/g)/Lab Flag | Data Validation Result/Flag | Reason Code |
|---|---|---|---|---|---|
| All sample results | | | | No flag | C03 |
| 101207SOMS3-27-0-C(5) | 195906001 | $^{137}Cs$ | 0.0882 | J | B01 |
| 101107SOMS3-36-0-C(3) | 195906002 | $^{228}Ra$ | 0.430 | J | B01 |
| 101207SOMS3-31-0-C(5) | 195906003 | $^{137}Cs$ | 0.0906 | J | B01 |
| 101307SOMF-1-0-C(5) | 195906010 | $^{137}Cs$ | 0.0577 | J | B01 |
| 101307SOMA-1-0-C(5) | 195906012 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |
| 101307SOMA-2-0-C(5) | 195906018 | $^{137}Cs$ | 0.0931 | UJ | Q09,B01 |
| 101207SOMS3-33-0-C(5) | 195906022 | $^{228}Ra$ | 0.258 | J | B01 |
| 101207SOMS3-107-0-C(5) | 195906024 | $^{137}Cs$ | 0.0799 | UJ | Q09,B01 |
| 101307SOMS3-66-0-C(5) | 195906030 | $^{137}Cs$ | 0.0722 | J | B01 |

# ATTACHMENT A
## Radiochemical Data Verification and Validation: Per Appendix A in *Evaluation of Radiochemical Data Usability, es/er/ms-5* USDOE April, 1995

| Flag | Definition |
|---|---|
| U | Nuclide considered not detected above the reported MDC or 2 times the uncertainty |
| J | Nuclide identified; the associated value is approximated |
| UJ | Nuclide not detected above the reported MDC or 2 times the uncertainty and a quality deficiency affects the data and impacts the uncertainty of the reported data |
| R | Result is not usable for its intended purpose |

| Reason Code | Definition |
|---|---|
| ***Method Blank*** | |
| B01 | Concentration of contaminant in the method blank at a level ≥ the qualification level |
| B02 | Method blank was not the same matrix as the analytical samples |
| B03 | Gross contamination exists |
| B04 | Blanks were not analyzed at the appropriate frequency |
| B05 | Sample not significantly different than radiochemical method blank |
| B06 | Blank data not reports |
| B07 | Other (describe in comments) |
| ***Calibration*** | |
| C01 | Initial calibration sequence was not followed as appropriate |
| C02 | Calibration was not performed at the appropriate frequency |
| C03 | Calibration data not reported |
| C04 | Calibration not performed |
| C05 | Chemical resolution criteria were not satisfied |
| C06 | Standard curve was established with fewer than the required number of standards |
| C07 | Instrumental system determined to be out of control |
| C08 | Other (describe in comments) |
| ***Laboratory Duplicate*** | |
| D01 | Significant difference between sample and duplicate |
| D02 | Laboratory duplicate was not analyzed at the appropriate frequency |
| D03 | Laboratory duplicate data was not reported |
| D04 | Other (describe in comments) |
| ***Evidentiary Concerns*** | |
| E01 | Custody of sample in question |
| E02 | Standard not traceable |
| E03 | Other (describe in comments) |
| ***General*** | |
| G01 | Professional judgment was used to qualify the data |
| G02 | Other (describe in comments) |
| ***Holding Times*** | |
| H01 | Holding times were exceeded |
| H02 | Holding times were grossly exceeded |
| H03 | Samples were not preserved properly |
| H04 | Other (describe in comments) |
| ***Laboratory Control Sample*** | |
| L01 | LCS recovery above upper control limit |
| L02 | LCS recovery below lower control limit |
| L03 | LCS was not analyzed at appropriate frequency |
| L04 | LCS not the same matrix as the analytical samples |

| Reason Code | Definition |
|---|---|
| L05 | LCS data not reported |
| L06 | Other (describe in comments) |
| ***Matrix Spike and MS/MSD*** | |
| M01 | MS recovery above upper control limit |
| M02 | MS recovery below lower control limit |
| M03 | MS not analyzed at the appropriate frequency |
| M04 | MS data not reported |
| M05 | Other (describe in comments) |
| ***Instrument Performance*** | |
| P01 | High background levels or a shift in the energy calibration were observed |
| P02 | Extraneous peaks were observed |
| P03 | Loss of resolution was observed |
| P04 | Peak-tailing or peak splitting that may result in inaccurate quantitation were observed |
| P05 | Instrument performance not analyzed at the appropriate frequency |
| P06 | Other (describe in comments) |
| ***Quantitation*** | |
| Q01 | Peak misidentified |
| Q02 | Target analyte affected by interfering peak |
| Q03 | Qualitative criteria were not satisfied |
| Q04 | Cross contamination occurred |
| Q05 | No raw data were provided to confirm Quantitation |
| Q06 | MDC > RDL |
| Q07 | Inappropriate aliquot sizes were used |
| Q08 | Sample result < MDC |
| Q09 | Sample result < 2s uncertainty |
| Q10 | Negative result |
| Q11 | Compounds were not adequately resolved |
| Q12 | Sample weight different from calibration geometry |
| Q13 | Sample weight greater than greatest weight on mass attenuation curve |
| Q14 | Other (describe in comments) |
| ***Radiochemical Yield*** | |
| Y01 | Radiochemical tracer yield was above the upper control limit |
| Y02 | Radiochemical tracer yield was below the lower control limit |
| Y03 | Radiochemical tracer yield was zero |
| Y04 | Radiochemical yield data was not present |
| Y05 | Other (describe in comments) |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195906**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101207SOMS3-27-0-C(5) | 195906001 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.225 | 0.0882 | | 0.0615 | 0.164 | 0.049 | 2.44 | 0.22 | J | B01,C03 |
| 101207SOMS3-27-0-C(5) | 195906001 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.10 | 0.172 | | 0.118 | 0.982 | 0.756 | 6.21 | 0.28 | | C03 |
| 101207SOMS3-27-0-C(5) | 195906001 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.26 | 0.297 | | 0.202 | 1.058 | 0.666 | 4.18 | 0.19 | | C03 |
| 101107SOMS3-36-0-C(3) | 195906002 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.570 | 0.126 | | 0.128 | 0.442 | 0.318 | 4.43 | | | C03 |
| 101107SOMS3-36-0-C(3) | 195906002 | 695971 | 1201446581 | SAMPLE | Radium-226 | 6.32 | 0.685 | | 0.199 | 6.121 | 4.950 | 9.24 | | | C03 |
| 101107SOMS3-36-0-C(3) | 195906002 | 695971 | 1201446581 | SAMPLE | Radium-228 | 0.898 | 0.430 | | 0.410 | 0.488 | 0.038 | 2.17 | | J | B01,C03 |
| 101207SOMS3-31-0-C(5) | 195906003 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.216 | 0.0906 | | 0.0636 | 0.152 | 0.035 | 2.29 | | J | B01,C03 |
| 101207SOMS3-31-0-C(5) | 195906003 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.22 | 0.176 | | 0.129 | 1.091 | 0.868 | 6.73 | | | C03 |
| 101207SOMS3-31-0-C(5) | 195906003 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.21 | 0.317 | | 0.229 | 0.981 | 0.576 | 3.80 | | | C03 |
| 101207SOMS3-97-0-C(5) | 195906004 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.405 | 0.0723 | | 0.0573 | 0.348 | 0.260 | 5.29 | | | C03 |
| 101207SOMS3-97-0-C(5) | 195906004 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.17 | 0.170 | | 0.0991 | 1.071 | 0.830 | 6.66 | | | C03 |
| 101207SOMS3-97-0-C(5) | 195906004 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.02 | 0.254 | | 0.173 | 0.847 | 0.512 | 3.92 | | | C03 |
| 101207SOMS2-22-0-C(5) | 195906005 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.0257 | 0.0341 | U | 0.0446 | -0.019 | -0.043 | 0.58 | | | C03 |
| 101207SOMS2-22-0-C(5) | 195906005 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.06 | 0.171 | | 0.096 | 0.964 | 0.718 | 6.02 | | | C03 |
| 101207SOMS2-22-0-C(5) | 195906005 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.27 | 0.257 | | 0.152 | 1.118 | 0.756 | 4.78 | | | C03 |
| 101007SOME-2-0-C(5) | 195906007 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.515 | 0.0891 | | 0.0922 | 0.423 | 0.337 | 5.56 | | | C03 |
| 101007SOME-2-0-C(5) | 195906007 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.11 | 0.221 | | 0.163 | 0.947 | 0.668 | 4.99 | | | C03 |
| 101007SOME-2-0-C(5) | 195906007 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.19 | 0.366 | | 0.319 | 0.871 | 0.458 | 3.28 | | | C03 |
| 101207SOMS3-28-0-C(5) | 195906008 | 695971 | 1201446581 | SAMPLE | Cesium-137 | -0.017 | 0.0436 | U | 0.0725 | -0.090 | -0.104 | 0.37 | | | C03 |
| 101207SOMS3-28-0-C(5) | 195906008 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.20 | 0.200 | | 0.135 | 1.065 | 0.800 | 5.90 | | | C03 |
| 101207SOMS3-28-0-C(5) | 195906008 | 695971 | 1201446581 | SAMPLE | Radium-228 | 0.995 | 0.296 | | 0.236 | 0.759 | 0.403 | 3.36 | | | C03 |
| 101307SOMF-1-0-C(5) | 195906010 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.136 | 0.0577 | | 0.0749 | 0.061 | 0.021 | 2.15 | | J | B01,C03 |
| 101307SOMF-1-0-C(5) | 195906010 | 695971 | 1201446581 | SAMPLE | Radium-226 | 0.964 | 0.162 | | 0.113 | 0.851 | 0.640 | 5.76 | | | C03 |
| 101307SOMF-1-0-C(5) | 195906010 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.44 | 0.299 | | 0.228 | 1.212 | 0.842 | 4.72 | | | C03 |
| 101307SOMF-2-0-C(5) | 195906011 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.274 | 0.0474 | | 0.0396 | 0.234 | 0.179 | 5.11 | | | C03 |
| 101307SOMF-2-0-C(5) | 195906011 | 695971 | 1201446581 | SAMPLE | Radium-226 | 0.900 | 0.145 | | 0.0883 | 0.812 | 0.610 | 5.93 | | | C03 |
| 101307SOMF-2-0-C(5) | 195906011 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.15 | 0.255 | | 0.156 | 0.994 | 0.640 | 4.38 | | | C03 |
| 101307SOMA-1-0-C(5) | 195906012 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.00 | 0.0931 | UI | 0.0767 | -0.077 | -0.186 | 0.02 | | UJ | Q02,C03 |
| 101307SOMA-1-0-C(5) | 195906012 | 695971 | 1201446581 | SAMPLE | Radium-226 | 0.877 | 0.183 | | 0.126 | 0.751 | 0.511 | 4.72 | | | C03 |
| 101307SOMA-1-0-C(5) | 195906012 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.48 | 0.359 | | 0.237 | 1.243 | 0.762 | 4.11 | | | C03 |
| 101307SOMBACK-3-0-C(5) | 195906013 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.170 | 0.0571 | | 0.0756 | 0.094 | 0.056 | 2.71 | | | C03 |
| 101307SOMBACK-3-0-C(5) | 195906013 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.00 | 0.183 | | 0.114 | 0.886 | 0.634 | 5.36 | | | C03 |
| 101307SOMBACK-3-0-C(5) | 195906013 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.21 | 0.322 | | 0.247 | 0.963 | 0.566 | 3.75 | | | C03 |
| 101207SOMS3-38-0-C(5) | 195906014 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.222 | 0.0625 | | 0.0559 | 0.166 | 0.097 | 3.29 | | | C03 |
| 101207SOMS3-38-0-C(5) | 195906014 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.41 | 0.207 | | 0.108 | 1.302 | 0.996 | 6.69 | | | C03 |
| 101207SOMS3-38-0-C(5) | 195906014 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.35 | 0.313 | | 0.218 | 1.132 | 0.724 | 4.26 | | | C03 |
| 101207SOMS2-04-0-C(5) | 195906015 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.425 | 0.114 | | 0.0952 | 0.330 | 0.197 | 3.63 | | | C03 |
| 101207SOMS2-04-0-C(5) | 195906015 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.38 | 0.275 | | 0.153 | 1.227 | 0.830 | 5.02 | | | C03 |
| 101207SOMS2-04-0-C(5) | 195906015 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.21 | 0.365 | | 0.292 | 0.918 | 0.480 | 3.34 | | | C03 |
| 101307SOMG-1-0-C(5) | 195906016 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.547 | 0.102 | | 0.0727 | 0.474 | 0.343 | 5.20 | | | C03 |
| 101307SOMG-1-0-C(5) | 195906016 | 695971 | 1201446581 | SAMPLE | Radium-226 | 0.987 | 0.216 | | 0.146 | 0.841 | 0.555 | 4.55 | | | C03 |
| 101307SOMG-1-0-C(5) | 195906016 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.72 | 0.397 | | 0.237 | 1.483 | 0.926 | 4.33 | | | C03 |
| 101307SOMBACK-1-0-C(5) | 195906017 | 695971 | 1201446581 | SAMPLE | Cesium-137 | 0.207 | 0.0563 | | 0.0413 | 0.166 | 0.094 | 3.35 | | | C03 |
| 101307SOMBACK-1-0-C(5) | 195906017 | 695971 | 1201446581 | SAMPLE | Radium-226 | 1.17 | 0.176 | | 0.101 | 1.069 | 0.818 | 6.46 | | | C03 |
| 101307SOMBACK-1-0-C(5) | 195906017 | 695971 | 1201446581 | SAMPLE | Radium-228 | 1.21 | 0.291 | | 0.165 | 1.045 | 0.628 | 4.10 | | | C03 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195906**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101307SOMA-2-0-C(5) | 195906018 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.158 | 0.0931 | | 0.0664 | 0.092 | -0.028 | 1.65 | | UJ | Q09,B01,C03 |
| 101307SOMA-2-0-C(5) | 195906018 | 695972 | 1201446584 | SAMPLE | Radium-226 | 1.00 | 0.176 | | 0.126 | 0.874 | 0.648 | 5.43 | | | C03 |
| 101307SOMA-2-0-C(5) | 195906018 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.27 | 0.289 | | 0.280 | 0.990 | 0.692 | 4.17 | | | C03 |
| 101207SOMS3-40-0-C(5) | 195906019 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 2.20 | 0.273 | | 0.107 | 2.093 | 1.654 | 8.04 | | | C03 |
| 101207SOMS3-40-0-C(5) | 195906019 | 695972 | 1201446584 | SAMPLE | Radium-226 | 2.26 | 0.349 | | 0.189 | 2.071 | 1.562 | 6.38 | | | C03 |
| 101207SOMS3-40-0-C(5) | 195906019 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.68 | 0.465 | | 0.355 | 1.325 | 0.750 | 3.50 | | | C03 |
| 101307SOMBACK-2-0-C(5) | 195906020 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.201 | 0.0683 | | 0.0622 | 0.139 | 0.064 | 2.82 | | | C03 |
| 101307SOMBACK-2-0-C(5) | 195906020 | 695972 | 1201446584 | SAMPLE | Radium-226 | 1.09 | 0.175 | | 0.106 | 0.984 | 0.740 | 5.96 | | | C03 |
| 101307SOMBACK-2-0-C(5) | 195906020 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.12 | 0.277 | | 0.209 | 0.911 | 0.566 | 3.82 | | | C03 |
| 101207SOMS3-95-0-C(5) | 195906021 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 2.05 | 0.221 | | 0.0985 | 1.952 | 1.608 | 9.24 | | | C03 |
| 101207SOMS3-95-0-C(5) | 195906021 | 695972 | 1201446584 | SAMPLE | Radium-226 | 2.56 | 0.335 | | 0.167 | 2.393 | 1.890 | 7.53 | | | C03 |
| 101207SOMS3-95-0-C(5) | 195906021 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.42 | 0.387 | | 0.326 | 1.094 | 0.646 | 3.53 | | | C03 |
| 101207SOMS3-33-0-C(5) | 195906022 | 695972 | 1201446584 | SAMPLE | Cesium-137 | -0.0117 | 0.0341 | U | 0.0548 | -0.067 | -0.080 | 0.34 | | | C03 |
| 101207SOMS3-33-0-C(5) | 195906022 | 695972 | 1201446584 | SAMPLE | Radium-226 | 0.785 | 0.144 | | 0.100 | 0.685 | 0.497 | 5.12 | | | C03 |
| 101207SOMS3-33-0-C(5) | 195906022 | 695972 | 1201446584 | SAMPLE | Radium-228 | 0.699 | 0.258 | | 0.183 | 0.516 | 0.183 | 2.50 | | J | B01,C03 |
| 101207SOMS3-35-0-C(5) | 195906023 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.285 | 0.0665 | | 0.0513 | 0.234 | 0.152 | 4.11 | | | C03 |
| 101207SOMS3-35-0-C(5) | 195906023 | 695972 | 1201446584 | SAMPLE | Radium-226 | 0.967 | 0.158 | | 0.0962 | 0.871 | 0.651 | 5.81 | | | C03 |
| 101207SOMS3-35-0-C(5) | 195906023 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.15 | 0.255 | | 0.147 | 1.003 | 0.640 | 4.24 | | | C03 |
| 101207SOMS3-107-0-C(5) | 195906024 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.157 | 0.0799 | | 0.0846 | 0.072 | -0.003 | 1.90 | | UJ | Q09,B01,C03 |
| 101207SOMS3-107-0-C(5) | 195906024 | 695972 | 1201446584 | SAMPLE | Radium-226 | 0.731 | 0.209 | | 0.144 | 0.587 | 0.313 | 3.35 | | | C03 |
| 101207SOMS3-107-0-C(5) | 195906024 | 695972 | 1201446584 | SAMPLE | Radium-228 | 0.210 | 0.271 | U | 0.224 | -0.014 | -0.332 | 0.63 | | | C03 |
| 101207SOMS3-29-0-C(5) | 195906026 | 695972 | 1201446584 | SAMPLE | Cesium-137 | -0.000163 | 0.0257 | U | 0.0435 | -0.044 | -0.052 | 0.05 | 0.26 | | C03 |
| 101207SOMS3-29-0-C(5) | 195906026 | 695972 | 1201446584 | SAMPLE | Radium-226 | 1.08 | 0.150 | | 0.0736 | 1.006 | 0.780 | 6.82 | 0.04 | | C03 |
| 101207SOMS3-29-0-C(5) | 195906026 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.00 | 0.266 | | 0.145 | 0.855 | 0.468 | 3.53 | 0.07 | | C03 |
| 101207SOMS3-96-0-C(5) | 195906027 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.310 | 0.0632 | | 0.053 | 0.257 | 0.184 | 4.69 | | | C03 |
| 101207SOMS3-96-0-C(5) | 195906027 | 695972 | 1201446584 | SAMPLE | Radium-226 | 0.802 | 0.164 | | 0.0977 | 0.704 | 0.474 | 4.63 | | | C03 |
| 101207SOMS3-96-0-C(5) | 195906027 | 695972 | 1201446584 | SAMPLE | Radium-228 | 0.984 | 0.250 | | 0.202 | 0.782 | 0.484 | 3.68 | | | C03 |
| 101207SOML1-06-0-C(5) | 195906028 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.358 | 0.0862 | | 0.0865 | 0.272 | 0.186 | 4.05 | | | C03 |
| 101207SOML1-06-0-C(5) | 195906028 | 695972 | 1201446584 | SAMPLE | Radium-226 | 1.32 | 0.206 | | 0.126 | 1.194 | 0.908 | 6.19 | | | C03 |
| 101207SOML1-06-0-C(5) | 195906028 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.42 | 0.366 | | 0.249 | 1.171 | 0.688 | 3.73 | | | C03 |
| 101307SOMS3-94-0-C(5) | 195906029 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.769 | 0.114 | | 0.0656 | 0.703 | 0.541 | 6.65 | | | C03 |
| 101307SOMS3-94-0-C(5) | 195906029 | 695972 | 1201446584 | SAMPLE | Radium-226 | 2.36 | 0.274 | | 0.116 | 2.244 | 1.812 | 8.45 | | | C03 |
| 101307SOMS3-94-0-C(5) | 195906029 | 695972 | 1201446584 | SAMPLE | Radium-228 | 0.984 | 0.276 | | 0.212 | 0.772 | 0.432 | 3.35 | | | C03 |
| 101307SOMS3-66-0-C(5) | 195906030 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.184 | 0.0722 | | 0.0781 | 0.106 | 0.040 | 2.45 | | J | B01,C03 |
| 101307SOMS3-66-0-C(5) | 195906030 | 695972 | 1201446584 | SAMPLE | Radium-226 | 1.67 | 0.228 | | 0.117 | 1.553 | 1.214 | 7.13 | | | C03 |
| 101307SOMS3-66-0-C(5) | 195906030 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.27 | 0.349 | | 0.234 | 1.036 | 0.572 | 3.48 | | | C03 |
| MB | 1201446581 | 695971 | 1201446581 | MB | Cesium-137 | 0.0016 | 0.0243 | U | 0.0423 | | | | | | |
| MB | 1201446581 | 695971 | 1201446581 | MB | Radium-226 | -0.0364 | 0.0625 | U | 0.101 | | | | | | |
| MB | 1201446581 | 695971 | 1201446581 | MB | Radium-228 | -0.0635 | 0.109 | U | 0.170 | | | | | | |
| 101207SOMS3-27-0-C(5) | 1201446582 | 695971 | 1201446581 | DUP | Cesium-137 | 0.274 | 0.0657 | | 0.079 | | | | | | |
| 101207SOMS3-27-0-C(5) | 1201446582 | 695971 | 1201446581 | DUP | Radium-226 | 1.25 | 0.207 | | 0.124 | | | | | | |
| 101207SOMS3-27-0-C(5) | 1201446582 | 695971 | 1201446581 | DUP | Radium-228 | 1.08 | 0.382 | | 0.280 | | | | | | |
| MB | 1201446584 | 695972 | 1201446584 | MB | Cesium-137 | 0.00144 | 0.0181 | U | 0.0308 | | | | | | |
| MB | 1201446584 | 695972 | 1201446584 | MB | Radium-226 | 0.0181 | 0.0416 | U | 0.069 | | | | | | |
| MB | 1201446584 | 695972 | 1201446584 | MB | Radium-228 | 0.0358 | 0.063 | U | 0.118 | | | | | | |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195906**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101207SOMS3-29-0-C(5) | 1201446585 | 695972 | 1201446584 | DUP | Cesium-137 | -0.0217 | 0.0326 | U | 0.0518 | | | | | | | |
| 101207SOMS3-29-0-C(5) | 1201446585 | 695972 | 1201446584 | DUP | Radium-226 | 1.10 | 0.190 | | 0.0947 | | | | | | | |
| 101207SOMS3-29-0-C(5) | 1201446585 | 695972 | 1201446584 | DUP | Radium-228 | 1.05 | 0.275 | | 0.164 | | | | | | | |

| | | |
|---|---|---|
| Dupl RPD= | Cesium-137 | -20 |
| | Radium-226 | -13 |
| | Radium-228 | 15 |

| | | |
|---|---|---|
| Dupl RPD= | Cesium-137 | NDs |
| | Radium-226 | -1.8 |
| | Radium-228 | -4.9 |

| | |
|---|---|
| **MWH Client:** | Monsanto Company |
| **MWH Project Name:** | CERCLA 2nd 5-Year Review |
| **MWH Project Number:** | 1010076.011701 |
| **Laboratory:** | GEL Laboratories, LLC (Charleston, SC) |
| **Data packages:** | Sample Delivery Group (SDG) Number 195907 |
| **Analytical Batches:** | 695971 and 695972 |
| **Method:** | Gamma Radium (Ra) 226 ($^{226}Ra$), $^{228}Ra$, and $^{137}Cs$ by EML HASL 300, 4.5.2.3 and per the laboratory's SOP GL-RAD-A-013 Rev #14 (a gamma spectrometry method) |
| **Guidance Documents:** | U.S. Department of Energy, *Evaluation of Radiochemical Data Usability*, es/er/ms-5, April 1997.<br><br>U.S. Department of Energy, Environmental Measurements Laboratory, *Health and Safety Laboratory (HASL)-300 Manual,* Section 4.5.2.3 (Ga-01-R: high resolution germanium detector gamma ray spectrometry), 28th Edition, February 1997. |
| **Modification:** | Data Flags and Reason Codes as specified in Appendix A of *Evaluation of Radiochemical Data Usability* (see Attachment A below) were used to qualify the data, with modification for the evaluation of laboratory duplicate (duplicate sample error ratio used instead of normalized absolute difference). |
| **Clarifications:** | Radiochemical tracers are referenced in the *Evaluation of Radiochemical Data Usability* guidance document, but are not applicable to gamma spectroscopy methods. Matrix spikes are also referenced, but were not used by GEL; data were not qualified because matrix spikes were not used. GEL did not provide calibration data. Results were not qualified, but sample results in the project database were populated with the applicable Reason Code (C03). |
| **Attachment A:** | Validation Flags and Reason Codes |
| **Attachment B:** | Validation Worksheet |

**Sample Cross Reference:**

| No. | Field Sample Identification | Date Collected | Laboratory Sample Identification |
|---|---|---|---|
| | | | |
| 1 | 100907SOMS-15-B-U | 10/09/07 | 195907001 |
| 2 | 100907SOMS-15-EQ-U | 10/09/07 | 195907002 |
| 3 | 100907SOMS2-06-B-U | 10/09/07 | 195907003 |
| 4 | 100907SOMS2-06-EQ-U | 10/09/07 | 195907004 |
| 5 | 101007SOMS2-11-B-U | 10/10/07 | 195907005 |
| 6 | 101007SOMS2-11-EQ-U | 10/10/07 | 195907006 |
| 7 | 101207SOMS2-35-B-U | 10/12/07 | 195907007 |
| 8 | 101207SOMS2-35-EQ-U | 10/12/07 | 195907008 |
| 9 | 101307SOMS3-09-B-U | 10/13/07 | 195907009 |
| 10 | 101307SOMS3-09-EQ-U | 10/13/07 | 195907010 |
| 11 | 101307SOMS3-12-B-U | 10/13/07 | 195907011 |
| 12 | 101307SOMS3-12-EQ-U | 10/13/07 | 195907012 |
| 13 | 1012207SOM3-47-B-U | 10/12/07 | 195907013 |
| 14 | 1012207SOM3-47-EQ-U | 10/12/07 | 195907014 |
| 15 | 101307SOMS3-79-B-U | 10/13/07 | 195907015 |
| 16 | 101307SOMS3-79-EQ-U | 10/13/07 | 195907016 |
| 17 | 101107SOMS3-82-B-U | 10/11/07 | 195907017 |
| 18 | 101107SOMS3-82-EQ-U | 10/11/07 | 195907018 |
| 19 | 101207SOMS3-89-B-U | 10/12/07 | 195907019 |
| 20 | 101207SOMS3-89-EQ-U | 10/12/07 | 195907020 |
| 21 | 100907SOMS3-99-B-U | 10/09/07 | 195907021 |
| 22 | 100907SOMS3-99-EQ-U | 10/09/07 | 195907022 |
| 23 | 101307SOMS3-112-B-U | 10/13/07 | 195907023 |
| 24 | 101307SOMS3-112-EQ-U | 10/13/07 | 195907024 |
| 25 | 101307SOMS3-119-B-U | 10/13/07 | 195907025 |
| 26 | 101307SOMS3-119-EQ-U | 10/13/07 | 195907026 |
| 27 | 101107SOMS4-16-B-U | 10/11/07 | 195907027 |
| 28 | 101107SOMS4-16-EQ-U | 10/11/07 | 195907028 |
| 29 | 101007SOMB-3-B-U | 10/10/07 | 195907029 |
| 30 | 101007SOMB-3-EQ-U | 10/10/07 | 195907030 |
| 31 | 101007SOMD-2-B-U | 10/10/07 | 195907031 |
| 32 | 101007SOMD-2-EQ-U | 10/10/07 | 195907032 |
| 33 | 101507SOMKMBACK-5-B-U | 10/15/07 | 195907033 |
| 34 | 101507SOMKMBACK-5-EQ-U | 10/15/07 | 195907034 |

## I. Chain-of-Custody Procedure, Sample Preservation, and Holding Time

_X__ Signatures on chain(s) and all samples accounted for
_X__ $^{226}Ra$, $^{228}Ra$, $^{137}Cs$: collected in HDPE (polyethylene) containers

A total of 17 equipment blanks and 17 water blanks were collected between October 9 and 15, 2007 for gamma spectrometry analysis, including analysis for $^{226}Ra$ and $^{137}Cs$. These field blanks were collected along with all the soil and sediment samples collected during this week, shipped in 11 coolers, and arrived at the laboratory on October 17, 2007. Sample chain-of-custody and laboratory receipt documentation appears intact.

The 34 blanks samples were prepared and analyzed between November 2 and 6, 21 to 26 days into the 6-month laboratory-referenced holding time.

## II. Instrument Calibration

____ Confirm summary report includes: dates of calibration, geometry, count times for all analysis, number of counts for each standard, measured activity for all samples
____ Confirm matrix used in geometry standard
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate
____ Calibration points including efficiency, energy, and peak resolution

Initial calibration data were not assessed because none was provided in the data package.

## III. Calibration Verification

____ Tolerance chart or statistical control chart of the appropriate 20 efficiencies and 20 relevant peak energies with 3 F+/- limits
____ Resolution demonstration of relevant peak(s)
____ Listing of X/Y coordinates in constructing the control charts
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate
____ Geometries used in analysis

Calibration verification data were not assessed because none was provided in the data package.

## IV. Target Compound Identification and Quantitation

_X___ Confirm all samples less than MDC are qualified not detected (U)
_X___ Less than two times the uncertainty were reported by the laboratory as not detected (U)

All sample results were less than the MDC and two times the uncertainty, and were reported by the laboratory as not detected (U).

The laboratory qualified the following samples as footnoted:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/L)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|
| 100907SOMS2-06-EQ-U | 195907004 | $^{226}Ra$ | 0.00 UI | UJ | Q02 |
| 101007SOMS2-11-B-U | 195907005 | $^{226}Ra$ | 0.00 UI | UJ | Q02 |
| 101207SOMS3-89-EQ-U | 195907020 | $^{226}Ra$ | 0.00 UI | UJ | Q02 |

[a] Data rejected due to a high counting uncertainty.
[b] Data rejected due to no valid peak.

"Data rejected due to a high counting uncertainty" and "Data rejected due to no valid peak" are interpreted to be that there was positive interference at the target frequency that did not meet the qualitative criteria for the target isotope, so the observed result is treated as not detected (UJ).

## V. Blanks

_X___ Method blank results < MDC
_____ Calculate normalized absolute difference (NAD) =

$$|(\text{Sample} - \text{Blank})| / ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Blank}}]^{1/2})$$

_____ If normalized absolute difference is > 2.58, no action necessary

_____ If normalized absolute difference is between 1.96 and 2.58, qualify sample J
_____ If normalized absolute difference is less than 1.96, consider rejecting data

All sample results and method blank results were not detected, so calculation of NADs was not applicable.

## VI. Laboratory Duplicates

_X___ Must be analyzed for each batch or for every 20 samples
_____ RPDs within the laboratory's control limits (RPD not calculated when one or both duplicate results are not detected)
_____ Calculate the duplicate error ratio (DER)) =

$$|(\text{Sample} - \text{Duplicate})| / (2 * ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Duplicate}}]^{1/2}))$$

$$\text{DER} \leq 1.42$$

_____ If DER > 1.42, qualify sample J

Laboratory duplicate results were not detected, so RPDs and DERs were not calculated.

## VII. Laboratory Control Samples

_X___ Must be analyzed for each batch or for every 20 samples
_X___ Compare %R with lab control limits (75-125%)

All recoveries for each laboratory control samples were within control limits.

## VIII. Overall Assessment of Data

With the following exceptions, all quality control data associated with the field samples were within control limits. All other field results are usable as reported by the laboratory.

**Summary of Qualified Data:**

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/L)/Lab Flag | Data Validation Result/Flag | Reason Code |
|---|---|---|---|---|---|
| All sample results | | | | No flag | C03 |
| 100907SOMS2-06-EQ-U | 195907004 | $^{226}Ra$ | 0.00 UI | UJ | Q02 |
| 101007SOMS2-11-B-U | 195907005 | $^{226}Ra$ | 0.00 UI | UJ | Q02 |
| 101207SOMS3-89-EQ-U | 195907020 | $^{226}Ra$ | 0.00 UI | UJ | Q02 |

# ATTACHMENT A
## Radiochemical Data Verification and Validation: Per Appendix A in *Evaluation of Radiochemical Data Usability, es/er/ms-5* USDOE April, 1995

| Flag | Definition |
|---|---|
| U | Nuclide considered not detected above the reported MDC or 2 times the uncertainty |
| J | Nuclide identified; the associated value is approximated |
| UJ | Nuclide not detected above the reported MDC or 2 times the uncertainty and a quality deficiency affects the data and impacts the uncertainty of the reported data |
| R | Result is not usable for its intended purpose |

| Reason Code | Definition |
|---|---|
| ***Method Blank*** | |
| B01 | Concentration of contaminant in the method blank at a level ≥ the qualification level |
| B02 | Method blank was not the same matrix as the analytical samples |
| B03 | Gross contamination exists |
| B04 | Blanks were not analyzed at the appropriate frequency |
| B05 | Sample not significantly different than radiochemical method blank |
| B06 | Blank data not reports |
| B07 | Other (describe in comments) |
| ***Calibration*** | |
| C01 | Initial calibration sequence was not followed as appropriate |
| C02 | Calibration was not performed at the appropriate frequency |
| C03 | Calibration data not reported |
| C04 | Calibration not performed |
| C05 | Chemical resolution criteria were not satisfied |
| C06 | Standard curve was established with fewer than the required number of standards |
| C07 | Instrumental system determined to be out of control |
| C08 | Other (describe in comments) |
| ***Laboratory Duplicate*** | |
| D01 | Significant difference between sample and duplicate |
| D02 | Laboratory duplicate was not analyzed at the appropriate frequency |
| D03 | Laboratory duplicate data was not reported |
| D04 | Other (describe in comments) |
| ***Evidentiary Concerns*** | |
| E01 | Custody of sample in question |
| E02 | Standard not traceable |
| E03 | Other (describe in comments) |
| ***General*** | |
| G01 | Professional judgment was used to qualify the data |
| G02 | Other (describe in comments) |
| ***Holding Times*** | |
| H01 | Holding times were exceeded |
| H02 | Holding times were grossly exceeded |
| H03 | Samples were not preserved properly |
| H04 | Other (describe in comments) |
| ***Laboratory Control Sample*** | |
| L01 | LCS recovery above upper control limit |
| L02 | LCS recovery below lower control limit |
| L03 | LCS was not analyzed at appropriate frequency |
| L04 | LCS not the same matrix as the analytical samples |

| Reason Code | Definition |
|---|---|
| L05 | LCS data not reported |
| L06 | Other (describe in comments) |
| ***Matrix Spike and MS/MSD*** | |
| M01 | MS recovery above upper control limit |
| M02 | MS recovery below lower control limit |
| M03 | MS not analyzed at the appropriate frequency |
| M04 | MS data not reported |
| M05 | Other (describe in comments) |
| ***Instrument Performance*** | |
| P01 | High background levels or a shift in the energy calibration were observed |
| P02 | Extraneous peaks were observed |
| P03 | Loss of resolution was observed |
| P04 | Peak-tailing or peak splitting that may result in inaccurate quantitation were observed |
| P05 | Instrument performance not analyzed at the appropriate frequency |
| P06 | Other (describe in comments) |
| ***Quantitation*** | |
| Q01 | Peak misidentified |
| Q02 | Target analyte affected by interfering peak |
| Q03 | Qualitative criteria were not satisfied |
| Q04 | Cross contamination occurred |
| Q05 | No raw data were provided to confirm Quantitation |
| Q06 | MDC > RDL |
| Q07 | Inappropriate aliquot sizes were used |
| Q08 | Sample result < MDC |
| Q09 | Sample result < 2s uncertainty |
| Q10 | Negative result |
| Q11 | Compounds were not adequately resolved |
| Q12 | Sample weight different from calibration geometry |
| Q13 | Sample weight greater than greatest weight on mass attenuation curve |
| Q14 | Other (describe in comments) |
| ***Radiochemical Yield*** | |
| Y01 | Radiochemical tracer yield was above the upper control limit |
| Y02 | Radiochemical tracer yield was below the lower control limit |
| Y03 | Radiochemical tracer yield was zero |
| Y04 | Radiochemical yield data was not present |
| Y05 | Other (describe in comments) |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195907**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**
**(Page 1 of 3)**

| | | | | | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Coll_date | Rec_date | Ext_date | Anal_date | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 100907SOMS-15-B-U | 195907001 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | 1.72 | 7.95 | U | 11.7 | -9.980 | -14.180 | - - NA - All results ND - - | | | C03 |
| 100907SOMS-15-B-U | 195907001 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | 1.64 | 1.81 | U | 3.24 | -1.600 | -1.980 | | | | C03 |
| 100907SOMS-15-B-U | 195907001 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | 0.239 | 1.79 | U | 3.09 | -2.851 | -3.341 | | | | C03 |
| 100907SOMS-15-B-U | 195907001 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | 29.3 | 80.4 | U | 63.3 | -34.000 | -131.500 | | | | C03 |
| 100907SOMS-15-EQ-U | 195907002 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | -31 | 16.1 | U | 25.4 | -56.400 | -63.200 | | | | C03 |
| 100907SOMS-15-EQ-U | 195907002 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | -0.141 | 3.05 | U | 5.03 | -5.171 | -6.241 | | | | C03 |
| 100907SOMS-15-EQ-U | 195907002 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | 0.430 | 3.22 | U | 5.46 | -5.030 | -6.010 | | | | C03 |
| 100907SOMS-15-EQ-U | 195907002 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | 89.6 | 140 | U | 97.4 | -7.800 | -190.400 | | | | C03 |
| 100907SOMS2-06-B-U | 195907003 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/03/07 | 11/03/07 | Americium-241 | 13.7 | 12.4 | U | 18.2 | -4.500 | -11.100 | | | | C03 |
| 100907SOMS2-06-B-U | 195907003 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/03/07 | 11/03/07 | Cesium-137 | 2.81 | 2.28 | U | 3.96 | -1.150 | -1.750 | | | | C03 |
| 100907SOMS2-06-B-U | 195907003 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/03/07 | 11/03/07 | Cobalt-60 | -0.334 | 2.15 | U | 3.56 | -3.894 | -4.634 | | | | C03 |
| 100907SOMS2-06-B-U | 195907003 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/03/07 | 11/03/07 | Radium-226 | 28.1 | 91.2 | U | 71.3 | -43.200 | -154.300 | | | | C03 |
| 100907SOMS2-06-EQ-U | 195907004 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/03/07 | 11/03/07 | Americium-241 | 8.66 | 13.9 | U | 21.3 | -12.640 | -19.140 | | | | C03 |
| 100907SOMS2-06-EQ-U | 195907004 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/03/07 | 11/03/07 | Cesium-137 | -0.62 | 1.93 | U | 3.18 | -3.800 | -4.480 | | | | C03 |
| 100907SOMS2-06-EQ-U | 195907004 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/03/07 | 11/03/07 | Cobalt-60 | 0.0578 | 2.25 | U | 3.35 | -3.292 | -4.442 | | | | C03 |
| 100907SOMS2-06-EQ-U | 195907004 | 695071 | 1201444430 | SAMPLE | 10/09/07 | 10/17/07 | 11/03/07 | 11/03/07 | Radium-226 | 0.00 | 169 | UI | 66.6 | -66.600 | -338.000 | | | UJ | Q02,C03 |
| 101007SOMS2-11-B-U | 195907005 | 695071 | 1201444430 | SAMPLE | 10/10/07 | 10/17/07 | 11/03/07 | 11/03/07 | Americium-241 | 8.39 | 11.1 | U | 17.5 | -9.110 | -13.810 | | | | C03 |
| 101007SOMS2-11-B-U | 195907005 | 695071 | 1201444430 | SAMPLE | 10/10/07 | 10/17/07 | 11/03/07 | 11/03/07 | Cesium-137 | -0.495 | 2.01 | U | 3.38 | -3.875 | -4.515 | | | | C03 |
| 101007SOMS2-11-B-U | 195907005 | 695071 | 1201444430 | SAMPLE | 10/10/07 | 10/17/07 | 11/03/07 | 11/03/07 | Cobalt-60 | -0.0718 | 2.62 | U | 3.77 | -3.842 | -5.312 | | | | C03 |
| 101007SOMS2-11-B-U | 195907005 | 695071 | 1201444430 | SAMPLE | 10/10/07 | 10/17/07 | 11/03/07 | 11/03/07 | Radium-226 | 0.00 | 153 | UI | 69.6 | -69.600 | -306.000 | | | UJ | Q02,C03 |
| 101007SOMS2-11-EQ-U | 195907006 | 695071 | 1201444430 | SAMPLE | 10/10/07 | 10/17/07 | 11/03/07 | 11/03/07 | Americium-241 | 0.621 | 3.08 | U | 4.87 | -4.249 | -5.539 | | | | C03 |
| 101007SOMS2-11-EQ-U | 195907006 | 695071 | 1201444430 | SAMPLE | 10/10/07 | 10/17/07 | 11/03/07 | 11/03/07 | Cesium-137 | -1.44 | 3.52 | U | 4.16 | -5.600 | -8.480 | | | | C03 |
| 101007SOMS2-11-EQ-U | 195907006 | 695071 | 1201444430 | SAMPLE | 10/10/07 | 10/17/07 | 11/03/07 | 11/03/07 | Cobalt-60 | 0.713 | 3.07 | U | 4.45 | -3.737 | -5.427 | | | | C03 |
| 101007SOMS2-11-EQ-U | 195907006 | 695071 | 1201444430 | SAMPLE | 10/10/07 | 10/17/07 | 11/03/07 | 11/03/07 | Radium-226 | 11.6 | 76.4 | U | 56.1 | -44.500 | -141.200 | | | | C03 |
| 101207SOMS2-35-B-U | 195907007 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | 7.06 | 13.3 | U | 21.5 | -14.440 | -19.540 | | | | C03 |
| 101207SOMS2-35-B-U | 195907007 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | 1.27 | 1.99 | U | 3.58 | -2.310 | -2.710 | | | | C03 |
| 101207SOMS2-35-B-U | 195907007 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | -1.45 | 2.18 | U | 3.29 | -4.740 | -5.810 | | | | C03 |
| 101207SOMS2-35-B-U | 195907007 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | -38.2 | 76.4 | U | 115 | -153.200 | -191.000 | | | | C03 |
| 101207SOMS2-35-EQ-U | 195907008 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | 5.86 | 18.9 | U | 28.9 | -23.040 | -31.940 | | | | C03 |
| 101207SOMS2-35-EQ-U | 195907008 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | 0.593 | 2.14 | U | 3.69 | -3.097 | -3.687 | | | | C03 |
| 101207SOMS2-35-EQ-U | 195907008 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | 1.10 | 2.12 | U | 3.81 | -2.710 | -3.140 | | | | C03 |
| 101207SOMS2-35-EQ-U | 195907008 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | 75.2 | 97.3 | U | 77.1 | -1.900 | -119.400 | | | | C03 |
| 101307SOMS3-09-B-U | 195907009 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | 1.16 | 10.7 | U | 16.3 | -15.140 | -20.240 | | | | C03 |
| 101307SOMS3-09-B-U | 195907009 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | -0.845 | 1.88 | U | 3.00 | -3.845 | -4.605 | | | | C03 |
| 101307SOMS3-09-B-U | 195907009 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | 1.04 | 2.02 | U | 3.27 | -2.230 | -3.000 | | | | C03 |
| 101307SOMS3-09-B-U | 195907009 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | -27.4 | 61.4 | U | 89.5 | -116.900 | -150.200 | | | | C03 |
| 101307SOMS3-09-EQ-U | 195907010 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | -11 | 14.1 | U | 20.4 | -31.400 | -39.200 | | | | C03 |
| 101307SOMS3-09-EQ-U | 195907010 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | -0.804 | 2.76 | U | 3.75 | -4.554 | -6.324 | | | | C03 |
| 101307SOMS3-09-EQ-U | 195907010 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | -0.241 | 2.44 | U | 4.04 | -4.281 | -5.121 | | | | C03 |
| 101307SOMS3-09-EQ-U | 195907010 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | 74.7 | 96.8 | U | 82.3 | -7.600 | -118.900 | | | | C03 |
| 101307SOMS3-12-B-U | 195907011 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | -0.046 | 8.09 | U | 11.9 | -11.946 | -16.226 | | | | C03 |
| 101307SOMS3-12-B-U | 195907011 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | -0.301 | 1.50 | U | 2.42 | -2.721 | -3.301 | | | | C03 |
| 101307SOMS3-12-B-U | 195907011 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | 0.411 | 1.64 | U | 2.76 | -2.349 | -2.869 | | | | C03 |
| 101307SOMS3-12-B-U | 195907011 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | -6.45 | 50.0 | U | 83.4 | -89.850 | -106.450 | | | | C03 |
| 101307SOMS3-12-EQ-U | 195907012 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | -2.74 | 17.7 | U | 26.9 | -29.640 | -38.140 | | | | C03 |
| 101307SOMS3-12-EQ-U | 195907012 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | -0.942 | 2.10 | U | 3.39 | -4.332 | -5.142 | | | | C03 |
| 101307SOMS3-12-EQ-U | 195907012 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | 1.93 | 2.60 | U | 4.78 | -2.850 | -3.270 | | | | C03 |
| 101307SOMS3-12-EQ-U | 195907012 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | 66.2 | 106 | U | 88.3 | -22.100 | -145.800 | | | | C03 |
| 1012207SOM3-47-B-U | 195907013 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | -1.72 | 13.2 | U | 19.1 | -20.820 | -28.120 | | | | C03 |
| 1012207SOM3-47-B-U | 195907013 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | 0.404 | 2.44 | U | 3.79 | -3.386 | -4.476 | | | | C03 |
| 1012207SOM3-47-B-U | 195907013 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | 0.169 | 1.96 | U | 3.35 | -3.181 | -3.751 | | | | C03 |
| 1012207SOM3-47-B-U | 195907013 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | -15.3 | 67.2 | U | 100 | -115.300 | -149.700 | | | | C03 |
| 1012207SOM3-47-EQ-U | 195907014 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | -3.92 | 12.2 | U | 16.5 | -20.420 | -28.320 | | | | C03 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195907**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Coll_date | Rec_date | Ext_date | Anal_date | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 1012207SOM3-47-EQ-U | 195907014 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | 0.161 | 2.09 | U | 3.47 | -3.309 | -4.019 | | | | C03 |
| 1012207SOM3-47-EQ-U | 195907014 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | -2.44 | 2.11 | U | 2.83 | -5.270 | -6.660 | | | | C03 |
| 1012207SOM3-47-EQ-U | 195907014 | 695071 | 1201444430 | SAMPLE | 10/12/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | -47.8 | 74.9 | U | 101 | -148.800 | -197.600 | | | | C03 |
| 101307SOMS3-79-B-U | 195907015 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | 7.06 | 8.48 | U | 13.1 | -6.040 | -9.900 | | | | C03 |
| 101307SOMS3-79-B-U | 195907015 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | 0.603 | 1.69 | U | 2.98 | -2.377 | -2.777 | | | | C03 |
| 101307SOMS3-79-B-U | 195907015 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | 0.719 | 1.73 | U | 3.12 | -2.401 | -2.741 | | | | C03 |
| 101307SOMS3-79-B-U | 195907015 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | 14.3 | 69.5 | U | 64.1 | -49.800 | -124.700 | | | | C03 |
| 101307SOMS3-79-EQ-U | 195907016 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | -21.2 | 9.45 | U | 14.4 | -35.600 | -40.100 | | | | C03 |
| 101307SOMS3-79-EQ-U | 195907016 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | 0.123 | 1.76 | U | 2.93 | -2.807 | -3.397 | | | | C03 |
| 101307SOMS3-79-EQ-U | 195907016 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | -2.45 | 2.45 | U | 3.07 | -5.520 | -7.350 | | | | C03 |
| 101307SOMS3-79-EQ-U | 195907016 | 695071 | 1201444430 | SAMPLE | 10/13/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | 5.59 | 57.2 | U | 93.6 | -88.010 | -108.810 | | | | C03 |
| 101107SOMS3-82-B-U | 195907017 | 695071 | 1201444430 | SAMPLE | 10/11/07 | 10/17/07 | 11/02/07 | 11/02/07 | Americium-241 | 1.71 | 4.20 | U | 6.76 | -5.050 | -6.690 | | | | C03 |
| 101107SOMS3-82-B-U | 195907017 | 695071 | 1201444430 | SAMPLE | 10/11/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cesium-137 | 0.818 | 2.97 | U | 4.63 | -3.812 | -5.122 | | | | C03 |
| 101107SOMS3-82-B-U | 195907017 | 695071 | 1201444430 | SAMPLE | 10/11/07 | 10/17/07 | 11/02/07 | 11/02/07 | Cobalt-60 | 2.39 | 2.98 | U | 5.17 | -2.780 | -3.570 | | | | C03 |
| 101107SOMS3-82-B-U | 195907017 | 695071 | 1201444430 | SAMPLE | 10/11/07 | 10/17/07 | 11/02/07 | 11/02/07 | Radium-226 | -2.72 | 58.3 | U | 100 | -102.720 | -119.320 | | | | C03 |
| 101107SOMS3-82-EQ-U | 195907018 | 695072 | 1201444434 | SAMPLE | 10/11/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | 2.96 | 13.2 | U | 17.8 | -14.840 | -23.440 | | | | C03 |
| 101107SOMS3-82-EQ-U | 195907018 | 695072 | 1201444434 | SAMPLE | 10/11/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | 1.17 | 2.09 | U | 3.20 | -2.030 | -3.010 | | | | C03 |
| 101107SOMS3-82-EQ-U | 195907018 | 695072 | 1201444434 | SAMPLE | 10/11/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | 0.0704 | 1.69 | U | 2.90 | -2.830 | -3.310 | | | | C03 |
| 101107SOMS3-82-EQ-U | 195907018 | 695072 | 1201444434 | SAMPLE | 10/11/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | 8.84 | 78.4 | U | 72.5 | -63.660 | -147.960 | | | | C03 |
| 101207SOMS3-89-B-U | 195907019 | 695072 | 1201444434 | SAMPLE | 10/12/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | -2.59 | 8.53 | U | 14.7 | -17.290 | -19.650 | | | | C03 |
| 101207SOMS3-89-B-U | 195907019 | 695072 | 1201444434 | SAMPLE | 10/12/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | -0.0627 | 1.39 | U | 2.35 | -2.413 | -2.843 | | | | C03 |
| 101207SOMS3-89-B-U | 195907019 | 695072 | 1201444434 | SAMPLE | 10/12/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | -0.226 | 1.36 | U | 2.23 | -2.456 | -2.946 | | | | C03 |
| 101207SOMS3-89-B-U | 195907019 | 695072 | 1201444434 | SAMPLE | 10/12/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | -31.1 | 57.2 | U | 79.5 | -110.600 | -145.500 | | | | C03 |
| 101207SOMS3-89-EQ-U | 195907020 | 695072 | 1201444434 | SAMPLE | 10/12/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | 1.72 | 11.4 | U | 14.9 | -13.180 | -21.080 | | | | C03 |
| 101207SOMS3-89-EQ-U | 195907020 | 695072 | 1201444434 | SAMPLE | 10/12/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | 0.202 | 1.49 | U | 2.48 | -2.278 | -2.778 | | | | C03 |
| 101207SOMS3-89-EQ-U | 195907020 | 695072 | 1201444434 | SAMPLE | 10/12/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | 1.19 | 1.75 | U | 2.77 | -1.580 | -2.310 | | | | C03 |
| 101207SOMS3-89-EQ-U | 195907020 | 695072 | 1201444434 | SAMPLE | 10/12/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | 0.00 | 95.4 | UI | 56.0 | -56.000 | -190.800 | | | UJ | Q02,C03 |
| 100907SOMS3-99-B-U | 195907021 | 695072 | 1201444434 | SAMPLE | 10/09/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | 21.8 | 24.0 | U | 32.9 | -11.100 | -26.200 | | | | C03 |
| 100907SOMS3-99-B-U | 195907021 | 695072 | 1201444434 | SAMPLE | 10/09/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | -1.11 | 2.63 | U | 4.26 | -5.370 | -6.370 | | | | C03 |
| 100907SOMS3-99-B-U | 195907021 | 695072 | 1201444434 | SAMPLE | 10/09/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | -1.02 | 2.85 | U | 4.52 | -5.540 | -6.720 | | | | C03 |
| 100907SOMS3-99-B-U | 195907021 | 695072 | 1201444434 | SAMPLE | 10/09/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | -80.3 | 114 | U | 119 | -199.300 | -308.300 | | | | C03 |
| 100907SOMS3-99-EQ-U | 195907022 | 695072 | 1201444434 | SAMPLE | 10/09/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | -1.97 | 16.1 | U | 24.6 | -26.570 | -34.170 | | | | C03 |
| 100907SOMS3-99-EQ-U | 195907022 | 695072 | 1201444434 | SAMPLE | 10/09/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | -3.65 | 5.21 | U | 5.26 | -8.910 | -14.070 | | | | C03 |
| 100907SOMS3-99-EQ-U | 195907022 | 695072 | 1201444434 | SAMPLE | 10/09/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | -0.675 | 3.16 | U | 5.19 | -5.865 | -6.995 | | | | C03 |
| 100907SOMS3-99-EQ-U | 195907022 | 695072 | 1201444434 | SAMPLE | 10/09/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | 33.2 | 125 | U | 102 | -68.800 | -216.800 | | | | C03 |
| 101307SOMS3-112-B-U | 195907023 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | 0.286 | 4.36 | U | 7.42 | -7.134 | -8.434 | | | | C03 |
| 101307SOMS3-112-B-U | 195907023 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | -0.446 | 1.31 | U | 2.17 | -2.616 | -3.066 | | | | C03 |
| 101307SOMS3-112-B-U | 195907023 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | -0.709 | 1.30 | U | 2.06 | -2.769 | -3.309 | | | | C03 |
| 101307SOMS3-112-B-U | 195907023 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | -30.5 | 54.3 | U | 58.0 | -88.500 | -139.100 | | | | C03 |
| 101307SOMS3-112-EQ-U | 195907024 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | -0.363 | 9.22 | U | 13.5 | -13.863 | -18.803 | | | | C03 |
| 101307SOMS3-112-EQ-U | 195907024 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | 0.345 | 1.39 | U | 2.34 | -1.995 | -2.435 | | | | C03 |
| 101307SOMS3-112-EQ-U | 195907024 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | -1.88 | 1.83 | U | 2.62 | -4.500 | -5.540 | | | | C03 |
| 101307SOMS3-112-EQ-U | 195907024 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | 49.4 | 73.3 | U | 53.5 | -4.100 | -97.200 | | | | C03 |
| 101307SOMS3-119-B-U | 195907025 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | 2.10 | 5.45 | U | 8.17 | -6.070 | -8.800 | | | | C03 |
| 101307SOMS3-119-B-U | 195907025 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | -0.322 | 1.10 | U | 1.78 | -2.102 | -2.522 | | | | C03 |
| 101307SOMS3-119-B-U | 195907025 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | -0.116 | 1.16 | U | 1.90 | -2.016 | -2.436 | | | | C03 |
| 101307SOMS3-119-B-U | 195907025 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | -27.2 | 44.6 | U | 55.0 | -82.200 | -116.400 | | | | C03 |
| 101307SOMS3-119-EQ-U | 195907026 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/06/07 | 11/06/07 | Americium-241 | -42.5 | 19.5 | U | 22.9 | -65.400 | -81.500 | | | | C03 |
| 101307SOMS3-119-EQ-U | 195907026 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/06/07 | 11/06/07 | Cesium-137 | 1.10 | 2.21 | U | 3.92 | -2.820 | -3.320 | | | | C03 |
| 101307SOMS3-119-EQ-U | 195907026 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/06/07 | 11/06/07 | Cobalt-60 | 0.911 | 2.30 | U | 4.14 | -3.229 | -3.689 | | | | C03 |
| 101307SOMS3-119-EQ-U | 195907026 | 695072 | 1201444434 | SAMPLE | 10/13/07 | 10/17/07 | 11/06/07 | 11/06/07 | Radium-226 | -84.7 | 93.3 | U | 103 | -187.700 | -271.300 | | | | C03 |
| 101107SOMS4-16-B-U | 195907027 | 695072 | 1201444434 | SAMPLE | 10/11/07 | 10/17/07 | 11/06/07 | 11/06/07 | Americium-241 | -3.78 | 14.2 | U | 21.8 | -25.580 | -32.180 | | | | C03 |
| 101107SOMS4-16-B-U | 195907027 | 695072 | 1201444434 | SAMPLE | 10/11/07 | 10/17/07 | 11/06/07 | 11/06/07 | Cesium-137 | 0.828 | 2.04 | U | 3.60 | -2.772 | -3.252 | | | | C03 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195907**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Coll_date | Rec_date | Ext_date | Anal_date | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101107SOMS4-16-B-U | 195907027 | 695072 | 1201444434 | SAMPLE | 10/11/07 | 10/17/07 | 11/06/07 | 11/06/07 | Cobalt-60 | 1.98 | 2.23 | U | 4.06 | -2.080 | -2.480 | | | | C03 |
| 101107SOMS4-16-B-U | 195907027 | 695072 | 1201444434 | SAMPLE | 10/11/07 | 10/17/07 | 11/06/07 | 11/06/07 | Radium-226 | -44.8 | 75.2 | U | 115 | -159.800 | -195.200 | | | | C03 |
| 101107SOMS4-16-EQ-U | 195907028 | 695072 | 1201444434 | SAMPLE | 10/11/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | -8.29 | 9.59 | U | 15.1 | -23.390 | -27.470 | | | | C03 |
| 101107SOMS4-16-EQ-U | 195907028 | 695072 | 1201444434 | SAMPLE | 10/11/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | 0.711 | 2.86 | U | 2.64 | -1.929 | -5.009 | | | | C03 |
| 101107SOMS4-16-EQ-U | 195907028 | 695072 | 1201444434 | SAMPLE | 10/11/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | -0.0804 | 1.61 | U | 2.71 | -2.790 | -3.300 | | | | C03 |
| 101107SOMS4-16-EQ-U | 195907028 | 695072 | 1201444434 | SAMPLE | 10/11/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | 0.0302 | 73.7 | U | 66.5 | -66.470 | -147.370 | | | | C03 |
| 101007SOMB-3-B-U | 195907029 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | -1.53 | 11.5 | U | 16.7 | -18.230 | -24.530 | | | | C03 |
| 101007SOMB-3-B-U | 195907029 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | -1.8 | 2.72 | U | 4.28 | -6.080 | -7.240 | | | | C03 |
| 101007SOMB-3-B-U | 195907029 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | -0.00323 | 2.88 | U | 4.81 | -4.813 | -5.763 | | | | C03 |
| 101007SOMB-3-B-U | 195907029 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | -4.4 | 79.3 | U | 108 | -112.400 | -163.000 | | | | C03 |
| 101007SOMB-3-EQ-U | 195907030 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | -4.54 | 12.1 | U | 16.0 | -20.540 | -28.740 | | | | C03 |
| 101007SOMB-3-EQ-U | 195907030 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | 0.265 | 2.90 | U | 4.18 | -3.915 | -5.535 | | | | C03 |
| 101007SOMB-3-EQ-U | 195907030 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | -2.83 | 4.09 | U | 4.73 | -7.560 | -11.010 | | | | C03 |
| 101007SOMB-3-EQ-U | 195907030 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | -36.1 | 79.3 | U | 105 | -141.100 | -194.700 | | | | C03 |
| 101007SOMD-2-B-U | 195907031 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | -2.67 | 11.3 | U | 16.9 | -19.570 | -25.270 | | | | C03 |
| 101007SOMD-2-B-U | 195907031 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | -1.87 | 2.56 | U | 4.07 | -5.940 | -6.990 | | | | C03 |
| 101007SOMD-2-B-U | 195907031 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | 1.42 | 2.51 | U | 4.49 | -3.070 | -3.600 | | | | C03 |
| 101007SOMD-2-B-U | 195907031 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | 63.6 | 113 | U | 79.8 | -16.200 | -162.400 | | | | C03 |
| 101007SOMD-2-EQ-U | 195907032 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | 7.64 | 9.19 | U | 14.0 | -6.360 | -10.740 | | | | C03 |
| 101007SOMD-2-EQ-U | 195907032 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | -1.19 | 2.51 | U | 3.53 | -4.720 | -6.210 | | | | C03 |
| 101007SOMD-2-EQ-U | 195907032 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | -1.34 | 2.16 | U | 3.44 | -4.780 | -5.660 | | | | C03 |
| 101007SOMD-2-EQ-U | 195907032 | 695072 | 1201444434 | SAMPLE | 10/10/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | 33.2 | 101 | U | 79.5 | -46.300 | -168.800 | | | | C03 |
| 101507SOMKMBACK-5-B-U | 195907033 | 695072 | 1201444434 | SAMPLE | 10/15/07 | 10/17/07 | 11/06/07 | 11/06/07 | Americium-241 | 7.32 | 19.2 | U | 22.2 | -14.880 | -31.080 | | | | C03 |
| 101507SOMKMBACK-5-B-U | 195907033 | 695072 | 1201444434 | SAMPLE | 10/15/07 | 10/17/07 | 11/06/07 | 11/06/07 | Cesium-137 | 0.760 | 2.30 | U | 3.92 | -3.160 | -3.840 | | | | C03 |
| 101507SOMKMBACK-5-B-U | 195907033 | 695072 | 1201444434 | SAMPLE | 10/15/07 | 10/17/07 | 11/06/07 | 11/06/07 | Cobalt-60 | 0.0272 | 2.12 | U | 3.56 | -3.533 | -4.213 | | | | C03 |
| 101507SOMKMBACK-5-B-U | 195907033 | 695072 | 1201444434 | SAMPLE | 10/15/07 | 10/17/07 | 11/06/07 | 11/06/07 | Radium-226 | 60.5 | 109 | U | 85.6 | -25.100 | -157.500 | | | | C03 |
| 101507SOMKMBACK-5-EQ-U | 195907034 | 695072 | 1201444434 | SAMPLE | 10/15/07 | 10/17/07 | 11/06/07 | 11/06/07 | Americium-241 | -4.72 | 19.4 | U | 28.3 | -33.020 | -43.520 | | | | C03 |
| 101507SOMKMBACK-5-EQ-U | 195907034 | 695072 | 1201444434 | SAMPLE | 10/15/07 | 10/17/07 | 11/06/07 | 11/06/07 | Cesium-137 | -1.53 | 2.34 | U | 3.20 | -4.730 | -6.210 | | | | C03 |
| 101507SOMKMBACK-5-EQ-U | 195907034 | 695072 | 1201444434 | SAMPLE | 10/15/07 | 10/17/07 | 11/06/07 | 11/06/07 | Cobalt-60 | -1.6 | 1.99 | U | 2.78 | -4.380 | -5.580 | | | | C03 |
| 101507SOMKMBACK-5-EQ-U | 195907034 | 695072 | 1201444434 | SAMPLE | 10/15/07 | 10/17/07 | 11/06/07 | 11/06/07 | Radium-226 | -11.3 | 71.7 | U | 107 | -118.300 | -154.700 | | | | C03 |
| MB | 1201444430 | 695071 | 1201444430 | MB | 11/03/07 | 11/03/07 | 11/03/07 | 11/03/07 | Americium-241 | 1.93 | 13.5 | U | 17.8 | | | | | | |
| MB | 1201444430 | 695071 | 1201444430 | MB | 11/03/07 | 11/03/07 | 11/03/07 | 11/03/07 | Cesium-137 | 1.10 | 2.33 | U | 4.02 | | | | | | |
| MB | 1201444430 | 695071 | 1201444430 | MB | 11/03/07 | 11/03/07 | 11/03/07 | 11/03/07 | Cobalt-60 | 2.32 | 2.20 | U | 3.85 | | | | | | |
| MB | 1201444430 | 695071 | 1201444430 | MB | 11/03/07 | 11/03/07 | 11/03/07 | 11/03/07 | Radium-226 | 0.00 | 122 | UI | 77.7 | | | | | | |
| 100907SOMS-15-B-U | 1201444431 | 695071 | 1201444430 | DUP | 10/09/07 | 10/17/07 | 11/05/07 | 11/05/07 | Americium-241 | 2.36 | 3.71 | U | 5.97 | | | | | | |
| 100907SOMS-15-B-U | 1201444431 | 695071 | 1201444430 | DUP | 10/09/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cesium-137 | 2.50 | 3.09 | U | 5.29 | | | | | | |
| 100907SOMS-15-B-U | 1201444431 | 695071 | 1201444430 | DUP | 10/09/07 | 10/17/07 | 11/05/07 | 11/05/07 | Cobalt-60 | 0.0818 | 3.05 | U | 5.02 | | | | | | |
| 100907SOMS-15-B-U | 1201444431 | 695071 | 1201444430 | DUP | 10/09/07 | 10/17/07 | 11/05/07 | 11/05/07 | Radium-226 | 14.4 | 91.2 | U | 65.3 | | | | | | |
| MB | 1201444434 | 695072 | 1201444434 | MB | 11/06/07 | 11/06/07 | 11/06/07 | 11/06/07 | Americium-241 | 4.88 | 13.8 | U | 21.7 | | | | | | |
| MB | 1201444434 | 695072 | 1201444434 | MB | 11/06/07 | 11/06/07 | 11/06/07 | 11/06/07 | Cesium-137 | -1.48 | 3.19 | U | 3.96 | | | | | | |
| MB | 1201444434 | 695072 | 1201444434 | MB | 11/06/07 | 11/06/07 | 11/06/07 | 11/06/07 | Cobalt-60 | 1.69 | 2.26 | U | 4.20 | | | | | | |
| MB | 1201444434 | 695072 | 1201444434 | MB | 11/06/07 | 11/06/07 | 11/06/07 | 11/06/07 | Radium-226 | 10.4 | 78.4 | U | 80.7 | | | | | | |
| 101107SOMS3-82-EQ-U | 1201444435 | 695072 | 1201444434 | DUP | 10/11/07 | 10/17/07 | 11/06/07 | 11/06/07 | Americium-241 | 14.5 | 14.5 | U | 22.7 | | | | | | |
| 101107SOMS3-82-EQ-U | 1201444435 | 695072 | 1201444434 | DUP | 10/11/07 | 10/17/07 | 11/06/07 | 11/06/07 | Cesium-137 | 0.260 | 2.47 | U | 3.58 | | | | | | |
| 101107SOMS3-82-EQ-U | 1201444435 | 695072 | 1201444434 | DUP | 10/11/07 | 10/17/07 | 11/06/07 | 11/06/07 | Cobalt-60 | 0.139 | 2.46 | U | 4.24 | | | | | | |
| 101107SOMS3-82-EQ-U | 1201444435 | 695072 | 1201444434 | DUP | 10/11/07 | 10/17/07 | 11/06/07 | 11/06/07 | Radium-226 | 0.00 | 132 | UI | 81.1 | | | | | | |

| | |
|---|---|
| **MWH Client:** | Monsanto Company |
| **MWH Project Name:** | CERCLA 2nd 5-Year Review |
| **MWH Project Number:** | 1010076.011701 |
| **Laboratory:** | GEL Laboratories, LLC (Charleston, SC) |
| **Data packages:** | Sample Delivery Group (SDG) Number 195910 |
| **Analytical Batches:** | 695972, 695973, and 695973 |
| **Method:** | Gamma Radium (Ra) 226 ($^{226}Ra$), $^{228}Ra$, and $^{137}Cs$ by EML HASL 300, 4.5.2.3 and per the laboratory's SOP GL-RAD-A-013 Rev #14 (a gamma spectrometry method) |
| **Guidance Documents:** | U.S. Department of Energy, *Evaluation of Radiochemical Data Usability*, es/er/ms-5, April 1997.<br><br>U.S. Department of Energy, Environmental Measurements Laboratory, *Health and Safety Laboratory (HASL)-300 Manual,* Section 4.5.2.3 (Ga-01-R: high resolution germanium detector gamma ray spectrometry), 28th Edition, February 1997. |
| **Modification:** | Data Flags and Reason Codes as specified in Appendix A of *Evaluation of Radiochemical Data Usability* (see Attachment A below) were used to qualify the data, with modification for the evaluation of laboratory duplicate (duplicate sample error ratio used instead of normalized absolute difference). |
| **Clarifications:** | Radiochemical tracers are referenced in the *Evaluation of Radiochemical Data Usability* guidance document, but are not applicable to gamma spectroscopy methods. Matrix spikes are also referenced, but were not used by GEL; data were not qualified because matrix spikes were not used. GEL did not provide calibration data. Results were not qualified, but sample results in the project database were populated with the applicable Reason Code (C03). |
| **Attachment A:** | Validation Flags and Reason Codes |
| **Attachment B:** | Validation Worksheet |

**Sample Cross Reference:**

| No. | Field Sample Identification | Date Collected | Laboratory Sample Identification |
|---|---|---|---|
| | | | |
| 1 | 101107SOMS3-110-0-C(5) | 10/11/07 | 195910002 |
| 2 | 101107SOMS3-86-0-C(5) | 10/11/07 | 195910003 |
| 3 | 101107SOMS4-13-0-C(5) | 10/11/07 | 195910005 |
| 4 | 101107SOMS4-11-0-C(5) | 10/11/07 | 195910006 |
| 5 | 101007SOME-1-0-C(5) | 10/11/07 | 195910007 |
| 6 | 101007SOMD-1-0-C(5) | 10/11/07 | 195910008 |
| 7 | 101007SOMS4-9-0-C(5) | 10/11/07 | 195910009 |
| 8 | 101107SOMS3-84-0-C(5) | 10/11/07 | 195910010 |
| 9 | 101107SOMS4-5-0-C(5) | 10/11/07 | 195910011 |
| 10 | 101107SOMS3-120-0-C(5) | 10/11/07 | 195910012 |
| 11 | 101107SOMS-01-0-C(5) | 10/11/07 | 195910013 |
| 12 | 101007SOMS4-12-0-C(5) | 10/10/07 | 195910014 |
| 13 | 101107SOMS-04-0-C(5) | 10/11/07 | 195910015 |
| 14 | 101107SOMS2-16-0-C(5) | 10/11/07 | 195910016 |
| 15 | 101007SOMS4-8-0-C(5) | 10/10/07 | 195910017 |
| 16 | 101007SOMS3-05-C(5) | 10/11/07 | 195910018 |
| 17 | 101107SOMS3-117-0-C(5) | 10/11/07 | 195910019 |
| 18 | 101107SOMS3-10-0-C(5) | 10/11/07 | 195910020 |
| 19 | 100907SOMS3-70-0-C(5) | 10/09/07 | 195910022 |
| 20 | 100907SOMS3-65-0-C(5) | 10/09/07 | 195910023 |
| 21 | 101107SOMS4-14-0-C(5) | 10/11/07 | 195910024 |
| 22 | 101107SOMS2-28-0-C(5) | 10/11/07 | 195910025 |
| 23 | 101107SOMS4-17-0-C(5) | 10/11/07 | 195910026 |
| 24 | 101107SOMS3-03-0-C(5) | 10/11/07 | 195910027 |
| 25 | 101107SOMS2-9-0-C(5) | 10/11/07 | 195910028 |
| 26 | 101007SOMS4-2-0-C(5) | 10/10/07 | 195910029 |
| 27 | 101107SOMS3-85-0-C(5) | 10/11/07 | 195910030 |
| 28 | 101107SOMS4-19-0-C(5) | 10/11/07 | 195910031 |
| 29 | 1011107SOMS3-57-0-C(5) | 10/11/07 | 195910032 |
| 30 | 101107SOMS2-27-0-C(5) | 10/11/07 | 195910033 |
| 31 | 100907SOMS2-8-0-C(5) | 10/09/07 | 195910034 |
| 32 | 101107SOMS4-7-0-C(5) | 10/11/07 | 195910035 |
| 33 | 100907SOMS-12-0-C(5) | 10/09/07 | 195910037 |
| 34 | 100907SOMS3-18-0-C(5) | 10/09/07 | 195910038 |
| 35 | 100907SOMS-13-0-C(5) | 10/09/07 | 195910039 |
| 36 | 100907SOMS3-20-0-C(5) | 10/09/07 | 195910040 |
| 37 | 100907SOMS-16-0-C(5) | 10/09/07 | 195910041 |

## I. Chain-of-Custody Procedure, Sample Preservation, and Holding Time

_X__ Signatures on chain(s) and all samples accounted for
_X__ $^{226}Ra$, $^{228}Ra$, $^{137}Cs$: collected in HDPE (polyethylene) containers

A total of 37 soil samples were collected between October 9 and 11, 2007 in HDPE containers. All samples collected during this week were shipped in 11 coolers, and

arrived at the laboratory on October 17, 2007. Sample chain-of-custody and laboratory receipt documentation appears intact. The 37 primary samples were prepared on October 22, 2007 and analyzed between October 31 and November 5, 2007, 20 to 27 days into the 6-month laboratory-referenced holding time.

## II. Instrument Calibration

____ Confirm summary report includes: dates of calibration, geometry, count times for all analysis, number of counts for each standard, measured activity for all samples
____ Confirm matrix used in geometry standard
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate
____ Calibration points including efficiency, energy, and peak resolution

Initial calibration data were not assessed because none was provided in the data package.

## III. Calibration Verification

____ Tolerance chart or statistical control chart of the appropriate 20 efficiencies and 20 relevant peak energies with 3 F+/- limits
____ Resolution demonstration of relevant peak(s)
____ Listing of X/Y coordinates in constructing the control charts
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate
____ Geometries used in analysis

Calibration verification data were not assessed because none was provided in the data package.

## IV. Target Compound Identification and Quantitation

_X___ Confirm all samples less than MDC are qualified not detected (U)
_X___ Less than two times the uncertainty were reported by the laboratory as not detected (U)

All sample results that were either less than two times the uncertainty were reported by the laboratory as not detected (U), or were greater than two times the uncertainty and greater than the minimum detectable concentration (MDC), with the following exceptions:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result Minus 2*Uncert | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101107SOMS-01-0-C(5) | 195910013 | $^{228}Ra$ | -0.014 | 0.896 | UJ | Q09 |
| 101107SOMS-04-0-C(5) | 195910015 | $^{228}Ra$ | -0.175 | 0.913 | UJ | Q09 |
| 101107SOMS4-19-0-C(5) | 195910031 | $^{228}Ra$ | -0.154 | 0.536 | UJ | Q09 |

Results were flagged as not detected (UJ) at the reported concentrations because they failed both the above “two times uncertainty” criterion and the blank criterion specified in Section V below.

Additionally, the laboratory qualified the following sample as footnoted:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|
| 101107SOMS4-13-0-C(5) | 195910005 | $^{137}Cs$ | 0.00 UI | R | P03 |
| 101007SOMD-1-0-C(5) | 195910008 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |
| 101107SOMS3-84-0-C(5) | 195910010 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |
| 101107SOMS3-10-0-C(5) | 195910020 | $^{228}Ra$ | 0.00 UI | UJ | Q02 |
| 100907SOMS-12-0-C(5) | 195910037 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |
| 100907SOMS3-18-0-C(5) | 195910038 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |
| 100907SOMS-13-0-C(5) | 195910039 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |

[a] Data rejected due to high peak-width.
[b] Data rejected due to no valid peak.
[c] Data rejected due to low abundance.

"Data rejected due to high peak-width" is interpreted to be a loss of resolution for the detected peak, so is considered rejected (R). "Data rejected due to no valid peak" and "Data rejected due to low abundance" are interpreted to be that there was positive interference at the target frequency that did not meet the qualitative criteria for the target isotope, so the observed result is treated as not detected (UJ).

## V. Blanks

_X___ Method blank results < MDC
_X___ Calculate normalized absolute difference (NAD) =

$$\left|(\text{Sample} - \text{Blank})\right| / ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Blank}}]^{1/2})$$

_X___ If normalized absolute difference is > 2.58, no action necessary
_X___ If normalized absolute difference is between 1.96 and 2.58, qualify sample J
_____ If normalized absolute difference is less than 1.96, consider rejecting data

All normalized absolute differences (per above calculation) were greater than 2.58 for all sample results that were reportable (that is, reported as a detection above the MDC), with the following exceptions:

| Field Sample Identification | Laboratory Sample Identification | Parameter | NAD | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101107SOMS3-110-0-C(5) | 195910002 | $^{228}Ra$ | 2.36 | 0.854 | J | B01 |
| 101007SOME-1-0-C(5) | 195910007 | $^{137}Cs$ | 2.57 | 0.275 | J | B01 |
| 101007SOMS4-9-0-C(5) | 195910009 | $^{137}Cs$ | 1.28 | 0.168 | J | B01 |
| 101107SOMS4-5-0-C(5) | 195910011 | $^{137}Cs$ | 1.38 | 0.156 | J | B01 |
| 101107SOMS3-120-0-C(5) | 195910012 | $^{137}Cs$ | 1.54 | 0.176 | J | B01 |
| 101107SOMS-01-0-C(5) | 195910013 | $^{228}Ra$ | 1.87 | 0.896 | J | B01 |
| 101007SOMS4-12-0-C(5) | 195910014 | $^{137}Cs$ | 2.32 | 0.254 | J | B01 |
| 101107SOMS-04-0-C(5) | 195910015 | $^{228}Ra$ | 1.60 | 0.913 | J | B01 |
| 101007SOMS4-8-0-C(5) | 195910017 | $^{137}Cs$ | 1.51 | 0.220 | J | B01 |
| 101007SOMS3-05-C(5) | 195910018 | $^{137}Cs$ | 2.03 | 0.227 | J | B01 |
| 101107SOMS3-117-0-C(5) | 195910019 | $^{137}Cs$ | 2.46 | 0.260 | J | B01 |
| 100907SOMS3-70-0-C(5) | 195910022 | $^{137}Cs$ | 2.07 | 0.236 | J | B01 |
| 100907SOMS3-65-0-C(5) | 195910023 | $^{137}Cs$ | 1.76 | 0.219 | J | B01 |
| 101107SOMS4-14-0-C(5) | 195910024 | $^{228}Ra$ | 2.26 | 0.823 | J | B01 |
| 101107SOMS2-28-0-C(5) | 195910025 | $^{137}Cs$ | 2.14 | 0.237 | J | B01 |

| Field Sample Identification | Laboratory Sample Identification | Parameter | NAD | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101107SOMS4-17-0-C(5) | 195910026 | $^{228}Ra$ | 2.31 | 0.583 | J | B01 |
| 101107SOMS2-9-0-C(5) | 195910028 | $^{228}Ra$ | 2.13 | 0.975 | J | B01 |
| 101007SOMS4-2-0-C(5) | 195910029 | $^{137}Cs$ | 1.12 | 0.127 | J | B01 |
| 101107SOMS4-19-0-C(5) | 195910031 | $^{228}Ra$ | 1.43 | 0.536 | J | B01 |
| 1011107SOMS3-57-0-C(5) | 195910032 | $^{137}Cs$ | 2.42 | 0.265 | J | B01 |
| 100907SOMS2-8-0-C(5) | 195910034 | $^{228}Ra$ | 2.54 | 0.934 | J | B01 |
| 101107SOMS4-7-0-C(5) | 195910035 | $^{137}Cs$ | 1.69 | 0.199 | J | B01 |
| 100907SOMS3-20-0-C(5) | 195910040 | $^{137}Cs$ | 1.35 | 0.173 | J | B01 |
| 100907SOMS3-20-0-C(5) | 195910040 | $^{228}Ra$ | 2.25 | 1.02 | J | B01 |
| 100907SOMS-16-0-C(5) | 195910041 | $^{137}Cs$ | 2.13 | 0.213 | J | B01 |

## VI. Laboratory Duplicates

_X___ Must be analyzed for each batch or for every 20 samples
_X___ RPDs within the laboratory's control limits (RPD not calculated when one or both duplicate results are not detected)
_X___ Calculate the duplicate error ratio (DER)) =

$$|(\text{Sample} - \text{Duplicate})| / (2 * ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Duplicate}}]^{1/2}))$$

$$\text{DER} \leq 1.42$$

_____ If DER > 1.42, qualify sample J

The laboratory's laboratory duplicate criteria are: If duplicate activities are less than 5 times MDC, then the RPD should be less than 100%; if activities are greater than 5 times the MDC, the RPD should be less than 20%.

With the following exception, all RPDs and DERs associated with both laboratory duplicate pairs were within these criteria:

| Field Sample Identification | Laboratory Sample Identification | Parameter | RPD | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 100907SOMS3-70-0-C(5) | 195905022 | $^{228}Ra$ | 33 | 1.59 | None | None |

Although the RPD of 33 for this duplicate pair was greater than the control limit of 20, the DER of 0.53 was within control. The variance does not constitute a significant difference, so neither the primary sample results nor associated samples results were qualified.

## VII. Laboratory Control Samples

_X___ Must be analyzed for each batch or for every 20 samples
_X___ Compare %R with lab control limits (75-125%)

All recoveries for each laboratory control samples were within control limits.

## VIII. Equipment and Water Blank Samples

A total of 17 equipment blanks and 17 water blanks were collected between October 9 and 15, 2007 for gamma spectrometry analysis, including analysis for $^{226}Ra$ and $^{137}Cs$ (see data validation report for GEL SDG 195907). All equipment blanks and water blanks were not detected for both $^{226}Ra$ and $^{137}Cs$.

## IX. Overall Assessment of Data

With the following exceptions, all quality control data associated with the field samples were within control limits. All other field results are usable as reported by the laboratory.

**Summary of Qualified Data:**

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/g)/Lab Flag | Data Validation Result/Flag | Reason Code |
|---|---|---|---|---|---|
| All sample results | | | | No flag | C03 |
| 101107SOMS3-110-0-C(5) | 195910002 | $^{228}Ra$ | 0.854 | J | B01 |
| 101107SOMS4-13-0-C(5) | 195910005 | $^{137}Cs$ | 0.00 UI | R | P03 |
| 101007SOME-1-0-C(5) | 195910007 | $^{137}Cs$ | 0.275 | J | B01 |
| 101007SOMD-1-0-C(5) | 195910008 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |
| 101007SOMS4-9-0-C(5) | 195910009 | $^{137}Cs$ | 0.168 | J | B01 |
| 101107SOMS3-84-0-C(5) | 195910010 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |
| 101107SOMS4-5-0-C(5) | 195910011 | $^{137}Cs$ | 0.156 | J | B01 |
| 101107SOMS3-120-0-C(5) | 195910012 | $^{137}Cs$ | 0.176 | J | B01 |
| 101107SOMS-01-0-C(5) | 195910013 | $^{228}Ra$ | 0.896 | J | Q09,B01 |
| 101007SOMS4-12-0-C(5) | 195910014 | $^{137}Cs$ | 0.254 | J | B01 |
| 101107SOMS-04-0-C(5) | 195910015 | $^{228}Ra$ | 0.913 | J | Q09,B01 |
| 101007SOMS4-8-0-C(5) | 195910017 | $^{137}Cs$ | 0.220 | J | B01 |
| 101007SOMS3-05-C(5) | 195910018 | $^{137}Cs$ | 0.227 | J | B01 |
| 101107SOMS3-117-0-C(5) | 195910019 | $^{137}Cs$ | 0.260 | J | B01 |
| 101107SOMS3-10-0-C(5) | 195910020 | $^{228}Ra$ | 0.00 UI | UJ | Q02 |
| 100907SOMS3-70-0-C(5) | 195910022 | $^{137}Cs$ | 0.236 | J | B01 |
| 100907SOMS3-65-0-C(5) | 195910023 | $^{137}Cs$ | 0.219 | J | B01 |
| 101107SOMS4-14-0-C(5) | 195910024 | $^{228}Ra$ | 0.823 | J | B01 |
| 101107SOMS2-28-0-C(5) | 195910025 | $^{137}Cs$ | 0.237 | J | B01 |
| 101107SOMS4-17-0-C(5) | 195910026 | $^{228}Ra$ | 0.583 | J | B01 |
| 101107SOMS2-9-0-C(5) | 195910028 | $^{228}Ra$ | 0.975 | J | B01 |
| 101007SOMS4-2-0-C(5) | 195910029 | $^{137}Cs$ | 0.127 | J | B01 |
| 101107SOMS4-19-0-C(5) | 195910031 | $^{228}Ra$ | 0.536 | J | Q09,B01 |
| 1011107SOMS3-57-0-C(5) | 195910032 | $^{137}Cs$ | 0.265 | J | B01 |
| 100907SOMS2-8-0-C(5) | 195910034 | $^{228}Ra$ | 0.934 | J | B01 |
| 101107SOMS4-7-0-C(5) | 195910035 | $^{137}Cs$ | 0.199 | J | B01 |
| 100907SOMS-12-0-C(5) | 195910037 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |
| 100907SOMS3-18-0-C(5) | 195910038 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |
| 100907SOMS-13-0-C(5) | 195910039 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |
| 100907SOMS3-20-0-C(5) | 195910040 | $^{137}Cs$ | 0.173 | J | B01 |
| 100907SOMS3-20-0-C(5) | 195910040 | $^{228}Ra$ | 1.02 | J | B01 |
| 100907SOMS-16-0-C(5) | 195910041 | $^{137}Cs$ | 0.213 | J | B01 |

# ATTACHMENT A
## Radiochemical Data Verification and Validation: Per Appendix A in *Evaluation of Radiochemical Data Usability, es/er/ms-5* USDOE April, 1995

| Flag | Definition |
|---|---|
| U | Nuclide considered not detected above the reported MDC or 2 times the uncertainty |
| J | Nuclide identified; the associated value is approximated |
| UJ | Nuclide not detected above the reported MDC or 2 times the uncertainty and a quality deficiency affects the data and impacts the uncertainty of the reported data |
| R | Result is not usable for its intended purpose |

| Reason Code | Definition |
|---|---|
| ***Method Blank*** | |
| B01 | Concentration of contaminant in the method blank at a level ≥ the qualification level |
| B02 | Method blank was not the same matrix as the analytical samples |
| B03 | Gross contamination exists |
| B04 | Blanks were not analyzed at the appropriate frequency |
| B05 | Sample not significantly different than radiochemical method blank |
| B06 | Blank data not reports |
| B07 | Other (describe in comments) |
| ***Calibration*** | |
| C01 | Initial calibration sequence was not followed as appropriate |
| C02 | Calibration was not performed at the appropriate frequency |
| C03 | Calibration data not reported |
| C04 | Calibration not performed |
| C05 | Chemical resolution criteria were not satisfied |
| C06 | Standard curve was established with fewer than the required number of standards |
| C07 | Instrumental system determined to be out of control |
| C08 | Other (describe in comments) |
| ***Laboratory Duplicate*** | |
| D01 | Significant difference between sample and duplicate |
| D02 | Laboratory duplicate was not analyzed at the appropriate frequency |
| D03 | Laboratory duplicate data was not reported |
| D04 | Other (describe in comments) |
| ***Evidentiary Concerns*** | |
| E01 | Custody of sample in question |
| E02 | Standard not traceable |
| E03 | Other (describe in comments) |
| ***General*** | |
| G01 | Professional judgment was used to qualify the data |
| G02 | Other (describe in comments) |
| ***Holding Times*** | |
| H01 | Holding times were exceeded |
| H02 | Holding times were grossly exceeded |
| H03 | Samples were not preserved properly |
| H04 | Other (describe in comments) |
| ***Laboratory Control Sample*** | |
| L01 | LCS recovery above upper control limit |
| L02 | LCS recovery below lower control limit |
| L03 | LCS was not analyzed at appropriate frequency |
| L04 | LCS not the same matrix as the analytical samples |

| Reason Code | Definition |
|---|---|
| L05 | LCS data not reported |
| L06 | Other (describe in comments) |
| ***Matrix Spike and MS/MSD*** | |
| M01 | MS recovery above upper control limit |
| M02 | MS recovery below lower control limit |
| M03 | MS not analyzed at the appropriate frequency |
| M04 | MS data not reported |
| M05 | Other (describe in comments) |
| ***Instrument Performance*** | |
| P01 | High background levels or a shift in the energy calibration were observed |
| P02 | Extraneous peaks were observed |
| P03 | Loss of resolution was observed |
| P04 | Peak-tailing or peak splitting that may result in inaccurate quantitation were observed |
| P05 | Instrument performance not analyzed at the appropriate frequency |
| P06 | Other (describe in comments) |
| ***Quantitation*** | |
| Q01 | Peak misidentified |
| Q02 | Target analyte affected by interfering peak |
| Q03 | Qualitative criteria were not satisfied |
| Q04 | Cross contamination occurred |
| Q05 | No raw data were provided to confirm Quantitation |
| Q06 | MDC > RDL |
| Q07 | Inappropriate aliquot sizes were used |
| Q08 | Sample result < MDC |
| Q09 | Sample result < 2s uncertainty |
| Q10 | Negative result |
| Q11 | Compounds were not adequately resolved |
| Q12 | Sample weight different from calibration geometry |
| Q13 | Sample weight greater than greatest weight on mass attenuation curve |
| Q14 | Other (describe in comments) |
| ***Radiochemical Yield*** | |
| Y01 | Radiochemical tracer yield was above the upper control limit |
| Y02 | Radiochemical tracer yield was below the lower control limit |
| Y03 | Radiochemical tracer yield was zero |
| Y04 | Radiochemical yield data was not present |
| Y05 | Other (describe in comments) |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195910**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSNATO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101107SOMS3-110-0-C(5) | 195910002 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 1.07 | 0.152 | | 0.0836 | 0.986 | 0.766 | 6.98 | | | C03 |
| 101107SOMS3-110-0-C(5) | 195910002 | 695972 | 1201446584 | SAMPLE | Radium-226 | 2.38 | 0.337 | | 0.153 | 2.227 | 1.706 | 6.96 | | | C03 |
| 101107SOMS3-110-0-C(5) | 195910002 | 695972 | 1201446584 | SAMPLE | Radium-228 | 0.854 | 0.341 | | 0.266 | 0.588 | 0.172 | 2.36 | | J | B01,C03 |
| 101107SOMS3-86-0-C(5) | 195910003 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.286 | 0.072 | | 0.0679 | 0.218 | 0.142 | 2.62 | | | C03 |
| 101107SOMS3-86-0-C(5) | 195910003 | 695972 | 1201446584 | SAMPLE | Radium-226 | 1.25 | 0.187 | | 0.114 | 1.136 | 0.876 | 6.15 | | | C03 |
| 101107SOMS3-86-0-C(5) | 195910003 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.13 | 0.283 | | 0.213 | 0.917 | 0.564 | 3.77 | | | C03 |
| 101107SOMS4-13-0-C(5) | 195910005 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.00 | 0.0819 | UI | 0.0664 | -0.066 | -0.164 | 0.35 | | R | P03,C03 |
| 101107SOMS4-13-0-C(5) | 195910005 | 695972 | 1201446584 | SAMPLE | Radium-226 | 1.22 | 0.193 | | 0.124 | 1.096 | 0.834 | 5.83 | | | C03 |
| 101107SOMS4-13-0-C(5) | 195910005 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.40 | 0.395 | | 0.220 | 1.180 | 0.610 | 3.41 | | | C03 |
| 101107SOMS4-11-0-C(5) | 195910006 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.271 | 0.0634 | | 0.0528 | 0.218 | 0.144 | 2.63 | | | C03 |
| 101107SOMS4-11-0-C(5) | 195910006 | 695972 | 1201446584 | SAMPLE | Radium-226 | 1.22 | 0.190 | | 0.104 | 1.116 | 0.840 | 5.92 | | | C03 |
| 101107SOMS4-11-0-C(5) | 195910006 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.08 | 0.273 | | 0.214 | 0.866 | 0.534 | 3.73 | | | C03 |
| 101007SOME-1-0-C(5) | 195910007 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.275 | 0.0684 | | 0.0655 | 0.210 | 0.138 | 2.57 | | J | B01,C03 |
| 101007SOME-1-0-C(5) | 195910007 | 695972 | 1201446584 | SAMPLE | Radium-226 | 1.19 | 0.196 | | 0.110 | 1.080 | 0.798 | 5.61 | | | C03 |
| 101007SOME-1-0-C(5) | 195910007 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.38 | 0.343 | | 0.236 | 1.144 | 0.694 | 3.85 | | | C03 |
| 101007SOMD-1-0-C(5) | 195910008 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.00 | 0.098 | UI | 0.0897 | -0.090 | -0.196 | 0.31 | | UJ | Q02,C03 |
| 101007SOMD-1-0-C(5) | 195910008 | 695972 | 1201446584 | SAMPLE | Radium-226 | 0.949 | 0.205 | | 0.126 | 0.823 | 0.539 | 4.26 | | | C03 |
| 101007SOMD-1-0-C(5) | 195910008 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.23 | 0.363 | | 0.274 | 0.956 | 0.504 | 3.24 | | | C03 |
| 101007SOMS4-9-0-C(5) | 195910009 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.168 | 0.0823 | | 0.0709 | 0.097 | 0.003 | 1.28 | | J | B01,C03 |
| 101007SOMS4-9-0-C(5) | 195910009 | 695972 | 1201446584 | SAMPLE | Radium-226 | 1.28 | 0.196 | | 0.121 | 1.159 | 0.888 | 6.04 | | | C03 |
| 101007SOMS4-9-0-C(5) | 195910009 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.32 | 0.345 | | 0.197 | 1.123 | 0.630 | 3.66 | | | C03 |
| 101107SOMS3-84-0-C(5) | 195910010 | 695972 | 1201446584 | SAMPLE | Cesium-137 | 0.00 | 0.0796 | UI | 0.056 | -0.056 | -0.159 | 0.35 | | UJ | Q02,C03 |
| 101107SOMS3-84-0-C(5) | 195910010 | 695972 | 1201446584 | SAMPLE | Radium-226 | 3.25 | 0.385 | | 0.149 | 3.101 | 2.480 | 8.24 | | | C03 |
| 101107SOMS3-84-0-C(5) | 195910010 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.10 | 0.340 | | 0.298 | 0.802 | 0.420 | 3.08 | | | C03 |
| 101107SOMS4-5-0-C(5) | 195910011 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.156 | 0.0599 | | 0.0657 | 0.090 | 0.036 | 1.38 | | J | B01,C03 |
| 101107SOMS4-5-0-C(5) | 195910011 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.25 | 0.187 | | 0.116 | 1.134 | 0.876 | 6.15 | | | C03 |
| 101107SOMS4-5-0-C(5) | 195910011 | 695973 | 1201446587 | SAMPLE | Radium-228 | 1.09 | 0.341 | | 0.250 | 0.840 | 0.408 | 3.04 | | | C03 |
| 101107SOMS3-120-0-C(5) | 195910012 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.176 | 0.0661 | | 0.0567 | 0.119 | 0.044 | 1.54 | | J | B01,C03 |
| 101107SOMS3-120-0-C(5) | 195910012 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.66 | 0.229 | | 0.109 | 1.551 | 1.202 | 6.84 | | | C03 |
| 101107SOMS3-120-0-C(5) | 195910012 | 695973 | 1201446587 | SAMPLE | Radium-228 | 1.35 | 0.307 | | 0.178 | 1.172 | 0.736 | 4.19 | | | C03 |
| 101107SOMS-01-0-C(5) | 195910013 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.516 | 0.104 | | 0.0941 | 0.422 | 0.308 | 3.95 | | | C03 |
| 101107SOMS-01-0-C(5) | 195910013 | 695973 | 1201446587 | SAMPLE | Radium-226 | 10.6 | 1.10 | | 0.205 | 10.395 | 8.400 | 9.59 | | | C03 |
| 101107SOMS-01-0-C(5) | 195910013 | 695973 | 1201446587 | SAMPLE | Radium-228 | 0.896 | 0.455 | | 0.392 | 0.504 | -0.014 | 1.87 | | UJ | Q09,B01,C03 |
| 101007SOMS4-12-0-C(5) | 195910014 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.254 | 0.0699 | | 0.0779 | 0.176 | 0.114 | 2.32 | | J | B01,C03 |
| 101007SOMS4-12-0-C(5) | 195910014 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.57 | 0.232 | | 0.132 | 1.438 | 1.106 | 6.38 | | | C03 |
| 101007SOMS4-12-0-C(5) | 195910014 | 695973 | 1201446587 | SAMPLE | Radium-228 | 1.36 | 0.347 | | 0.323 | 1.037 | 0.666 | 3.75 | | | C03 |
| 101107SOMS-04-0-C(5) | 195910015 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.653 | 0.131 | | 0.110 | 0.543 | 0.391 | 4.25 | | | C03 |
| 101107SOMS-04-0-C(5) | 195910015 | 695973 | 1201446587 | SAMPLE | Radium-226 | 4.26 | 0.525 | | 0.208 | 4.052 | 3.210 | 7.99 | | | C03 |
| 101107SOMS-04-0-C(5) | 195910015 | 695973 | 1201446587 | SAMPLE | Radium-228 | 0.913 | 0.544 | | 0.443 | 0.470 | -0.175 | 1.60 | | UJ | Q09,B01,C03 |
| 101107SOMS2-16-0-C(5) | 195910016 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.345 | 0.0906 | | 0.0709 | 0.274 | 0.164 | 2.80 | | | C03 |
| 101107SOMS2-16-0-C(5) | 195910016 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.27 | 0.197 | | 0.135 | 1.135 | 0.876 | 5.97 | | | C03 |
| 101107SOMS2-16-0-C(5) | 195910016 | 695973 | 1201446587 | SAMPLE | Radium-228 | 0.911 | 0.279 | | 0.237 | 0.674 | 0.353 | 3.06 | | | C03 |
| 101007SOMS4-8-0-C(5) | 195910017 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.220 | 0.104 | | 0.0658 | 0.154 | 0.012 | 1.51 | | J | B01,C03 |
| 101007SOMS4-8-0-C(5) | 195910017 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.33 | 0.218 | | 0.130 | 1.200 | 0.894 | 5.70 | | | C03 |
| 101007SOMS4-8-0-C(5) | 195910017 | 695973 | 1201446587 | SAMPLE | Radium-228 | 1.31 | 0.351 | | 0.238 | 1.072 | 0.608 | 3.57 | | | C03 |
| 101007SOMS3-05-C(5) | 195910018 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.227 | 0.0703 | | 0.0608 | 0.166 | 0.086 | 2.03 | | J | B01,C03 |
| 101007SOMS3-05-C(5) | 195910018 | 695973 | 1201446587 | SAMPLE | Radium-226 | 2.28 | 0.267 | | 0.128 | 2.152 | 1.746 | 8.18 | | | C03 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195910**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
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| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101007SOMS3-05-C(5) | 195910018 | 695973 | 1201446587 | SAMPLE | Radium-228 | 1.48 | 0.339 | | 0.225 | 1.255 | 0.802 | 4.19 | | | C03 |
| 101107SOMS3-117-0-C(5) | 195910019 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.260 | 0.0659 | | 0.0761 | 0.184 | 0.128 | 2.46 | | J | B01,C03 |
| 101107SOMS3-117-0-C(5) | 195910019 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.79 | 0.269 | | 0.139 | 1.651 | 1.252 | 6.35 | | | C03 |
| 101107SOMS3-117-0-C(5) | 195910019 | 695973 | 1201446587 | SAMPLE | Radium-228 | 1.28 | 0.363 | | 0.287 | 0.993 | 0.554 | 3.38 | | | C03 |
| 101107SOMS3-10-0-C(5) | 195910020 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.642 | 0.090 | | 0.0652 | 0.577 | 0.462 | 5.52 | | | C03 |
| 101107SOMS3-10-0-C(5) | 195910020 | 695973 | 1201446587 | SAMPLE | Radium-226 | 2.98 | 0.333 | | 0.121 | 2.859 | 2.314 | 8.69 | | | C03 |
| 101107SOMS3-10-0-C(5) | 195910020 | 695973 | 1201446587 | SAMPLE | Radium-228 | 0.00 | 0.286 | UI | 0.423 | -0.423 | -0.572 | 0.12 | | UJ | Q02,C03 |
| 100907SOMS3-70-0-C(5) | 195910022 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.236 | 0.0736 | | 0.0699 | 0.166 | 0.089 | 2.07 | 0.41 | J | B01,C03 |
| 100907SOMS3-70-0-C(5) | 195910022 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.39 | 0.233 | | 0.135 | 1.255 | 0.924 | 5.61 | 0.32 | | C03 |
| 100907SOMS3-70-0-C(5) | 195910022 | 695973 | 1201446587 | SAMPLE | Radium-228 | 1.59 | 0.342 | | 0.239 | 1.351 | 0.906 | 4.47 | 0.53 | J | C03 |
| 100907SOMS3-65-0-C(5) | 195910023 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.219 | 0.083 | | 0.0685 | 0.151 | 0.053 | 1.76 | | J | B01,C03 |
| 100907SOMS3-65-0-C(5) | 195910023 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.20 | 0.199 | | 0.138 | 1.062 | 0.802 | 5.58 | | | C03 |
| 100907SOMS3-65-0-C(5) | 195910023 | 695973 | 1201446587 | SAMPLE | Radium-228 | 1.20 | 0.300 | | 0.223 | 0.977 | 0.600 | 3.80 | | | C03 |
| 101107SOMS4-14-0-C(5) | 195910024 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 1.05 | 0.126 | | 0.0744 | 0.976 | 0.798 | 7.20 | | | C03 |
| 101107SOMS4-14-0-C(5) | 195910024 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.78 | 0.252 | | 0.123 | 1.657 | 1.276 | 6.71 | | | C03 |
| 101107SOMS4-14-0-C(5) | 195910024 | 695973 | 1201446587 | SAMPLE | Radium-228 | 0.823 | 0.343 | | 0.236 | 0.587 | 0.137 | 2.26 | | J | B01,C03 |
| 101107SOMS2-28-0-C(5) | 195910025 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.237 | 0.070 | | 0.0622 | 0.175 | 0.097 | 2.14 | | J | B01,C03 |
| 101107SOMS2-28-0-C(5) | 195910025 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.12 | 0.181 | | 0.122 | 0.998 | 0.758 | 5.66 | | | C03 |
| 101107SOMS2-28-0-C(5) | 195910025 | 695973 | 1201446587 | SAMPLE | Radium-228 | 1.03 | 0.303 | | 0.249 | 0.781 | 0.424 | 3.21 | | | C03 |
| 101107SOMS4-17-0-C(5) | 195910026 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.294 | 0.0721 | | 0.0623 | 0.232 | 0.150 | 2.70 | | | C03 |
| 101107SOMS4-17-0-C(5) | 195910026 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.64 | 0.217 | | 0.116 | 1.524 | 1.206 | 7.10 | | | C03 |
| 101107SOMS4-17-0-C(5) | 195910026 | 695973 | 1201446587 | SAMPLE | Radium-228 | 0.583 | 0.228 | | 0.217 | 0.366 | 0.127 | 2.31 | | J | B01,C03 |
| 101107SOMS3-03-0-C(5) | 195910027 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.365 | 0.0875 | | 0.0642 | 0.301 | 0.190 | 3.05 | | | C03 |
| 101107SOMS3-03-0-C(5) | 195910027 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.98 | 0.276 | | 0.132 | 1.848 | 1.428 | 6.87 | | | C03 |
| 101107SOMS3-03-0-C(5) | 195910027 | 695973 | 1201446587 | SAMPLE | Radium-228 | 0.892 | 0.317 | | 0.259 | 0.633 | 0.258 | 2.65 | | | C03 |
| 101107SOMS2-9-0-C(5) | 195910028 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.476 | 0.105 | | 0.0847 | 0.391 | 0.266 | 3.59 | | | C03 |
| 101107SOMS2-9-0-C(5) | 195910028 | 695973 | 1201446587 | SAMPLE | Radium-226 | 2.46 | 0.362 | | 0.187 | 2.273 | 1.736 | 6.60 | | | C03 |
| 101107SOMS2-9-0-C(5) | 195910028 | 695973 | 1201446587 | SAMPLE | Radium-228 | 0.975 | 0.437 | | 0.405 | 0.570 | 0.101 | 2.13 | | J | B01,C03 |
| 101007SOMS4-2-0-C(5) | 195910029 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.127 | 0.0514 | | 0.0661 | 0.061 | 0.024 | 1.12 | | J | B01,C03 |
| 101007SOMS4-2-0-C(5) | 195910029 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.22 | 0.198 | | 0.0995 | 1.121 | 0.824 | 5.70 | | | C03 |
| 101007SOMS4-2-0-C(5) | 195910029 | 695973 | 1201446587 | SAMPLE | Radium-228 | 1.25 | 0.321 | | 0.182 | 1.068 | 0.608 | 3.71 | | | C03 |
| 101107SOMS3-85-0-C(5) | 195910030 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.267 | 0.0537 | | 0.0571 | 0.210 | 0.160 | 2.79 | | | C03 |
| 101107SOMS3-85-0-C(5) | 195910030 | 695973 | 1201446587 | SAMPLE | Radium-226 | 1.06 | 0.182 | | 0.102 | 0.958 | 0.696 | 5.32 | | | C03 |
| 101107SOMS3-85-0-C(5) | 195910030 | 695973 | 1201446587 | SAMPLE | Radium-228 | 1.18 | 0.287 | | 0.185 | 0.995 | 0.606 | 3.89 | | | C03 |
| 101107SOMS4-19-0-C(5) | 195910031 | 695973 | 1201446587 | SAMPLE | Cesium-137 | 0.800 | 0.127 | | 0.0975 | 0.703 | 0.546 | 5.39 | | | C03 |
| 101107SOMS4-19-0-C(5) | 195910031 | 695973 | 1201446587 | SAMPLE | Radium-226 | 3.43 | 0.417 | | 0.158 | 3.272 | 2.596 | 8.05 | | | C03 |
| 101107SOMS4-19-0-C(5) | 195910031 | 695973 | 1201446587 | SAMPLE | Radium-228 | 0.536 | 0.345 | | 0.294 | 0.242 | -0.154 | 1.43 | | UJ | Q09,B01,C03 |
| 1011107SOMS3-57-0-C(5) | 195910032 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.265 | 0.0707 | | 0.0612 | 0.204 | 0.124 | 2.42 | 0.09 | J | B01,C03 |
| 1011107SOMS3-57-0-C(5) | 195910032 | 695974 | 1201446590 | SAMPLE | Radium-226 | 1.30 | 0.193 | | 0.138 | 1.162 | 0.914 | 6.23 | 0.25 | | C03 |
| 1011107SOMS3-57-0-C(5) | 195910032 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.45 | 0.330 | | 0.227 | 1.223 | 0.790 | 4.21 | 0.10 | | C03 |
| 101107SOMS2-27-0-C(5) | 195910033 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.326 | 0.0785 | | 0.062 | 0.264 | 0.169 | 2.88 | | | C03 |
| 101107SOMS2-27-0-C(5) | 195910033 | 695974 | 1201446590 | SAMPLE | Radium-226 | 2.03 | 0.264 | | 0.124 | 1.906 | 1.502 | 7.35 | | | C03 |
| 101107SOMS2-27-0-C(5) | 195910033 | 695974 | 1201446590 | SAMPLE | Radium-228 | 0.976 | 0.339 | | 0.279 | 0.697 | 0.298 | 2.73 | | | C03 |
| 100907SOMS2-8-0-C(5) | 195910034 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 1.70 | 0.173 | | 0.0884 | 1.612 | 1.354 | 9.04 | | | C03 |
| 100907SOMS2-8-0-C(5) | 195910034 | 695974 | 1201446590 | SAMPLE | Radium-226 | 8.29 | 0.776 | | 0.166 | 8.124 | 6.738 | 10.60 | | | C03 |
| 100907SOMS2-8-0-C(5) | 195910034 | 695974 | 1201446590 | SAMPLE | Radium-228 | 0.934 | 0.348 | | 0.374 | 0.560 | 0.238 | 2.54 | | J | B01,C03 |
| 101107SOMS4-7-0-C(5) | 195910035 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.199 | 0.073 | | 0.0701 | 0.129 | 0.053 | 1.69 | | J | B01,C03 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195910**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSNATO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101107SOMS4-7-0-C(5) | 195910035 | 695974 | 1201446590 | SAMPLE | Radium-226 | 1.32 | 0.216 | | 0.126 | 1.194 | 0.888 | 5.71 | | | C03 |
| 101107SOMS4-7-0-C(5) | 195910035 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.22 | 0.317 | | 0.195 | 1.025 | 0.586 | 3.66 | | | C03 |
| 100907SOMS-12-0-C(5) | 195910037 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.00 | 0.0944 | UI | 0.091 | -0.091 | -0.189 | 0.32 | | UJ | Q02,C03 |
| 100907SOMS-12-0-C(5) | 195910037 | 695974 | 1201446590 | SAMPLE | Radium-226 | 3.12 | 0.390 | | 0.158 | 2.962 | 2.340 | 7.81 | | | C03 |
| 100907SOMS-12-0-C(5) | 195910037 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.24 | 0.355 | | 0.305 | 0.935 | 0.530 | 3.34 | | | C03 |
| 100907SOMS3-18-0-C(5) | 195910038 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.00 | 0.0768 | UI | 0.0822 | -0.082 | -0.154 | 0.36 | | UJ | Q02,C03 |
| 100907SOMS3-18-0-C(5) | 195910038 | 695974 | 1201446590 | SAMPLE | Radium-226 | 2.74 | 0.357 | | 0.145 | 2.595 | 2.026 | 7.46 | | | C03 |
| 100907SOMS3-18-0-C(5) | 195910038 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.34 | 0.400 | | 0.281 | 1.059 | 0.540 | 3.22 | | | C03 |
| 100907SOMS-13-0-C(5) | 195910039 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.00 | 0.0687 | UI | 0.0763 | -0.076 | -0.137 | 0.38 | | UJ | Q02,C03 |
| 100907SOMS-13-0-C(5) | 195910039 | 695974 | 1201446590 | SAMPLE | Radium-226 | 3.11 | 0.329 | | 0.141 | 2.969 | 2.452 | 9.18 | | | C03 |
| 100907SOMS-13-0-C(5) | 195910039 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.28 | 0.339 | | 0.285 | 0.995 | 0.602 | 3.61 | | | C03 |
| 100907SOMS3-20-0-C(5) | 195910040 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.173 | 0.0793 | | 0.0889 | 0.084 | 0.014 | 1.35 | | J | B01,C03 |
| 100907SOMS3-20-0-C(5) | 195910040 | 695974 | 1201446590 | SAMPLE | Radium-226 | 5.61 | 0.582 | | 0.154 | 5.456 | 4.446 | 9.52 | | | C03 |
| 100907SOMS3-20-0-C(5) | 195910040 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.02 | 0.432 | | 0.338 | 0.682 | 0.156 | 2.25 | | J | B01,C03 |
| 100907SOMS-16-0-C(5) | 195910041 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.213 | 0.0542 | | 0.0358 | 0.177 | 0.105 | 2.13 | | J | B01,C03 |
| 100907SOMS-16-0-C(5) | 195910041 | 695974 | 1201446590 | SAMPLE | Radium-226 | 2.17 | 0.241 | | 0.0961 | 2.074 | 1.688 | 8.57 | | | C03 |
| 100907SOMS-16-0-C(5) | 195910041 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.50 | 0.313 | | 0.170 | 1.330 | 0.874 | 4.59 | | | C03 |
| MB | 1201446584 | 695972 | 1201446584 | MB | Cesium-137 | 0.00144 | 0.0181 | U | 0.0308 | | | | | | |
| MB | 1201446584 | 695972 | 1201446584 | MB | Radium-226 | 0.0181 | 0.0416 | U | 0.069 | | | | | | |
| MB | 1201446584 | 695972 | 1201446584 | MB | Radium-228 | 0.0358 | 0.063 | U | 0.118 | | | | | | |
| 101207SOMS3-29-0-C(5) | 195906026 | 695972 | 1201446584 | SAMPLE | Cesium-137 | -0.000163 | 0.0257 | U | 0.0435 | | | | ND | | |
| 101207SOMS3-29-0-C(5) | 195906026 | 695972 | 1201446584 | SAMPLE | Radium-226 | 1.08 | 0.150 | | 0.0736 | | | | 0.04 | | |
| 101207SOMS3-29-0-C(5) | 195906026 | 695972 | 1201446584 | SAMPLE | Radium-228 | 1.00 | 0.266 | | 0.145 | | | | 0.07 | | |
| 101207SOMS3-29-0-C(5) | 1201446585 | 695972 | 1201446584 | DUP | Cesium-137 | -0.0217 | 0.0326 | U | 0.0518 | | | | | | |
| 101207SOMS3-29-0-C(5) | 1201446585 | 695972 | 1201446584 | DUP | Radium-226 | 1.10 | 0.190 | | 0.0947 | | | | | | |
| 101207SOMS3-29-0-C(5) | 1201446585 | 695972 | 1201446584 | DUP | Radium-228 | 1.05 | 0.275 | | 0.164 | | | | | | |
| MB | 1201446587 | 695973 | 1201446587 | MB | Cesium-137 | -0.0016 | 0.0169 | U | 0.0282 | | | | | | |
| MB | 1201446587 | 695973 | 1201446587 | MB | Radium-226 | 0.000251 | 0.0375 | U | 0.0641 | | | | | | |
| MB | 1201446587 | 695973 | 1201446587 | MB | Radium-228 | 0.136 | 0.094 | U | 0.147 | | | | | | |
| 100907SOMS3-70-0-C(5) | 1201446588 | 695973 | 1201446587 | DUP | Cesium-137 | 0.161 | 0.0546 | | 0.0569 | | | | | | |
| 100907SOMS3-70-0-C(5) | 1201446588 | 695973 | 1201446587 | DUP | Radium-226 | 1.21 | 0.160 | | 0.0893 | | | | | | |
| 100907SOMS3-70-0-C(5) | 1201446588 | 695973 | 1201446587 | DUP | Radium-228 | 1.13 | 0.264 | | 0.178 | | | | | | |
| MB | 1201446590 | 695974 | 1201446590 | MB | Cesium-137 | 0.00528 | 0.0341 | U | 0.059 | | | | | | |
| MB | 1201446590 | 695974 | 1201446590 | MB | Radium-226 | 0.0591 | 0.140 | U | 0.103 | | | | | | |
| MB | 1201446590 | 695974 | 1201446590 | MB | Radium-228 | 0.0421 | 0.217 | U | 0.249 | | | | | | |
| 1011107SOMS3-57-0-C(5) | 1201446591 | 695974 | 1201446590 | DUP | Cesium-137 | 0.249 | 0.0592 | | 0.0589 | | | | | | |
| 1011107SOMS3-57-0-C(5) | 1201446591 | 695974 | 1201446590 | DUP | Radium-226 | 1.44 | 0.201 | | 0.104 | | | | | | |
| 1011107SOMS3-57-0-C(5) | 1201446591 | 695974 | 1201446590 | DUP | Radium-228 | 1.36 | 0.335 | | 0.189 | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dupl RPD= | Cesium-137 | ND | | -0.000163 | < 5* MDL | NA | 0.0435 | 0.2175 |
| | Radium-226 | -2 | | 1.08 | > 5* MDL | 20 | 0.0736 | 0.368 |
| | Radium-228 | -5 | | 1.00 | > 5* MDL | 20 | 0.145 | 0.725 |
| | | | | | | | | 0 |
| Dupl RPD= | Cesium-137 | 38 | | 0.236 | < 5* MDL | 100 | 0.0699 | 0.3495 |
| | Radium-226 | 14 | | 1.39 | > 5* MDL | 20 | 0.135 | 0.675 |
| | Radium-228 | 34 | | 1.59 | > 5* MDL | 20 | 0.239 | 1.195 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 195910**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSNATO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| | | | | | | | | | 0 | | | | | | |
| Dupl RPD= | Cesium-137 | 6 | | | 0.265 | < 5* MDL | 100 | 0.0612 | 0.306 | | | | | | |
| | Radium-226 | -10 | | | 1.30 | > 5* MDL | 20 | 0.138 | 0.69 | | | | | | |
| | Radium-228 | 6 | | | 1.45 | > 5* MDL | 20 | 0.227 | 1.135 | | | | | | |

| | |
|---|---|
| **MWH Client:** | Monsanto Company |
| **MWH Project Name:** | CERCLA 2nd 5-Year Review |
| **MWH Project Number:** | 1010076.011701 |
| **Laboratory:** | GEL Laboratories, LLC (Charleston, SC) |
| **Data packages:** | Sample Delivery Group (SDG) Number 196017 |
| **Analytical Batches:** | 695974, 695975, and 695976 |
| **Method:** | Gamma Radium (Ra) 226 ($^{226}Ra$), $^{228}Ra$, and $^{137}Cs$ by EML HASL 300, 4.5.2.3 and per the laboratory's SOP GL-RAD-A-013 Rev #14 (a gamma spectrometry method) |
| **Guidance Documents:** | U.S. Department of Energy, *Evaluation of Radiochemical Data Usability*, es/er/ms-5, April 1997.<br><br>U.S. Department of Energy, Environmental Measurements Laboratory, *Health and Safety Laboratory (HASL)-300 Manual,* Section 4.5.2.3 (Ga-01-R: high resolution germanium detector gamma ray spectrometry), 28th Edition, February 1997. |
| **Modification:** | Data Flags and Reason Codes as specified in Appendix A of *Evaluation of Radiochemical Data Usability* (see Attachment A below) were used to qualify the data, with modification for the evaluation of laboratory duplicate (duplicate sample error ratio used instead of normalized absolute difference). |
| **Clarifications:** | Radiochemical tracers are referenced in the *Evaluation of Radiochemical Data Usability* guidance document, but are not applicable to gamma spectroscopy methods. Matrix spikes are also referenced, but were not used by GEL; data were not qualified because matrix spikes were not used. GEL did not provide calibration data. Results were not qualified, but sample results in the project database were populated with the applicable Reason Code (C03). |
| **Attachment A:** | Validation Flags and Reason Codes |
| **Attachment B:** | Validation Worksheet |

## Sample Cross Reference:

| No. | Field Sample Identification | Date Collected | Laboratory Sample Identification |
|---|---|---|---|
| | | | |
| 1 | 101107SOMS3-82-1-C(5) | 10/11/07 | 196017001 |
| 2 | 101107SOMS3-82-2-C(5) | 10/11/07 | 196017002 |
| 3 | 101107SOMS3-82-3-C(5) | 10/11/07 | 196017003 |
| 4 | 101507SOMKMBACK-5-1-C-(5) | 10/15/07 | 196017004 |
| 5 | 101507SOMKMBACK-5-2-C-(5) | 10/15/07 | 196017005 |
| 6 | 101507SOMKMBACK-5-3-C-(5) | 10/15/07 | 196017006 |
| 7 | 101307SOMS3-119-1-C(5) | 10/13/07 | 196017007 |
| 8 | 101307SOMS3-119-2-C(5) | 10/13/07 | 196017008 |
| 9 | 101307SOMS3-119-3-C(5) | 10/13/07 | 196017009 |
| 10 | 101207SOMS3-89-1-C(5) | 10/12/07 | 196017010 |
| 11 | 101207SOMS3-89-2-C(5) | 10/12/07 | 196017011 |
| 12 | 101207SOMS3-89-3-C(5) | 10/12/07 | 196017012 |
| 13 | 101207SOMS3-47-1-C(5) | 10/12/07 | 196017013 |
| 14 | 101207SOMS3-47-2-C(5) | 10/12/07 | 196017014 |
| 15 | 101207SOMS3-47-3-C(5) | 10/12/07 | 196017015 |
| 16 | 101007SOMB-B-3-1-C(5) | 10/10/07 | 196017016 |
| 17 | 101007SOMB-B-3-2-C(5) | 10/10/07 | 196017017 |
| 18 | 101007SOMB-B-3-3-C(5) | 10/10/07 | 196017018 |
| 19 | 101007SOMD-2-1-C(5) | 10/10/07 | 196017019 |
| 20 | 101007SOMD-2-2-C(5) | 10/10/07 | 196017020 |
| 21 | 101007SOMD-2-3-C(5) | 10/10/07 | 196017021 |
| 22 | 101107SOMS2-11-1-C(5) | 10/11/07 | 196017022 |
| 23 | 101107SOMS2-11-2-C(5) | 10/11/07 | 196017023 |
| 24 | 101107SOMS2-11-3-C(5) | 10/11/07 | 196017024 |
| 25 | 101107SOMS4-16-1-C(5) | 10/11/07 | 196017025 |
| 26 | 101107SOMS4-16-2-C(5) | 10/11/07 | 196017026 |
| 27 | 101107SOMS4-16-3-C(5) | 10/11/07 | 196017027 |
| 28 | 100907SOMS-15-1-C(5) | 10/09/07 | 196017028 |
| 29 | 100907SOMS-15-2-C(5) | 10/09/07 | 196017029 |
| 30 | 100907SOMS-15-3-C(5) | 10/09/07 | 196017030 |
| 31 | 100907SOMS2-06-1-C(5) | 10/09/07 | 196017031 |
| 32 | 100907SOMS2-06-2-C(5) | 10/09/07 | 196017032 |
| 33 | 100907SOMS2-06-3-C(5) | 10/09/07 | 196017033 |
| 34 | 100907SOMS3-99-1-C(5) | 10/09/07 | 196017034 |
| 35 | 100907SOMS3-99-2-C(5) | 10/09/07 | 196017035 |
| 36 | 100907SOMS3-99-3-C(5) | 10/09/07 | 196017036 |
| 37 | 101307SOMS3-79-1-C(5) | 10/13/07 | 196017037 |
| 38 | 101307SOMS3-79-2-C(5) | 10/13/07 | 196017038 |
| 39 | 101307SOMS3-79-3-C(5) | 10/13/07 | 196017039 |
| 40 | 101307SOMS3-12-1-C(5) | 10/13/07 | 196017040 |
| 41 | 101307SOMS3-12-2-C(5) | 10/13/07 | 196017041 |
| 42 | 101307SOMS3-12-3-C(5) | 10/13/07 | 196017042 |
| 43 | 101307SOMS3-112-1-C(5) | 10/13/07 | 196017043 |
| 44 | 101307SOMS3-112-2-C(5) | 10/13/07 | 196017044 |
| 45 | 101307SOMS3-112-3-C(5) | 10/13/07 | 196017045 |

| No. | Field Sample Identification | Date Collected | Laboratory Sample Identification |
|---|---|---|---|
| | | | |
| 46 | 101207SOMS2-35-1-C(5) | 10/12/07 | 196017046 |
| 47 | 101207SOMS2-35-2-C(5) | 10/12/07 | 196017047 |
| 48 | 101207SOMS2-35-3-C(5) | 10/12/07 | 196017048 |
| 49 | 101307SOMS3-09-1-C(5) | 10/13/07 | 196017049 |
| 50 | 101307SOMS3-09-2-C(5) | 10/13/07 | 196017050 |
| 51 | 101307SOMS3-09-3-C(5) | 10/13/07 | 196017051 |

## I. Chain-of-Custody Procedure, Sample Preservation, and Holding Time

_X__ Signatures on chain(s) and all samples accounted for
_X__ $^{226}Ra$, $^{228}Ra$, $^{137}Cs$: collected in HDPE (polyethylene) containers

A total of 51 soil (17 triplicate samples) samples were collected between October 9 and 15, 2007 in HDPE containers. All samples collected during this week were shipped in 11 coolers, and arrived at the laboratory on October 17, 2007. Sample chain-of-custody and laboratory receipt documentation appears intact. The 51 samples were prepared on October 19, 2007 and analyzed between November 3 and 5, 2007, 19 to 28 days into the 6-month laboratory-referenced holding time.

## II. Instrument Calibration

____ Confirm summary report includes: dates of calibration, geometry, count times for all analysis, number of counts for each standard, measured activity for all samples
____ Confirm matrix used in geometry standard
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate
____ Calibration points including efficiency, energy, and peak resolution

Initial calibration data were not assessed because none was provided in the data package.

## III. Calibration Verification

____ Tolerance chart or statistical control chart of the appropriate 20 efficiencies and 20 relevant peak energies with 3 F+/- limits
____ Resolution demonstration of relevant peak(s)
____ Listing of X/Y coordinates in constructing the control charts
____ Evidence of decay correction of standard prior to calculation of efficiencies, as appropriate
____ Geometries used in analysis

Calibration verification data were not assessed because none was provided in the data package.

## IV. Target Compound Identification and Quantitation

_X___ Confirm all samples less than MDC are qualified not detected (U)
_X___ Less than two times the uncertainty were reported by the laboratory as not detected (U)

All sample results that were either less than two times the uncertainty were reported by the laboratory as not detected (U), or were greater than two times the uncertainty and greater than the minimum detectable concentration (MDC), with the following exceptions:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result Minus 2*Uncert | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101107SOMS3-82-1-C(5) | 196017001 | $^{137}Cs$ | -0.017 | 0.168 | UJ | Q09 |
| 101207SOMS3-89-1-C(5) | 196017010 | $^{228}Ra$ | -0.024 | 0.556 | UJ | Q09 |
| 101207SOMS3-89-3-C(5) | 196017012 | $^{228}Ra$ | -0.099 | 0.511 | UJ | Q09 |
| 101107SOMS2-11-1-C(5) | 196017022 | $^{137}Cs$ | -0.007 | 0.160 | UJ | Q09 |
| 101107SOMS4-16-1-C(5) | 196017025 | $^{228}Ra$ | -0.058 | 0.532 | UJ | Q09 |
| 100907SOMS3-99-1-C(5) | 196017034 | $^{228}Ra$ | -0.050 | 0.618 | UJ | Q09 |
| 100907SOMS3-99-2-C(5) | 196017035 | $^{228}Ra$ | -0.100 | 0.666 | UJ | Q09 |

Results were flagged as not detected (UJ) at the reported concentrations because they failed both the above "two times uncertainty" criterion and the blank criterion specified in Section V below.

Additionally, the laboratory qualified the following sample as footnoted:

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|
| 101307SOMS3-119-1-C(5) | 196017007 | $^{137}Cs$ | 0.00 UI [a] | R | P03 |
| 101207SOMS3-89-1-C(5) | 196017010 | $^{137}Cs$ | 0.00 UI [b] | UJ | Q02 |
| 101107SOMS4-16-2-C(5) | 196017026 | $^{228}Ra$ | 0.00 UI [c] | UJ | Q02 |
| 100907SOMS3-99-3-C(5) | 196017036 | $^{228}Ra$ | 0.00 UI [b] | UJ | Q02 |

[a] Data rejected due to high peak-width.
[b] Data rejected due to no valid peak.
[c] Data rejected due to low abundance.

"Data rejected due to high peak-width" is interpreted to be a loss of resolution for the detected peak, so is considered rejected (R). "Data rejected due to no valid peak" and "Data rejected due to low abundance" are interpreted to be that there was positive interference at the target frequency that did not meet the qualitative criteria for the target isotope, so the observed result is treated as not detected (UJ).

## V. Blanks

_X___ Method blank results < MDC
_X___ Calculate normalized absolute difference (NAD) =

$$|(\text{Sample} - \text{Blank})| / ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Blank}}]^{1/2})$$

_X___ If normalized absolute difference is > 2.58, no action necessary
_X___ If normalized absolute difference is between 1.96 and 2.58, qualify sample J
_X___ If normalized absolute difference is less than 1.96, consider rejecting data

All normalized absolute differences (per above calculation) were greater than 2.58 for all sample results that were reportable (that is, reported as a detection above the MDC), with the following exceptions:

| Field Sample Identification | Laboratory Sample Identification | Parameter | NAD | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101107SOMS3-82-1-C(5) | 196017001 | $^{137}Cs$ | 1.65 | 0.168 | J | B01 |
| 101107SOMS3-82-1-C(5) | 196017001 | $^{228}Ra$ | 2.18 | 1.05 | J | B01 |

| Field Sample Identification | Laboratory Sample Identification | Parameter | NAD | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101107SOMS3-82-2-C(5) | 196017002 | $^{228}Ra$ | 2.37 | 0.963 | J | B01 |
| 101107SOMS3-82-3-C(5) | 196017003 | $^{228}Ra$ | 2.46 | 1.04 | J | B01 |
| 101307SOMS3-119-3-C(5) | 196017009 | $^{228}Ra$ | 2.54 | 0.915 | J | B01 |
| 101207SOMS3-89-1-C(5) | 196017010 | $^{228}Ra$ | 1.42 | 0.556 | J | B01 |
| 101207SOMS3-89-2-C(5) | 196017011 | $^{228}Ra$ | 2.00 | 0.842 | J | B01 |
| 101207SOMS3-89-3-C(5) | 196017012 | $^{228}Ra$ | 1.39 | 0.511 | J | B01 |
| 101207SOMS3-47-3-C(5) | 196017015 | $^{228}Ra$ | 2.43 | 1.20 | J | B01 |
| 101107SOMS2-11-1-C(5) | 196017022 | $^{137}Cs$ | 1.83 | 0.160 | J | B01 |
| 101107SOMS2-11-2-C(5) | 196017023 | $^{137}Cs$ | 2.03 | 0.138 | J | B01 |
| 101107SOMS4-16-1-C(5) | 196017025 | $^{228}Ra$ | 1.50 | 0.532 | J | B01 |
| 101107SOMS4-16-3-C(5) | 196017027 | $^{228}Ra$ | 1.91 | 0.527 | J | B01 |
| 100907SOMS-15-2-C(5) | 196017029 | $^{137}Cs$ | 2.09 | 0.235 | J | B01 |
| 100907SOMS2-06-2-C(5) | 196017032 | $^{137}Cs$ | 2.32 | 0.171 | J | B01 |
| 100907SOMS3-99-1-C(5) | 196017034 | $^{228}Ra$ | 1.79 | 0.618 | J | B01 |
| 100907SOMS3-99-2-C(5) | 196017035 | $^{228}Ra$ | 1.69 | 0.666 | J | B01 |
| 101307SOMS3-09-1-C(5) | 196017049 | $^{228}Ra$ | 2.23 | 0.871 | J | B01 |
| 101307SOMS3-09-2-C(5) | 196017050 | $^{228}Ra$ | 2.14 | 0.661 | J | B01 |

## VI. Laboratory Duplicates

_X___ Must be analyzed for each batch or for every 20 samples

_X___ RPDs within the laboratory's control limits (RPD not calculated when one or both duplicate results are not detected)

_X___ Calculate the duplicate error ratio (DER)) =

$$\left|(\text{Sample} - \text{Duplicate})\right| / (2 * ([\text{Uncertainty}^2_{\text{Sample}} + \text{Uncertainty}^2_{\text{Duplicate}}]^{1/2}))$$

$$\text{DER} \leq 1.42$$

_____ If DER > 1.42, qualify sample J

The laboratory's laboratory duplicate criteria are: If duplicate activities are less than 5 times MDC, then the RPD should be less than 100%; if activities are greater than 5 times the MDC, the RPD should be less than 20%.

With the following exception, all RPDs and DERs associated with both laboratory duplicate pairs were within these criteria:

| Field Sample Identification | Laboratory Sample Identification | Parameter | RPD | Result (pCi/g)/Lab Flag | Data Validation Flag | Reason Code |
|---|---|---|---|---|---|---|
| 101207SOMS3-47-2-C(5) | 196017014 | $^{228}Ra$ | 33 | 1.36 | None | None |
| 100907SOMS2-06-2-C(5) | 196017032 | $^{228}Ra$ | 31 | 1.50 | None | None |

Although the RPDs of 33 and 31 for the duplicate pairs were greater than the control limit of 20, the DERs of 0.39 and 38, respectively, were within control. The variance does not constitute a significant difference, so neither the primary sample results nor associated samples results were qualified.

## VII. Laboratory Control Samples

_X___ Must be analyzed for each batch or for every 20 samples

_X___ Compare %R with lab control limits (75-125%)

All recoveries for each laboratory control samples were within control limits.

## VIII. Equipment and Water Blank Samples

A total of 17 equipment blanks and 17 water blanks were collected between October 9 and 15, 2007 for gamma spectrometry analysis, including analysis for $^{226}Ra$ and $^{137}Cs$ (see data validation report for GEL SDG 195907). All equipment blanks and water blanks were not detected for both $^{226}Ra$ and $^{137}Cs$.

## IX. Overall Assessment of Data

With the following exceptions, all quality control data associated with the field samples were within control limits. All other field results are usable as reported by the laboratory.

**Summary of Qualified Data:**

| Field Sample Identification | Laboratory Sample Identification | Parameter | Result (pCi/g)/Lab Flag | Data Validation Result/Flag | Reason Code |
|---|---|---|---|---|---|
| All sample results | | | | No flag | C03 |
| 101107SOMS3-82-1-C(5) | 196017001 | $^{137}Cs$ | 0.168 | UJ | Q09,B01 |
| 101107SOMS3-82-1-C(5) | 196017001 | $^{228}Ra$ | 1.05 | J | B01 |
| 101107SOMS3-82-2-C(5) | 196017002 | $^{228}Ra$ | 0.963 | J | B01 |
| 101107SOMS3-82-3-C(5) | 196017003 | $^{228}Ra$ | 1.04 | J | B01 |
| 101307SOMS3-119-1-C(5) | 196017007 | $^{137}Cs$ | 0.00 UI | R | P03 |
| 101307SOMS3-119-3-C(5) | 196017009 | $^{228}Ra$ | 0.915 | J | B01 |
| 101207SOMS3-89-1-C(5) | 196017010 | $^{137}Cs$ | 0.00 UI | UJ | Q02 |
| 101207SOMS3-89-1-C(5) | 196017010 | $^{228}Ra$ | 0.556 | UJ | Q09,B01 |
| 101207SOMS3-89-2-C(5) | 196017011 | $^{228}Ra$ | 0.842 | J | B01 |
| 101207SOMS3-89-3-C(5) | 196017012 | $^{228}Ra$ | 0.511 | UJ | Q09,B01 |
| 101207SOMS3-47-3-C(5) | 196017015 | $^{228}Ra$ | 1.20 | J | B01 |
| 101107SOMS2-11-1-C(5) | 196017022 | $^{137}Cs$ | 0.160 | UJ | Q09,B01 |
| 101107SOMS2-11-2-C(5) | 196017023 | $^{137}Cs$ | 0.138 | J | B01 |
| 101107SOMS4-16-1-C(5) | 196017025 | $^{228}Ra$ | 0.532 | UJ | Q09,B01 |
| 101107SOMS4-16-2-C(5) | 196017026 | $^{228}Ra$ | 0.00 UI | UJ | Q02 |
| 101107SOMS4-16-3-C(5) | 196017027 | $^{228}Ra$ | 0.527 | J | B01 |
| 100907SOMS-15-2-C(5) | 196017029 | $^{137}Cs$ | 0.235 | J | B01 |
| 100907SOMS2-06-2-C(5) | 196017032 | $^{137}Cs$ | 0.171 | J | B01 |
| 100907SOMS3-99-1-C(5) | 196017034 | $^{228}Ra$ | 0.618 | UJ | Q09,B01 |
| 100907SOMS3-99-2-C(5) | 196017035 | $^{228}Ra$ | 0.666 | UJ | Q09,B01 |
| 100907SOMS3-99-3-C(5) | 196017036 | $^{228}Ra$ | 0.00 UI | UJ | Q02 |
| 101307SOMS3-09-1-C(5) | 196017049 | $^{228}Ra$ | 0.871 | J | B01 |
| 101307SOMS3-09-2-C(5) | 196017050 | $^{228}Ra$ | 0.661 | J | B01 |

# ATTACHMENT A
## Radiochemical Data Verification and Validation: Per Appendix A in *Evaluation of Radiochemical Data Usability, es/er/ms-5* USDOE April, 1995

| Flag | Definition |
|---|---|
| U | Nuclide considered not detected above the reported MDC or 2 times the uncertainty |
| J | Nuclide identified; the associated value is approximated |
| UJ | Nuclide not detected above the reported MDC or 2 times the uncertainty and a quality deficiency affects the data and impacts the uncertainty of the reported data |
| R | Result is not usable for its intended purpose |

| Reason Code | Definition |
|---|---|
| ***Method Blank*** | |
| B01 | Concentration of contaminant in the method blank at a level ≥ the qualification level |
| B02 | Method blank was not the same matrix as the analytical samples |
| B03 | Gross contamination exists |
| B04 | Blanks were not analyzed at the appropriate frequency |
| B05 | Sample not significantly different than radiochemical method blank |
| B06 | Blank data not reports |
| B07 | Other (describe in comments) |
| ***Calibration*** | |
| C01 | Initial calibration sequence was not followed as appropriate |
| C02 | Calibration was not performed at the appropriate frequency |
| C03 | Calibration data not reported |
| C04 | Calibration not performed |
| C05 | Chemical resolution criteria were not satisfied |
| C06 | Standard curve was established with fewer than the required number of standards |
| C07 | Instrumental system determined to be out of control |
| C08 | Other (describe in comments) |
| ***Laboratory Duplicate*** | |
| D01 | Significant difference between sample and duplicate |
| D02 | Laboratory duplicate was not analyzed at the appropriate frequency |
| D03 | Laboratory duplicate data was not reported |
| D04 | Other (describe in comments) |
| ***Evidentiary Concerns*** | |
| E01 | Custody of sample in question |
| E02 | Standard not traceable |
| E03 | Other (describe in comments) |
| ***General*** | |
| G01 | Professional judgment was used to qualify the data |
| G02 | Other (describe in comments) |
| ***Holding Times*** | |
| H01 | Holding times were exceeded |
| H02 | Holding times were grossly exceeded |
| H03 | Samples were not preserved properly |
| H04 | Other (describe in comments) |
| ***Laboratory Control Sample*** | |
| L01 | LCS recovery above upper control limit |
| L02 | LCS recovery below lower control limit |
| L03 | LCS was not analyzed at appropriate frequency |

| Reason Code | Definition |
|---|---|
| L04 | LCS not the same matrix as the analytical samples |
| L05 | LCS data not reported |
| L06 | Other (describe in comments) |
| ***Matrix Spike and MS/MSD*** | |
| M01 | MS recovery above upper control limit |
| M02 | MS recovery below lower control limit |
| M03 | MS not analyzed at the appropriate frequency |
| M04 | MS data not reported |
| M05 | Other (describe in comments) |
| ***Instrument Performance*** | |
| P01 | High background levels or a shift in the energy calibration were observed |
| P02 | Extraneous peaks were observed |
| P03 | Loss of resolution was observed |
| P04 | Peak-tailing or peak splitting that may result in inaccurate quantitation were observed |
| P05 | Instrument performance not analyzed at the appropriate frequency |
| P06 | Other (describe in comments) |
| ***Quantitation*** | |
| Q01 | Peak misidentified |
| Q02 | Target analyte affected by interfering peak |
| Q03 | Qualitative criteria were not satisfied |
| Q04 | Cross contamination occurred |
| Q05 | No raw data were provided to confirm Quantitation |
| Q06 | MDC > RDL |
| Q07 | Inappropriate aliquot sizes were used |
| Q08 | Sample result < MDC |
| Q09 | Sample result < 2s uncertainty |
| Q10 | Negative result |
| Q11 | Compounds were not adequately resolved |
| Q12 | Sample weight different from calibration geometry |
| Q13 | Sample weight greater than greatest weight on mass attenuation curve |
| Q14 | Other (describe in comments) |
| ***Radiochemical Yield*** | |
| Y01 | Radiochemical tracer yield was above the upper control limit |
| Y02 | Radiochemical tracer yield was below the lower control limit |
| Y03 | Radiochemical tracer yield was zero |
| Y04 | Radiochemical yield data was not present |
| Y05 | Other (describe in comments) |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 196017**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101107SOMS3-82-1-C(5) | 196017001 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.168 | 0.0924 | | 0.0934 | 0.075 | -0.017 | 1.65 | | UJ | Q09,B01C03 |
| 101107SOMS3-82-1-C(5) | 196017001 | 695974 | 1201446590 | SAMPLE | Radium-226 | 1.50 | 0.260 | | 0.149 | 1.351 | 0.980 | 4.88 | | | C03 |
| 101107SOMS3-82-1-C(5) | 196017001 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.05 | 0.409 | | 0.344 | 0.706 | 0.232 | 2.18 | | J | B01,C03 |
| 101107SOMS3-82-2-C(5) | 196017002 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.228 | 0.0617 | | 0.0536 | 0.174 | 0.105 | 3.16 | | | C03 |
| 101107SOMS3-82-2-C(5) | 196017002 | 695974 | 1201446590 | SAMPLE | Radium-226 | 1.41 | 0.221 | | 0.127 | 1.283 | 0.968 | 5.16 | | | C03 |
| 101107SOMS3-82-2-C(5) | 196017002 | 695974 | 1201446590 | SAMPLE | Radium-228 | 0.963 | 0.322 | | 0.250 | 0.713 | 0.319 | 2.37 | | J | B01,C03 |
| 101107SOMS3-82-3-C(5) | 196017003 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.281 | 0.0705 | | 0.0675 | 0.214 | 0.140 | 3.52 | | | C03 |
| 101107SOMS3-82-3-C(5) | 196017003 | 695974 | 1201446590 | SAMPLE | Radium-226 | 1.45 | 0.240 | | 0.117 | 1.333 | 0.970 | 5.01 | | | C03 |
| 101107SOMS3-82-3-C(5) | 196017003 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.04 | 0.343 | | 0.212 | 0.828 | 0.354 | 2.46 | | J | B01,C03 |
| 101507SOMKMBACK-5-1-C-(5) | 196017004 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 1.96 | 0.189 | | 0.0782 | 1.882 | 1.582 | 10.18 | | | C03 |
| 101507SOMKMBACK-5-1-C-(5) | 196017004 | 695974 | 1201446590 | SAMPLE | Radium-226 | 1.10 | 0.228 | | 0.154 | 0.946 | 0.644 | 3.89 | | | C03 |
| 101507SOMKMBACK-5-1-C-(5) | 196017004 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.25 | 0.318 | | 0.214 | 1.036 | 0.614 | 3.14 | | | C03 |
| 101507SOMKMBACK-5-2-C-(5) | 196017005 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 1.69 | 0.205 | | 0.0761 | 1.614 | 1.280 | 8.11 | | | C03 |
| 101507SOMKMBACK-5-2-C-(5) | 196017005 | 695974 | 1201446590 | SAMPLE | Radium-226 | 1.03 | 0.271 | | 0.154 | 0.876 | 0.488 | 3.18 | | | C03 |
| 101507SOMKMBACK-5-2-C-(5) | 196017005 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.26 | 0.407 | | 0.311 | 0.949 | 0.446 | 2.64 | | | C03 |
| 101507SOMKMBACK-5-3-C-(5) | 196017006 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 1.65 | 0.171 | | 0.0613 | 1.589 | 1.308 | 9.43 | | | C03 |
| 101507SOMKMBACK-5-3-C-(5) | 196017006 | 695974 | 1201446590 | SAMPLE | Radium-226 | 1.34 | 0.230 | | 0.108 | 1.232 | 0.880 | 4.76 | | | C03 |
| 101507SOMKMBACK-5-3-C-(5) | 196017006 | 695974 | 1201446590 | SAMPLE | Radium-228 | 0.983 | 0.282 | | 0.199 | 0.784 | 0.419 | 2.64 | | | C03 |
| 101307SOMS3-119-1-C(5) | 196017007 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.00 | 0.0767 | UI | 0.072 | -0.072 | -0.153 | 0.06 | | UJ | Q02,C03 |
| 101307SOMS3-119-1-C(5) | 196017007 | 695974 | 1201446590 | SAMPLE | Radium-226 | 1.29 | 0.201 | | 0.121 | 1.169 | 0.888 | 5.03 | | | C03 |
| 101307SOMS3-119-1-C(5) | 196017007 | 695974 | 1201446590 | SAMPLE | Radium-228 | 0.952 | 0.278 | | 0.184 | 0.768 | 0.396 | 2.58 | | | C03 |
| 101307SOMS3-119-2-C(5) | 196017008 | 695974 | 1201446590 | SAMPLE | Cesium-137 | -0.0226 | 0.0535 | U | 0.0743 | -0.097 | -0.130 | 0.44 | | | C03 |
| 101307SOMS3-119-2-C(5) | 196017008 | 695974 | 1201446590 | SAMPLE | Radium-226 | 1.25 | 0.197 | | 0.147 | 1.103 | 0.856 | 4.93 | | | C03 |
| 101307SOMS3-119-2-C(5) | 196017008 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.17 | 0.317 | | 0.225 | 0.945 | 0.536 | 2.94 | | | C03 |
| 101307SOMS3-119-3-C(5) | 196017009 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.0243 | 0.052 | U | 0.0667 | -0.042 | -0.080 | 0.31 | | | C03 |
| 101307SOMS3-119-3-C(5) | 196017009 | 695974 | 1201446590 | SAMPLE | Radium-226 | 1.26 | 0.213 | | 0.125 | 1.135 | 0.834 | 4.71 | | | C03 |
| 101307SOMS3-119-3-C(5) | 196017009 | 695974 | 1201446590 | SAMPLE | Radium-228 | 0.915 | 0.267 | | 0.234 | 0.681 | 0.381 | 2.54 | | J | B01,C03 |
| 101207SOMS3-89-1-C(5) | 196017010 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.00 | 0.0768 | UI | 0.0794 | -0.079 | -0.154 | 0.06 | | UJ | Q02,C03 |
| 101207SOMS3-89-1-C(5) | 196017010 | 695974 | 1201446590 | SAMPLE | Radium-226 | 4.16 | 0.456 | | 0.156 | 4.004 | 3.248 | 8.60 | | | C03 |
| 101207SOMS3-89-1-C(5) | 196017010 | 695974 | 1201446590 | SAMPLE | Radium-228 | 0.556 | 0.290 | | 0.289 | 0.267 | -0.024 | 1.42 | | UJ | Q09,B01C03 |
| 101207SOMS3-89-2-C(5) | 196017011 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.344 | 0.126 | | 0.124 | 0.220 | 0.092 | 2.59 | | | C03 |
| 101207SOMS3-89-2-C(5) | 196017011 | 695974 | 1201446590 | SAMPLE | Radium-226 | 4.57 | 0.522 | | 0.190 | 4.380 | 3.526 | 8.35 | | | C03 |
| 101207SOMS3-89-2-C(5) | 196017011 | 695974 | 1201446590 | SAMPLE | Radium-228 | 0.842 | 0.336 | | 0.402 | 0.440 | 0.170 | 2.00 | | J | B01,C03 |
| 101207SOMS3-89-3-C(5) | 196017012 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.307 | 0.0863 | | 0.0697 | 0.237 | 0.134 | 3.41 | | | C03 |
| 101207SOMS3-89-3-C(5) | 196017012 | 695975 | 1201446593 | SAMPLE | Radium-226 | 3.49 | 0.393 | | 0.140 | 3.350 | 2.704 | 8.69 | | | C03 |
| 101207SOMS3-89-3-C(5) | 196017012 | 695975 | 1201446593 | SAMPLE | Radium-228 | 0.511 | 0.305 | | 0.271 | 0.240 | -0.099 | 1.39 | | UJ | Q09,B01C03 |
| 101207SOMS3-47-1-C(5) | 196017013 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 2.58 | 0.236 | | 0.0994 | 2.481 | 2.108 | 10.87 | | | C03 |
| 101207SOMS3-47-1-C(5) | 196017013 | 695975 | 1201446593 | SAMPLE | Radium-226 | 2.68 | 0.347 | | 0.183 | 2.497 | 1.986 | 7.51 | | | C03 |
| 101207SOMS3-47-1-C(5) | 196017013 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.22 | 0.431 | | 0.304 | 0.916 | 0.358 | 2.61 | | | C03 |
| 101207SOMS3-47-2-C(5) | 196017014 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 2.68 | 0.278 | | 0.0822 | 2.598 | 2.124 | 9.60 | 0.00 | | C03 |
| 101207SOMS3-47-2-C(5) | 196017014 | 695975 | 1201446593 | SAMPLE | Radium-226 | 2.72 | 0.339 | | 0.145 | 2.575 | 2.042 | 7.80 | 0.06 | | C03 |
| 101207SOMS3-47-2-C(5) | 196017014 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.36 | 0.358 | | 0.239 | 1.121 | 0.644 | 3.47 | 0.39 | | C03 |
| 101207SOMS3-47-3-C(5) | 196017015 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 2.57 | 0.291 | | 0.113 | 2.457 | 1.988 | 8.80 | | | C03 |
| 101207SOMS3-47-3-C(5) | 196017015 | 695975 | 1201446593 | SAMPLE | Radium-226 | 3.02 | 0.397 | | 0.188 | 2.832 | 2.226 | 7.44 | | | C03 |
| 101207SOMS3-47-3-C(5) | 196017015 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.20 | 0.457 | | 0.350 | 0.850 | 0.286 | 2.43 | | J | B01,C03 |
| 101007SOMB-B-3-1-C(5) | 196017016 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 1.82 | 0.188 | | 0.067 | 1.753 | 1.444 | 9.59 | | | C03 |
| 101007SOMB-B-3-1-C(5) | 196017016 | 695975 | 1201446593 | SAMPLE | Radium-226 | 0.943 | 0.196 | | 0.121 | 0.822 | 0.551 | 4.43 | | | C03 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 196017**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101007SOMB-B-3-1-C(5) | 196017016 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.66 | 0.366 | | 0.224 | 1.436 | 0.928 | 4.18 | | | C03 |
| 101007SOMB-B-3-2-C(5) | 196017017 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 1.75 | 0.231 | | 0.100 | 1.650 | 1.288 | 7.53 | | | C03 |
| 101007SOMB-B-3-2-C(5) | 196017017 | 695975 | 1201446593 | SAMPLE | Radium-226 | 1.11 | 0.245 | | 0.194 | 0.916 | 0.620 | 4.27 | | | C03 |
| 101007SOMB-B-3-2-C(5) | 196017017 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.48 | 0.434 | | 0.400 | 1.080 | 0.612 | 3.17 | | | C03 |
| 101007SOMB-B-3-3-C(5) | 196017018 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 2.12 | 0.207 | | 0.0754 | 2.045 | 1.706 | 10.16 | | | C03 |
| 101007SOMB-B-3-3-C(5) | 196017018 | 695975 | 1201446593 | SAMPLE | Radium-226 | 1.37 | 0.199 | | 0.121 | 1.249 | 0.972 | 6.40 | | | C03 |
| 101007SOMB-B-3-3-C(5) | 196017018 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.41 | 0.350 | | 0.268 | 1.142 | 0.710 | 3.67 | | | C03 |
| 101007SOMD-2-1-C(5) | 196017019 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.805 | 0.124 | | 0.0704 | 0.735 | 0.557 | 6.36 | | | C03 |
| 101007SOMD-2-1-C(5) | 196017019 | 695975 | 1201446593 | SAMPLE | Radium-226 | 1.04 | 0.187 | | 0.124 | 0.916 | 0.666 | 5.10 | | | C03 |
| 101007SOMD-2-1-C(5) | 196017019 | 695975 | 1201446593 | SAMPLE | Radium-228 | 0.939 | 0.266 | | 0.262 | 0.677 | 0.407 | 3.05 | | | C03 |
| 101007SOMD-2-2-C(5) | 196017020 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.389 | 0.0879 | | 0.0543 | 0.335 | 0.213 | 4.25 | | | C03 |
| 101007SOMD-2-2-C(5) | 196017020 | 695975 | 1201446593 | SAMPLE | Radium-226 | 1.15 | 0.173 | | 0.0855 | 1.065 | 0.804 | 6.05 | | | C03 |
| 101007SOMD-2-2-C(5) | 196017020 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.09 | 0.298 | | 0.159 | 0.931 | 0.494 | 3.24 | | | C03 |
| 101007SOMD-2-3-C(5) | 196017021 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.788 | 0.120 | | 0.0651 | 0.723 | 0.548 | 6.42 | | | C03 |
| 101007SOMD-2-3-C(5) | 196017021 | 695975 | 1201446593 | SAMPLE | Radium-226 | 1.15 | 0.197 | | 0.123 | 1.027 | 0.756 | 5.40 | | | C03 |
| 101007SOMD-2-3-C(5) | 196017021 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.11 | 0.325 | | 0.240 | 0.870 | 0.460 | 3.06 | | | C03 |
| 101107SOMS2-11-1-C(5) | 196017022 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.160 | 0.0834 | | 0.0608 | 0.099 | -0.007 | 1.83 | | UJ | Q09,B01C03 |
| 101107SOMS2-11-1-C(5) | 196017022 | 695975 | 1201446593 | SAMPLE | Radium-226 | 1.62 | 0.230 | | 0.114 | 1.506 | 1.160 | 6.65 | | | C03 |
| 101107SOMS2-11-1-C(5) | 196017022 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.10 | 0.288 | | 0.206 | 0.894 | 0.524 | 3.37 | | | C03 |
| 101107SOMS2-11-2-C(5) | 196017023 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.138 | 0.0629 | | 0.0628 | 0.075 | 0.012 | 2.03 | | J | B01,C03 |
| 101107SOMS2-11-2-C(5) | 196017023 | 695975 | 1201446593 | SAMPLE | Radium-226 | 1.65 | 0.226 | | 0.119 | 1.531 | 1.198 | 6.89 | | | C03 |
| 101107SOMS2-11-2-C(5) | 196017023 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.20 | 0.321 | | 0.241 | 0.959 | 0.558 | 3.35 | | | C03 |
| 101107SOMS2-11-3-C(5) | 196017024 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.252 | 0.0815 | | 0.0655 | 0.187 | 0.089 | 2.95 | | | C03 |
| 101107SOMS2-11-3-C(5) | 196017024 | 695975 | 1201446593 | SAMPLE | Radium-226 | 1.76 | 0.238 | | 0.127 | 1.633 | 1.284 | 7.01 | | | C03 |
| 101107SOMS2-11-3-C(5) | 196017024 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.33 | 0.371 | | 0.232 | 1.098 | 0.588 | 3.28 | | | C03 |
| 101107SOMS4-16-1-C(5) | 196017025 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.541 | 0.108 | | 0.0655 | 0.476 | 0.325 | 4.87 | | | C03 |
| 101107SOMS4-16-1-C(5) | 196017025 | 695975 | 1201446593 | SAMPLE | Radium-226 | 1.37 | 0.228 | | 0.131 | 1.239 | 0.914 | 5.65 | | | C03 |
| 101107SOMS4-16-1-C(5) | 196017025 | 695975 | 1201446593 | SAMPLE | Radium-228 | 0.532 | 0.295 | | 0.219 | 0.313 | -0.058 | 1.50 | | UJ | Q09,B01C03 |
| 101107SOMS4-16-2-C(5) | 196017026 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 1.00 | 0.138 | | 0.0821 | 0.918 | 0.724 | 7.12 | | | C03 |
| 101107SOMS4-16-2-C(5) | 196017026 | 695975 | 1201446593 | SAMPLE | Radium-226 | 2.51 | 0.323 | | 0.124 | 2.386 | 1.864 | 7.53 | | | C03 |
| 101107SOMS4-16-2-C(5) | 196017026 | 695975 | 1201446593 | SAMPLE | Radium-228 | 0.00 | 0.290 | UI | 0.466 | -0.466 | -0.580 | 0.19 | | UJ | Q02,C03 |
| 101107SOMS4-16-3-C(5) | 196017027 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.645 | 0.106 | | 0.0642 | 0.581 | 0.433 | 5.91 | | | C03 |
| 101107SOMS4-16-3-C(5) | 196017027 | 695975 | 1201446593 | SAMPLE | Radium-226 | 1.97 | 0.247 | | 0.136 | 1.834 | 1.476 | 7.59 | | | C03 |
| 101107SOMS4-16-3-C(5) | 196017027 | 695975 | 1201446593 | SAMPLE | Radium-228 | 0.527 | 0.217 | | 0.222 | 0.305 | 0.093 | 1.91 | | J | B01,C03 |
| 100907SOMS-15-1-C(5) | 196017028 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.306 | 0.0975 | | 0.0958 | 0.210 | 0.111 | 3.03 | | | C03 |
| 100907SOMS-15-1-C(5) | 196017028 | 695975 | 1201446593 | SAMPLE | Radium-226 | 6.40 | 0.673 | | 0.202 | 6.198 | 5.054 | 9.42 | | | C03 |
| 100907SOMS-15-1-C(5) | 196017028 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.26 | 0.440 | | 0.341 | 0.919 | 0.380 | 2.65 | | | C03 |
| 100907SOMS-15-2-C(5) | 196017029 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.235 | 0.109 | | 0.106 | 0.129 | 0.017 | 2.09 | | J | B01,C03 |
| 100907SOMS-15-2-C(5) | 196017029 | 695975 | 1201446593 | SAMPLE | Radium-226 | 6.06 | 0.597 | | 0.161 | 5.899 | 4.866 | 10.04 | | | C03 |
| 100907SOMS-15-2-C(5) | 196017029 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.13 | 0.397 | | 0.380 | 0.750 | 0.336 | 2.60 | | | C03 |
| 100907SOMS-15-3-C(5) | 196017030 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.303 | 0.0829 | | 0.102 | 0.201 | 0.137 | 3.49 | | | C03 |
| 100907SOMS-15-3-C(5) | 196017030 | 695975 | 1201446593 | SAMPLE | Radium-226 | 6.54 | 0.674 | | 0.208 | 6.332 | 5.192 | 9.62 | | | C03 |
| 100907SOMS-15-3-C(5) | 196017030 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.52 | 0.444 | | 0.438 | 1.082 | 0.632 | 3.19 | | | C03 |
| 100907SOMS2-06-1-C(5) | 196017031 | 695975 | 1201446593 | SAMPLE | Cesium-137 | 0.227 | 0.067 | | 0.0667 | 0.160 | 0.093 | 3.16 | | | C03 |
| 100907SOMS2-06-1-C(5) | 196017031 | 695975 | 1201446593 | SAMPLE | Radium-226 | 1.14 | 0.200 | | 0.114 | 1.026 | 0.740 | 5.28 | | | C03 |
| 100907SOMS2-06-1-C(5) | 196017031 | 695975 | 1201446593 | SAMPLE | Radium-228 | 1.32 | 0.341 | | 0.250 | 1.070 | 0.638 | 3.51 | | | C03 |
| 100907SOMS2-06-2-C(5) | 196017032 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 0.171 | 0.0781 | | 0.0881 | 0.083 | 0.015 | 2.32 | 0.38 | J | B01,C03 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 196017**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 100907SOMS2-06-2-C(5) | 196017032 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.03 | 0.200 | | 0.146 | 0.884 | 0.630 | 4.90 | 0.14 | | C03 |
| 100907SOMS2-06-2-C(5) | 196017032 | 695976 | 1201446596 | SAMPLE | Radium-228 | 1.50 | 0.411 | | 0.268 | 1.232 | 0.678 | 3.57 | 0.38 | | C03 |
| 100907SOMS2-06-3-C(5) | 196017033 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 0.254 | 0.0901 | | 0.0705 | 0.184 | 0.074 | 2.93 | | | C03 |
| 100907SOMS2-06-3-C(5) | 196017033 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.21 | 0.200 | | 0.139 | 1.071 | 0.810 | 5.77 | | | C03 |
| 100907SOMS2-06-3-C(5) | 196017033 | 695976 | 1201446596 | SAMPLE | Radium-228 | 1.14 | 0.337 | | 0.259 | 0.881 | 0.466 | 3.27 | | | C03 |
| 100907SOMS3-99-1-C(5) | 196017034 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 1.98 | 0.241 | | 0.0873 | 1.893 | 1.498 | 8.25 | | | C03 |
| 100907SOMS3-99-1-C(5) | 196017034 | 695976 | 1201446596 | SAMPLE | Radium-226 | 0.945 | 0.241 | | 0.144 | 0.801 | 0.463 | 3.76 | | | C03 |
| 100907SOMS3-99-1-C(5) | 196017034 | 695976 | 1201446596 | SAMPLE | Radium-228 | 0.618 | 0.334 | | 0.263 | 0.355 | -0.050 | 1.79 | | UJ | Q09,B01C03 |
| 100907SOMS3-99-2-C(5) | 196017035 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 1.15 | 0.159 | | 0.0794 | 1.071 | 0.832 | 7.28 | | | C03 |
| 100907SOMS3-99-2-C(5) | 196017035 | 695976 | 1201446596 | SAMPLE | Radium-226 | 0.630 | 0.171 | | 0.148 | 0.482 | 0.288 | 3.43 | | | C03 |
| 100907SOMS3-99-2-C(5) | 196017035 | 695976 | 1201446596 | SAMPLE | Radium-228 | 0.666 | 0.383 | | 0.241 | 0.425 | -0.100 | 1.69 | | UJ | Q09,B01C03 |
| 100907SOMS3-99-3-C(5) | 196017036 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 1.92 | 0.229 | | 0.092 | 1.828 | 1.462 | 8.42 | | | C03 |
| 100907SOMS3-99-3-C(5) | 196017036 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.16 | 0.213 | | 0.157 | 1.003 | 0.734 | 5.21 | | | C03 |
| 100907SOMS3-99-3-C(5) | 196017036 | 695976 | 1201446596 | SAMPLE | Radium-228 | 0.00 | 0.387 | UI | 0.250 | -0.250 | -0.774 | 0.00 | | UJ | Q02,C03 |
| 101307SOMS3-79-1-C(5) | 196017037 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 2.21 | 0.225 | | 0.0784 | 2.132 | 1.760 | 9.85 | | | C03 |
| 101307SOMS3-79-1-C(5) | 196017037 | 695976 | 1201446596 | SAMPLE | Radium-226 | 2.27 | 0.291 | | 0.126 | 2.144 | 1.688 | 7.62 | | | C03 |
| 101307SOMS3-79-1-C(5) | 196017037 | 695976 | 1201446596 | SAMPLE | Radium-228 | 0.259 | 0.175 | U | 0.269 | -0.010 | -0.091 | 1.32 | | | C03 |
| 101307SOMS3-79-2-C(5) | 196017038 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 1.93 | 0.205 | | 0.0667 | 1.863 | 1.520 | 9.45 | | | C03 |
| 101307SOMS3-79-2-C(5) | 196017038 | 695976 | 1201446596 | SAMPLE | Radium-226 | 2.05 | 0.276 | | 0.139 | 1.911 | 1.498 | 7.24 | | | C03 |
| 101307SOMS3-79-2-C(5) | 196017038 | 695976 | 1201446596 | SAMPLE | Radium-228 | 0.0793 | 0.228 | U | 0.238 | -0.159 | -0.377 | 0.33 | | | C03 |
| 101307SOMS3-79-3-C(5) | 196017039 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 1.76 | 0.203 | | 0.0723 | 1.688 | 1.354 | 8.71 | | | C03 |
| 101307SOMS3-79-3-C(5) | 196017039 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.67 | 0.248 | | 0.144 | 1.526 | 1.174 | 6.52 | | | C03 |
| 101307SOMS3-79-3-C(5) | 196017039 | 695976 | 1201446596 | SAMPLE | Radium-228 | 0.0485 | 0.194 | U | 0.304 | -0.256 | -0.340 | 0.23 | | | C03 |
| 101307SOMS3-12-1-C(5) | 196017040 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 0.272 | 0.0639 | | 0.0678 | 0.204 | 0.144 | 4.30 | | | C03 |
| 101307SOMS3-12-1-C(5) | 196017040 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.18 | 0.191 | | 0.108 | 1.072 | 0.798 | 5.88 | | | C03 |
| 101307SOMS3-12-1-C(5) | 196017040 | 695976 | 1201446596 | SAMPLE | Radium-228 | 1.39 | 0.277 | | 0.194 | 1.196 | 0.836 | 4.77 | | | C03 |
| 101307SOMS3-12-2-C(5) | 196017041 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 0.223 | 0.0662 | | 0.0697 | 0.153 | 0.091 | 3.46 | | | C03 |
| 101307SOMS3-12-2-C(5) | 196017041 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.19 | 0.178 | | 0.126 | 1.064 | 0.834 | 6.33 | | | C03 |
| 101307SOMS3-12-2-C(5) | 196017041 | 695976 | 1201446596 | SAMPLE | Radium-228 | 1.27 | 0.324 | | 0.222 | 1.048 | 0.622 | 3.78 | | | C03 |
| 101307SOMS3-12-3-C(5) | 196017042 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 0.280 | 0.0674 | | 0.0698 | 0.210 | 0.145 | 4.21 | | | C03 |
| 101307SOMS3-12-3-C(5) | 196017042 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.37 | 0.207 | | 0.111 | 1.259 | 0.956 | 6.34 | | | C03 |
| 101307SOMS3-12-3-C(5) | 196017042 | 695976 | 1201446596 | SAMPLE | Radium-228 | 1.04 | 0.283 | | 0.230 | 0.810 | 0.474 | 3.50 | | | C03 |
| 101307SOMS3-112-1-C(5) | 196017043 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 0.290 | 0.110 | | 0.0802 | 0.210 | 0.070 | 2.74 | | | C03 |
| 101307SOMS3-112-1-C(5) | 196017043 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.30 | 0.235 | | 0.158 | 1.142 | 0.830 | 5.33 | | | C03 |
| 101307SOMS3-112-1-C(5) | 196017043 | 695976 | 1201446596 | SAMPLE | Radium-228 | 1.42 | 0.395 | | 0.323 | 1.097 | 0.630 | 3.51 | | | C03 |
| 101307SOMS3-112-2-C(5) | 196017044 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 0.290 | 0.0948 | | 0.0815 | 0.209 | 0.100 | 3.16 | | | C03 |
| 101307SOMS3-112-2-C(5) | 196017044 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.21 | 0.227 | | 0.118 | 1.092 | 0.756 | 5.12 | | | C03 |
| 101307SOMS3-112-2-C(5) | 196017044 | 695976 | 1201446596 | SAMPLE | Radium-228 | 1.17 | 0.333 | | 0.205 | 0.965 | 0.504 | 3.39 | | | C03 |
| 101307SOMS3-112-3-C(5) | 196017045 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 0.277 | 0.0765 | | 0.073 | 0.204 | 0.124 | 3.71 | | | C03 |
| 101307SOMS3-112-3-C(5) | 196017045 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.21 | 0.195 | | 0.133 | 1.077 | 0.820 | 5.91 | | | C03 |
| 101307SOMS3-112-3-C(5) | 196017045 | 695976 | 1201446596 | SAMPLE | Radium-228 | 0.907 | 0.295 | | 0.250 | 0.657 | 0.317 | 2.94 | | | C03 |
| 101207SOMS2-35-1-C(5) | 196017046 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 0.410 | 0.0802 | | 0.0705 | 0.340 | 0.250 | 5.16 | | | C03 |
| 101207SOMS2-35-1-C(5) | 196017046 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.41 | 0.237 | | 0.123 | 1.287 | 0.936 | 5.74 | | | C03 |
| 101207SOMS2-35-1-C(5) | 196017046 | 695976 | 1201446596 | SAMPLE | Radium-228 | 1.15 | 0.286 | | 0.241 | 0.909 | 0.578 | 3.84 | | | C03 |
| 101207SOMS2-35-2-C(5) | 196017047 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 0.367 | 0.0919 | | 0.0921 | 0.275 | 0.183 | 4.07 | | | C03 |
| 101207SOMS2-35-2-C(5) | 196017047 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.29 | 0.225 | | 0.162 | 1.128 | 0.840 | 5.51 | | | C03 |
| 101207SOMS2-35-2-C(5) | 196017047 | 695976 | 1201446596 | SAMPLE | Radium-228 | 1.51 | 0.349 | | 0.255 | 1.255 | 0.812 | 4.19 | | | C03 |

**ATTACHMENT B: DATA VALIDATION_WORKSHEET**
**GEL SDG 196017**
**CERCLA 2ND 5-YEAR REVIEW_SOIL 2007**
**MONSANTO**


| | | | | | | | | | | Data Validation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample_No | Lab_Id | Batch_No | Assoc_Blnk | Sample_Type | Parameter | Lab_Result | Uncertainty | Lab_Qual | MDL | Result-MDC | Result-2*Unc | Dval_MB | Dval_DER | Qual | ReasonCode |
| 101207SOMS2-35-3-C(5) | 196017048 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 0.372 | 0.0848 | | 0.0747 | 0.297 | 0.202 | 4.45 | | | C03 |
| 101207SOMS2-35-3-C(5) | 196017048 | 695976 | 1201446596 | SAMPLE | Radium-226 | 1.36 | 0.203 | | 0.124 | 1.236 | 0.954 | 6.41 | | | C03 |
| 101207SOMS2-35-3-C(5) | 196017048 | 695976 | 1201446596 | SAMPLE | Radium-228 | 1.36 | 0.281 | | 0.197 | 1.163 | 0.798 | 4.61 | | | C03 |
| 101307SOMS3-09-1-C(5) | 196017049 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 3.08 | 0.299 | | 0.0781 | 3.002 | 2.482 | 10.33 | | | C03 |
| 101307SOMS3-09-1-C(5) | 196017049 | 695976 | 1201446596 | SAMPLE | Radium-226 | 4.85 | 0.526 | | 0.151 | 4.699 | 3.798 | 9.14 | | | C03 |
| 101307SOMS3-09-1-C(5) | 196017049 | 695976 | 1201446596 | SAMPLE | Radium-228 | 0.871 | 0.380 | | 0.263 | 0.608 | 0.111 | 2.23 | | J | B01,C03 |
| 101307SOMS3-09-2-C(5) | 196017050 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 3.88 | 0.351 | | 0.0748 | 3.805 | 3.178 | 11.08 | | | C03 |
| 101307SOMS3-09-2-C(5) | 196017050 | 695976 | 1201446596 | SAMPLE | Radium-226 | 5.87 | 0.616 | | 0.145 | 5.725 | 4.638 | 9.47 | | | C03 |
| 101307SOMS3-09-2-C(5) | 196017050 | 695976 | 1201446596 | SAMPLE | Radium-228 | 0.661 | 0.296 | | 0.272 | 0.389 | 0.069 | 2.14 | | J | B01,C03 |
| 101307SOMS3-09-3-C(5) | 196017051 | 695976 | 1201446596 | SAMPLE | Cesium-137 | 3.61 | 0.292 | | 0.0691 | 3.541 | 3.026 | 12.39 | | | C03 |
| 101307SOMS3-09-3-C(5) | 196017051 | 695976 | 1201446596 | SAMPLE | Radium-226 | 6.07 | 0.571 | | 0.135 | 5.935 | 4.928 | 10.56 | | | C03 |
| 101307SOMS3-09-3-C(5) | 196017051 | 695976 | 1201446596 | SAMPLE | Radium-228 | 0.964 | 0.271 | | 0.258 | 0.706 | 0.422 | 3.38 | | | C03 |
| MB | 1201446590 | 695974 | 1201446590 | MB | Cesium-137 | 0.00528 | 0.0341 | U | 0.059 | | | | | | |
| MB | 1201446590 | 695974 | 1201446590 | MB | Radium-226 | 0.0591 | 0.140 | U | 0.103 | | | | | | |
| MB | 1201446590 | 695974 | 1201446590 | MB | Radium-228 | 0.0421 | 0.217 | U | 0.249 | | | | | | |
| 1011107SOMS3-57-0-C(5) | 1201446591 | 695974 | 1201446590 | DUP | Cesium-137 | 0.249 | 0.0592 | | 0.0589 | | | | | | |
| 1011107SOMS3-57-0-C(5) | 1201446591 | 695974 | 1201446590 | DUP | Radium-226 | 1.44 | 0.201 | | 0.104 | | | | | | |
| 1011107SOMS3-57-0-C(5) | 1201446591 | 695974 | 1201446590 | DUP | Radium-228 | 1.36 | 0.335 | | 0.189 | | | | | | |
| 1011107SOMS3-57-0-C(5) | 195910032 | 695974 | 1201446590 | SAMPLE | Cesium-137 | 0.265 | 0.0707 | | 0.0612 | | | | 0.09 | | |
| 1011107SOMS3-57-0-C(5) | 195910032 | 695974 | 1201446590 | SAMPLE | Radium-226 | 1.30 | 0.193 | | 0.138 | | | | 0.25 | | |
| 1011107SOMS3-57-0-C(5) | 195910032 | 695974 | 1201446590 | SAMPLE | Radium-228 | 1.45 | 0.330 | | 0.227 | | | | 0.10 | | |
| MB | 1201446593 | 695975 | 1201446593 | MB | Cesium-137 | 0.000787 | 0.0251 | U | 0.0429 | | | | | | |
| MB | 1201446593 | 695975 | 1201446593 | MB | Radium-226 | 0.0249 | 0.0679 | U | 0.106 | | | | | | |
| MB | 1201446593 | 695975 | 1201446593 | MB | Radium-228 | 0.0577 | 0.114 | U | 0.203 | | | | | | |
| 101207SOMS3-47-2-C(5) | 1201446594 | 695975 | 1201446593 | DUP | Cesium-137 | 2.68 | 0.264 | | 0.102 | | | | | | |
| 101207SOMS3-47-2-C(5) | 1201446594 | 695975 | 1201446593 | DUP | Radium-226 | 2.78 | 0.383 | | 0.182 | | | | | | |
| 101207SOMS3-47-2-C(5) | 1201446594 | 695975 | 1201446593 | DUP | Radium-228 | 0.972 | 0.350 | | 0.268 | | | | | | |
| MB | 1201446596 | 695976 | 1201446596 | MB | Cesium-137 | -0.0158 | 0.0197 | U | 0.0288 | | | | | | |
| MB | 1201446596 | 695976 | 1201446596 | MB | Radium-226 | 0.0167 | 0.0521 | U | 0.0931 | | | | | | |
| MB | 1201446596 | 695976 | 1201446596 | MB | Radium-228 | -0.000669 | 0.0901 | U | 0.154 | | | | | | |
| 100907SOMS2-06-2-C(5) | 1201446597 | 695976 | 1201446596 | DUP | Cesium-137 | 0.257 | 0.0823 | | 0.0603 | | | | | | |
| 100907SOMS2-06-2-C(5) | 1201446597 | 695976 | 1201446596 | DUP | Radium-226 | 0.952 | 0.184 | | 0.117 | | | | | | |
| 100907SOMS2-06-2-C(5) | 1201446597 | 695976 | 1201446596 | DUP | Radium-228 | 1.11 | 0.316 | | 0.193 | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dupl RPD= | Cesium-137 | 6 | | 0.265 | < 5* MDL | 100 | 0.0612 | 0.306 |
| | Radium-226 | -10 | | 1.30 | > 5* MDL | 20 | 0.138 | 0.69 |
| | Radium-228 | 6 | | 1.45 | > 5* MDL | 20 | 0.227 | 1.135 |
| | | | | | | | | 0 |
| Dupl RPD= | Cesium-137 | 0 | | 2.68 | > 5* MDL | 20 | 0.0822 | 0.411 |
| | Radium-226 | -2 | | 2.72 | > 5* MDL | 20 | 0.145 | 0.725 |
| | Radium-228 | 33 | | 1.36 | > 5* MDL | 20 | 0.239 | 1.195 |
| | | | | | | | | 0 |
| Dupl RPD= | Cesium-137 | -40 | | 0.171 | < 5* MDL | 100 | 0.0881 | 0.4405 |
| | Radium-226 | 8 | | 1.03 | > 5* MDL | 20 | 0.146 | 0.73 |
| | Radium-228 | 30 | | 1.50 | > 5* MDL | 20 | 0.268 | 1.34 |

# APPENDIX B

**GEL LABORATORIES LLC**
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

# Certificate of Analysis

Company : MWH Americas, Inc.
Address : 2353 130th Avenue NE
Suite 200
Bellevue, Washington 98005
Contact: Ms. Sarah.E.VonRaesfeld
Project: **Split Samples**

Report Date: March 27, 2008

Client Sample ID: 100907SOMS3-73-0-C(5)
Sample ID: 204882001
Matrix: Soil
Collect Date: 09-OCT-07 14:30
Receive Date: 17-OCT-07
Collector: Client

Project: MWHA00207
Client ID: MWHA001

| Parameter | Qualifier | Result | Uncertainty | DL | RL | Units | DF | AnalystDate | Time | Batch | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Rad Gamma Spec Analysis** | | | | | | | | | | | |
| *Gamma, Ra226, Solid* | | | | | | | | | | | |
| Cesium-137 | | 0.776 | +/-0.168 | 0.146 | 0.100 | pCi/g | | MJH1 03/26/08 | 0955 | 737557 | 1 |
| Radium-226 | UI | 0.00 | +/-0.282 | 0.227 | 1.00 | pCi/g | | | | | |
| Radium-228 | UI | 0.00 | +/-0.380 | 0.337 | 0.500 | pCi/g | | | | | |

**The following Prep Methods were performed**

| Method | Description | Analyst | Date | Time | Prep Batch |
|---|---|---|---|---|---|
| Dry Soil Prep | Dry Soil Prep GL-RAD-A-021 | BXJ1 | 03/19/08 | 1153 | 737274 |

**The following Analytical Methods were performed**

| Method | Description | Analyst Comments |
|---|---|---|
| 1 | EML HASL 300, 4.5.2.3 | |

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

## QC Summary

**Report Date: March 27, 2008**


**MWH Americas, Inc.**
**2353 130th Avenue NE**
**Suite 200**
**Bellevue, Washington**

**Contact:** **Ms. Sarah.E.VonRaesfeld**

**Workorder:** **204882**

| Parmname | NOM | | Sample | Qual | QC | Units | RPD% | REC% | Range | Anlst | Date Time |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Rad Gamma Spec** | | | | | | | | | | | |
| Batch 737557 | | | | | | | | | | | |
| QC1201539862 204882001 DUP | | | | | | | | | | | |
| Cesium-137 | | | 0.776 +/-0.168 | | 0.788 +/-0.144 | pCi/g | 1 | | (0% - 20%) | MJH1 | 03/26/08 12:03 |
| Radium-226 | | UI | 0.00 +/-0.282 | | 0.352 +/-0.189 | pCi/g | 30 | | (0% - 100%) | | |
| Radium-228 | | UI | 0.00 +/-0.380 | UI | 0.00 +/-0.255 | pCi/g | 16 | | N/A | | |
| QC1201539863 LCS | | | | | | | | | | | |
| Americium-241 | 91.9 | | | | 84.9 +/-7.24 | pCi/g | | 92 | (75%-125%) | | 03/26/08 10:26 |
| Cesium-137 | 34.9 | | | | 35.9 +/-3.35 | pCi/g | | 103 | (75%-125%) | | |
| Cobalt-60 | 47.3 | | | | 44.9 +/-3.63 | pCi/g | | 95 | (75%-125%) | | |
| Radium-226 | | | | U | 0.570 +/-0.658 | pCi/g | | | (75%-125%) | | |
| Radium-228 | | | | U | 1.55 +/-1.85 | pCi/g | | | | | |
| QC1201539861 MB | | | | | | | | | | | |
| Cesium-137 | | | | U | -0.0331 +/-0.0685 | pCi/g | | | | | 03/26/08 10:13 |
| Radium-226 | | | | U | 0.00243 +/-0.150 | pCi/g | | | | | |
| Radium-228 | | | | U | 0.133 +/-0.261 | pCi/g | | | | | |

Notes:
The Qualifiers in this report are defined as follows:

- ** Analyte is a surrogate compound
- < Result is less than value reported
- > Result is greater than value reported
- A The TIC is a suspected aldol-condensation product
- B For General Chemistry and Organic analysis the target analyte was detected in the associated blank.
- BD Results are either below the MDC or tracer recovery is low
- C Analyte has been confirmed by GC/MS analysis
- D Results are reported from a diluted aliquot of the sample
- H Analytical holding time was exceeded

## QC Summary

**Workorder: 204882**



| Parmname | NOM | Sample | Qual | QC | Units | RPD% | REC% | Range | Anlst | Date | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|

| | |
|---|---|
| J | Value is estimated |
| M | M if above MDC and less than LLD |
| N/A | RPD or %Recovery limits do not apply. |
| ND | Analyte concentration is not detected above the detection limit |
| NJ | Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier |
| R | Sample results are rejected |
| U | Analyte was analyzed for, but not detected above the MDL, MDA, or LOD. |
| UI | Gamma Spectroscopy--Uncertain identification |
| X | Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier |
| Y | QC Samples were not spiked with this compound |
| ^ | RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry. |
| h | Preparation or preservation holding time was exceeded |

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

# RAW DATA

VAX/VMS Nuclide Identification Report Generated

```
*************************************************************************
*                          GEL Laboratories LLC                         *
*                              2040 Savage Road                         *
*                            Charleston, SC 29414                       *
*************************************************************************
*                                                                       *
*                              DETECTOR DATA                            *
*                                                                       *
* Configuration     : DKA300:[CANBERRA.GAMMA.ARCHIVE.GAMMA]R204882001   *
* Acquisition date : 26-MAR-2008 09:55:52 Detector SN#    :             *
* Detector ID      : GAM15                Sensitivity     : 3.000      *
* Geometry         : BIGPETRI             Energy tolerance: 2.000      *
* Elapsed live time:    0 02:00:00.00     Abundance limit : 75.000     *
* Elapsed real time:    0 02:00:00.52     Half life ratio :  8.000     *
*************************************************************************
*                                                                       *
*                              SAMPLE DATA                              *
*                                                                       *
* Sample date      :  9-OCT-2007 14:30:00 Nuclide Library :             *
* Sample ID        : R204882001           Analyst initials: MJH1        *
* Batch Number     : 737557               Sample Quantity : 2.6990E+01 GRAM *
* Recovery         :    1.00000           Carrier Weight :    0.00000  *
*************************************************************************
*                                                                       *
*                                QC DATA                                *
* Standard Weight  :   0.00000                                          *
* CALIB. DATE/TIME : 20-MAR-2008 09:58:32 MS Isotope      :             *
* MSD DPM          :    0.000             MSD Isotope     :             *
* LCS DPM          :    0.000             LCS Isotope     :             *
* LCSD DPM         :    0.000             LCSD Isotope    :             *
*************************************************************************
```

Combined Activity-MDA Report

---- Identified Nuclides ----

| Nuclide | Activity (pCi/GRAM ) | Act error | MDA (pCi/GRAM ) | |
|---|---|---|---|---|
| CS-137 | 7.764E-01 | 1.676E-01 | 1.457E-01 | 0.000E+00 |
| RA-226 | 2.611E-01 | 2.816E-01 | 2.271E-01 | 0.000E+00 |
| RA-228 | 6.580E-01 | 3.800E-01 | 3.366E-01 | 0.000E+00 |
| U-238 | 5.917E+00 | 5.636E+00 | 5.730E+00 | 0.000E+00 |

---- Non-Identified Nuclides ----

| Nuclide | Key-Line Activity (pCi/GRAM ) | K.L. Ided | Act error | MDA (pCi/GRAM ) | | |
|---|---|---|---|---|---|---|
| CO-60 | -5.348E-02 | | 8.821E-02 | 1.260E-01 | 0.000E+00 | NOT IDENT. |
| AM-241 | -8.235E-02 | | 5.253E-01 | 7.445E-01 | 0.000E+00 | NOT IDENT. |

# APPENDIX C

## Summary of report

This report covers an assessment of the 2007 sampling campaign from various viewpoints and comparison of the results with previous campaigns in 1996, 2002 and 2004.

The 2004 sampling was designed to allow detailed analysis of the spatial continuity, trends and anisotropy in the study area. The 2007 sampling campaign was influenced by the 2004 findings.

The 2007 data was studied using the whole data set with/without land use, with/without topography. Topography was found to be an influence on Ra226 levels but, since most sampling is carried out on lower elevations, not significant enough to use the more complex estimation methods. A subset of the 2007 data containing only stations which were sampled in 1996 and 2002 – 39 location – was also studied. It is considered that the smaller data set is insufficient for reliable spatial characterisation of the study area.

From this current study, we find that land use affects the results for Ra226 found in the soil samples. Areas classified as Native or Pasture show relatively elevated levels of Ra226 over those areas which are classified as Tilled. It is recommended that future sampling is altered slightly to take account of land usage. Fewer samples could be taken in Tilled areas with Native and other undisturbed ground more densely sampled than currently.

The 2007 evaluation shows an overall decrease in Ra226 levels of 20 to 30% on average compared to 2004. The percentage of the study area which exceeds the level of concern of 3.7 pCi/g dw is 25 to 28% lower than in 2004. The average value found above this level is 4 to 5% lower in 2007 than in 2004 if the complete data sets are used. If only the 39 original stations are considered, the value above 3.7 pCi/g dw **increases** by 5% in 2007.

***Table 1: summary statistics***

| | data sets | | | grid estimates | | |
|---|---|---|---|---|---|---|
| Exceedance level = 3.7 | average value | average above 3.7 | percentage above 3.7 | average value | average above 3.7 | percentage above 3.7 |
| 1996 39 stations | 3.96 | 9.05 | 26.3 | 3.15 | 5.19 | 19.0 |
| 2002 39 stations | 2.87 | 7.09 | 21.1 | 2.08 | 4.35 | 1.4 |
| 2004 39 stations | 3.35 | 6.30 | 30.8 | 2.69 | 4.14 | 6.5 |
| 2007 39 stations | 2.73 | 6.91 | 21.1 | 2.08 | 4.38 | 1.8 |
| | | | | | | |
| 2004 all stations | 2.88 | 6.17 | 21.3 | 2.52 | 4.47 | 9.7 |
| 2004 all stations and land use boundaries | | | | 2.61 | 4.51 | 13.8 |
| | | | | | | |
| 2007 all stations | 2.10 | 7.01 | 10.3 | 1.80 | 4.29 | 2.4 |
| 2007 all stations and land use boundaries | | | | 1.92 | 4.30 | 3.5 |

**Available sampling data**

Three previous sampling campaigns in 1996, 2002 and 2004 have provided information on the necessary density of sampling and directions in which sampling should be extended for useful information. The 2007 campaign provided 145 samples in the main study area around the plant. Figure 1 shows the location of the sample sites around the central void of the plant.

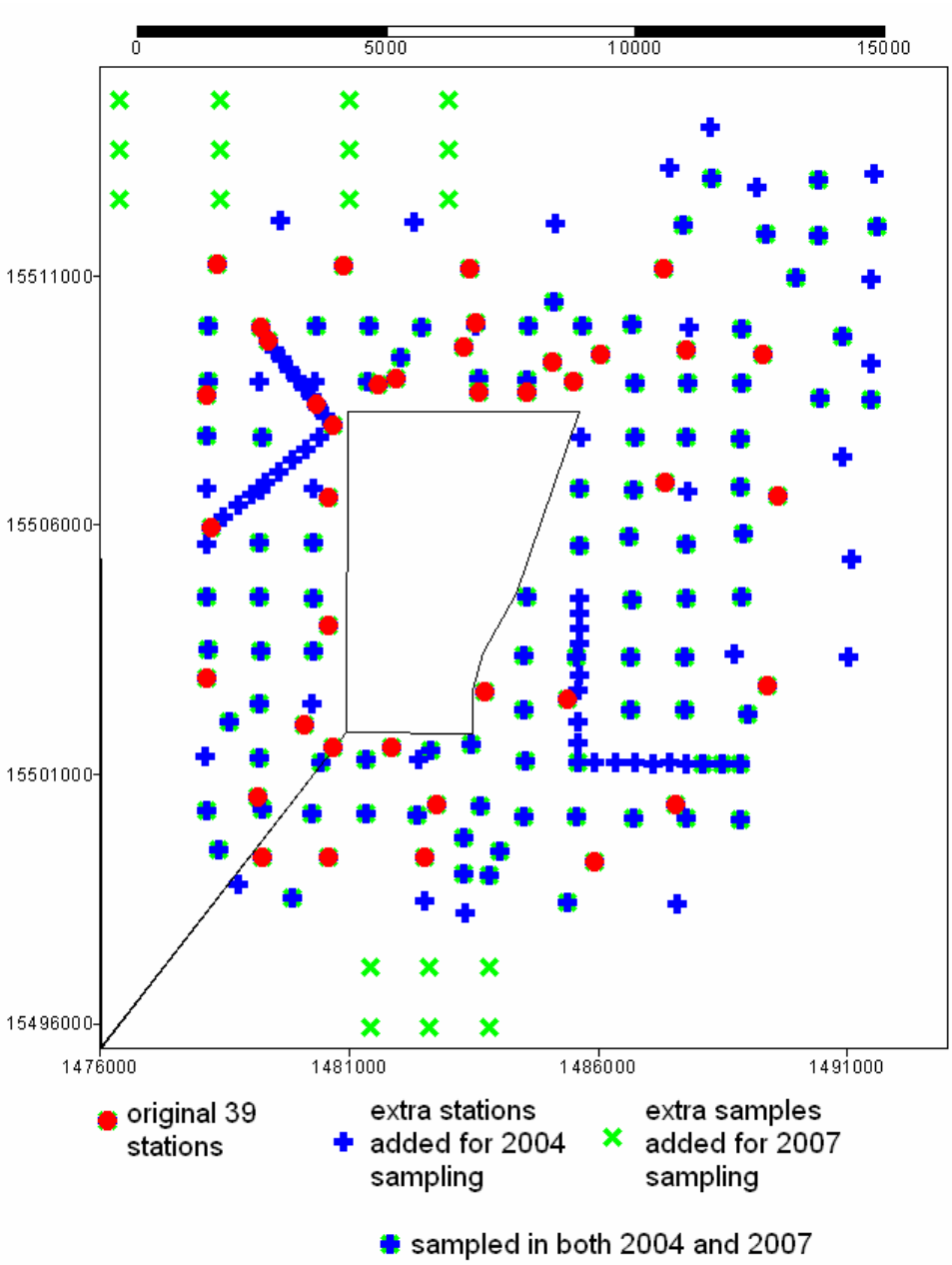



*Figure 1: sampling schemes showing date of collection*

The previous study of the 2004 data suggested that the apparent levels of Ra226 differed significantly with land use type. Native and undisturbed ground show much higher levels

than tilled land. Since sampling is taken from the upper layers of soil, measurements are likely to be affected by tilling of any kind. In this study, polygons were provided for three major land use types: Native, Pasture and Tilled. Samples were allocated land use codes. Mapping was carried out with and without land use information and comparisons made.

A topographic digital terrain model was also supplied. All of this information is summarised in Figure 2. (If this figure is difficult to view, please refer to Figure 3: *Surface Soil Sampling Locations, Topography, and Land Use in the Vicinity of the Plant, 2007* in the main body of this report, for a larger scale and clearer version of the map from which this was derived).

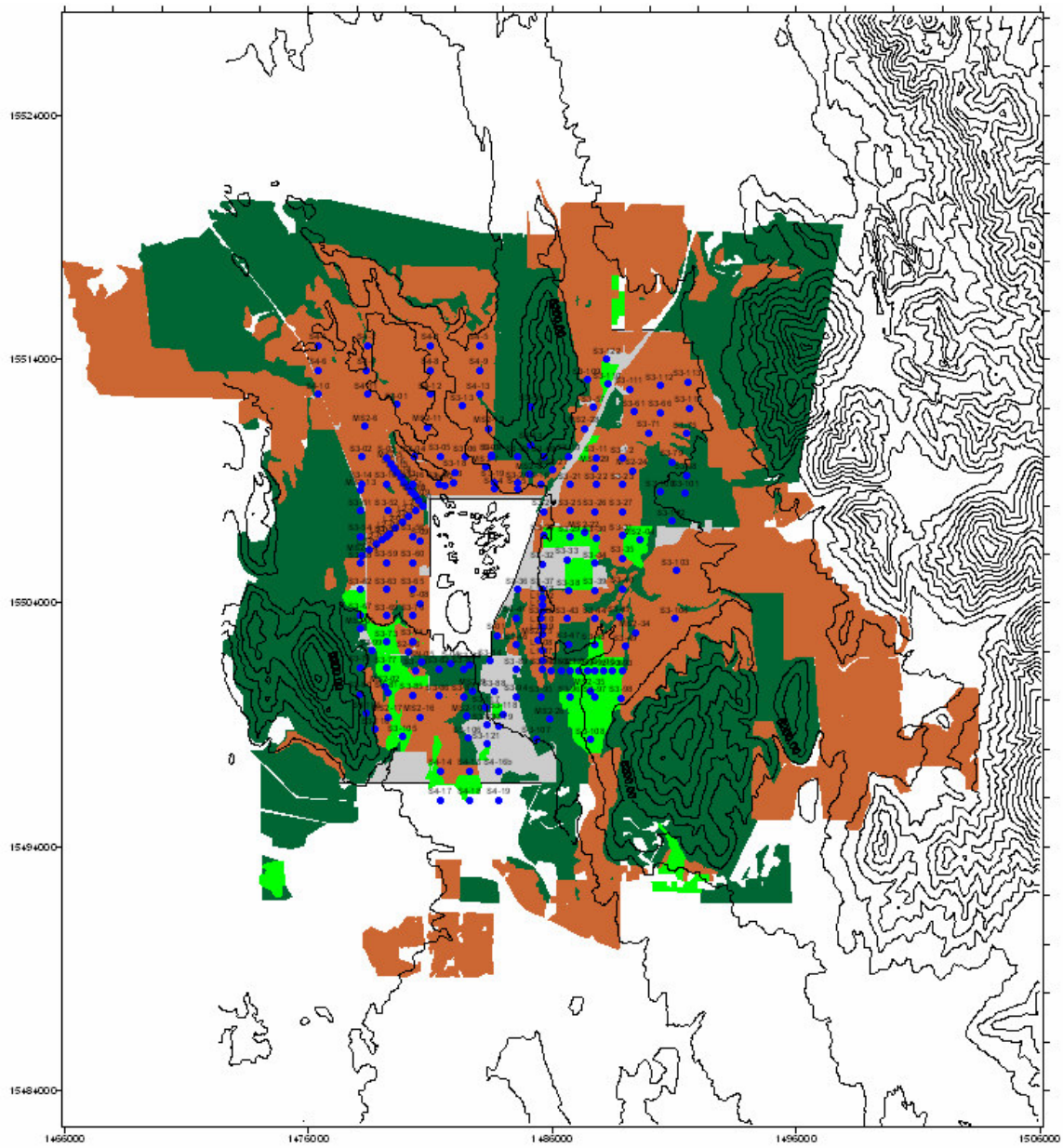



*Figure 2: Land use polygons, topography and sampled locations*

Since the deposition of Ra226 is probably affected by wind strength and direction, a wind rose was provided. However, time constraints prevented this information being included in the analysis. It is hoped, however, that the design of the next monitoring study may be guided by this additional information.

A geostatistical study of the 2007 data including the topography as an "external drift" was undertaken. It is fairly certain that topography affects the Ra226 levels. However, since almost all of the sampling lies in the valley, the impact of the topography is of limited use in the mapping exercise.

**Comparison of 2007 sampling with previous campaigns**

A scatterplot of the values found in the 2007 sampling (the x-axis) against those found at the same sites in previous monitoring exercises (the y-axis). Note one apparent extreme low value. At the date of this report, no reason has been found to exclude this sample from the study.

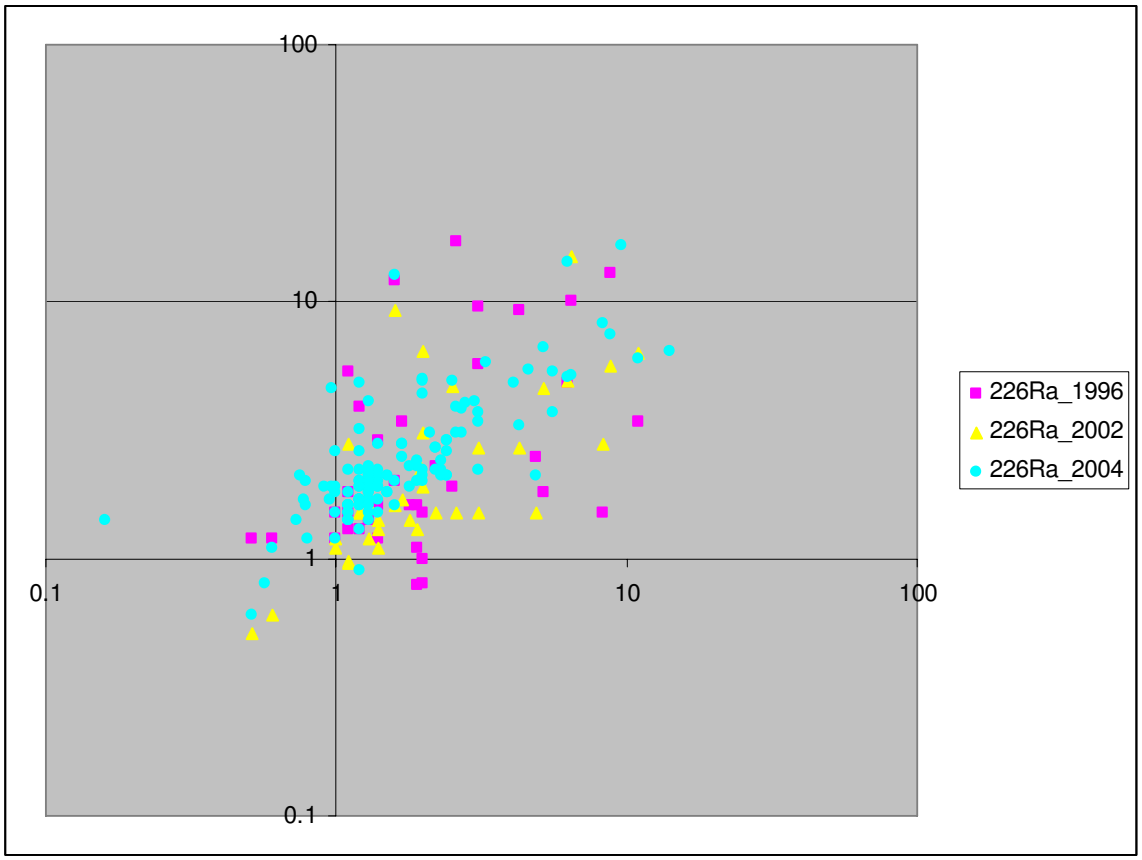



*Figure 3: 2007 sampling compared to previous years' results (logarithmic scales)*

A simple comparison of the data sets shows that values in 2007 are lower than those in any other year. Table 1, column 1 shows the average value of sampling for each year. A comparison is also included which compares only those 39 sample sites taken in the 1996 and 2002 campaigns.

The recommended level of concern for Ra226 in this study was given as 3.7 pCi/g dw.

Table 1 shows the percentage of the samples taken which exceed this value in each case. The 2007 complete data set shows only 10% of samples above the level of concern. However, if we consider only the 39 sample sites included in the earlier campaigns, this percentage rises to over 21% of the samples.

Table 1 also shows the average value of those samples which exceed the level of concern. Whether the whole data set or the subset of 39 samples are considered, the average value for 2007 exceeds that of the 2004 sampling.

It is felt that such direct comparisons may be misleading, for three reasons:

- If the total data sets are considered, they do not cover the same geographical extent within the study area;

- If only the 39 samples are compared, the confidence in the statistics which have been calculated is far less than desirable;

- In any case, the sampling information is not spread uniformly over the study area. Even allowing for the void caused by the plant boundary, the remainder of the area is not uniformly sampled. In 2004, nested closer sampling was taken to provide extra information for geostatistical modelling – causing clustering in the data. In 2007, the sampled are has been extended to the north-west and to the south.

A simple strategy to avoid this uneven weighting of sample information is to produce a regular grid of estimated values such as that used commonly for mapping. Maps were produced for:

- 1996 campaign, 39 samples
- 2002 campaign, 39 samples
- 2004 campaign, only using the 39 previously sampled locations
- 2004 campaign, using all of the 188 samples collected
- 2004 campaign, using all 188 samples but dividing the mapped area by land use code – that is, only samples with the correct land use code were used to estimate the grid points within the land use polygons. Where no land use information has been supplied, all samples are used.
- 2007 campaign, using only the 39 previously sampled locations
- 2007 campaign, using all 145 samples collected (including low outlier)

- 2007 campaign, using all 145 samples and land use information

Lognormal kriging was used for the mapping as in 2004, using the semi-variogram model developed in 2004. This model was validated against the 2007 sampling before mapping was carried out. Cross validation statistics were not as good as those achieved with 2004 data, but within acceptable limits when land use data was included in the kriging. With this option, only samples with similar land use codes are used in the validation exercise.

| **Cross validation 2004 semi-variogram model** | Average error statistic | Standard deviation of errors | Average of samples | Average of estimates |
|---|---|---|---|---|
| 1996 39 stations | 0.093 | 2.343 | 4.229 | 3.300 |
| 2002 39 stations | 0.092 | 2.265 | 2.032 | 2.449 |
| 2004 39 original stations | -0.114 | 1.852 | 3.346 | 2.944 |
| 2004 all samples | 0.032 | 1.401 | 2.883 | 2.662 |
| **2004 all samples and land use information** | **0.043** | **0.973** | **2.913** | **3.040** |
| **Ideal behaviour** | **0.000** | **1.000** | **True average** | **equals true average** |
| 2007 39 original stations | 0.158 | 1.756 | 2.734 | 2.192 |
| 2007 all samples | 0.033 | 1.474 | 2.102 | 1.887 |
| 2007 all samples and land use information | 0.069 | 1.270 | 2.034 | 1.881 |

As in 2004, a grid spacing of 200 by 200 feet was selected. Each grid point was compared to the land use polygons, to determine the likely land use at that point. Grid points were not included in the results if they failed to pass the *ygiagam* criterion – that is, where the kriging estimate is no better than simply using the regional average value. Grid files were written and transferred to Excel spreadsheets for detailed study.

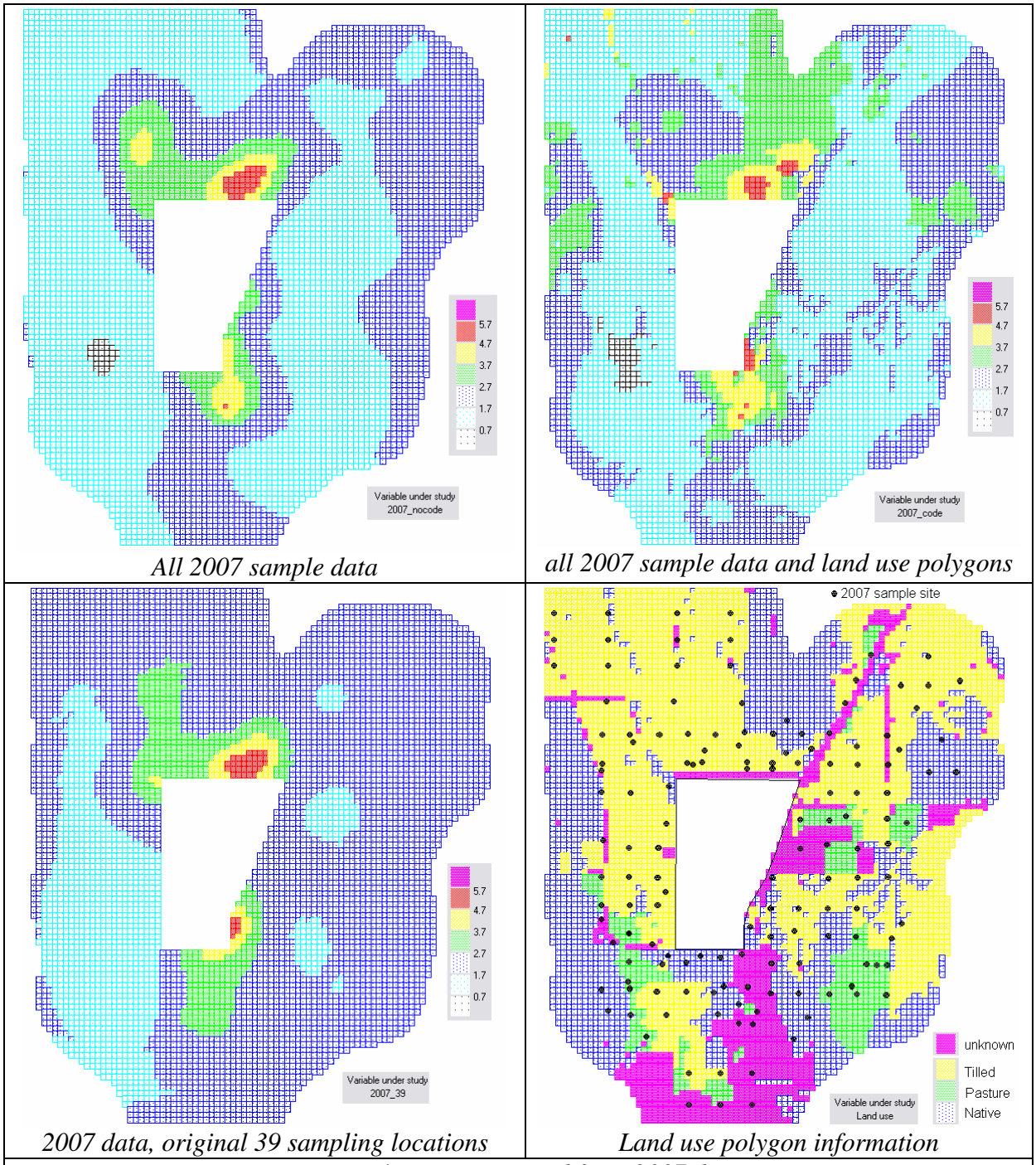
These grids were then investigated in various ways, including calculating the difference between campaigns, applying levels of concern and simple summary statistics. Details are given in the body of this report. Table 1 shows the final results for average over the whole grid and for average and percentage above the level of concern.

Figure 4 overleaf shows the maps produced using all of the 2007 sampling data with and without the land use information. It is recommended that any future sampling campaigns should take into account the local land use in placing sample locations.

Also shown in Figure 4 is a map produced using only 2007 data which has been collected at sites used in 1996 and 2002. It can be seen that this map has little local detail on contours compared with the maps produced using 145 samples. If only the original 39

location are used for mapping, little reliance can be placed on the actual location of the contours on the map.

The land use codes are also shown, along with the 145 sample sites for the 2007 campaign.




*All 2007 sample data*

*all 2007 sample data and land use polygons*

*2007 data, original 39 sampling locations*

*Land use polygon information*

*Figure 4: maps estimated from 2007 data*

The impact of including the land use data is obvious from the above maps. As an example, consider the north-western area. One single high value sample in an untilled area is 'smeared' across 100 acres of tilled ground when land use classification is ignored.

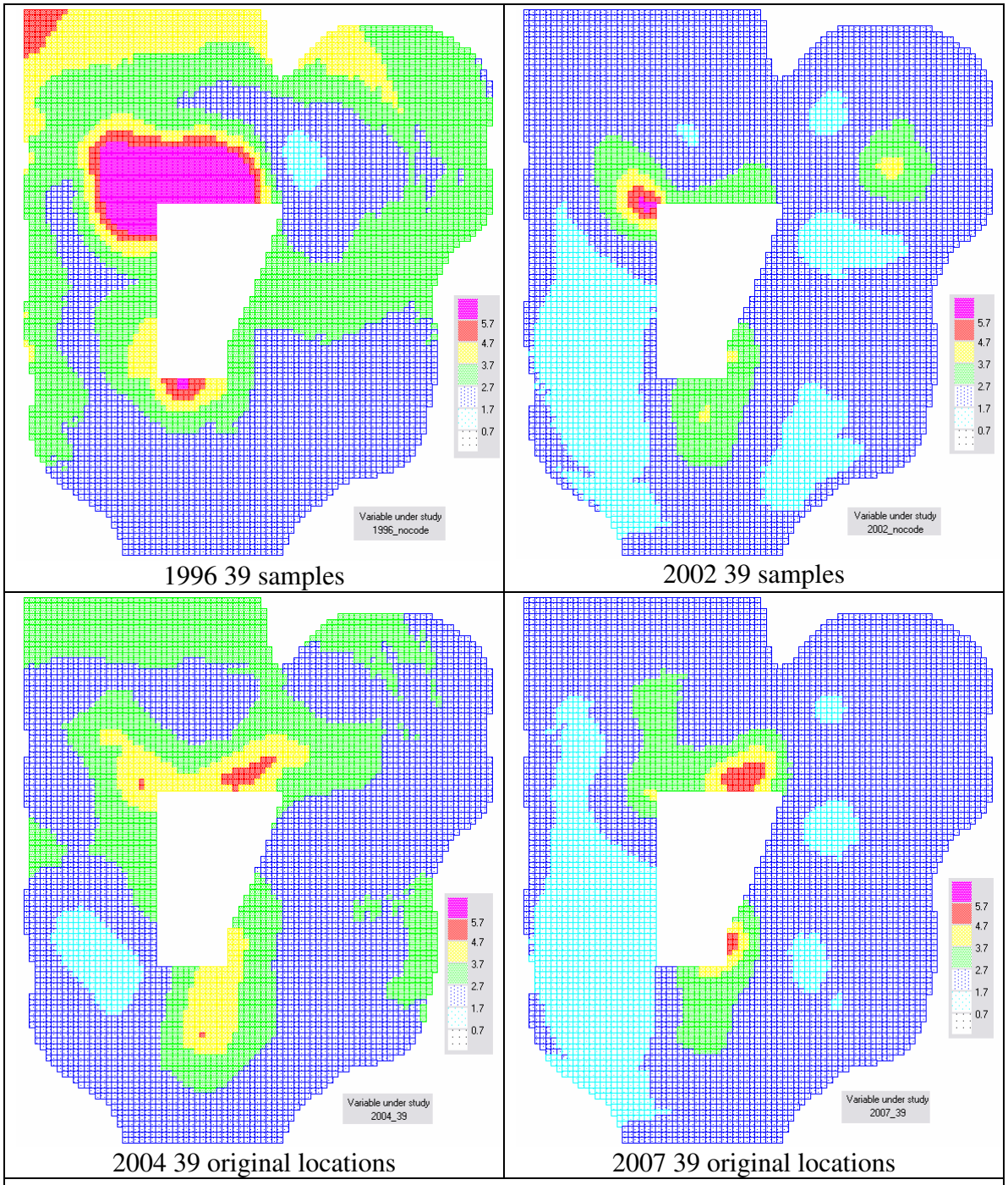



*Figure 5: comparison maps using only original 1996 sample locations*

Figure 5 above shows a direct comparison between the 4 sampling campaigns using only the common sampling locations. These maps give a broad scale idea of the pattern of Ra226 deposition, but are not reliable for any local information or confidence on contour locations.

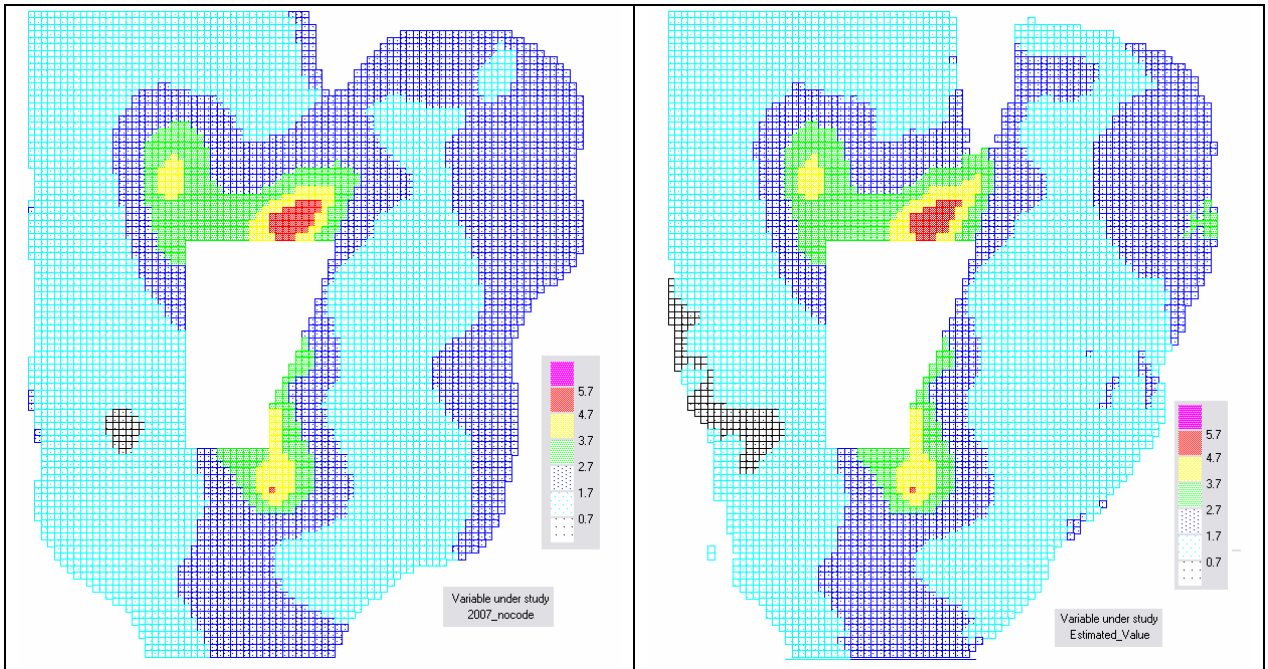
**Kriging with topographic control**

There is a variation on the kriging technique which allows for the inclusion of a background feature which may control the quantity of Ra226 which is deposited.

The wind direction and strength seems to play a part in the deposition, but time prevented investigation of this factor.

Comparison of the 2004 maps with local topography suggested that this may be a factor. A digital terrain model was provided and tied to the mapping grid. This was included in the kriging of the map as an "external drift". At this time the technique could not be combined with the land use coding. The following example is, therefore, limited to mapping without land use code.

Figure 6 shows a comparison between the 2007 map kriged without land use and the same map kriged without land use but with topographic "external drift". It would seem that there is little extra information available when including the topographic data. This may simply be because the bulk of the sampling is taken on fairly level ground.




2007 all samples | 2007 all samples plus topography

*Figure 6: 2007 map with and without topographic "external drift"*

# APPENDIX D

# $P_4$ Production, LLC

**Soda Springs Plant**
1853 Highway 34
P.O. Box 816
Soda Springs, Idaho 83276-0816
Phone: (208) 547-4300
Fax: (208) 547-3312


December 23, 1999

CERTIFIED MAIL

Mr. Wallace Reed
U.S. EPA Region 10
1200 Sixth Avenue, ECL-115
Seattle, Washington 98101

cc: J.P. Hyland, Solutia-St. Louis
D.K. Wilson, Solutia-St. Louis
R.L. Simmons, Solutia-Soda Springs
D.W. Farnsworth, Solutia-Soda Springs
G.R. MacIlwraith, Solutia-Soda Springs
R.C. Budge, Racine, Olson, Nye, Budge and Cooper
W.E. Wright, Montgomery Watson

Dear Mr. Reed,

Attached is a copy of the Environmental Protection Easement and Declaration of Restrictive Covenants that is associated with the plant site and property surrounding the Solutia (Monsanto) facility in Soda Springs, Idaho.

These easements and restrictive covenants were recorded on December 22, 1999, as official records at the Caribou County Courthouse. The conditions and restrictions, as agreed to by EPA Region 10 and $P_4$ Production, L.L.C. will apply to and run with the property as required by EPA's Record of Decision for the Monsanto Soda Springs, Idaho superfund site.

Efforts to monitor environmental conditions and the approved uses associated with these properties in order to assure protection to human health and the environment will continue.

If you have any questions regarding this significant milestone, please contact me.

Sincerely,

Robert L. Geddes
Superfund Project Manager

Enclosure

160535

STATE OF IDAHO
County of Caribou
Date: 12/22/99
Time: 9:45 AM
Official Records
Recorder: Edie Izatt
Deputy: Edie Izatt
Fee: 33.00

# ENVIRONMENTAL PROTECTION EASEMENT AND DECLARATION OF RESTRICTIVE COVENANTS

This Environmental Protection Easement and Declaration of Restrictive Covenants (hereinafter "Agreement") is granted by P4 PRODUCTION, L.L.C., whose address is P.O. Box 816, Soda Springs, Idaho 83276 ("Grantor"), in favor of SOLUTIA INC., whose address is 10300 Olive Boulevard, St. Louis, Missouri 63166-6760, and MONSANTO, whose address is 800 N. Lindbergh Boulevard, St. Louis, Missouri 63167 ("Grantee"). Grantor being the owner of the real property located in Caribou County, Idaho, described in Exhibit "A" attached hereto and incorporated by reference as if set forth fully (the "Property"), for valuable consideration paid by Grantee, the receipt and sufficiency of which are hereby acknowledged, hereby Grants to Grantee an environmental protection easement and adopts the covenants, conditions and restrictions set forth herein which shall apply to and run with the Property.

1. **Background, Purpose.** The Property is located at or near the site of an elemental phosphorus plant near Soda Springs in Caribou County, Idaho (the "Facility") that was previously owned and operated by Monsanto Company from 1952 until 1997, and is now owned by Grantor and operated by Solutia Inc., as successors in interest. The covenants, conditions and restrictions set forth herein are necessary to ensure the development and use of the Property in a manner consistent with the current environmental law and the use and character of Grantee's Facility.

2. **Restrictive Covenant .** The Property shall not be used or developed for any residential use, including but not limited to single and multiple family dwelling units and other facilities used for living quarters. Additionally, affected ground water underlying the property shall not be consumed until EPA certifies that ground water beneath the Property meets the Performance Standards.

3. **Environmental Protection Easement.** Grantor grants to Grantee, the United States, the State of Idaho and their representatives, including, but not limited to, EPA and its contractors,

a continuing right of access to the Property to enforce the land use restrictions and conduct any related activity required by the RD/RA Consent Decree entered on June 29, 1998 in the United States District Court for the District of Idaho, in the matter of the United States of America, Plaintiff, v. Monsanto Company and P4 Production L.L.C., Defendants, Civil Action No. 98-154, recorded December 18, 1998, in the Public Land Records in the Office of the County Recorder of Caribou County, Idaho, as Recorder's Instrument No. 158132.

4. **No Public Access or Use.** The property will not be open to public access or use. Grantee may construct and maintain, at their expense, such fences, gates and signs as may be necessary to prevent public access or use. Access and use shall be limited to Grantor, Grantee, and their agents, representatives and employees.

5. **Application.** All real estate, lots, parcels or portions thereof located within or on the Property, and any conveyance or transfer covering or describing any part thereof, shall be subject to the environmental protection easement, covenants, conditions and restrictions contained herein. By acceptance of such conveyance or transfer, each transferee or grantee and each of their heirs, successors, transferees or assigns agrees with Grantor and each other to be bound by the covenants, conditions and restriction contained herein.

6. **Partial Resale, Lease or Sublease.** The sale, subdivision, leasing and subleasing of a portion of the Property shall be prohibited unless each such portion resulting from such sale, subdivision, leasing or subleasing meets all of the requirements contained herein and contained in any applicable, valid governmental ordinances and regulations.

7. **Notice Requirement.** Grantor agrees to include in any instrument conveying any interest in any portion of the property, including but not limited to deeds, leases and mortgages, a notice which is substantially in the following form:

> **NOTICE:** The interest conveyed hereby is subject to the effect of: (1) an Environmental Protection Easement and Declaration of Restrictive Covenants, dated 12-22-99, 1999, recorded in the Public Land Records in the Office of the County Recorder of Caribou County, Idaho, as Recorder's Instrument No. 160535 ; and, (2) the RD/RA Consent Decree entered on June 29, 1998 in the United States District Court for the District of Idaho in the matter of the United States Of America, Plaintiff, v. Monsanto Company and P4 Production, L.L.C., Defendants, Civil Action No.98-154, recorded

December 18, 1998, in the Public Land Records in the Office of the County Recorder of Caribou County, Idaho, as Recorder's Instrument No. 158132.

Within thirty (30) days of the date any such instrument of conveyance is executed, Grantor must provide Grantee with a certified true copy of said instrument and, if it has been recorded in the Public Land Records, its recording reference.

**8.** **Enforcement.** The environmental protection easement and restrictive covenants granted herein are contractual in nature. Grantor, Grantee and any person, corporation or other entity who hereafter asserts or claims any right, title, claim or interest in and to the Property, whether as successor in title or otherwise and whether voluntarily or by operation of law, and any person, corporation or other entity claiming by, through or under Grantor or Grantee, or their heirs, assigns or successors, or any of them severally, shall have the right to enforce the restrictions contained in this Agreement and to proceed at law or in equity to compel compliance with or prevent the violation or breach of the terms hereof. The prevailing party in any action to enforce any provision of this Agreement shall be entitled to recover all costs of such action, including reasonable attorney fees.

**9.** **Reserved Rights.** Grantor reserves all rights and privileges in and to the use of the property which are not incompatible with the restrictions granted herein.

**10.** **Notices.** Any notice, demand, request, consent, approval or communication that either party desires or is required to give shall be in writing and shall either be served personally or sent by first class mail postage prepaid at the address above indicated for each party.

**11.** **General Provisions.**

11.1 Controlling Law. The interpretation and enforcement of this Agreement shall be governed by the laws of the State of Idaho.

11.2 Binding Effect. This Agreement shall remain in full force and effect, run with the land and bind all persons obtaining or succeeding to an interest in the Property after the date hereof until released. Grantee may release this Agreement in full or in part at any time consistent with U.S. Environmental Protection Agency requirements.

11.3 Severability. The determination that any provision of this Covenant is invalid shall not affect any other provision of this Covenant and the other provisions of this Covenant shall remain in full force and effect.

11.4 No Forfeiture. No waiver of the breach of any provision of this Agreement shall constitute a waiver of a subsequent breach or forfeiture of any provision. No right of action shall accrue for or on account of the failure of any person to exercise any right created by this Agreement nor for imposing any provision, condition, restriction or covenant which may be unenforceable.

11.5 Liberal Construction. This Agreement shall be liberally construed to affect the purpose of this instrument. If any provision of this instrument is found to be ambiguous, an interpretation consistent with the purpose of this instrument that would render the provision valid shall be favored over any interpretation that would render it invalid.

11.6 Entire Agreement. This instrument sets forth the entire agreement between the parties with respect to the rights and restrictions created hereby, and supersedes all prior discussions, negotiations, understandings, or agreements relating thereto, all of which are merged herein.

IN WITNESS WHEREOF, GRANTOR HAS EXECUTED THIS AGREEMENT THIS 3 DAY OF December, 1999.

**GRANTOR:**

P4 PRODUCTION, L.L.C.

By _____ WDL

Vice President

160535

STATE OF )
: ss
County of )

I certify that I know or have satisfactory evidence that Marty Blaylock is the person who appeared before me, that said person acknowledged that he signed this instrument on behalf of MONSANTO COMPANY, and that the signing of the instrument was his free and voluntary act.

Given under my hand and official seal this 3rd day of December, 1999.

Ruth A. Dunlap

NOTARY PUBLIC FOR:

Residing at: 4867 Margaretta

My Commission Expires:

RUTH A. DUNLAP
Notary Public, State of Missouri
St. Louis City
My Commission Expires 11/17/2001

(SEAL)

160535

STATE OF ~~IDAHO~~ MISSOURI )
County of ~~Caribou~~ St. Louis : ss )

I certify that I know or have satisfactory evidence that Dennis Cavner is the person who appeared before me, that said person acknowledged that he signed this instrument on behalf of SOLUTIA INC., and that the signing of the instrument was his free and voluntary act.

Given under my hand and official seal this 2nd day of December, 1999.

Joani M. Madden

NOTARY PUBLIC FOR ~~IDAHO~~ MISSOURI
Residing at:
My Commission Expires:

(SEAL)

JOANI M. MADDEN
NOTARY PUBLIC, STATE OF MISSOURI
MY COMMISSION EXPIRES JUNE 29, 2000
ST. CHARLES COUNTY

160535

## GRANTEE'S ACCEPTANCE

Grantee, Solutia Inc., hereby accepts the foregoing grant of Environmental Protection Easement and Declaration of Restrictive Covenants and agrees to be bound by the terms and conditions thereof.

SOLUTIA INC.

By _____

Print Name: DENNIS CAVNER

Title: V.P. OPERATIONS EXCELLENCE

MONSANTO COMPANY

By _____

Print Name: M E BLAYLOCK

Title: VP MANUFACTURING OPERATIONS

160535

STATE OF MISSOURI )
: ss
County of St. Louis )

I certify that I know or have satisfactory evidence that Alan W. Seder is the person who appeared before me, that said person acknowledged that he signed this instrument on behalf of P4 PRODUCTION, L.L.C., and that the signing of the instrument was his free and voluntary act.

Given under my hand and official seal this 9th day of December, 1999.

Mary K. McBride

NOTARY PUBLIC FOR MISSOURI
Residing at:
My Commission Expires:

(SEAL)

MARY K. MC BRIDE
NOTARY PUBLIC - STATE OF MISSOURI
MY COMMISSION EXPIRES 2/12/2002
ST. LOUIS COUNTY

160535

EXHIBIT "A"

DESCRIPTION OF REAL PROPERTY IN CARIBOU COUNTY, IDAHO, SUBJECT TO ENVIRONMENTAL PROTECTION EASEMENT AND DECLARATION OF RESTRICTIVE COVENANTS

TOWNSHIP 8 SOUTH, RANGE 42 EAST OF THE BOISE MERIDIAN:

SECTION 29: W½SW¼, ALSO, ALL THAT PORTION OF THE SE¼SW¼ LYING WESTERLY OF THE WESTERLY RIGHT OF WAY LINE OF STATE HIGHWAY NO. 34.

SECTION 30: LOTS 2 AND 3, NE¼SW¼, SE¼
EXCEPT THEREFROM, A STRIP OF LAND 50 FEET WIDE, BEING 25 FEET ON EACH SIDE OF THE CENTERLINE LYING OVER AND ACROSS THE SE¼NE¼ OF SECTION 25, TOWNSHIP 8 SOUTH, RANGE 41 EAST OF THE BOISE MERIDIAN, AND OVER AND ACROSS LOTS 2 AND 3, AND THE NE¼SW¼ OF SECTION 30, TOWNSHIP 8 SOUTH, RANGE 42 EAST OF THE BOISE MERIDIAN, SAID CENTERLINE BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE WEST FENCE LINE OF GRANTOR'S LAND, WHICH POINT IS 25 FEET SOUTH OF THE INTERSECTION OF THE SAID WEST FENCE LINE WITH THE NORTH LINE OF THE SAID SE¼NE¼ OF SAID SECTION 25, AND 1285 FEET, MORE OR LESS, WEST OF THE EAST LINE OF SAID SECTION 25, AND RUNNING
THENCE EASTERLY, PARALLEL TO AND 25 FEET DISTANCE SOUTHERLY FROM THE SAID NORTH LINE OF SAID SE¼NE¼ OF SAID SECTION 25 AND 25 FEET DISTANT SOUTHERLY FROM AND PARALLEL TO THE NORTH LINE OF LOT 2 OF SAID SECTION 30, TO A POINT 25 FEET WEST OF THE WESTERLY BASE OF A LAVA REEF IN THE NORTHEASTERLY PORTION OF SAID LOT 2;

THENCE SOUTHEASTERLY PARALLEL TO AND 25 FEET DISTANT WESTERLY FROM THE BASE OF SAID LAVA REEF TO THE SOUTHERLY SURFACE END OF SAID LAVA REEF;

THENCE CONTINUING SOUTHEASTERLY TO AND AROUND AND 25 FEET DISTANT FROM THE SOUTHERLY AND WESTERLY SIDE OF A SECOND LAVA REEF SITUATED IN OR NEAR THE SOUTHEAST CORNER OF SAID LOT 2 AND IN OR NEAR THE NORTHEAST CORNER OF SAID LOT 3 OF SAID SECTION 30;

THENCE SOUTHEASTERLY BETWEEN TWO ADDITIONAL LAVA REEFS TO A POINT 25 FEET EAST OF THE EASTERLY SIDE THEREOF;

THENCE RUNNING NORTHEASTERLY TO A POINT 25 FEET SOUTH OF THE NORTH LINE OF SAID NE¼SW¼ OF SAID SECTION 30;

THENCE EASTERLY PARALLEL TO AND 25 FEET DISTANT SOUTHERLY FROM THE SAID NORTH LINE OF SAID NE¼SW¼ OF SAID SECTION 30, TO A POINT 25 FEET WEST OF THE EAST FENCE LINE OF GRANTOR'S LAND IN THE SAID NE¼SW¼ OF SAID SECTION 30;

THENCE SOUTHERLY, PARALLEL TO AND 25 FEET DISTANCE WESTERLY FROM SAID EAST FENCE LINE OF GRANTOR'S LAND TO THE SOUTH LINE OF THE SAID NE¼SW¼ OF SAID SECTION 30, TOWNSHIP 8 SOUTH, RANGE 42 EAST OF THE BOISE MERIDIAN, EXCEPTING ANY PROPERTIES LYING WITHIN THE COUNTY ROAD RIGHT OF WAYS.

SECTION 31: E½

SECTION 32: ALL THAT PORTION OF THE NW¼ AND THE W½SW¼ LYING WESTERLY OF THE WESTERLY RIGHT OF WAY OF STATE HIGHWAY 34 AS THE SAME NOW EXISTS.

ALSO, BEGINNING AT THE SOUTHWEST CORNER OF SECTION 32; THENCE NORTH 00°33'26" EAST 60 FEET TO A FOUND 5/8" REBAR, THE TRUE POINT OF BEGINNING, AND RUNNING

THENCE NORTH 00°25'51" WEST 654.08 FEET ALONG THE EAST RIGHT OF WAY LINE OF HIGHWAY NO. 34 TO A HIGHWAY RIGHT OF WAY MONUMENT, WHICH IS THE P.C. OF A 1860.00 FOOT RADIUS CURVE TO THE RIGHT;

THENCE NORTHERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 02°05'01", AN ARC LENGTH OF 67.64 FEET, THE CHORD OF WHICH BEARS NORTH 01°17'53" EAST, AND HAVING A CHORD DISTANCE OF 67.64 FEET TO A POINT OF TANGENCY, WHICH IS A 5/8" REBAR WITH CAP LABELLED "A.A. HUDSON PLUS 4735";

THENCE SOUTH 37°20'30" EAST 804.98 FEET TO A 5/8" REBAR WITH CAP;

THENCE SOUTH 16°32'26" EAST 81.09 FEET TO A FOUND 5/8" REBAR;

THENCE SOUTH 90°33'07" WEST 507.99 FEET, TO THE TRUE POINT OF BEGINNING.
ALSO, A TRACT OF LAND 200 FEET IN WIDTH, ADJOINING THE WESTERLY SIDE OF THE CONDA-SODA SPRINGS RAILROAD RIGHT OF WAY AND RUNNING NORTHWESTERLY THEREFROM TO AND ADJOINING THE EASTERLY SIDE OF STATE HIGHWAY NO. 34 AND SITUATED IN THE SW¼SW¼ OF SECTION 32, AND FURTHER DESCRIBED AS SITUATED 100 FEET ON EACH SIDE OF THE FOLLOWING DESCRIBED CENTERLINE, TO-WIT:

BEGINNING AT A POINT ON THE WEST BOUNDARY LINE OF SAID CONDA-SODA SPRINGS RAILROAD RIGHT OF WAY LOCATED 439 FEET EAST AND 358 FEET NORTH OF THE SOUTHWEST CORNER OF SAID SECTION 32, AND RUNNING

THENCE NORTHWESTERLY TO A POINT 933.4 FEET NORTH OF SAID SOUTHWEST CORNER OF SECTION 32, WHICH LAST POINT INTERSECTS THE EASTERLY BOUNDARY LINE OF SAID STATE HIGHWAY NO. 34.

TOWNSHIP 9 SOUTH, RANGE 42 EAST OF THE BOISE MERIDIAN:

SECTION 6: LOTS 1, 2, AND 3
EXCEPT THEREFROM, THE FOLLOWING TRACT:

BEGINNING AT THE POINT OF INTERSECTION OF THE WEST LINE OF STATE HIGHWAY NO. 34, AND THE SOUTH LINE OF HOOPER SPRINGS ROAD, WHICH POINT IS APPROXIMATELY 86 FEET WEST AND 100 FEET SOUTH FROM THE NORTHEAST CORNER OF SAID SECTION 6; THENCE CONTINUING SOUTH ALONG THE WESTERLY RIGHT OF WAY LINE OF SAID HIGHWAY NO. 34, A DISTANCE OF 208.7 FEET, TO THE TRUE POINT OF BEGINNING, AND RUNNING

160535

THENCE CONTINUING SOUTH ALONG THE WESTERLY RIGHT OF WAY LINE OF HIGHWAY NO. 34, A DISTANCE OF 1011.3 FEET, MORE OR LESS, TO THE SOUTH LINE OF THE NE¼NE¼ OF SAID SECTION 6;

THENCE WEST ALONG SAID SOUTH LINE 440 FEET;

THENCE NORTH 1011.3 FEET;

THENCE EAST 440 FEET, TO THE POINT OF BEGINNING.
EXCEPTING ANY PROPERTIES LYING WITHIN THE COUNTY ROAD RIGHT OF WAYS.

# APPENDIX E

# P4 Production, LLC

Robert Geddes
**Soda Springs Plant**
1853 Highway 34
P.O. Box 816
Soda Springs, Idaho 83276-0816
Phone: (208) 547-1234
Fax: (208) 547-3312

July 3, 2008

Mark Ader
Environmental Cleanup Office (ECL-115)
U.S. Environmental Protection Agency
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

Re: **Five-Year Review**
**CERCLA Record of Decision**
**P4 Production, LLC Soda Springs Plant**

Dear Mr. Ader:

You asked that P4 Production, LLC ("P4") provide information related to the Five-Year Review of the CERCLA Record of Decision ("ROD") for P4's plant in Soda Springs, Idaho (the "Plant"). Specifically, you requested information that addresses the requirement in the ROD that the Five-Year Review "verify that operations continue to be in compliance with environmental (CAA, IDAPA, CWA, RCRA) and worker health and safety requirements *so that potential releases and exposures remain adequately controlled* and the remedy remains effective."

As stated in the ROD, EPA concluded that "as of August, 1996, … the Plant is in compliance with the Resource Conservation and Recovery Act (RCRA), the Clean Air Act (CAA), the Toxic Substances Control Act (TSCA), and the National Pollutant Discharge Elimination System (NPDES). In addition, the Monsanto Plant has received awards from the Occupational Safety and Health Administration (OSHA) because of its implementation of worker safety programs, compliance with OSHA regulations, and worker safety record." In the first Five-Year Review, dated September 30, 2003, EPA did not note any change to this conclusion.

Since the date of the first Five-Year Review, P4 continues to operate its Soda Springs Plant in substantial compliance with all environmental, health and safety requirements. All permit and regulatory requirements that limit or control potential releases and exposures have been met. Additional information related to specific permit requirements follows.

Clean Air Act

As required by the Plant's Tier I permit, issued by the Idaho Department of Environmental Quality ("IDEQ") pursuant to the requirements of Title V of the Clean Air Act, annual compliance certifications have been submitted to IDEQ and EPA. There have been no deviations, excursions or other instances of noncompliance that would impair or adversely affect the effectiveness of the remedy.

Clean Water Act

As required by the Plant's NPDES permit, issued by EPA, all monthly discharge monitoring reports have been timely submitted and there have been no deviations or excursions.

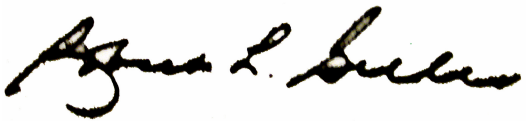
Resource Conservation and Recovery Act

The Plant does not treat, store or dispose of any hazardous waste in a manner that requires a RCRA permit. The Plant has complied with all generator requirements, including manifest and related reporting requirements. Since the ROD was signed, the Plant has made no material changes to its method of handling solid or hazardous wastes, including secondary materials that would impair or adversely affect the effectiveness of the remedy.

Employee Health and Safety

The Plant remains in compliance with all applicable employee health and safety requirements so that the remedy remains effective. The Soda Springs Plant has installed a robust environmental management system and was certified as an ISO14001 facility in 2007. Among other things, the environmental management system includes a management system policy, system manual, numerous procedures, an environmental compliance self-evaluation, management reviews, a rigorous internal audit schedule, environmental aspect development and management, Plant-wide communication briefings and annual objectives and targets.

Very truly yours,



Robert L. Geddes