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MAR 8 2000

Mr. James A. Saric, Remedial Project Manager
U.S. Environmental Protection Agency
Region V, SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

DOE-0474-00

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF RESPONSES TO OHIO ENVIRONMENTAL PROTECTION AGENCY COMMENTS AND THE REVISED CALIBRATION REPORT FOR THE MOBILE SODIUM IODIDE SYSTEM KNOWN AS THE GATOR

References:

1) Letter, J. Bradburne to J. Craig, "Transmittal of the Draft Calibration Report for the Mobile Sodium Iodide System Known as the GATOR," dated November 5, 1999

2) Letter, T. Schneider to J. Reising, "GATOR Calibration Report Comments," dated December 20, 1999

Enclosed are responses to the Ohio Environmental Protection Agency (OEPA) comments and the revised Calibration Report for the Mobile Sodium Iodide System known as the GATOR. These comment responses were informally sent to the Agencies on January 13, 2000.

The enclosed report documents the calibration process and the calibration equations used to calculate isotopic concentrations resulting from radiation measurements collected by the GATOR instrument.

Recycled and Recyclable

1. As discussed on Pages 11 and 12 of the report, there are limitations to the applicability of the GATOR calibration equations, especially the uranium-238 and total uranium equations. To provide an added level of assurance that above-Waste Acceptance Criteria (WAC) locations will not be missed while scanning with any of the mobile sodium iodide (NaI) instruments, conservative data screens have been developed and implemented for each NaI instrument. Unique administrative cutoff limits have been derived for each instrument. These conservative data screens have been incorporated into Real Time Instrumentation Measurements Program (RTIMP) data review procedures and software. The software automatically flags those measurements that exceed any of the screening criteria, thus identifying locations that need more careful evaluation for possible WAC exceedance. The checklist used to document data review contains guidance which requires that each data point, which exceeds any of the screening criteria, be verified with an HPGe measurement because these instruments are more accurate and less susceptible to spectral interference problems.

2. As noted in responses to OEPA comments, a schedule has been developed for recalibration of all of the sodium iodide tools on the calibration pad. So far, this work is on schedule. Source patterns, source strengths, and gamma fluxes have been computed. These computations will serve as the basis for plans for performing calibration of all the NaI instruments on the calibration pad. Uranium, thorium, and radium materials have been identified for use as radioactive calibration sources, and preparation of these sources has begun.

If you have any questions regarding these documents or need further information, please contact Robert Janke at (513) 648-3124.

Sincerely,

Johnny Reising

FEMP:R.J. Janke

Johnny W. Reising
Fernald Remedial Action
Project Manager

Enclosures

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cc w/enclosures:
R. J. Janke, OH/FEMP
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T. Schneider, OEPA-Dayton (three copies of enclosures)
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T. Hagen, Fluor Fernald/65-2
J. Harmon, Fluor Fernald/90
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M. Jewett, Fluor Fernald/52-2
T. Walsh, Fluor Fernald/65-2
J. White, Fluor Fernald/52-8
ECDC, Fluor Fernald/52-7

RESPONSES TO OHIO ENVIRONMENTAL PROTECTION AGENCY COMMENTS ON THE DRAFT CALIBRATION REPORT FOR THE MOBILE SODIUM IODIDE SYSTEM KNOWN AT THE GATOR (20310-RP-0002, REVISION A)

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

GENERAL COMMENTS

Commenting Organization: Ohio EPA Commentator: OFFO
Section #: Pg. #: Line #: Code: C
Original Comment #: 1

Comment: It is the position of the Ohio Environmental Protection Agency and the Ohio Department of Health that a "calibration pad" be constructed for daily use for all the *in situ* gamma instruments. This is especially important now that several of the areas that were used for quick daily instrument performance checks have been remediated. Such a pad would be especially important to resolve outstanding orientation differences in the GATOR. It could also be used for daily source checks for all of the *in situ* instruments.

Response: The FEMP agrees with the general thrust of the comment. Daily performance checks are effective in demonstrating the validity of measurements, and thus are an important aspect of a good instrument quality control program. A calibration pad has already been constructed. Planned uses for the Real Time Instrumentation Measurements Program (RTIMP) calibration pad include instrument calibration, daily instrument performance checks, and special studies to resolve outstanding technical issues such as sodium iodide (NaI) instrument differences, interference effects, etc. When practical methods for accomplishing these tasks are developed, they will be incorporated into existing or new RTIMP procedures. However, for very practical reasons, it would be unwise for us to commit to conducting daily performance tests of each instrument on the calibration pad. Driving the Real Time Radiation Tracking System (RTRAK) and the GATOR onto the pad for these tests each day would probably damage the pad. In addition, when these vehicles conduct scans in radiological contamination zones, the vehicles generally remain in those zones until the scans are complete, even if this takes several days or more. The process of decontaminating the vehicle and performing a radiological release survey is too time consuming to release each vehicle from the contamination zone each day. With the calibration pad, it will be feasible to run instrument performance checks on one HPGe detector and one NaI detector daily or prior to use, whichever is less frequent.

Action: RTIMP procedures will be revised to incorporate the use of the calibration pad as described above.

Commenting Organization: Ohio EPA Commentator: ODH
Section #: Pg. #: Line #: Code: C
Original Comment #: 2

Comment: In light of the success with which the identically equipped RTRAK and RSS have been deployed in precertification activities at the site, it is appropriate to consider future use of the GATOR for screening applications despite it's acknowledged limitations.

The potential to miss AWAC areas is a serious flaw. The development of trigger levels and operator software "flags" to minimize the potential for missing AWAC areas in those locales where Radium and Thorium are near background should be a priority.

Response: Agree. The GATOR will be used in same manner and for same purposes as RTRAK and RSS. Operator software flags similar to those currently in use for RTRAK and Radiological Scanning System (RSS) will be incorporated into the GATOR software before it is deployed for WAC attainment scans. Exceedance of the screening levels will require HPGe confirmatory measurements.

Action: The following "flags," which will minimize the potential for missing AWAC material in those areas where radium-226 and thorium-232 are near background, will be incorporated into the GATOR software and the RMS Data Verification Checklist which is part of procedure ADM-17, In-situ Gamma Spectroscopy Data Management: Were the following criteria met for GATOR net count rates?

$$MF*UNCPS < 53 \text{ and}$$
$$MF*RaNCPS < 57 \text{ and } MF*UNCPS < 27$$

where MF = moisture fraction, and UNCPS and RaNCPS stand for uranium and radium net counts per second.

NOTE: The criteria above may not apply when ThNCPS is elevated because this contradicts the assumptions from which the cutoff values were derived.

If either criterion is NOT met, confirm the uranium result with a high-purity germanium (HPGe) measurement.

Commenting Organization: Ohio EPA Commentator: ODH
Section #: General Comment Pg. #: Line #: Code: C
Original Comment #: 3
Comment: Has an effort been made to orient the crystal the same as the RTRAK to eliminate some of the geometrical differences between the device.

Response: As well as could be determined, without performing very precise alignments, the GATOR and RTRAK NaI crystals have the same orientation. Shielding by the body and wheels of the two vehicles is in all probability the most important factor giving rise to response differences between the two instruments.

Action: No action required.

Commenting Organization: Ohio EPA Commentator: OFFO
Section #: Calibration Process Pg. #: 2 Line #: Code: C
Original Comment #: 4
Comment: The inhomogeneity issue with concentrations near the upper range of interest can be resolved through the use of the planned calibration pad. The development of a calibration pad for the real-time instruments needs to be a priority for this program. Provide information on the status of the calibration pad and time table for its implementation.

Response: Agree. At this time the calibration pad has been constructed and the FEMP is in the process of identifying and characterizing radioactive materials that will be suitable gamma ray sources for the calibration pad. This is proceeding more slowly than anticipated.

Action: Implement the current status and schedule for the calibration pad.

Calibration Pad Current Status and Schedule

Items Completed

- Calibration Pad constructed
- Draft calibration plans written
- Work plan issued to prepare U, Ra, and Th standards

Items To Be Completed

- Source preparation completed - 3/15/00
- Recalibrate all NaI systems - 4/30/00
- Issue draft calibration report (for all NaI systems) - 5/31/00
- Receive comments on draft calibration report - 6/30/00
- Issue final calibration report - 7/31/00

Commenting Organization: Ohio EPA Commentator: OFFO
Section #: Calibration Results Pg. #: 4 Line #: 7-11 Code: C
Original Comment #: 5

Comment: The calibration process for this instrument spanned a time greater than 70 days. This appears to be a rather long time to perform a calibration. With calibration time frames this long unidentified interferences can enter the process which can influence the calibration. Recommend that a set time period for the calibration of instruments be specified.

Response: Comment accepted. In general it is desirable to complete instrument calibrations in as short a time span as possible to minimize the effects of external variables. Most of the calibration measurements were actually performed over a one-week period. After an initial review of the calibration data, it was decided that it would be desirable to increase the number of calibration points. To that end, measurements at two new locations were added to the data set in May, and confirmatory measurements at one of the new locations were performed in June. The calibration data collection process took longer than normal because of the decision to perform additional calibration measurements and to perform confirmatory measurements at one of the new locations. It is anticipated that when calibrations are performed on the calibration pad, the measurements can be completed in a day or two.

Action: No action required.

Commenting Organization: Ohio EPA Commentator: ODH
Section #: Calibration Results Pg. #: 7 Line #: Code: C
Original Comment #: 6

Comment: It appears the large relative percent deviation of GATOR measurements vs. HPGe for Ra-226 would necessitate a lot of extra time and effort confirming an increase in hotspots during precertification.

Response: The FEMP is committed to performing *in situ* measurements in a manner that will provide a high degree of confidence in the measurement results. This includes confirmatory HPGe measurements when potential hot spots are identified by NaI measurements. This policy will not change when the GATOR is placed into service. The calibration report does contain instances in which the relative percent differences between HPGe and GATOR results for radium-226 are large. In all probability, this situation will necessitate some HPGe measurements to confirm GATOR results. If the number of confirmatory measurements becomes inordinately large, use of the GATOR would be discontinued rather than changing the policy regarding confirmation of NaI results potentially above hot spot criteria. It is anticipated that recalibration of the GATOR on the RTIMP calibration pad will result in an improved calibration that will make this a moot point.

Action: No action required.

Commenting Organization: Ohio EPA Commentator: ODH
Section #: Calibration Results Pg. #: 10 Line #: Code: C
Original Comment #: 7

Comment: The data comparisons for Th-232 and K-40 are encouraging. This demonstrates that good precertification data can be obtained when the contaminant is homogeneously distributed and spectral interferences are minimal. The assumption of uniform contamination at depth, typical geometries, and spectra impacted by waste inventories in the production area will significantly compromise data quality unless compensated for.

Response: The FEMP recognizes the validity of this observation and its impact to all the NaI instruments and to a certain degree the HPGe instruments. We believe there are adequate programmatic controls in place that will enable us to recognize and compensate when results are being impacted by "shine" from sources outside a detector's normal field of view. For example, see Section 4.12 of the User Guidelines, Measurement Strategies, and Operational Factors for Deployment of *In-Situ* Gamma Spectrometry at the Fernald Site (20701-RP-0006, Rev. B, July 1998). In addition, it should be recognized that all waste inventories will be drastically reduced before soil remediation activities take place in the production area. In terms of contamination at depth, the situation is somewhat more difficult and realistically points to a limitation with the *in situ* gamma spectrometry instruments. As discussed in workgroup meetings, HPGe detector-based instruments can be utilized to help identify uranium contamination at depth by comparing the low energy gamma-ray signals (63 KeV and 93 KeV) with the high energy signal (1001 KeV). However, due to the large amount of electronic noise at low energy levels, the NaI-based instruments are less suited for such evaluations. Furthermore, scientists at DOE's Environmental Measurements Laboratory (EML) are performing studies to extend the theory of *in situ* gamma spectrometry measurements to non-flat terrains. These scientists are collaborating with personnel at Fernald to aid in the proper interpretation of *in situ* measurement data.

Action: No action required.

Commenting Organization: Ohio EPA Commentator: OFFO
Section #: Calibration Verification Pg. #: 13 Line #: 1-4 Code: C
Original Comment #: 8

Comment: By restricting the comparisons, the verification process is defeated. The calibration and verification process should be documented in a procedure and followed. Deviations to the procedure and the resulting changes in results should be clearly documented. Restricting comparisons for the sake of getting "better" calibration curves in unacceptable.

Response: The FEMP agrees that the calibration and verification process should be documented in a procedure. A calibration procedure will be issued after a decision is reached on the technical details of how to use the newly constructed calibration pad to calibrate the sodium iodide detectors. Written plans will be developed to perform the NaI calibrations on the calibration pad. Specific details of the process may have to be altered in response to lessons learned during the first round of calibrations. So it is probable that an official, detailed RTIMP procedure will not be issued until after the first round of calibrations.

The FEMP does not agree with the contention that the verification process would be defeated by restricting it to cases in which each HPGe shot had 20 or more NaI results. within its field of view. The verification process was NOT restricted "for the sake of getting better calibration curves." The verification process was completely independent of the calibration process. It was carried out AFTER the calibration process was complete. The verification process was "restricted" to ensure that each NaI instrument was looking at substantially the same ground that was seen by the HPGe detector. A comparison of HPGe and NaI results to verify the NaI calibration would not be meaningful unless there was some assurance that the two instruments were looking at the same ground. The verification testing of the GATOR and the other NaI instruments was performed by operating them under nominal field conditions, (i.e., in a mobile mode with a speed of 1 mile per hour and 4-second acquisition times). The only way to provide reasonable assurance that the NaI instrument saw substantially the same ground as the HPGe detector was to perform the comparison only when there was some arbitrary "large" number of NaI results within the field of view of a given HPGe reading. If only a "small" number of NaI results were found within the field of view of an HPGe measurement, in all likelihood the NaI vehicle did not traverse the center of the HPGe circular field of view.

Action: The calibration and verification process will be documented in an RTIMP procedure.

Commenting Organization: Ohio EPA Commentator: OFFO
Section #: Summary and Conclusions Pg. #: 16 Line #: 28-29 Code: C
Original Comment #: 9

Comment: Agree that the GATOR may be used only at ASL A. Additional work still needs to be performed to resolve the discrepancies noted in this report.

Response: The FEMP agrees that further work should be performed to understand some of the instrument differences that were noted in this report. Performing tests in the more controlled environment of the calibration pad may be helpful in resolving these issues. As stated in the report, however, we believe that the data presented in the report provide sufficient justification for placing the GATOR into service at this time. The Real Time

Instrumentation Measurements Program has the necessary programmatic and procedural infrastructure to accommodate any changes that may result from recalibration or special studies conducted on the RTIMP calibration pad.

Action: Special studies will be performed on the calibration pad to resolve outstanding technical issues associated with the use of the sodium iodide scanning tools.

Commenting Organization: Ohio EPA Commentator: OFFO
Section #: Table 8 Pg. #: NA Line #: NA Code: C
Original Comment #: 10
Comment: The averaging of two counts and change in geometry is inappropriate during the calibration procedure, especially since the geometry may be a major cause for the discrepancies in the calibration.

Response: This comment expresses concern about the averaging of counts and changing the orientation of the GATOR during calibration. Averaging of counts should always be acceptable, since averaging corresponds to an increased count time. The longer the count time the better, even if some difference does exist between locations. For calibration in the field, measurements should be made with the NaI detector in both the "0 degree" and "90 degree" orientations to determine if heterogeneity problems are present. What constitutes "0 degrees" is arbitrary. The issue is not that the detector was rotated; the issue is that the location had a heterogeneous distribution of contamination and, therefore, is probably not the best location for a calibration point. This point constituted only one of the ten calibration locations. With future calibrations slated to be conducted on the RTIMP calibration pad, the issue of heterogeneous (less desirable) calibration points should be avoided.

Action: No action required.

Commenting Organization: Ohio EPA Commentator: ODH
Section #: Tables 1 through 3 Pg. #: Line #: Code: C
Original Comment #: 11
Comment: The calibration measurements summarized in Tables 1-3 include % dead time. For clarity, it would be prudent to include a footnote stating the data is corrected for such.

Response: Comment accepted. A footnote will be added to these tables stating that the data are corrected for dead time.

Action: Tables 1 through 3 of the GATOR Calibration Report will be revised as stated above.