



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science

**Assessment Plan for the  
Fermi National Accelerator  
Laboratory  
Occupational and Environmental  
Radiation Protection Programs**

Revision 0

April 2021

Approved:

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Salma El-Safwany

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Date

## Acronyms and Abbreviations

ALARA	As Low As Reasonable Achievable
CFR	Code of Federal Regulations
CRAD	Criteria Review and Approach Document
DOE	U.S. Department of Energy
ERP	Environmental Radiation Protection
FNAL	Fermi National Accelerator Laboratory
FSO	Fermi Site Office
LOI	Lines of Inquiry
O	Order
ORP	Occupational Radiation Protection
SC	Office of Science
RPP	Radiation Protection Program
SCMS	Office of Science Management System

## 1.0 INTRODUCTION

In response to a memorandum dated March 4, 2021, and signed by the Fermi Site Office (FSO) Manager, a team was established to assess compliance with selected sections of Title 10 Code of Federal Regulations, Part 835—Occupational Radiation Protection (10 CFR 835); and DOE O 458.1, *Radiation Protection of the Public and Environment*. The assessment will be conducted virtually from April 5 through April 9<sup>th</sup>. On-site field work may be warranted depending on the Assessment Team’s ability to address the questions posed in the memorandum balanced against Fermi National Accelerator Laboratory’s (FNAL) site access restrictions in place due to the COVID-19 pandemic.

The Assessment Team includes the following Office of Science (SC) individuals:

- Team Leader – Salma El-Safwany, Bay Area Site Office
- Team Member – Joe Cracco, Brookhaven Site Office
- Team Member – Craig Booker, Consolidated Service Center – Oak Ridge
- Team Leader – Chuck Mansfield, Consolidated Service Center – Chicago
- Team Member – Rachel Madiar, Fermi Site Office

## 2.0 SCOPE

This assessment will include the examination of the implementation of portions of the FNAL Occupational Radiation Protection Program (RPP) and the Environmental RPP. The effectiveness of the programs in protecting workers, members of the public, and the environment, as well as the management of accelerator produced radioactive materials will also be examined for compliance with the requirements of 10 CFR 835, and DOE O 458.1. Specifically, this assessment will address:

- Whether Fermilab has an RPP that meets the requirements of 10 CFR 835, *Occupational Radiation Protection* and DOE O 458.1, Chg.4 *Radiation Protection of the Public and the Environment*;
- Evaluate the potential exposure risks of the public and whether the risk is managed by the Laboratory in accordance with ALARA principles and DOE regulations;
- Whether Fermilab protect workers, onsite residents, and the visiting public from potential radiation exposure per 10 CFR 835, Occupational Radiation Protection and DOE O 458.1, Chg.4 *Radiation Protection of the Public and the Environment*;
- Whether Fermilab has an effective on-site contamination control procedures and processes in place per 10 CFR 835, *Occupational Radiation Protection*; and,
- Whether the eating, drinking and smoking controls and practices are adequate for Radioactive Material Areas.

Specific assessment criteria are provided in Section 4.0.

## 3.0 CATEGORIZATION OF ASSESSMENT RESULTS

The results of the assessment will be expressed as strengths or weaknesses. The weaknesses will be compiled into statements of findings relative to the Office of Science Management System (SCMS) criteria contained in the SCMS Quality Assurance and Oversight Management System.

- Weaknesses identified will be categorized as Level 1, 2, or 3 Findings. This categorization identifies the significance the team places on the finding as well as indicating to contractor and DOE management the level of rigor that should be applied in addressing the finding. The categories of finding levels delineated in SCMS are as follows:

- **Level 1 (L1) Finding** - An issue of major significance that warrants a high level of attention on the part of line management. Typically, such an issue reflects a gap in addressing requirements or a systemic problem with implementing the requirements. If left uncorrected, this level of finding could negatively impact the adequacy of operations and/or accomplishment of the SC mission.
- **Level 2 (L2) Finding** - An issue that represents a nonconformance or deviation with the implementation of a requirement. Multiple issues at this level--when of a similar nature--may be rolled up together into one or more Level 1 Findings.
- **Level 3 (L3) Finding** - An issue in which it is recognized that improvements can be gained in the process, performance, or efficiency already established for meeting a requirement. This level of finding should also include minor deviations observed during oversight activities that have been promptly corrected on the spot and verified as completed.

Positive attributes in the Laboratory’s Radiation Protection Program or its implementation cited during the assessment will also be reported. They will be categorized as either Strengths or Noteworthy Practices.

- **Noteworthy Practice** - A positive observation--based on objective assessment data--of a particular practice, procedure, process, or system considered so unique or innovative enough that the entire Department might find it beneficial. Mere compliance with mandatory requirements is not considered to be a noteworthy practice.
- **Strength** - A mature process or activity that has consistently demonstrated the ability to meet expectations, or a process or activity that efficiently and effectively facilitates and integrates processes, activities, and resources.

#### 4.0 ASSESSMENT CRITERIA

<b>Functional Areas and Criteria</b>	
<b>Occupational Radiation Protection (ORP)</b>	
1	Fermilab’s RPP meets the requirements of 10 CFR 835, <i>Occupational Radiation Protection..</i>
2	Fermilab’s ERPP meets the requirements of DOE O 458.1, Chg.4 <i>Radiation Protection of the Public and Environment.</i>
3	Routine and non-routine radiological contamination control monitoring is performed for fixed and removable contamination, as needed to characterize radiological conditions and ensure safety of personnel.
4	Radiological activities at FNAL are conducted such that exposures to onsite residents and members of the public are less than DOE dose limits.

#### 5.0 ASSESSMENT METHODOLOGY

The assessment will be conducted in accordance with the SCMS: Quality Assurance and Oversight; Subject Area: Assessments, Procedure 2, *Performing Assessments*. Due to the ongoing COVID-19 pandemic and FNAL site access restrictions in place at the time of the assessment, most assessment activities will be conducted virtually, via videoconferencing.

Details of the schedule and logistics, assessment lines of inquiry, assessment conduct, and assessment reporting are included in the following sections.

## 5.1 Schedule and Logistics

The assessment will be conducted in accordance with the following schedule:

First document request to FNAL:	2 April, 2021
Document review:	5 April – 9 April, 2021
Assessment in brief:	2 April, 2021
Interviews	As needed
Assessment out brief:	9 April, 2021

Multiple document requests are anticipated; however, the Assessment Team will attempt to batch all document requests to prevent burdening the FNAL personnel with excessive administrative tasks. By mutual consent between FNAL and the Assessment Team Leader, documents may be emailed to the team or placed on an FNAL file sharing platform such as Box or SharePoint. FNAL is requested to provide the Assessment Team with the documents listed in Attachment A of this assessment plan as soon as practical, but no later than 5 April, 2021.

Briefings with FSO and FNAL will be held on April 6 and 8 to discuss developing issues and unmet document request needs. The briefings may be canceled by mutual consent.

## 5.2 Assessment Lines of Inquiry

Appendix A contains the Criteria Review and Approach Document (CRAD) for each specific assessment criterion. Specific Lines of Inquiry (LOI) have been developed for each assessment criterion to ensure that the scope of the assessment, as defined in Section 3.0, is fully addressed. To the extent possible, all LOIs will be addressed during the assessment. Additional LOIs may be developed during the course of the assessment at the discretion of the Assessment Team consistent with the assessment scope.

## 5.3 Assessment Conduct

The assessment will be performance based in that the FNAL programs, plans, and procedures within the scope of the assessment will be reviewed for implementation and compliance with relevant requirements.

The assessment approach is identified in Appendix A. Each team member will document the evaluation of the assessment criteria using the assessment form provided in Appendix B. All findings, noteworthy practices, or strengths will be documented on the assessment form as well.

## 6.0 ASSESSMENT REPORTING

The results of the assessment will be included in a draft report no later than three weeks following the review and will be submitted to FSO and to FNAL for a factual accuracy review. The factual accuracy review should be completed within 10 business days of receipt. Should either organization need an extension for their review, a request for an extension should be made to the assessment team leader. The assessment team will finalize and issue the assessment report within 30 days of completion of the factual accuracy review.

### Appendix A – CRAD and Lines of Inquiry

### Appendix B – Assessment Form

## **Appendix A: CRAD and Lines of Inquiry**

**Functional Area: Occupational Radiation Protection**  
**Assessment Criterion 1:**

**The FNAL RPP meets the requirements of 10 CFR 835, *Occupational Radiation Protection*.**

**Lines of Inquiry:**

- Does the RPP address the requirements of 10 CFR 835, commensurate with the scope of the activities performed at FNAL?
- Does the RPP include formal plans and measures for applying the as low as reasonably achievable (ALARA) process to occupational exposure?
- Does the scope of the RPP completely address all the radiological activities conducted?
- Are updates to the RPP submitted to DOE whenever a change or addition to the RPP is made and before the initiation of a task not within the scope of the RPP?
- Do internal audit reports show that the functional elements under review were comprehensively and objectively examined?
- Are the plans and measures for applying the ALARA process to occupational exposures reflected in procedures that are commensurate with the expected level of exposure?

**Requirements**

- 10 CFR 835, *Occupational Radiation Protection*, Subpart B – *Management and Administrative Requirements*.

**Assessment Activities:**

Document review

**Relevant Documents & Records** (include the revision number as indicated in the contract or the latest revision if not a contractual document):

**Assessment Team Member: Joe Cracco and Craig Booker**

Revision: 0

**Functional Area: Environmental Radiation Protection  
Assessment Criterion 2:**

**The FNAL ERPP meets the requirements of DOE O 458.1, *Radiation Protection of the Public and Environment*.**

**Lines of Inquiry:**

- Does the ERPP address the requirements of Attachment 1 to DOE O 458.1, Chg 4, *Radiation Protection of the Public and the Environment*?
- Are public dose evaluations conducted in compliance with paragraph 2.e of Attachment 1 to DOE O 458.1?
- Is an ALARA process in place that optimizes control and management of radiological activities so that doses to members of the public (both individual and collective) and releases to the environment are kept as low as reasonably achievable.
- Are radionuclides in liquid and airborne effluents controlled and managed such that DOE release limits are not exceeded?
- Have practices and procedures to protect drinking and ground water been implemented?
- Have practices and procedures to protect biota been implemented?
- Are procedures in place that address the release or clearance of property with the potential to contain residual radioactive material is conducted in accordance with DOE direction.

**Requirements**

- DOE O 458.1, Chg 4, *Radiation Protection of the Public and the Environment*

**Assessment Activities:**

Document review

**Relevant Documents & Records** (include the revision number as indicated in the contract or the latest revision if not a contractual document):

**Assessment Team Member: Salma El-Safwany, Rachel Madiar and Chuck Mansfield**



**Functional Area: Occupational Radiation Protection**

**Assessment Criterion 3:**

**Routine and non-routine radiological contamination control monitoring is performed for fixed and removable contamination, as needed to characterize radiological conditions and ensure safety of personnel.**

**Lines of Inquiry:**

- Are survey frequencies and techniques documented in procedures or technical basis documents?
- Is area monitoring performed to: (a) document radiological conditions, including prior to work activities (b) detect changes in radiological conditions, (c) verify the effectiveness of engineering and process controls in containing radioactive material and reducing radiation exposure, and (d) identify and control potential sources of individual exposure to radiation and/or radioactive materials?
- Are individuals performing surveys trained on the instruments and techniques used to acquire radiological data necessary for the survey and on the response to off-normal survey results?
- Are the instruments and equipment used for monitoring: (a) periodically maintained and calibrated on an established frequency; (b) appropriate for the type(s), levels, and energies of the radiation(s) encountered; (c) appropriate for existing environmental conditions; and (d) routinely tested for operability?
- For the radionuclide being measured, are the field or laboratory instruments used to analyze surface swipes or to take direct surface contamination measurements sufficiently sensitive to detect the surface contamination at the levels specified in Appendix D of 10 CFR 835?
- Are appropriate controls maintained and verified which prevent the inadvertent transfer of removable contamination to locations outside of radiological areas under normal operating conditions?

**Regulatory Requirements**

- 10 CFR 835, *Occupational Radiation Protection*, Subpart E – *Monitoring of Individuals and Areas*.
- DOE G 441.1-1C, *Radiation Protection Programs Guide for Use with Title 10, Code of Federal Regulations, Part 835, Occupational Radiation Protection*, Section 11.0, *Radioactive Contamination Control*

**Assessment Activities:**

Document review

**Relevant Documents & Records** (include the revision number as indicated in the contract or the latest revision if not a contractual document):

**Assessment Team Member:            Joe Cracco and Craig Booker**

**Functional Area: Environmental Radiation Protection****Assessment Criterion 4:**

**Radiological activities at FNAL are conducted such that exposures to onsite residents and members of the public are less than DOE dose limits.**

**Lines of Inquiry:**

- Are ALARA principles sufficiently implemented to optimize control and management of radiological activities so that doses to members of the public (both individual and collective) and releases to the environment are kept as low as reasonably achievable?
- To the extent practical, is the environmental ALARA process coordinated with the 10 CFR 835 ALARA process?
- Are potential exposures to the worker, onsite resident, visiting public, and offsite public perspectives as well as implications of onsite food crop cultivation, onsite minors, pregnant members of the public understood and appropriate (at the facility and site level)? Are all the exposure locations mapped and understood?
- Is the public dose limit applied to members of the public located off DOE sites and on DOE sites outside of controlled areas?
- The dose to members of the public are calculated using accepted methodologies and sound judgment in making assumptions such as occupancy factors.

**Requirements**

- DOE O 458.1 Chg 4, *Radiation Protection of the Public and Environment*, Attachment 1, 2.d, 2.e, 2.b.(2).

**Assessment Activities:**

Document review

**Relevant Documents & Records** (include the revision number as indicated in the contract or the latest revision if not a contractual document):

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**Assessment Team Member:**

**Salma El-Safwany, Rachel Madiar and Chuck Mansfield**

## **Appendix B: Assessment Results Form**

### Assessment Results Form

<b>Functional Area:</b>	<b>Criterion:</b>	
	<b>Date:</b>	

**OBJECTIVE**

**Records Reviewed**

Document Number	Title	Revision No.	Issue Date (MM/DD/YYYY)

**Interviews Conducted** (list titles only)

**Activity Observations**

**Discussion of Results**

**Conclusion**

**Findings**

Criterion	Finding Level (L1, L2, or L3)	Number	Description

**Noteworthy Practices and Strengths**

Criterion	Noteworthy Practice or Strength	Number	Description