



Radiological Environmental Sciences Laboratory Baseline Report

**U.S. Department of Energy
Office of Environmental Management
Office of Science and Technology**



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Executive Summary

The purpose of this document is to provide an overview of the Radiological and Environmental Sciences Laboratory (RESL) and summarize its current status to provide the Office of Environmental Management (EM) with a current baseline of the Laboratory's structure, management, and activities. Section 1 of this report discusses RESL's mission, organization, capabilities, and customers. Section 2 provides a status report of RESL's management and operations based on existing documentation and a site visit.

Overview

The RESL is a government-owned and government-operated (GOGO) laboratory operated by the Department of Energy (DOE). It is located at the Central Facilities Area of the Idaho National Engineering and Environmental Laboratory (INEEL). The laboratory and its predecessor organizations have been part of the DOE Idaho Operations Office (DOE-ID) since 1949. RESL is under the programmatic direction of the EM and is administered through the DOE-ID. The Laboratory reports directly to the DOE-ID Assistant Manager for Technical Programs and Operations.

RESL's mission is to provide cost-effective measurement quality assurance, free of conflicts of interest, for federal oversight of analytical and radiation protection programs.

RESL's goals are to:

- Provide state-of-the-art technical capabilities for its customers
- Exceed customer expectations
- Demonstrate technical and operational excellence
- Strengthen management systems (e.g., quality assurance, Integrated Safety Management System, information and records management)
- Increase the amount and quality of professional activities (i.e., publishing in technical journals, presenting at technical meetings and workshops, participating on professional working groups and committees).

RESL strives to provide a cooperative, professional working environment that promotes individual and team growth and success in full compliance with environmental, safety, and health (ES&H) requirements.

To accomplish its mission and goals, RESL has core capabilities in:

- Analytical Chemistry
- Radiation Measurements and Calibrations.

Analytical chemistry at RESL primarily supports measurement quality assurance programs conducted for DOE and the Nuclear Regulatory Commission (NRC). Major programs are the Mixed-Analyte Performance Evaluation Program (MAPEP), DOE Laboratory Accreditation

Program (DOELAP), and the Radiological Measurements Assurance Program (RMAP). RESL has a broad range of chemical separation, measurement, and analytical standards development and preparation capabilities that allow it to act as the reference laboratory for these programs. RESL scientists also provide expert analytical chemistry support to DOE-ID, the INEEL site contractor, the United States Geological Survey (USGS), the Department of the Army, other DOE sites, and DOE headquarters (DOE-HQ).

RESL operates a radiation calibration facility that primarily supports the DOE Laboratory Accreditation Program (DOELAP) for Personnel Dosimetry. Radiation sources at the calibration facility are used to irradiate whole body and extremity dosimeters. They are also used for research and development to improve the accuracy of dosimetry programs and to intercompare radiation fields with other national and international organizations. Operation of the sources in each of the source rooms is highly automated and separately computer controlled. The beta, gamma, low-energy photon, and x-ray fields are well characterized, and traceable to standards at the National Institute of Standards and Technology (NIST). RESL also operates an automated thermoluminescent dosimetry system for quality assurance verification of irradiations that are performed.

Status Report

RESL's programs are managed according to program documents that have been developed for each program. For MAPEP and DOELAP, specific goals, milestones, and timelines are developed each year by subject matter teams to prioritize and plan their work according to the program direction that has been given and guidelines in program documents. Key program-specific goals and more crosscutting RESL goals fold into the annual operating plan and individual performance agreements. Program status and accomplishments are reported periodically to program sponsors for each program and management and technical reviews are performed on a regular basis.

RESL staff consists of professional chemists, physical scientists (including health physicists), engineers, and related technicians. RESL currently has 24 DOE full time equivalents (FTEs). Minor fluctuations above or below this number will occur due to retirement and other attrition. The current hiring freeze is an issue in filling vacancies.

In FY 2000, RESL has an operating budget of \$3.73 million. Through DOE-ID Program Direction Funds, EM provides 57%, or \$2.13 million of RESL's funding and is responsible for providing staff funding. For FY 2000, RESL will receive \$1.4 million from Office of Environment, Safety and Health (EH) for DOELAP and \$0.2 million from NRC for the administration of RMAP.

RESL has implemented an Integrated Safety Management System (ISMS) for its laboratory operations to better integrate and focus the efforts of both management and employees to ensure work is performed safely. RESL successfully completed a Phase I review of its ISM Description in September 1999. The Phase II review in January 2000 verified implementation of the system. RESL is the first GOGO to complete its ISM certification.

RESL has requested \$60 thousand in capital equipment for FY 2000 for a liquid argon tank (\$20K) and an upgrade of its gamma spectrometry system (\$40K). Overall, RESL's facilities are

in workable condition after recent roof, electrical, HVAC, and other equipment upgrades; however, the main laboratory building would not meet current ventilation, fire, OSHA, or electrical code requirements for a laboratory. Water pipes are deteriorating with age, and rust in the water is an increasing problem. Several leaks in the steam lines developed last winter and could not be fixed without shutting down the heat to the building. There is a \$5 million request for major building system upgrades in two years; however, with limited funding available, other priorities may take precedence. A conceptual design for a combined laboratory/calibration facility was prepared in 1993 to evaluate the needs and cost of a new building. The plan recommended constructing a new building, but with the change of RESL's Program Secretarial Office (PSO), the new building was dropped off the priority list. This issue will be reconsidered with the new PSO.

All key computer systems and databases have been modernized. RESL has recently purchased and installed a new Laboratory Information System (LIMS) for all of its chemistry operations to replace a 20-year old system that was developed in-house and only covered radiochemistry operations.

1 Overview of the Laboratory

1.1 Introduction

The Radiological and Environmental Sciences Laboratory (RESL) is a government-owned and government-operated (GOGO) laboratory operated by the Department of Energy (DOE). It is located at the Central Facilities Area of the Idaho National Engineering and Environmental Laboratory (INEEL). The laboratory and its predecessor organizations have been part of the DOE Idaho Operations Office (DOE-ID) since 1949. The main RESL facility (CFA-690) was built in 1963. RESL is a critical resource for the DOE, the Office of Environmental Management (EM) and the Office of Environment, Safety, and Health (EH). It provides DOE a reference laboratory to conduct key measurement quality assurance programs and provides technical support and quality assurance metrology that is directly traceable to reference standards maintained by the National Institute of Standards and Technology (NIST). Its key mission capabilities are in analytical chemistry and in radiation measurements and calibrations.

1.1.1 Mission

RESL's mission is to provide cost-effective measurement quality assurance, free of conflicts of interest, for federal oversight of analytical and radiation protection programs.

1.1.2 Vision

RESL's vision is to be recognized for its:

- Scientific and technical excellence as a DOE Reference Laboratory
- Broad scope of technical capabilities in radiation measurements and analytical chemistry
- Innovation in applying state-of-the-art technologies.

1.1.3 Goals/Objectives

RESL's goals are to:

- Provide state-of-the-art technical capabilities for its customers
- Exceed customer expectations
- Demonstrate technical and operational excellence
- Strengthen management systems (e.g., Quality Assurance [QA], Integrated Safety Management System [ISMS], information and records management)
- Increase the amount and quality of professional activities (i.e., publishing in technical journals, presenting at technical meetings and workshops, participating on professional working groups and committees).

RESL strives to provide a cooperative, professional working environment that promotes individual and team growth and success in full compliance with environmental, safety, and health requirements.

1.1.4 Strategies

RESL will continue to build upon the accomplishments of the past, while strengthening and improving existing capabilities and programs, increasing recognition of its role as a NIST-traceable reference laboratory and federal technical resource, and identifying and responding to new opportunities to apply its resources to address EM challenges. RESL is currently developing a business plan that will address its long-term strategies, future projections, and competitive analysis. The business plan is scheduled for completion in early FY 2000. An annual operating plan, which is integrated into DOE-ID's plan, is developed each year to establish and monitor annual goals.

In managing its programs, RESL has continuously sought to develop and maintain state-of-the-art technical resources and work processes. Significant improvements have been made over the past several years in the configuration of the radiation calibration facility, where new equipment and computer systems have been designed and installed to automate and control irradiations. Data collection and analysis, report generation, and the associated work processes have been streamlined. New instrumentation and software have also been or are being implemented to modernize and expand inorganic, organic and radiochemical measurement capabilities. As needed, new technical methodologies, such as new or improved procedures for calibration of radiation sources, characterization of radiation fields, and radiochemical separations, are developed.

RESL works closely with its program sponsors to understand customers' needs and expectations, and coordinate plans to expand capabilities. Annual goals and priorities are developed, and progress is reported to sponsors, program participants, and DOE-ID field office management.

In addition to programmatic improvements, RESL is working to improve key management systems. Significant effort was made in FY 1999 to baseline safety activities and systems, to develop and get approved an ISMS for the laboratory, and to begin implementing necessary changes. Significant progress was made to modernize RESL information management systems and to ensure that all computer systems were Y2K ready. In both cases, general goals were included in the annual operating plan, with more detailed goals set in project management plans.

Increasing the visibility of the laboratory through greater involvement and professional growth opportunities for the scientific staff is a key to success. General goals for RESL are set in the DOE-ID annual operating plan, and individual goals for RESL scientists are included in individual performance agreements. Individual scientists are encouraged to participate in professional activities that support these goals. These include publishing articles in peer reviewed journals, presenting papers at technical meetings and workshops, participating on scientific working groups and committees, collaborating with other scientists, and taking advantage of professional training opportunities.

1.2 Organization

1.2.1 Structure

RESL is organized in teams, which are responsible for major program activities described in Section 1.4. The team administers its respective program providing technical expertise and program direction to accomplish its mission. In some cases, individuals have functional responsibilities (machinist, industrial hygiene, waste management, etc.) that support all RESL programs. Figure 1 shows the current division of RESL staff.

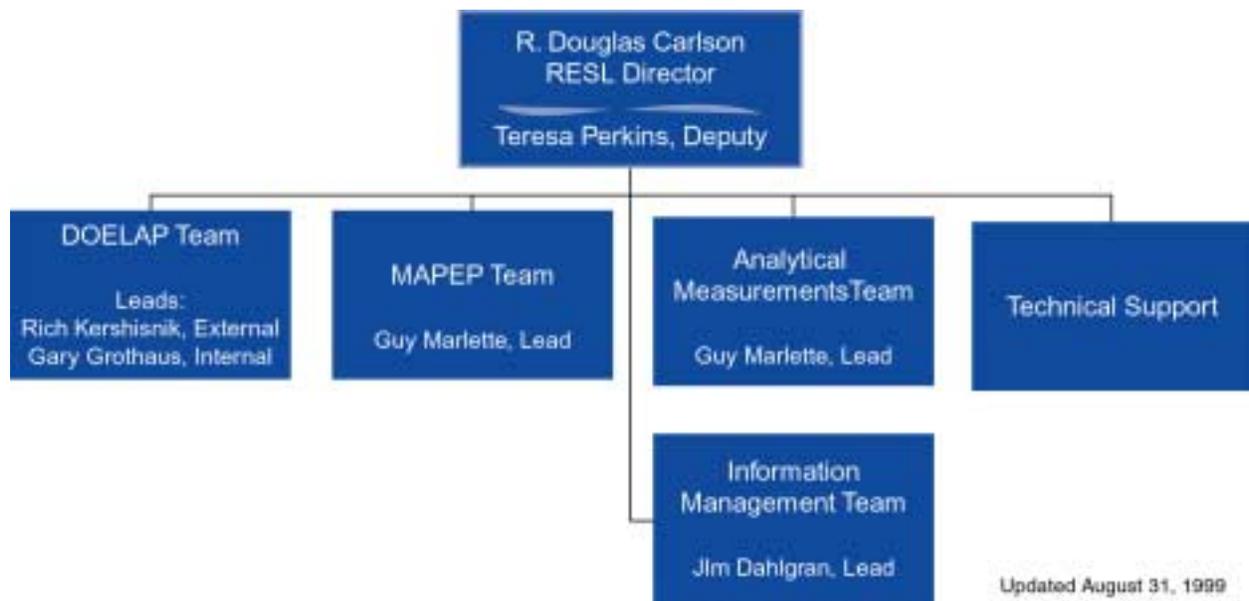


Figure 1. RESL's Organization.

1.2.2 Responsibility and Accountability

RESL is under the programmatic direction of the Office of Environmental Management (EM) and is administered through DOE-ID. The Laboratory reports directly to the ID Assistant Manager for Technology Programs and Operations.

1.3 Core Capabilities

RESL has core capabilities in:

- Analytical Chemistry
 - Radiochemistry
 - Stable Inorganic Chemistry
 - Organic Chemistry
- Radiation Measurements and Calibrations.

1.3.1 Analytical Chemistry

Analytical chemistry at RESL primarily supports measurement quality assurance programs conducted for DOE and the Nuclear Regulatory Commission (NRC). Major programs are the Mixed-Analyte Performance Evaluation Program (MAPEP), DOE Laboratory Accreditation Program (DOELAP) and the Radiological Measurements Assurance Program (RMAP), discussed in more detail in Section 1.4. RESL has a broad range of chemical separation, measurement, and analytical standards development and preparation capabilities that allow it to act as the reference laboratory for these programs. RESL scientists also provide expert analytical chemistry support to DOE-ID, the INEEL site contractor, the United States Geological Survey (USGS), the Department of the Army, other DOE sites, and DOE headquarters (DOE-HQ). RESL chemists prepare analytical standards and test materials containing radiological, inorganic, and organic analytes in a variety of matrices. They also perform analyses on environmental and programmatic samples including such matrices as water, soil, vegetation, airborne particulates, feces, and urine. Additional techniques and methodologies can be developed to provide analyses of more difficult matrices. Examples include radiochemistry analyses of liquid waste, soil tailings and crushed slag from nuclear power-utilities, and microwave extraction of inorganic and organic components in different sample matrices for further characterization.

Radiochemistry

The most commonly performed analyses include the alpha particle emitters U, Th, Am, and Pu; the beta particle emitting isotopes of Sr-89, Sr-90, H-3, Ni-63, Fe-55; and an array of gamma ray emitting isotopes. Other radionuclides are analyzed on an as-needed basis depending on customer needs and requirements. Instrumentation includes:

- Alpha Spectrometry
- Gamma Spectrometry
- Gas Flow Proportional Counting
- Liquid Scintillation
- Gross Alpha, Beta, and Gamma Counting
- 2-Pi Counting of Alpha Emitters.

Inorganic Chemistry

The analysis of inorganic elements and metals encompass most of the periodic chart from lithium to uranium. Microwave digestion capabilities provide greater flexibility for the dissolution of various matrices. Instrumentation and uses include:

- Inductively Coupled Plasma - Atomic Emission Spectrometry (ICP-AES) – Quantification for elements from parts per trillion (ppt) through high parts per million (ppm) range
- Inductively Coupled Plasma - Mass Spectrometry (ICP-MS) – Identification and quantification for elements from parts per quadrillion through low ppm range. This method is being used for long-lived radionuclide measurements
- Ion chromatography – Identification and quantification of anions, cations, and transition metals

-
- Mercury analyzer – Cold vapor atomic absorption technique for elemental mercury.

Organic Chemistry

The organic compounds that can be analyzed encompass pesticides, semi-volatile, and volatile organic compounds. Various extraction techniques, primarily microwave extraction of organic compounds from various matrices, provide versatile extraction capabilities. Instrumentation and uses include:

- Gas Chromatography (GC) – Separation and quantification of organic compounds
- Gas Chromatography - Mass Spectrometry (GC-MS) – Identification and quantification of organic compounds
- Liquid Chromatography (LC) – Separation and quantification of explosive residues.

1.3.2 Radiation Measurements and Calibrations

RESL operates a radiation calibration facility that primarily supports the DOE Laboratory Accreditation Program (DOELAP) for Personnel Dosimetry. This program is discussed in more detail in Section 1.4. Radiation sources at the calibration facility are used to irradiate whole body and extremity dosimeters. They are also used for research and development to improve the accuracy of dosimetry programs, and to intercompare radiation fields with other national and international organizations. Operation of the sources in each of the source rooms is highly automated and separately computer controlled. The beta, gamma, low-energy photon, and x-ray fields are well characterized and traceable to standards at NIST. RESL also operates an automated thermoluminescent dosimetry system for QA verification of irradiations that are performed.

Radiation sources at the calibration facility include:

- 20 Curie Cs-137 gamma irradiator
- 1000 Curie Cs-137 gamma irradiator
- Beta irradiators (50 millicurie Sr/Y-90 and 50 millicurie Tl-204)
- Natural uranium slab irradiators
- Am-241 low-energy photon irradiator
- High-precision industrial x-ray machine.

RESL operates a low-background, graded shielding, in-vivo radiobioassay counting vault. It is used for photon spectrometry measurements on whole body and lung/torso phantoms for the DOE Laboratory Accreditation Program for Bioassay. The vault is equipped with swivel mounted, coaxial 50% hyperpure Germanium detector for high-energy photons and planar hyperpure Germanium detectors for low-energy photons. It also has multi-geometry, rotational, and track-mounted measurement platform for special measurements and calibrations.

1.4 Summary of Major Program Initiatives

RESL administers three major measurement quality assurance programs:

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- Mixed-Analyte Performance Evaluation Program (MAPEP)
 - Department of Energy Laboratory Accreditation Program (DOELAP)
 - Radiological Measurements Assurance Program (RMAP).

In addition, RESL supports a number of programmatic initiatives of the DOE-EM National Analytical Measurement Program (NAMP).

1.4.1 Mixed-Analyte Performance Evaluation Program (MAPEP)

MAPEP is a performance evaluation (PE) program conducted by RESL for the EM NAMP, formerly known as the Analytical Services Division (ASD). It is the only PE program that distributes samples containing all three classes of hazardous constituents. Its purpose is to assure reliable, defensible analytical data are available to support DOE EM decisions. It was developed for EM in the early 1990's. Since 1994, all DOE and commercial analytical laboratories that perform environmental analytical measurements for EM have been required to participate to demonstrate their analytical capabilities.

MAPEP PE samples contain known amounts of added radioactive, stable inorganic, and organic constituents (analytes). The samples are designed to be representative of real-world samples and the challenges faced by analytical labs that analyze samples taken during environmental remediation or waste management activities. Liquid and soil matrix samples, containing known amounts of environmentally important radioactive, stable inorganic, and organic constituents (analytes) are sent to participating labs on an alternating six-month distribution schedule. The labs typically have 60 to 90 days to complete their analyses and report the results. The performance on these test samples is reported by RESL as acceptable, acceptable with warning, or not acceptable according to criteria described in the MAPEP Handbook. It is anticipated that other matrices and analytes will be added in the future.

MAPEP is a performance-based PE program, so specific analysis methodologies are not prescribed. Information on the methodologies used by participant laboratories is, however, collected and the performance data are compared to identify issues that might be methodology specific. Analyte concentrations in MAPEP samples are typically well above detection limits, such that counting uncertainties in the 5-10% range are typically achievable for all analyte categories. MAPEP samples are typically not classified as radioactive (total activity < 2 nCi/gram) by the Department of Transportation (DOT). They are products, and not hazardous waste, so they are not regulated by the Resource Conservation and Recovery Act (RCRA). Participating laboratories must manage any wastes generated from these samples and their analytical processes according to their local, state, and federal waste disposal requirements.

The MAPEP team at RESL is responsible for all aspects of program execution including:

- Preparing the MAPEP samples
- Performing analyses to characterize and verify reference values and homogeneity
- Distributing the samples to the participating laboratories
- Analyzing results reported by the participants
- Reviewing the methodologies used
- Evaluating the results based on program acceptance criteria.

Performance results are reported to the individual participants, to NAMP, and to the appropriate DOE Field Offices and Sample Management Offices. MAPEP provides a forum in which analytical deficiencies and areas for improvement can be identified, technical assistance can be requested, and various methodologies can be compared.

1.4.2 Department of Energy Laboratory Accreditation Program (DOELAP)

RESL has administered and conducted for DOE's Office of Worker Health and Safety, EH-52, the DOE Laboratory Accreditation Program (DOELAP) for complex-wide evaluation of worker radiation protection programs since it began in the mid 1980's. DOELAP is designed to ensure that personnel dosimetry programs and bioassay programs used at DOE sites where there is potential worker exposure to radiation (this includes EM cleanup activities) meet specific requirements for sensitivity, accuracy, precision, and QA. Accreditation is required by 10CFR835.

DOELAP is a QA program for dosimetry and bioassay programs that requires facilities to demonstrate their capabilities both through performance testing and onsite assessments. The performance testing is conducted according to DOE-approved performance standards. Each site participates in those test categories that reflect the potential types of internal and external radiation exposure found there. Radiation protection professionals conduct the onsite assessments, using detailed criteria published in DOELAP program documents. Any deficiencies identified must be corrected. A PE Program Administrator at RESL receives applications for accreditation, coordinates the performance testing and the onsite assessments, and makes accreditation recommendations to a DOELAP Oversight Board. Figure 2 shows the DOELAP program organization.

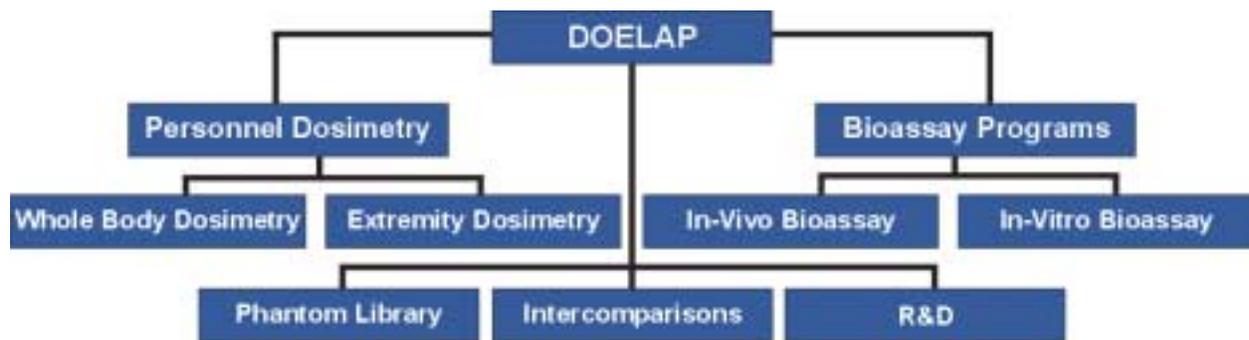


Figure 2. DOELAP Program Organization.

DOELAP for Personnel Dosimetry

As part of a two-year accreditation/reaccreditation cycle, RESL conducts performance testing of DOE-contractor personnel (whole body and extremity) programs. The performance standards are EH-0027, "Department of Energy Standard for the Performance Testing of Personnel Dosimetry Systems," and HPS N13.32-1995, "Performance Testing of Extremity Dosimeters." The DOELAP Team operates a calibration facility, at which gamma, low-energy photon, x-ray, and beta sources are used to irradiate whole body and extremity dosimeters that are submitted by, returned to, and processed by those dosimetry programs. Neutron irradiations are performed at

an outside laboratory. The doses reported by the participants are evaluated, compared to requirements in the performance test standards, and the results are reported to DOE and the participants. Successful completion of both the performance testing and onsite assessment requirements is required for accreditation.

DOELAP for Bioassay

RESL also conducts an accreditation program for DOE contractors that provide both in-vitro and in-vivo bioassay measurements, to ensure that their programs provide accurate and consistent data. HPS N13.30-1996, "Performance Criteria for Radiobioassay," is the performance standard for bioassay programs.

The DOELAP team prepares and distributes synthetic urine and fecal samples for the in-vitro bioassay performance testing. For the in-vivo performance testing, it prepares and distributes Bottle Mannequin Absorber (BOMAB) Phantoms (which simulates the whole body) and a human torso phantom with interchangeable lung sets for whole body and lung counts in their counting vaults. NIST traceable standard reference materials are used in the preparation of these test materials. The laboratories are required to successfully measure and report the radionuclide concentrations in these samples and phantoms and pass an onsite assessment to be accredited every three years.

1.4.3 NRC Radiological Measurements Assurance Program (RMAP)

RESL administers the Radiological Measurements Assurance Program (RMAP) for the NRC as a Work for Others Activity. In this role, RESL provides the NRC with a reference laboratory for radiological measurements, as it has for over 20 years, thus RESL provides both DOE and NRC with a NIST traceable program. The RMAP consists of the following:

- An intercomparison program
- Audit plate development
- Audit program for the NRC's Regional and test laboratories
- Expert technical assistance as requested.

The intercomparison program involves preparing and sending performance evaluation materials, prepared using NIST traceable radioactive standards. The matrices include filters, swipes, soils, or liquids to test the analytical performance of the NRC laboratories. RESL staff also conducts annual technical/QA audits of the NRC laboratories and provide them with assistance to improve their technical capabilities. In conjunction with the audit tasks, RMAP provides the NRC with an overall external QA program for those laboratories.

1.5 Customers/Funding Sources

RESL has an approved FY 2000 operating budget of \$3.73 million. As previously discussed, RESL's customers are:

- Office of Environmental Management (EM)
- Office of Environment, Safety, and Health (EH)

-
- Nuclear Regulatory Commission (NRC).

As depicted in Figure 3, EM provides 57%, or \$2.13 million through the Program Direction funding to DOE-ID. For FY 1999, RESL received \$1.4 million from EH for DOELAP and \$0.2 million from NRC for the implementation of RMAP.

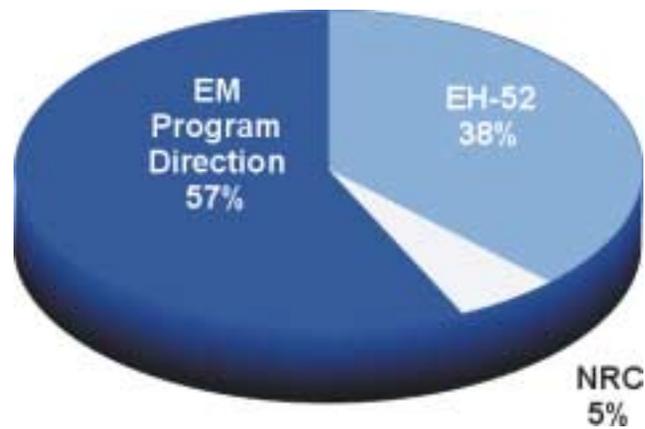


Figure 3. RESL's FY 1999 Operating Budget - \$3.73 million.

1.6 Facilities

RESL work is performed in two facilities located at the Central Facilities Area of the INEEL site: a main laboratory building (CFA-690), which RESL shares, and in which it is the principal occupant, and a radiation calibration facility (CFA-638). In addition, RESL shares a Butler building that is used for storage only.

CFA-690 is the main laboratory building for RESL operations. RESL occupies 25,750 sq. ft. of space - administrative offices, staff offices, analytical, instrument and standards laboratories, computer rooms, shops, chemical and waste management areas, and storage areas.

CFA-638, the radiation calibration facility (1030 sq. ft.), was originally built as an armaments bunker in 1942-43 for the WWII Navy gun testing area, and was transformed into a calibration facility around 1973. There have been three major modifications of the radiation calibration facility in the last 10 years. The laboratory is currently configured into five source rooms for gamma, low-energy photon, and beta sources, plus an x-ray room. The sources are remotely operated from control areas by computer. There is no area large enough for neutron irradiations, so this service must be contracted for when it is required. The calibration facility does not have running water or restroom facilities.

2 Status Report

2.1 Management Oversight

2.1.1 Program Management

The programs discussed in Section 1.4 are managed according to program guidance documents that have been developed for each program. For MAPEP and DOELAP, specific goals, milestones and timelines are developed each year by subject matter teams to prioritize and plan their work according to the program guidance that has been given and guidelines in the program documents. These activities include tasks necessary to accomplish routine program maintenance tasks such as preparing and characterizing test materials, analyzing and evaluating data reported by participants, and preparing reports of test results. They encompass developmental tasks such as improving methods and processes and expanding program capacities. The MAPEP team leader is designated as the MAPEP Coordinator, coordinating MAPEP team efforts. In addition to the team leaders for the dosimetry and bioassay programs, DOELAP has a PE Program Administrator as the key interface with participants, the external oversight boards, and the HQ DOELAP Program Manager. A designated program manager coordinates the planning of RESL work for the NRC contract.

Key program specific goals and more crosscutting RESL goals are integrated into the DOE-ID annual operating plan and individual performance agreements with RESL scientists. The RESL Director and Deputy Director work with the team leaders to evaluate progress and redirect resources where necessary. RESL performs quarterly reporting of progress on tasks in the annual operating to DOE-ID senior management.

The overall RESL budget is part of the DOE-ID annual budget. Each RESL team provides information to the RESL Director regarding specific budget requirements to accomplish its goals and justification to support the requests. Using this information, the Director develops a laboratory-wide budget for RESL and submits it to the Deputy Assistant Manager for Technical Programs and Operations. Following review, it is submitted to DOE-ID senior management.

Program status and accomplishments are reported to program sponsors for each program. They are included in semiannual performance test reports for MAPEP and quarterly reports to the HQ Administrator and oversight boards for dosimetry and bioassay DOELAPs. Program reports are submitted and cost reports are provided monthly for NRC.

Although there has been an informal understanding for years between EM and EH on RESL's conduct of DOELAP, a formal Memorandum of Agreement (MOA) is needed for the laboratory accreditation program. This MOA is to be formalized in the future.

2.1.2 Management/Technical Reviews

Management and technical reviews of RESL programs take a number of different forms. Teams of experts, DOE-ID and INEEL subject matter experts, and oversight boards perform periodic

external reviews. RESL also has several programs with NIST to verify the traceability of RESL measurements and test materials.

To provide oversight of the dosimetry and bioassay DOELAPs, the HQ Program Manager chooses five-member oversight boards for each. Members are chosen for their technical and management experience in these fields. RESL staff meets once or twice a year with each oversight board to review the status of the programs and RESL recommendations to accredit labs. Every 2 years, each oversight board visits RESL and conducts a full program audit. Their report to the HQ Program Manager identifies findings and recommendations to improve the program. The HQ Program Manager also periodically invites scientists from NIST and from international standards labs to visit RESL and advise him on their observations. RESL is currently seeking NIST accreditation of its dosimetry DOELAP program through the National Voluntary Laboratory Accreditation Program (NVLAP) for ionizing radiation calibration laboratories. NVLAP has completed a thorough review of its QA program documents and recently conducted an onsite assessment. The findings are being addressed, and RESL has participated in the next performance test session. It is anticipated that accreditation should be achieved this year.

The MAPEP is conducted for NAMP. The NAMP Director performs programmatic oversight through annual program meetings, monthly NAMP core team meetings, and dialogue with MAPEP staff at workshops and other meetings. RESL participated on a team that developed a new radiochemical traceability program with NIST for the two NAMP reference labs. It included the development of a performance evaluation program and acceptance criteria for the test materials made and analyses performed. RESL has participated in the initial performance tests, exceeding all performance requirements. In addition, MAPEP is supported by RESL programs with NIST for traceability of measurements and test materials containing stable inorganic elements and organic compounds.

The NRC relies upon the traceability of radiochemical measurements and test materials. The NRC Program Manager regularly discusses program expectations with the RESL Director, and participates as an observer in audits of the NRC labs by RESL staff.

DOE-ID and INEEL subject matter experts perform management reviews of RESL environment, safety, health, and quality (ESH&Q) activities. Example areas of inquiry include RESL's QA, operational safety, environmental compliance, waste management practices, chemical management, and radiation control programs. Findings are tracked to correction as required in the DOE-ID issues management system.

Any research carried out by RESL staff is applied research to support the programs. Examples are developing better performance test materials, and performing model calculations and measurements to better characterize x-ray beams for DOELAP. It represents only a small portion of the total effort of select RESL staff. No review outside the programs is conducted.

2.2 Status of Staffing

2.2.1 Demographics

RESL staff consists of professional chemists, physicists (including health physicists), engineers, and related technicians. Figure 4 shows both the education level and disciplines of the staff at RESL. Individual staff members participate in professional society activities, in working groups and committees, such as American Standards for Testing of Materials (ASTM), International Standards Organization (ISO) and American National Standard Institute (ANSI) committees, and on accreditation boards.

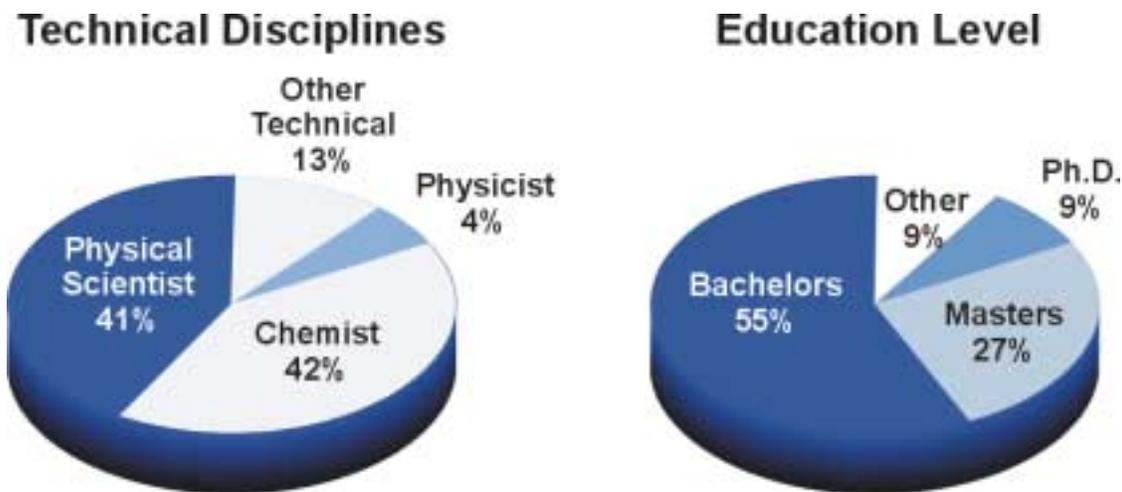


Figure 4. Staffing Profile for RESL.

2.2.2 Staffing Needs

RESL currently has 24 DOE FTEs. Minor fluctuations above or below this number will occur due to retirement and other attrition. The current hiring freeze is an issue in filling vacancies. Over the next 3 years, RESL is currently anticipating the following staffing needs:

FY 2000

- Experienced health physicist (direct replacement – vacant)
- Experienced inorganic chemist (direct replacement – vacant)
- Experienced radiochemist/external radiobioassay (direct replacement – planned retirement)

FY 2001/ 2002

- Entry-level organic/inorganic chemist (new)
- Entry-level radiochemist (replacement).

Filling these requirements will enable RESL to continue to support existing programs in key mission areas; however, this strategy does not provide adequate depth. RESL's ability to attract and successfully perform new programs will be predicated upon its ability to hire additional staff to perform the work. Hiring freezes, limitations, or delays will have a detrimental effect. Three

additional FTEs in program management, radiation physics/health physics, and chemistry would greatly improve RESL's flexibility to respond to new opportunities.

2.2.3 Labor Relations

Some staff at RESL belongs to the International Federation of Professional and Technical Engineers (IFPTE) Local 94. RESL maintains a cooperative relationship with the union.

2.3 Status of Programs and Program Funding

2.3.1 Major Programs/Funding

A budget of \$3.73 million has been approved for FY 2000. This is less than the \$3.96 million that was requested because of reductions in DOE-ID's Program Direction funding. DOE-ID expects to receive \$1.4 million from EH for DOELAP and \$0.2 million from the NRC for RESL. All FTEs and the balance of the funding for RESL would come from DOE-ID's EM Program Direction account. Figure 5 provides a breakout of the projected budget.

Labor (DOE FTE's)	\$1,555K	41.7%
(Contractor Support Staff)	857K	23.0%
Travel	43K	1.2%
Training	14K	0.4%
Facility Adder ¹	394K	10.6%
Equipment & Supplies ²	192K	5.1%
Lab Upgrades ³	38K	1.0%
Contractor Services ⁴	315K	8.4%
DOELAP Pass-throughs ⁵	90K	2.4%
NIST Contracts ⁶	90K	2.4%
Maintenance/Service Contracts ⁷	94K	2.5%
Miscellaneous Technical Support	50K	1.3%
Total	\$3,732K	100%

1. Charge to DOE by the INEEL contractor for use of RESL facilities and use of other site services such as medical, buses, cafeteria, & other site overhead. It is charged on a per capita basis for all DOE and contractor staff.
2. Small lab and computer equipment, supplies, chemicals, compressed gases, standard reference materials, and \$60K for capital equipment.
3. Improvements in individual labs and a lab disability upgrade to accommodate a disabled employee.
4. Crafts, maintenance, waste management, HP instruments, IH monitoring, shipping, vehicles, telephones, printing & graphic arts.
5. Neutron irradiations and reimbursement for assessor travel.
6. Standards exchange for traceability programs; calibrations; NVLAP accreditation.
7. Protection of different instrumental and computer systems.

Figure 5. RESL's FY 2000 Budget Submission.

2.3.2 Work for Others

NRC has contracted with RESL for over 20 years to provide support as a radiological reference laboratory. Although specific programs have changed, RESL continues to provide measurement QA that is traceable to NIST. A Work for Others agreement has recently been reached for RESL to prepare synthetic bioassay standards for the Department of the Army in FY 2000 (\$70K).

2.3.3 Technology Transfer/Privatization

One of RESL's scientists recently developed, and was granted a patent for, a method of preparing analytical soil standards that contain volatile organic compounds. A collaborator currently manufactures these standards and additional tests are being performed. There has been some discussion about possible licensing of this technology.

2.4 Operations Oversight

2.4.1 Capital Equipment

RESL requested \$60K in capital equipment for FY 2000 for a liquid argon tank (\$20K) and an upgrade of its gamma spectrometry system (\$40 thousand). Because of Program Direction funding cuts for the current year, these have been deleted unless additional funds are identified later. In addition to the \$60K to be moved to FY 2001, a prioritized list for the outyears includes:

FY 2001

- New gas chromatography mass spectrometry system \$90K
- Air conditioning/humidity control unit for instrument lab \$40K

FY 2002

- Hardware upgrade for alpha spectrometry system \$50K
- RESL network upgrade \$40K

2.4.2 Infrastructure and Facility Maintenance/Needs

CFA-690, the main laboratory building was completed in 1963, with a minor add-on in the 1970's. An older building, CFA-690 would not meet current ventilation, fire, OSHA, or electrical code requirements for a laboratory. Major building systems include:

- A common-plenum heating, ventilation, and air conditioning (HVAC) system that relies on steam generated in a nearby boiler for heat, and a large evaporative cooling system for air conditioning. These are the original units. There are no area temperature controls for individual work areas, except in a few of the instrument labs where additional air conditioning units have been added because the building system was inadequate.
- Electrical systems are the original systems and are outdated. Over the years, various minor modifications have been made in the wiring to the buildings that are not well documented. A number of uninterruptible power supplies have been added to protect computers and instruments.
- Water lines are original, and supply non-potable water to most of the building. Pipes are deteriorating with age, and rust in the water is an increasing problem. Several leaks in the

steam lines developed last winter and could not be fixed without shutting down the heat to the building.

- Laboratory hoods and exhaust stacks are generally in adequate condition. Some of the hoods have been replaced in recent years. Many, but not all, of the airflow controllers have been replaced within the last few years. RESL anticipates the rest of the hoods and controllers will be replaced within the next year or two. These remaining items are in the budget since there is no means of maintaining negative air pressure in the labs without operable hoods.

The roof was replaced 3 years ago. This has corrected the roof leaks that regularly caused problems throughout the laboratory.

A General GPP project has been estimated about \$5 million for upgrades to the HVAC systems and internal water lines to separate industrial from potable water lines, replace deteriorating lines, and eliminate the need for a number of backflow prevention devices. The project has a high CAMP score, but has not yet been approved.

The overall configuration of the laboratory is inflexible and not optimal for current operations. The areas used for shipping and receiving, chemical storage, and waste management were not designed for those purposes, and it has been necessary to maintain chemistry office spaces within individual laboratories.

The HVAC system in the radiation calibration facility (CFA-638) was replaced about 6 years ago and is adequate for current operations. The building does not have any water or sewer connection. A port-a-potty is located outside the building and is the only nearby facility for staff use.

The electrical systems were upgraded to code at the same time the HVAC was upgraded. There is no fire suppression system, so fire protection relies on fire/smoke detectors. There is only a single entrance to the facility.

A conceptual design for a combined laboratory/calibration facility was prepared in 1993 to evaluate the needs and cost of a new building. The plan recommended constructing a new building, but with the change of RESL's Program Secretarial Office (PSO), the new building was dropped off the priority list. DOE-ID and Bechtel BWXD Idaho, LLC (BBWI) are working to develop priorities and this issue will be resurfaced to the new PSO for support.

2.4.3 Environmental Safety and Health (including Integrated Safety Management)

RESL has implemented an integrated safety management system (ISMS) for its laboratory operations to better integrate and focus the efforts of both management and employees to ensure work is performed safely. RESL successfully completed a Phase I review of its ISM Description in September 1999. The Phase II Review in January 2000 verified implementation of the system. RESL is the first GOGO to complete its ISMS certification. Key elements include:

- Further clarification of roles and responsibilities for management and staff, and for the tenant and landlord organizations
- Improved hazards assessment process

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- Better self-assessment processes
 - Improved and updated administrative procedures for all work activities
 - Appropriate work authorization processes
 - Focus throughout on worker involvement, ownership, and commitment.

Safety is everyone's responsibility, so RESL staff members share a number of collateral duty responsibilities for safety, such as participation on the safety committee and as emergency response wardens. In addition, RESL is supported by INEEL contractor safety professionals in operational safety, radiation safety, industrial hygiene, waste management, and environmental compliance.

2.4.4 Quality Assurance

RESL's QA program is based on DOE Order 414.1A, Quality Assurance. The program is documented in the RESL manual as QPP-RESL-1, Quality Program Plan for Radiological and Environmental Sciences Laboratory. Implementing procedures, which achieve the policies and objectives of QPP-1, can be found in the RESL Manual, the RESL Chemistry Manual, and the DOELAP Manuals.

Taken together, the documented quality system controls work processes that are critical to achieving quality. The objective in implementing the system is to give RESL staff and customers confidence in the RESL's work and work products.

As a reference metrology laboratory, the traceability of RESL measurements and test materials to national standards at NIST is particularly important. To maintain this traceability, RESL participates in several programs with NIST for radiochemistry and for organic and inorganic chemistry. RESL also uses and exchanges NIST traceable ion chambers for radiation field measurements at the radiation calibration facility.

2.4.5 Information Management

All key computer systems and databases have been modernized. RESL has recently purchased and installed a new Laboratory Information System (LIMS) for all of its chemistry operations to replace a 20-year old chemistry system. Most chemistry instruments are computer controlled and will be on-line to the LIMS for data management. RESL has also completed development of a new PC-based operating system for the DOELAP program to replace the old VAX-based system and installed a new computerized source control system for the radiation calibration facility. Many other processes such as chemical management, the material safety data sheet system, and issues management are also computerized.