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Summary Report for the Environmental Protection Agency MERL/FRMAC Mission Alignment Exercise held at the Environmental Protection Agency Facility on June 24-26, 2014

Project Name: Mission Alignment with EPA Mobile Laboratory and FRMAC Fly Away Laboratory

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Executive Summary

From June 24th thru June 26th 2014, members of the Federal Radiological Monitoring and Assessment Center (FRMAC), FRMAC Fly Away Laboratory, and the Environmental Protection Agency (EPA) participated in a joint nuclear incident emergency response/round robin exercise at the EPA facility in Las Vegas, Nevada. The purpose of this exercise was to strengthen the interoperability relationship between the FRMAC Fly Away Laboratory (FAL) and the EPA Mobile Environmental Radiation Laboratory (MERL) stationed in Las Vegas, Nevada. The exercise was designed to allow for immediate delivery of pre-staged, spiked samples to the EPA MERL and the FAL for sample preparation and radiological analysis. Upon completion of laboratory analysis, data was reviewed and submitted back to the FRMAC via an electronic data deliverable (EDD). In order to conduct a laboratory inter-comparison study, samples were then traded between the two laboratories and re-counted. As part of the exercise, an evaluation was conducted to identify gaps and potential areas for improvements for FRMAC, FAL and EPA operations. Additionally, noteworthy practices and potential future areas of interoperability opportunities between the FRMAC, FAL and EPA were acknowledged. The exercise also provided a unique opportunity for FRMAC personnel to observe EPA sample receipt and sample preparation processes and to gain familiarity with the MERL laboratory instrumentation and radiation detection capabilities. The areas for potential improvements and interoperability from this exercise will be critical for developing a more efficient, integrated response for future interactions between the FRMAC and EPA MERL assets.

List of Acronyms

AAL- Analytical Action Level
AIS- Analysis Instruction Sheet
ARF- Analytical Request Form
EDD- Electronic Data Deliverable
EPA- Environmental Protection Agency
FAL- Fly Away Laboratory
FRMAC- Federal Radiological Monitoring and Assessment Center
GPC- Gas Proportional Counter
Lc- Critical Level
LCS- Laboratory Control Sample
LLNL-Lawrence Livermore National Laboratory
MAPEP- Mixed Analyte Performance Evaluation Program
MDA- Minimum Detectable Activity
MERL- Mobile Environmental Radiation Laboratory
MERL-LV- Mobile Environmental Radiation Laboratory stationed at Las Vegas, Nevada
MERL-AL- Mobile Environmental Radiation Laboratory stationed at Montgomery, Alabama
POC- Point of Contact
PPE-Personal Protective Equipment
QC- Quality Control
RDD- Radiological Dispersion Device
RAMS- Radiological Assessment and Management System
RSL- Remote Sensing Laboratory
RTFL- Radiation Task Force Leader
SCF- Sample Control Form
SOP- Standard Operating Procedure
SNL- Sandia National Laboratories
SPL- Sample Preparation Laboratory (EPA MERL Asset)

Introduction

The U.S. Department of Energy (DOE) and the Environmental Protection Agency (EPA) have independently developed mobile laboratory assets for use in high-priority sample analysis during a nuclear incident. The DOE Fly Away Laboratory (FAL) is composed of one gamma spectrometer, two alpha/beta counting systems and two liquid scintillation counters, all of which are portable and have the ability to be shipped via commercial airlines or DOE aircraft to the incident site. EPA has two mobile laboratory assets: one mobile radiation detection laboratory with accompanying sample preparation laboratory and command post, stationed in Las Vegas, NV; and one mobile radiation detection laboratory with accompanying sample preparation laboratory based in Montgomery, AL. During an emergency response, both EPA and DOE mobile laboratory assets would likely be deployed to the same location, with the FAL most likely arriving before the ground-transported EPA mobile laboratories. As such, coordination between the groups is not only desirable, but essential to a united, efficient response.

Recently, a unique opportunity has presented itself as the two EPA mobile laboratories are in the process of restructuring under common leadership in an effort to provide consistency between the two assets. This consistency between the two EPA mobile labs could also be expanded to the DOE FAL in many cases to create operating efficiencies. Since each of the DOE and EPA assets have strengths and shortfalls, collaboration between the laboratories could leverage the capabilities of each asset to create a more unified effort.

Since the two EPA MERLs differ somewhat in their equipment, personnel and capabilities, it was prudent for the FRMAC to conduct interoperability exercises with each EPA mobile laboratory so that unique strengths and weaknesses could be identified. This report summarizes the second of these interoperability drills, conducted between the Federal Radiological Monitoring and Assessment Center (FRMAC) FAL and the EPA MERL stationed at Las Vegas, Nevada (MERL-LV).

Objectives of the Interoperability Exercise

The technical expertise of the EPA MERL and FAL laboratory personnel also assisted in a productive evaluation and allowed for interoperability opportunities to be identified between the organizations. In an effort to practice interoperability and conduct a same-day laboratory inter-comparison study, the following objectives were agreed upon by EPA and FRMAC prior to the exercise:

EPA Objectives:

- Both organizations provide a demonstration on instrumentation including gamma spectrometers, gross alpha/beta counters and liquid scintillation counters (LSC). Describe its technical specifications and purpose, how it is maintained, and what efficiency and geometries are currently being used.

- Draw up a list of geometries that are common between the two groups – both what is available now and what is desirable for the future. This will aid both groups in future planning.

- Of the common geometries currently in use, count "unknown" samples in both systems back-to-back for same day inter-comparisons.

- Generate a report of how those inter-comparisons turn out and a path forward on the geometries the two groups will share.

- Gain additional experience with exporting data to FRMAC Radiological Assessment and Management System (RAMS) via electronic data deliverable (EDD) or via the FRMAC WebPortal.

- Explore sample preparation procedure commonalities by processing samples on all three major pieces of equipment and requiring reconfiguration/preparation of samples submitted for analysis.

Additional FRMAC Objectives:

- Walk down RAMS, especially the back end processes that involve receiving data results back from the laboratories, validating the results and uploading it into RAMS.

- Evaluate multiple matrices and sample preparation capabilities.

- Evaluation of Web Portal by EPA Laboratory Personnel. Compile recommendations and future considerations.

Description of the Interoperability/Round Robin Exercise

Historically, exercises have focused on processes that occur during the first few days of an event, which include sampling and monitoring, taking field measurements, and submitting samples for laboratory analysis. Due to time constraints, exercises typically do not progress to the latter-stage processes that involve sample analysis and evaluation of data/results. Many of these processes are analytically complex, including data transfer from laboratories to the FRMAC, data quality evaluation, and the assessment of radiological sample results. While many of these processes have been developed and integrated into existing tools, many of them have not been tested in a functional exercise. To avoid this potential shortcoming, an event was created in RAMS prior to the start of the exercise and populated with Sample Control Forms (SCFs) corresponding to soil, water and air filter samples that were pre-collected and pre-labeled. Since one of the objectives of the exercise was to conduct a laboratory inter-comparison of results, Mixed Analyte Performance Evaluation Program (MAPEP) samples were selected for use in this exercise. Besides their availability, MAPEP samples were viewed as ideal round robin samples since they are well characterized.

In all, each laboratory logged-in, analyzed and reported data for 33 samples. Nine soils were pre-staged, 5 of which were MAPEP samples (Appendix 1). Six MAPEP air filters and 5 MAPEP water samples were

also pre-staged along with an additional 6 blank air filters and 6 blank water samples. Multiple event mixtures were created in RAMS that were used to specify radionuclides of interest for the various matrices. ARFs were also pre-staged in RAMS to allow for immediate delivery of samples to MERL-LV and the FAL at the start of the exercise (Appendix 2). This proved to be an extremely valuable effort prior to the start of the exercise and a critical part of its success.

On June 24, 2014, members of the FRMAC Laboratory Analysis Working Group (LAWG) joined members of the EPA MERL-LV team at the EPA facility in Las Vegas to participate in a joint nuclear incident emergency response/round robin exercise. On the afternoon of June 24th, the FRMAC FAL was transported from the Remote Sensing Laboratory (RSL) to a staging area within an enclosed high bay where the MERL-LV and Sample Preparation Laboratory (SPL) are permanently warehoused. Upon arrival, FRMAC personnel unloaded FAL equipment and proceeded to set up one Falcon gamma spectrometer, two iSolo radon compensating gross alpha/beta counters and two Triathler Liquid Scintillation (LSC) counters. A FRMAC sample control hotline was also set up in a convenient location between the MERL-LV, FAL and the SPL. EPA personnel simultaneously set up the radiation detection instrumentation in the MERL-LV and conducted quality control measurements in preparation for sample counting operations that were planned for the following day.

The following morning (June 25, 2014), a pre-exercise informational briefing was conducted for all EPA and FRMAC members. EPA and FRMAC exercise objectives were reiterated and participants were informed that pre-staged soil, water and air samples were ready to be delivered to the MERL-LV and FAL for analysis. Once each laboratory had successfully counted the distributed samples, those same samples would be traded between the laboratories and re-counted, thus completing the round robin cycle.

Before beginning with the exercise, both organizations had the opportunity to provide short presentations on the instruments and capabilities of each respective mobile laboratory. FAL personnel described the technical specifications and functions of the Falcon gamma spectrometer, iSolo radon compensating gross alpha/beta counters and the Triathler LSCs. MERL-LV staff hosted a tour of the SLP and the MERL-LV and provided presentations on their High Purity Germanium (HPGe) gamma spectrometers, LB-4100 gas proportional counters (GPC) and a Perkin Elmer LSC unit. The technical exchange offered a good opportunity for both organizations to discuss detection capabilities and to become more familiar with the calibrated geometries that are currently employed by each respective laboratory.

After presentations were completed, the exercise commenced with the FRMAC sample control hotline delivering the pre-staged MAPEP samples and associated ARFs to the respective FAL and EPA sample receipt lines. Samples received by MERL-LV staff in the SPL were inspected, characterized for dose rate, surveyed for external contamination and logged into an internal sample tracking system. Samples were then re-packaged (if necessary) into appropriate counting geometries for analysis by gamma spectroscopy, gas proportional counting or LSC. After samples were appropriately prepared, they were

once again surveyed for external contamination and then transferred to the MERL-LV for analysis by the method requested on the ARF.

It should be noted that the FAL had few sample receipt processes in place since it typically relies on the FRMAC Health & Safety group to perform external contamination surveys and other health physics activities on samples received at the FRMAC hotline. Also noted was the fact that the FAL had no sample preparation capabilities for any type of sample aliquoting or re-packaging. However, FAL personnel were allowed to perform minimum sample preparation for water samples within the EPA SPL for this event.

Over the 2-day exercise period, five ARFs containing 17 samples were prepared and sent to the MERL-LV, while four ARFs containing 16 samples were sent to the FAL. By the end of the exercise, each mobile lab processed, counted and output analytical results for 6 air filters and 5 water samples. The FAL also analyzed 5 soil samples, while the MERL-LV analyzed the same 5 samples, plus one additional blank soil sample (i.e. the additional ARF that was submitted to the MERL-LV). One of the air samples was characterized by both gamma spectroscopy and gross alpha/beta counting, while the remaining air samples were all analyzed by gross alpha/beta counting only. Soil and water samples were both analyzed by gamma spectroscopy. In addition, aliquots were taken from the water samples to conduct tritium analysis by LSC counting. A summary of the samples that were submitted to the laboratories and counted during the exercise are included in Appendix 2.

After samples were counted, reports of results were reviewed by the appropriate instrument analyst(s) before being entered into an electronic data deliverable (EDD) format and delivered to FRMAC staff via portable memory devices. There was an attempt by both mobile labs to deliver the EDDs via the FRMAC WebPortal, but software bugs prevented the successful transfer of the files. Once submitted, EDDs were reviewed and approved by FRMAC Quality Control Specialists. At the close of the exercise, two of the nine submitted EDDs had passed through the entire FRMAC Quality Control (QC) process. The remaining seven submitted EDDs have yet to be reviewed by FRMAC Quality Control Specialists, but will be evaluated at a later date.

Following the conclusion of the exercise, a hotwash was conducted among the participants to discuss lessons-learned. Process improvements and potential areas for interoperability that were discussed are captured in the subsequent sections of this report. The inter-comparison of the results obtained from the mobile laboratories in the exercise is ongoing and will be provided in a separate report.

Evaluation of the Exercise (FRMAC FAL and EPA MERL-LV Operations)

The technical expertise of the EPA MERL and FAL laboratory personnel also assisted in a productive evaluation and allowed for interoperability opportunities to be identified between the organizations. During the exercise, FRMAC/SNL personnel had the opportunity to act as outside observers to EPA's sample receipt, preparation and counting processes as well as evaluate the effectiveness of the FAL and

established FRMAC processes. These observations were compiled and shared at the hotwash following the conclusion of the exercise. The observations were categorized according to the following functional areas:

- sample receipt
- sample preparation
- logistics
- conduct of operations
- waste management
- sample analysis, and
- reporting/Electronic Data Deliverable (EDD).

In total, 13 potential process improvements were noted for FRMAC operations. For MERL-LV and SPL operations, 21 process improvements were identified, as well as 10 noteworthy practices. For the FAL, 24 process improvements were identified, as well as 2 noteworthy practices. Appendix 3 captures all of the observations noted in each functional category and groups items according to recommended process improvements and noteworthy practices.

The exercise proved to be largely successful, evidenced by the fact that nearly all of the pre-determined FRMAC and EPA drill objectives were met within the 2-day exercise period. Most of the major FRMAC and MERL-LV laboratory operational processes were successfully walked down during the exercise. In contrast to most other interagency drills, this exercise was successful in testing many of the "backend" processes (i.e. QC of analytical results, uploading results into RAMS, etc.) that typically are not tested in drills due to time constraints. Pre-staging of samples and allowing for a partial day of time to set up the MERL and FAL proved to be crucial steps in ensuring the success of the exercise.

Future Opportunities for FRMAC and EPA Interoperability

One of the goals of this joint exercise was to evaluate areas of interoperability between the FRMAC FAL and the EPA MERL. The following areas were identified as potential opportunities for future interoperability and areas where goals can be aligned between the FAL and MERL-LV to provide for a more efficient, unified response:

- The Perkin Elmer LSC unit was recognized as an effective and versatile instrument, especially when compared to the labor-intensive FAL Triathler units. The internal shielding and dark adaption functionality also allows for attaining much lower and more consistent MDA values compared to the portable Triathlers.
- Further simultaneous alpha/beta counting techniques using the LSC should be explored and developed between the EPA MERL and SNL to take advantage of these unique capabilities.
- There is opportunity to reduce costs and improve efficiency if both mobile laboratories choose to standardize methods to use the same liquid scintillation cocktail.

- Agencies should consider exchanging calibration sources to reduce the costs associated with replacing these sources. In addition, a source verification program could be created to extend the usable life of the calibration standards.
- It would be desirable for FRMAC to explore alternative standard geometries for packaging soil samples and share these geometries with the MERLs.
- Both laboratory assets would benefit from jointly-developed iSOCS gamma spectrometer calibration files and standardized event specific gamma libraries.
- Exploring the possibility of a common color code scheme with on paperwork that conveys urgency of sample turnaround time.
- A formalized agreement should be considered to define who is accountable for waste disposal of PPE, sample preparation waste, contaminated containers, etc. from the on-site mobile laboratories during emergency operations.
- During the exercise, it became apparent that it was difficult to consistently identify the active side of an air filter with 100% confidence, especially when there was little residue on the active side of the filter. A process to identify the active side of air filters should be agreed upon between the two groups and the FRMAC Monitoring and Sampling field collection teams.
- A positive outcome of the exercise was an observed sharing of equipment (i.e. Mobile Command Center, office equipment, copiers, internet connections, etc.) between MERL-LV and FRMAC. An agreed upon process may be useful to solidify expectations of resource sharing between the two groups and to identify areas where either organization can serve as a surrogate to the other for specified items.
- The formation of a Field Operation Workgroup that meets semi-annually at alternating facilities (i.e. Montgomery, AL and Las Vegas, NV) would be useful for addressing common issues encountered by both EPA MERLs the FRMAC Lab Analysis group, and the FRMAC Fly Away Laboratory.
- A joint drill between FRMAC FAL, MERL-NV, MERL-AL and their RTFLs would be an effective means of further exploring interoperability between the mobile laboratories. In a real event, all three mobile laboratories would most likely be deployed, but a joint exercise between the assets has never been attempted. A joint exercise between these groups would further identify gaps in operations and capabilities of the overall response effort as well as pinpoint potential areas of collaboration and synergy.

Conclusions

The joint exercise at the EPA Las Vegas facility provided a unique opportunity for FRMAC and FAL personnel to work side-by-side with MERL-LV personnel and to work through many of processes that have not been exercised in other drills. In addition, this exercise allowed both organizations to observe one another's sample receipt and sample preparation processes and to gain familiarity with one another's laboratory instrumentation and radiation detection capabilities. The observations of areas for improvement and potential interoperability opportunities from this exercise will be critical for developing a more efficient, integrated response for future interactions between the FRMAC and EPA

assets.

Appendix 1. List of Pre-staged MAPEP and Blank Samples.

FRMAC Barcode ID	MAPEP ID	Sample Type		FRMAC Barcode ID	MAPEP ID	Sample Type
SCF-02528	MAPEP-13-MaS29	Air Filter		SCF-02837	N/A (Blank)	Soil
SCF-02528-1	MAPEP-13-MaS29	Air Filter		SCF-02837-1	N/A (Blank)	Soil
SCF-02529	MAPEP-13-GrF28	Soil		SCF-02838	N/A (Blank)	Soil
SCF-02529-1	MAPEP-13-GrF28	Soil		SCF-02838-1	N/A (Blank)	Soil
SCF-02530	MAPEP-13-MaW29	Water		SCF-02839	N/A (Blank)	Water
SCF-02530-1	MAPEP-13-MaW29	Water		SCF-02839-1	N/A (Blank)	Water
SCF-02531	MAPEP-12-GrF26	Air Filter		SCF-02840	N/A (Blank)	Water
SCF-02531-1	MAPEP-12-GrF26	Air Filter		SCF-02840-1	N/A (Blank)	Water
SCF-02532	MAPEP-12-GrF27	Air Filter		SCF-02841	N/A (Blank)	Water
SCF-02532-1	MAPEP-12-GrF27	Air Filter		SCF-02841-1	N/A (Blank)	Water
SCF-02533	MAPEP-13-GrF28	Air Filter		SCF-02842	N/A (Blank)	Water
SCF-02533-1	MAPEP-13-GrF28	Air Filter		SCF-02842-1	N/A (Blank)	Water
SCF-02534	MAPEP-13-GrF29	Air Filter		SCF-02843	N/A (Blank)	Water
SCF-02534-1	MAPEP-13-GrF29	Air Filter		SCF-02843-1	N/A (Blank)	Water
SCF-02535	MAPEP-13-RdF29	Air Filter		SCF-02844	N/A (Blank)	Water
SCF-02535-1	MAPEP-13-RdF29	Air Filter		SCF-02844-1	N/A (Blank)	Water
SCF-02536	MAPEP-12-MaW26	Water				
SCF-02536-1	MAPEP-12-MaW26	Water				
SCF-02537	MAPEP-12-MaW27	Water				
SCF-02537-1	MAPEP-12-MaW27	Water				
SCF-02538	MAPEP-13-MaW28	Water				
SCF-02538-1	MAPEP-13-MaW28	Water				
SCF-02539	MAPEP-13-MaW29	Water				
SCF-02539-1	MAPEP-13-MaW29	Water				
SCF-02540	MAPEP-12-MaS26	Soil				
SCF-02540-1	MAPEP-12-MaS26	Soil				
SCF-02541	MAPEP-12-MaS27	Soil				
SCF-02541-1	MAPEP-12-MaS27	Soil				
SCF-02542	MAPEP-13-MaS28	Soil				
SCF-02542-1	MAPEP-13-MaS28	Soil				
SCF-02543	MAPEP-13-MaS29	Soil				
SCF-02543-1	MAPEP-13-MaS29	Soil				
SCF-02596	N/A (Blank)	Soil				
SCF-02597	N/A (Blank)	Soil				

Appendix 2. Summary of ARFs and samples submitted to MERL-LV and the FAL during the exercise.

ARF Number	Receiving Laboratory	Sample Quantity/Type	Analysis Requested
ARF-00001	FAL	5 Air Filters	Gross alpha/beta counting
ARF-00002	FAL	1 Air Filter	Multiple radionuclides by gamma spec
ARF-00003	MERL-LV	5 Waters	Multiple radionuclides by gamma spec; H-3 by LSC
ARF-00004	MERL-LV	5 Soils	Multiple radionuclides by gamma spec
ARF-00005	FAL	5 Waters	Multiple radionuclides by gamma spec; H-3 by LSC
ARF-00006	FAL	5 Soils	Multiple radionuclides by gamma spec
ARF-00007	MERL-LV	5 Air Filters	Gross alpha/beta counting
ARF-00008	MERL-LV	1 Air Filter	Multiple radionuclides by gamma spec
ARF-00009	MERL-LV	1 Soil	Multiple radionuclides by gamma spec

Appendix 3. Description of observations, recommended process improvements and noteworthy practices for FRMAC, FAL and MERL-AL operations according to functional categories.

Sample Receipt

Process Improvements (FRMAC):

- Need to rethink how special instructions are conveyed on the Analysis Instruction Sheet (AIS) to the laboratories. Currently, special instructions are often ignored by receiving labs because there is so much other standard informational text on the AIS that masks the special instructions.

Process Improvements (FAL):

- If Quality Control (QC) samples are incorporated into counting processes, then sample batching procedures need to be developed. The current FAL Manual is inconsistent in this regard to the different instrumentation.

Process Improvements (EPA):

- Overall sample receipt process was time consuming. Efficiencies could be gained by moving from a paper-based system to an electronic LIMS system.

Sample Preparation

Process Improvements (FRMAC):

- The FRMAC should consider adding a section to the ARF or AIS that indicates special sample preparation instructions.

Process Improvements (FAL):

- Need to develop a deployable sample preparation capability and procedures

Process Improvements (EPA):

- Consider screening samples outside of the SPL sample receiving window before they enter the laboratory
- Consider substituting parafilm for the electrical tape currently used for sealing marinelli lids.
- Modify MERL-LV Sample Preparation Sheets to accommodate LSC analysis, sample splitting and dilutions. Also include customer number on sheet.

Noteworthy Practices (EPA):

- When it was determined that water samples had to be diluted for repackaging in gamma spec counting geometry, EPA staff initiated conversations with FRMAC leaders to ensure that it was acceptable that the entire sample would be altered/consumed.

Logistics

Process Improvements (FRMAC):

- Balance and printers need to be replaced at sample hotline with ruggedized units.
- FRMAC Initial Laboratory Questionnaire is not consistent with Laboratory Analysis Manual.
- FRMAC needs to include the barcode manuals in the sample control hotline load out boxes.
- Personnel should consider wearing apparel that contains identifiable FRMAC roles.

Process Improvements (FAL):

- Need deployable portable thumb drives as a backup for data transfer.
- Computers need to be replaced with ruggedized units.
- Need USB compatible keypad for manual data entry applications.
- Need file organizers for paperwork.
- Need to avoid mixing FAL equipment with sample control equipment when repacking into load out containers.
- Need copier and scanner in sample receipt area.
- Should purchase larger pipettes for aliquoting liquid samples.
- Should create a pipette check logbook.
- Should keep glass LSC vials on hand for preparing and counting H-3 samples.
- Equipment calibrations need to be repeated due to insufficient source strength activity.
- A sample storage system needs to be developed to allow for segregating high activity samples.
- Triathlers should not be co-located in the FAL tent with the Falcon unit due to the high activity external standard (~16 uCi) that is used in LSC calibrations. In this exercise, the resulting interference adversely affected gamma spectrometry counting operations.

Process Improvements (EPA):

- Need copier and scanner in sample receipt area.
- Should keep glass LSC vials on hand for preparing and counting H-3 samples.
- Consider keeping a 47mm air filter punch in the SPL to accommodate non-standard filter media that is submitted.

Conduct of Operations

Process Improvements (FRMAC):

- Should consider how important information can be better communicated with laboratories, instead of current AIS method.
- Various issues were encountered with RAMS during the exercise, including:
    - Need a search capability for data validation process
    - When a count time is specified to a laboratory as opposed to a critical level, a problem is created when the data is to be uploaded into RAMS. In this case, RAMS will denote result failure since the critical level was not met.
    - If a mistake is made in uploading data, RAMS is very unforgiving (i.e. it is very difficult to remove the incorrect result).
    - The overall QC process is cumbersome and has too many levels of review (i.e. hardcopy, EDD, RAMS, again in RAMS, etc.)

Process Improvements (FAL):

- FRMAC should consider specifying a count time range (i.e. 10-100 minutes) for its detectors in the Fly Away Laboratory Manual, similar to what EPA prescribes in their Standard Operating Procedures (SOPs).
- No formalized records storage process is currently in place.
- There was a recognized personnel shortage. Additional trained personnel would be necessary to create a more efficient operation.
- Need an additional gamma spectrometry unit to improve turn-around time and serve as a back-up unit.

Process Improvements (EPA):

- There was a recognized personnel shortage. Additional trained personnel would be necessary to create a more efficient operation.
- Should consider using manila folders to organize paper work as it flows between internal operations.
- There was inconsistency regarding if and when the Analysis Instruction Sheet (AIS) was being read. It appeared that the AIS was only read when an abnormal sample was encountered. When a second abnormal sample was encountered, sample preparation personnel assumed that the sample was to be repackaged in the same manner as the first abnormal sample, even though special instructions on the AIS indicated otherwise.
- Since personnel split duties between sample preparation and instrument counting activities, EPA should consider appointing a team leader to coordinate staff between the MERL and SPL trailers as well as interactions with FRMAC and customers.
- Evaluate process of transferring samples internally from person to person within EPA MERL.
- Consider developing a method to communicate sample non-conformances (i.e. torn air filter, rocky soil, etc.).
- Overarching QC batching process needs to be developed for MERL-LV and MERL-AL

Noteworthy Practices (EPA):

- MERL-LV staff played dual roles as instrument analysts and sample receipt/sample preparation specialists.
- Sample preparation and counting facilities were state of the art and well-maintained. The EPA facility provided an ideal location for conducting the interoperability drill.
- MERL-LV staff was very competent and knowledgeable with their equipment and operations.

Waste Management

Process Improvements (EPA):

- Should consider segregating waste to minimize the volume of radioactive waste produced. For example, PPE waste could be labeled with a batch number and set aside until analytical results are obtained. Waste could then be assessed as radioactive or non-radioactive waste and disposed of accordingly.
- Consider implementing a waste addition log to track volume and activity of waste

Sample Analysis

Process Improvements (FAL):

- The FAL manual does not clearly indicate if a new background count is required for the Falcon gamma spectrometer if the collimator is removed.
- Falcon iSOCS calibrations should require a formalized calibration package.
- Consider building a sample jig for the gamma spectrometers that is similar to the one used by MERL-LV.
- Removing the collimator to count the instrument QC was cumbersome. The FAL should consider re-defining the QC baseline to have the source counted with the collimator on.
- The Triathler LSC counters were cumbersome and very labor intensive to use. The process for counting a sample was very lengthy as samples had to be counted 2-3 times in addition to counting backgrounds in between sample counts. The external standard also interfered with gamma spectroscopy counting operations. The value of the Triathlers to the FAL should be re-evaluated in light of the various weaknesses encountered in this exercise.

Noteworthy Practices (FAL):

- Analysts demonstrated flexible counting capabilities of gamma system by modeling un-calibrated geometries using iSOCS.
- Samples were processed relatively quickly through the FAL.

Process Improvements (EPA):

- Recommendation for MERL-LV and MERL-Alabama to develop consistent QA and QC processes.
- Re-evaluate the gamma spectroscopy processing parameters to reduce report processing time.

Noteworthy Practices (EPA):

- The Perkin Elmer LSC unit proved to be vastly superior to the Triathler LSC units employed by the FAL. The Perkin Elmer unit offered more technical capabilities such as alpha/beta discrimination and the ability to perform three simultaneous analyses on one sample count. The Perkin Elmer unit also employs an automatic sample changer which allows MERL analysts to effectively multi-task.
- A sample jig was developed for gamma spectroscopy that addresses many technical issues for various geometries.
- Gamma spectroscopy backgrounds were properly re-established when MERL-NV was moved back into the high bay following deployment.
- There were no instructions from FRMAC to indicate the active side of the submitted air filters. The analyst therefore counted both sides of the air filter to ensure the active side was characterized.

Reporting/Electronic Data Deliverable (EDD)

Process Improvements (FAL)

- The Falcon Lab Control Sample QA report and standard reporting templates need re-formatting.
- The EDD generator for the FRMAC FALCON should include a step where the analyst selects the radionuclides he wishes to report. Currently, an activity value is associated with each nuclide in the library which will clutter RAMS with false data.
- The iSOLO and Triathler EDD generators were not usable. Data had to be hand-entered into the spreadsheet which lead to transcription errors and valuable time wasted.

Process Improvements (FRMAC):

- The sample batching requirements driven by the RAMS QA engine was confusing and difficult for the EPA to work with. FRMAC should consider revising the QA process in RAMS to accommodate more flexibility.
- WebPortal had major issues and was unusable during drill.

Process Improvements (EPA):

- Recommendation to consider sharing and standardizing reports between MERL-LV and MERL-AL
- Case narratives should be included with samples where abnormalities are encountered.
- Consider automating elements of the EDD creation process.

Noteworthy Practices (EPA):

- A Z-score is tabulated for duplicate samples as a standard QC practice.
- GPC reports included sigma level and counting time.