



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

Contents

Introduction 1
 Contractor Requirements Document (CRD) – Attachment 1 1
 FNAL Reference Documents27
 Approvals **Error! Bookmark not defined.**

Introduction

This Site Compliance Plan (SCP):

- a) corresponds with the version of the DOE Order on Radiation Protection of the Public and the Environment listed in the Prime Contract,
- b) states how the Laboratory complies with applicable requirements as tailored to the risks at the Laboratory,
- c) identifies CRD sections that do not apply, and
- d) documents DOE-approved methods of compliance for applicable requirements and that **there are not recurring** deliverables*.

Impact on the Contract:

Under the SCP, sections of the CRD are incorporated into the Contract as-is, unless the SCP indicates that a section or portion thereof is inapplicable, or the section has been changed. Thus, for example, if “In compliance” is listed next to a CRD section, that section is incorporated into the Contract as-is. However, where an SCP indicates that a section or portion thereof is inapplicable, the section or portion thereof is excluded from the Contract. In addition, where a section or portion thereof is applicable, but changes to the section have been agreed by the Parties, the section, as modified by the Parties, shall be incorporated into the Contract. The SCP also memorializes the Parties’ agreement on how FNAL will comply with sections of the CRD (whether or not modified).

Contractor Requirements Document (CRD) – Attachment 1

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
Section 1 General Requirements							
1.a	The contractor must establish and implement a program to protect the public and the environment against undue risk from radiation associated with DOE radiological activities through application of the Specific Requirements (paragraph 2.) in this CRD.	Outlined in Section 2 below.					
1.b	The contractor must provide a schedule for full implementation of the Specific Requirements in this CRD as directed by DOE.	See Reference 1					
1.c	The contractor must develop documentation that demonstrates how the Specific Requirements in this CRD are implemented.	Outlined in Section 2 below.					

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
1.d	The contractor must obtain DOE line management approval of the documentation demonstrating compliance with the Specific Requirements in this CRD.	See Reference 1					
Section 2 Specific Requirements							
2.a	<u>Environmental Radiological Protection Program</u> . The contractor conducting radiological activities must develop and implement a documented program which addresses compliance with the Specific Requirements in this CRD that are relevant to the particular activities being conducted.	In compliance	<u>FESHM^[2], as implemented in FRCM^[3] and EMS^[4]</u>	n/a	n/a	n/a	n/a
2.a.(1)	The program, (documented by the contractor's plans, procedures, protocols and other documents developed to implement the relevant requirements of this CRD) must be tailored to these activities and reflect a graded approach commensurate with the hazard or risk to the public and the environment resulting from the DOE operations.	In compliance	FRCM FESHM Chapters 8000	n/a	n/a	n/a	n/a
2.a.(2)	Where long-term stewardship and institutional controls for protection of the public and the environment are necessary to meet the Specific Requirements in this CRD, the contractor must ensure that the need for the controls is documented and maintained and to the extent the contractor is responsible, implement the controls. If the contractor is not responsible for implementation of the controls, the contractor must provide reasonable assurance that necessary controls are being implemented by the responsible party prior to conducting activities that can affect the public or the environment.	In compliance	FRCM EMS -see also, RWP ^[5] SAD ^[6]	n/a	n/a	n/a	n/a
2.b	<u>Public Dose Limit</u> . The contractor must establish and implement procedures and practices to address the following elements related to the public dose limit:	In compliance	FRCM Article 212, <i>Dose Limits for Visitors, Individuals Under 18 years of Age, and Members of the Public</i> FRCM Article 1104, <i>Public Dose Limits</i>	n/a	n/a	n/a	n/a
2.b.(1)	DOE radiological activities, including remedial actions and activities using Technologically Enhanced Naturally Occurring Radioactive Material (TENORM), must be conducted so that exposure of members of the public to ionizing radiation will:	Outlined in sections below.					
2.b.(1)(a)	Not cause a total effective dose (TED) exceeding 100 mrem (1mSv) in a year, an equivalent dose to the lens of the eye exceeding 1500 mrem	In compliance	FRCM Article 1104, <i>Public Dose Limits</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	(15 mSv) in a year, or an equivalent dose to the skin or extremities exceeding 5000 mrem (50 mSv) in a year, from all sources of ionizing radiation and exposure pathways that could contribute significantly to the total dose excepting: 1 Dose from radon and its decay products in air [Radon is addressed separately e.g., under paragraphs 2.f. and 2.h. of the Specific Requirements in this CRD and under Title 40 Code of Federal Regulations (CFR) Part 61, Subparts Q and T]; 2 Dose received by patients from medical sources of radiation, and by volunteers in medical research programs; 3 Dose from background radiation; and 4 Dose from occupational exposure under Nuclear Regulatory Commission (NRC) or Agreement State license or to general employees regulated under 10 CFR Part 835.		Equivalent doses to the lens of the eye, the skin, or extremities to the public are not considered credible				
2.b.(1)(b)	Comply with As Low As Reasonably Achievable (ALARA) requirements in paragraph 2.d. of the Specific Requirements in this CRD.	In compliance	FRCM Chapter 3, Part 5, <i>Fermilab ALARA Program</i>	n/a	n/a	n/a	n/a
2.b.(2)	The public dose limit applies to members of the public located off DOE sites and on DOE sites outside of controlled areas, and to those exposed to residual radioactive material subsequent to any remedial action or clearance of property.	In compliance	FRCM Article 212, <i>Dose Limits for Visitors, Individuals Under 18 Years of Age, and Members of the Public</i> FRCM Article 1104, <i>Public Dose Limits</i>	n/a	n/a	n/a	n/a
2.c	<u>Temporary Dose Limit.</u> If special circumstances could affect a DOE radiological activity in such a manner that the potential dose to a member of the public could exceed a TED of 100 mrem (1 mSv) in a year the contractor must submit a request for specific authorization for a temporary public dose limit higher than 100 mrem (1 mSv) in a year to the responsible Field Element Manager. This request must include documentation that justifies the need for the increase, the alternatives considered, and the application of the ALARA process. The specific exposure pathways excepted in paragraphs 2.b.(1)(a) 1-4 of the Specific Requirements in this CRD are also excepted for temporary dose limits.		FRCM policy does not allow MEI dose to exceed 100 mrem in a year. FNAL has controls and monitoring in place such that the special circumstances that MEI could exceed 100 mrem in a year is not considered credible. Historically, doses have been well below this limit.				
2.d	<u>As Low As Reasonably Achievable (ALARA)</u>						
2.d.(1)	An ALARA process must be 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	In compliance	FRCM Chapter 3, Part 5, <i>Fermilab ALARA Program</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	are kept as low as reasonably achievable. The process must be applied to the design or modification of facilities and conduct of activities that can expose the public or the environment to radiation or radioactive material.		FRCM Chapter 8, <i>ALARA Management of Accelerator Radiation Shielding</i> Radiation Safety Subcommittee (RSSC) serves as the ALARA committee and ensures ALARA is implemented uniformly throughout FNAL				
2.d.(2)	The ALARA process must: consider DOE sources, modes of exposure and all pathways which potentially could result in the release of radioactive material into the environment, or exposure to the public; use a graded approach; and, to the extent practical and when appropriate, be coordinated with the 10 CFR Part 835 ALARA process.	In compliance	FRCM Chapter 3, Part 5, <i>Fermilab ALARA Program</i>	n/a	n/a	n/a	n/a
2.e	<u>Demonstrating Compliance with the Public Dose Limit.</u> The contractor must establish and implement procedures and practices to demonstrate compliance with the public dose limit and to address the following elements:	In compliance	Outlined in 2.e.(1)(a) through (d)	n/a	n/a	n/a	n/a
2.e.(1)	Dose evaluations to demonstrate compliance with the public dose limit in paragraph 2.b.(1) of the Specific Requirements in this CRD and assess collective dose must include the following:	In compliance	Outlined in 2.e.(1)(a) through (d)	n/a	n/a	n/a	n/a
2.e.(1)(a)	The TED to members of the public from exposure to radiation, airborne effluents, and liquid effluents, of DOE origin. 1 Compliance may be demonstrated by calculating dose to the representative person or to the maximally exposed individual (MEI). 2 Determination of the representative person or the MEI must include members of the public both on DOE sites outside of controlled areas and off DOE sites. 3 If it is suspected that any of the dose limits specified in paragraph 2.b.(1)(a) of the Specific Requirements in this CRD may be exceeded or the estimated TED for members of the public exceeds 25 mrem (0.25 mSv) in a year, then dose to the lens of the eye, skin, and extremities must be evaluated.	In compliance	FRCM Article 1104, <i>Public Dose Limits</i> Report to the Director on the Fermilab Environment (annual) ^[7] The TED threshold of 25 mrem is not likely to be approached and is explicitly stated in FRCM Chapter 11, <i>Environmental Radiation Monitoring and Control</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
2.e.(1) (b)	Analytical models that consider likely exposure pathways, such as: 1 Direct external radiation from sources located on-site; 2 External radiation from airborne radioactive material; 3 External radiation from radioactive material deposited on surfaces off-site; 4 Internal radiation from inhaled airborne radioactive material; 5 Internal radiation from radioactive material ingested with water, and with food from terrestrial crops or animal products (e.g., meat, eggs, milk); 6 Internal radiation from radioactive material ingested with aquatic food products such as fish, shellfish, crustaceans (e.g., crayfish, shrimp, crab, lobsters), and aquatic plants and algae; 7 External or internal radiation due to residual radioactive material on, or in, cleared real property; and 8 Any other pathway unique to the DOE site or activity.	In compliance	FRCM Article 1104, <i>Public Dose Limits</i> Report to the Director on the Fermilab Environment (annual)	n/a	n/a	n/a	n/a
2.e.(1) (c)	The dose to members of the public from DOE-related exposure sources only, if the projected DOE-related dose to the representative person or MEI is 25 mrem (0.25mSv) in a year or less. If the DOE-related dose is greater than 25 mrem in a year, the dose to members of the public must include both major non-DOE sources of exposure (excluding dose from radon and its decay products in air, background radiation dose, occupational doses and doses due to medical exposures) and dose from DOE-related sources;		FRCM policy does not allow MEI dose to exceed 25 mrem in a year. FNAL has design, controls and monitoring in place such that the special circumstances that MEI could exceed 25 mrem in a year is not considered credible. Historical MEI doses from FNAL operations have been well below 25 mrem/year.				
2.e.(1) (d)	Collective dose for members of the public resulting from radiation emitted and radioactive materials released from DOE radiological activities only (not including radon and its decay products). Collective dose for members of the public must be representative of the total dose and of adequate quality for supported comparisons, trending or decisions. Consistent with the graded approach, collective dose estimates may be truncated by distance (e.g., 50 miles) or individual dose level (e.g., 10 microrem) when integration of doses beyond such thresholds does not significantly affect data quality objectives. Where it is of concern, collective dose for members of the public resulting from radon and its decay products released by DOE radiological activities needs to be calculated separately from other radionuclides.	In compliance	FRCM Article 1104, <i>Public Dose Limits</i> Report to the Director on the Fermilab Environment (annual) -see also, ESH-RPO-MON-01, <i>Routine Monitoring Program</i> , which includes collecting representative environmental dosimetry data in many areas where the public may be present	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
2.e.(2)	The estimated individual dose to the MEI or representative person that is representative of the persons or group likely to receive the most dose and is based on pathway and exposure parameters that are not likely to underestimate or substantially overestimate the dose, and, the collective dose (population dose) that is a realistic as practicable estimate of the sum of the doses to all members of the actual exposed population.	In compliance	Report to the Director on the Fermilab Environment (annual)	n/a	n/a	n/a	n/a
2.e.(3)	Site-specific information on radiation source dispersion patterns, location and demography of members of the public in the vicinity of DOE radiological activities, land use, food supplies, and exposure pathway information must be updated, as necessary, to document significant changes that could affect dose evaluations.	In compliance	Report to the Director on the Fermilab Environment (annual)	n/a	n/a	n/a	n/a
2.e.(4)	Values of assumed default or site-specific parameters used in calculations must be identified and included with the documentation of the calculations.	In compliance	Report to the Director on the Fermilab Environment (annual)	n/a	n/a	n/a	n/a
2.e.(5)	Direct measurements must be made, to the extent practicable, to obtain information characterizing source terms, exposures, exposure modes, and other information needed in evaluating dose.	In compliance	FRCM Chapter 5, Part 5, <i>Radiological Monitoring and Surveys</i> FRCM Article 812.5, <i>Special Technical Considerations</i>	n/a	n/a	n/a	n/a
2.e.(6)	Models for dose evaluation calculations must be appropriate for their purpose. Dose evaluation models that are codified or approved for use by regulators of DOE or by DOE must be used where applicable. Alternatives to such codified or approved dose evaluation models to be used for demonstrating compliance must be approved by the Field Element Manager.	In compliance	The certified CAP88-PC4.1 code for public doses from radioactive air emission, or special Monte Carlo codes such as MARS or MCNPX are used by the Radiation Physics Group to calculate public doses	n/a	n/a	n/a	n/a
2.e.(7)	DOE-approved dose coefficients must be used to evaluate doses resulting from DOE radiological activities. Use of alternative dose coefficients must be approved by the Chief Health, Safety and Security Officer or by a Cognizant Secretarial Officer in consultation with the Chief Health, Safety and Security Officer.	In compliance	FRCM Appendix 2A: <i>Weighting Factors for Organs and Tissues</i> FRCM Table 8.1, <i>Radiation Weighting Factors for Various Particles</i> FRCM Table 8.2, <i>Neutron Radiation Weighting Factors According to ICRP Publication 103</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
2.e.(8)	Doses to members of the public from airborne effluents must be evaluated with the CAP-88 model or another EPA-approved model or method to demonstrate compliance with applicable subparts of 40 CFR Part 61, <i>National Emission Standards for Hazardous Air Pollutants</i> .	In compliance	Report to the Director on the Fermilab Environment (annual) FRCM Article 1107, <i>Management of Environmental Airborne Radioactivity</i>	n/a	n/a	n/a	n/a
2.e.(9)	Environmental monitoring must be conducted to characterize routine and non-routine releases of radioactive material from radiological activities, estimate the dispersal pattern in the environs, characterize the pathway(s) of exposure to members of the public and estimate the doses to individuals and populations in the vicinity of the site or operation commensurate with the nature of the DOE radiological activities and the risk to the public and the environment. Radiological monitoring must be integrated with the general environmental and effluent monitoring. Environmental monitoring must include, but is not limited to:	In compliance	FRCM Chapter 11, <i>Environmental Radiation Monitoring and Control</i> FRCM Appendix 11A, <i>Sources, Measurement and Control of Environmental Radiation</i> -see also, ESH-RPO-MON-01, <i>Routine Monitoring Program</i>	n/a	n/a	n/a	n/a
2.e.(9) (a)	Effluent Monitoring	In compliance	EMP FRCM Chapter 11, <i>Environmental Radiation Monitoring and Control</i>	n/a	n/a	n/a	n/a
2.e.(9) (b)	Environmental Surveillance	In compliance	EMP FRCM Chapter 11, <i>Environmental Radiation Monitoring and Control</i>	n/a	n/a	n/a	n/a
2.e.(9) (c)	Meteorological Monitoring. Meteorological monitoring must be commensurate with the level of site radiological activities, the site topographical characteristics, and the distance to critical receptors. The scope must be sufficient to characterize atmospheric dispersion and model the dose to members of the public over distances commensurate with the magnitude of potential source terms and possible pathways to the atmosphere.	In compliance	per EMP, “An on-site meteorological station is maintained near the New Muon Laboratory, north of Wilson Street, in the northern portion of the site. Air temperature, wind velocity and direction, relative humidity, precipitation, and solar radiation are logged at this site.”	n/a	n/a	n/a	n/a
2.e.(9) (d)	Pre-operational Monitoring. Prior to the startup of a new site, facility or process with the potential to expose the public or environment to	In compliance	EMP	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	radiation or radioactive material, it is necessary to ensure that adequate knowledge exists to understand: 1) radiological background; 2) pertinent environmental and ecological parameters; and 3) potential pathways for human exposures or ecological/natural resource impacts either from existing data or documents (for example, NEPA evaluations or existing monitoring and surveillance programs, etc.) or from the conduct of a pre-operational study initiated at least one year prior to startup of a new operation.		FRCM Chapter 5, Part 5, <i>Radiological Monitoring and Surveys</i> -see also, ESH-RPO-MON-01, <i>Routine Monitoring Program</i>				
2.e.(10)	Site-specific environmental monitoring criteria must be established to ensure that representative measurements of quantities and concentrations of radiological contaminants are conducted and that the effects from DOE radiological activities on members of the public and the environment are monitored sufficiently to demonstrate compliance with the Specific Requirements in this CRD.	In compliance	EMP FRCM Chapter 11, <i>Environmental Radiation Monitoring and Control</i>	n/a	n/a	n/a	n/a
2.f.	<u>Airborne Radioactive Effluents</u> The contractor must establish and implement procedures and practices related to airborne radioactive effluents so that radiological activities are conducted in a manner such that the release of radioactive material to the atmosphere will: (1) Be evaluated using the ALARA process established in paragraph 2.d. of the Specific Requirements in this CRD; (2) Not cause radon-222 flux rates to exceed 20 pCi (0.7 Bq)/m ² -sec ⁻¹ averaged over the surface area overlaying waste, including the covering or other confinement structures, wherever radium-226 wastes are accepted for storage or disposal (See 40 CFR Part 61, Subparts Q and T); (3) Meet compliance agreements under 40 CFR Part 61, Subparts H, Q, and T; (4) Not cause the radon-220 and radon-222 decay product concentration, including background, to exceed 0.03 WL in buildings that are being released from DOE control. Further, a reasonable effort must be made to meet a 0.02WL generic guideline for annual average radon-220 and radon-222 decay product concentration, including background, in such buildings; and	In compliance ???	EMP FRCM Chapter 8, <i>ALARA Management of Accelerator Radiation Shielding</i> FRCM Article 1107, <i>Management of Environmental Airborne Radioactivity</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	(5) Not exceed 3 pCi/L annual average radon-220 and radon-222 concentration, not including background, at the site boundary if DOE activities release radon-220 and radon-222 or their decay products.						
2.g.(1)-(3)	Control and Management of Radionuclides from DOE Activities in Liquid Discharges. The contractor must establish and implement procedures and practices related to control and management of radionuclides from DOE activities in liquid discharges. Operators of DOE facilities discharging or releasing liquids containing radionuclides from DOE activities must: (1) Characterize planned and unplanned releases of liquids containing radionuclides from DOE activities, consistent with the potential for on- and off-site impacts and provide an assessment of radiological consequences as necessary to demonstrate compliance with the Specific Requirements of this CRD. (2) Comply with the ALARA process requirements in paragraph 2.d. of the Specific Requirements in this CRD. (3) Conduct activities to ensure that liquid releases containing radionuclides from DOE activities are managed in a manner that protects ground water resources now and, in the future, based on use and value considerations.	In compliance	EMP FRCM Article 1106, <i>Management of Environmental Waterborne Radioactivity</i> FESHM Chapter 8025, <i>Wastewater Discharge to Sanitary Sewers</i> FESHM Chapter 8026, <i>Surface Water Protection</i>	n/a	n/a	n/a	n/a
2.g.(4)	Conduct activities to ensure that liquid discharges containing radionuclides from DOE activities do not exceed an annual average (at the point of discharge) of either of the following:	Outlined in sections below.					
2.g.(4)(a)	5 pCi (0.2 Bq) per gram above background of settleable solids for alpha-emitting radionuclides.	Not applicable; FNAL does not discharge settleable solids containing alpha-emitting radionuclides.					
2.g.(4)(b)	50 pCi (2 Bq) per gram above background of settleable solids for beta-gamma-emitting radionuclides.	In compliance	EMP FRCM Article 1106, <i>Management of Environmental Waterborne Radioactivity</i>	n/a	n/a	n/a	n/a
2.g.(5)	Except for tritium and sanitary sewers, apply Best Available Technology (BAT) if at the point of discharge:	In compliance	EMP FRCM Article 1106, <i>Management of Environmental Waterborne Radioactivity</i> Levels of tritium are below the DOE limits. No BAT is required at FNAL. Should the unlikely conditions in sections	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
			2.g.(5)(a-c) arise at FNAL, the EMP will be revised to address it.				
2.g.(5)(a)-(c)	(a) The annual average concentration of a given radionuclide is greater than the DOE-approved derived concentration standard (DCS) value for water contained in the derived concentration Standard (DCS) value for water contained in the Derived Concentration Technical Standard, DOE-STD-1196-2011, or for multiple radionuclides, the composite DCS must be the sum of the fractional DCS values derived from DOE-approved DCS values; (b) The discharge contributes greater than 10 mrem (0.1 mSv) annual TED to members of the public; or (c) The collective dose from all DOE sources is greater than 100 person-rem (1 person-Sv) and the liquid discharge contributes 50 percent or more of this collective dose.	In compliance	FNAL's annual average concentration is well below the DOE DCS. See 2.g.(5) above.	n/a	n/a	n/a	n/a
2.g.(6)	Control releases of tritium in a manner that has been established by application of the ALARA process.	In compliance	EMP FRCM Chapter 11, <i>Environmental Radiation Monitoring and Control</i>	n/a	n/a	n/a	n/a
2.g.(7)	Conduct radiological activities to ensure that radionuclides from DOE activities contained in liquid effluents do not cause private or public drinking water systems to exceed the drinking water maximum contaminant levels in 40 CFR Part 141, <i>National Primary Drinking Water Regulations</i> .	In compliance	EMP FRCM Article 1104, <i>Public Dose Limits</i>	n/a	n/a	n/a	n/a
2.g.(8)	Control discharges into sanitary sewers in accordance with the following requirements:	Outlined in sections below.					
2.g.(8)(a)	Except for excreta from patients and medical research volunteers treated with radioactive material, discharges of liquids containing radionuclides from DOE activities into non-Federally owned sanitary sewers are prohibited unless: 1 The material is readily soluble (or readily dispersed biological materials) in water; 2 Such discharges comply with ALARA process requirements; 3 BAT is applied to discharges of liquid releases containing radionuclides from DOE activities if the average monthly concentration level at the point of discharge into the sanitary sewer is	In compliance	EMP FRCM Article 1106, <i>Management of Environmental Waterborne Radioactivity</i>	n/a		n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	<p>greater than five times the DOE-approved DCS values for ingestion except for tritium which is addressed under paragraph 2.g.(6);</p> <p>4 Releases do not result in an annual discharge (above background) into sanitary sewers in excess of 5 Ci (185 GBq) of tritium; 1 Ci (37 GBq) carbon-14 or 1 Ci (37 +GBq) of all other radionuclides combined;</p> <p>5 DOE operations are conducted to minimize long-term buildup of radionuclides in the sewage treatment plants that may create handling and disposal issues or interfere with plant operations;</p> <p>6 The contractor notifies the responsible Field Element Manager of unusual discharges to sanitary sewers from DOE facilities;</p> <p>7 The contractor prepares and provides a report that describes and summarizes such discharges to sanitary sewers to the responsible Field Element Manager at least annually; and</p> <p>8 Existing agreements, contracts, statements of understanding or other formal arrangements with other agencies concerning the discharge of liquids containing radionuclides from DOE activities to sanitary sewers are not violated.</p>						
2.g.(8)(b)	<p>DOE facilities discharging liquids containing radionuclides from DOE activities into sanitary sewer systems owned by the Federal government are not subject to the requirements in paragraph 2.g.(8)(a) of the Specific Requirements in this CRD if:</p> <p>1 The system provides treatment in accordance with the environmental radiological protection program and</p> <p>2 Sludge from the system is disposed of in accordance with the Specific Requirements in this CRD and</p>	Not applicable to FNAL; Releases go into publicly owned sanitary sewer.					
2.g.(9)	Prohibit the use of soil columns.	Not applicable to FNAL; Soil column is not used.					
2.g.(10)	Manage the disposition of non-process water potentially containing radionuclides from DOE activities to protect soil and ground water and prevent the creation of future cleanup sites.	In compliance	FRCM Article 1106, <i>Management of Environmental Waterborne Radioactivity</i>	n/a	n/a	n/a	n/a
2.g.(11)	Ensure that storm water runoff containing radionuclides from DOE activities is considered, as appropriate, as a pathway of exposure that has the potential for on- and off-site impacts. Using a graded approach, the receiving ecosystem including, but not limited to, wetlands, floodplains, streams, ponds, basins and lakes must be monitored to evaluate human or ecological impacts when warranted based on site specific risk.	In compliance	EMP FRCM Article 1106, <i>Management of Environmental Waterborne Radioactivity</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
2.h.	Radioactive Waste and Spent Nuclear Fuel. The contractor must establish and implement procedures and practices to ensure that management, storage and disposal of radioactive waste and spent nuclear fuel on DOE sites address the following elements:	Outlined in sections below.					
2.h.(1)	Radiological activities must be conducted in a manner such that radiation exposure to members of the public from management and storage of radioactive waste complies with ALARA process requirements and does not result in a TED greater than 25 mrem (0.25 mSv) in a year from all exposure pathways and radiation sources associated with the waste, except for transportation and radon and its decay products.	In compliance	FESHM Chapter 8021, <i>Chemical and Radioactive Waste Management</i> FRCM Chapter 4, Part 4, <i>Radioactive Waste Management</i>				
2.h.(2)	Management of spent nuclear fuel, and high-level and transuranic wastes at a disposal facility which is not regulated by the NRC must comply with the requirements of this CRD and 40 CFR Part 191, <i>Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-level and Transuranic Radioactive Wastes.</i>	Not applicable to FNAL; FNAL does not manage spent nuclear fuel nor high-level and transuranic wastes.					
2.h.(3)	Management, storage and disposal of low-level radioactive waste must be conducted in a manner such that exposure to members of the public to radiation from radioactive waste complies with ALARA process requirements, and does not exceed a TED of 25 mrem (0.25 mSv) in a year from all exposure pathways and radiation sources associated with the waste, except for transportation and radon and its decay products.	In compliance	FRCM Chapter 4, Part 4, <i>Radioactive Waste Management</i> FESHM Chapter 8021, <i>Chemical and Radioactive Waste Management</i> Low Level Waste Certification Program (LLWCP) ^[8] In general, the public is prohibited from all areas where radioactive waste may be present	n/a	n/a	n/a	n/a
2.h.(4)	Management, storage and disposal of 11e.(2) byproduct material, as defined in Section 11e.(2) of the AEA and other wastes containing uranium and thorium and their decay products which are not subject to the requirements of 40 CFR Part 192, <i>Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings</i> , are not	Not applicable to FNAL; The wastes from FNAL are only disposed of at NRC licensed or DOE facilities.					

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	at facilities licensed by the NRC, or are not disposed of at DOE low-level waste disposal facilities, must be in accordance with the requirements of paragraph 2.h. of the Specific Requirements in this CRD and DOE-approved plans.						
2.h.(5)	Discrete sources of radium-226, accelerator produced radioactive material, or naturally-occurring radioactive material (NORM) that pose a threat similar to discrete sources of radium-226, which are defined as Section 11e.(3) or 11e.(4) byproduct material in the AEA, must be managed as high-level waste, low-level waste or 11e.(2) material as appropriate under DOE AEA authorities and in compliance with the Specific Requirements in this CRD and the requirements in the CRD to DOE O 435.1 Chg 1.	Not applicable to FNAL; Fermilab radioactive waste management operations do not include such material.					
2.i	Protection of Drinking Water and Ground Water						
2.i.(1)	The contractor must establish and implement procedures and practices to ensure that DOE sites provide a level of radiation protection for persons consuming water from a drinking water system operated by DOE, directly or through a DOE contractor, which is equivalent to that provided to members of the public by the community drinking water standards of 40 CFR Part 141, <i>National Primary Drinking Water Regulations</i> (that is, not exceed the radionuclide maximum contaminant levels (MCLs)).	Not applicable to FNAL; The drinking water system is operated by the local municipalities.					
2.i.(2)	The contractor must protect ground water from radiological contamination to ensure compliance with dose limits in the Specific Requirements in this CRD and consistent with ALARA process requirements. To that end the contractor must ensure that:	In compliance	FESHM Chapter 8011, <i>Groundwater Protection – Excavations and Wells</i> FRCM Article 1106, <i>Management of Environmental Waterborne Radioactivity</i> EMP	n/a	n/a	n/a	n/a
2.i.(2)(a)	Baseline conditions of the ground water quantity and quality are documented;	In compliance	FESHM Chapter 8011, <i>Groundwater Protection – Excavations and Wells</i> FRCM Article 1106, <i>Management of Environmental Waterborne Radioactivity</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
			EMP				
2.i.(2)(b)	Possible sources of, and potential for, radiological contamination is identified and assessed;	In compliance	EMP FRCM Article 1106, <i>Management of Environmental Waterborne Radioactivity</i>	n/a	n/a	n/a	n/a
2.i.(2)(c)	Strategies to control radiological contamination are documented and implemented;	In compliance	EMP FRCM Article 1106, <i>Management of Environmental Waterborne Radioactivity</i>	n/a	n/a	n/a	n/a
2.i.(2)(d)	Monitoring methodologies are documented and implemented; and	In compliance	EMP FRCM Article 1106, <i>Management of Environmental Waterborne Radioactivity</i>	n/a	n/a	n/a	n/a
2.i.(2)(e)	Ground water monitoring activities are integrated with other environmental monitoring activities.	In compliance	FESHM Chapter 8011, <i>Groundwater Protection – Excavations and Wells</i> FRCM Chapter 11, <i>Environmental Radiation Monitoring and Control</i> EMP	n/a	n/a	n/a	n/a
2.j	Protection of Biota. The contractor must establish and implement procedures and practices to ensure that biota are protected and to address the following elements:	In compliance	FRCM Article 1104, <i>Public Dose Limits</i> EMP	n/a	n/a	n/a	n/a
2.j.(1)	Radiological activities that have the potential to impact the environment must be conducted in a manner that protects populations of aquatic animals, terrestrial plants, and terrestrial animals in local ecosystems from adverse effects due to radiation and radioactive material released from DOE operations.	In compliance	FRCM Article 1104, <i>Public Dose Limits</i> EMP	n/a	n/a	n/a	n/a
2.j.(2)	When actions taken to protect humans from radiation and radioactive materials are not adequate to protect biota then evaluations must be done to demonstrate compliance with paragraph 2.j.(1) of the Specific Requirements in this CRD in one or more of the following ways:	Not applicable; Fermilab activities to protect humans from radiation and radioactive materials are determined to be adequate to protect biota.					

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
2.j.(2)(a)	Use DOE-STD-1153-2002, <i>A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota</i> .	In compliance	FRCM Article 1104, <i>Public Dose Limits</i> EMP	n/a	n/a	n/a	n/a
2.j.(2)(b)	Use an alternative approach to demonstrate that the dose rates to representative biota populations do not exceed the dose rate criteria in DOE-STD-1153-2002, Table 2.2.	In compliance	FRCM Article 1104, <i>Public Dose Limits</i> EMP	n/a	n/a	n/a	n/a
2.j.(2)(c)	Use an ecological risk assessment to demonstrate that radiation and radioactive material released from DOE operations will not adversely affect populations within the ecosystem.	In compliance	See 2.j.(2)(b)	n/a	n/a	n/a	n/a
2k	Release and Clearance of Property. The contractor must establish and implement procedures and practices to ensure that release or clearance of property with the potential to contain residual radioactive material must be conducted in accordance with DOE direction and in accordance with the requirements in paragraph 2.k. of the Specific Requirements in this CRD.	In compliance	FRCM Chapter 2, Part 4, <i>Release Certification Program for Facilities Containing Radioactive Materials</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>	n/a	n/a	n/a	n/a
2.k.(1)	Property control and clearance processes must be developed and implemented in accordance with the dose limits in paragraph 2.b of the Specific Requirements in this CRD under any plausible use of the property and the ALARA process requirements in paragraph 2.d of the Specific Requirements in this CRD must be met before property is cleared.	In compliance	FRCM Chapter 2, Part 4, <i>Release Certification Program for Facilities Containing Radioactive Materials</i> FRCM Chapter 3, Part 5, <i>Fermilab ALARA Program</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
2.k.(2)	Dose Constraints. Unless alternative dose constraints are approved by issuance of a directive or memorandum by the Chief Health, Safety and Security Officer or for NNSA, the Cognizant Secretarial Officer in consultation with the Chief Health, Safety and Security Officer, the following dose constraints for DOE residual radioactive material must be applied to each specific clearance of property for any actual or likely future use of the property:	In compliance	FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i> FRCM Article 1104, <i>Public Dose Limits</i>	n/a	n/a	n/a	n/a
2.k.(2) (a)	Real property – a TED of 25 mrem (0.25 mSv) above background in any calendar year;	In compliance	FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i> FRCM Article 1104, <i>Public Dose Limits</i>	n/a	n/a	n/a	n/a
2.k.(2) (b)	Personal property - a TED of 1 mrem (0.01 mSv) above background in any calendar year.	In compliance	Radiation Physics Note #109, <i>Radioactivity Release Criteria for Materials, Equipment, and Waste</i> ^[9]	n/a	n/a	n/a	n/a
2.k.(3)	Residual Radioactive Material. Property potentially containing residual radioactive material must not be cleared from DOE control unless either:	Outlined in sections below					
2.k.(3) (a)	The property is demonstrated not to contain residual radioactive material based on process and historical knowledge, radiological monitoring or surveys, or a combination of these; or	In compliance	FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>	n/a	n/a	n/a	n/a
2.k.(3) (b) (1 – 4)	The property is evaluated and appropriately monitored or surveyed to determine: those stated in 2.k.(3)(b) <u>1 - 4</u> . 1 The types and quantities of residual radioactive material within the property; 2 The quantities of removable and total residual radioactive material on property surfaces (including residual radioactive material present on and under any coating); 3 That for property with potentially contaminated surfaces that are difficult to access for radiological monitoring or surveys, an evaluation of residual radioactive material on such surfaces is performed which is: a Based on process and historical knowledge meeting the requirements of paragraph 2.k.(5) of the Specific Requirements in this CRD and monitoring and or surveys, to the extent feasible and	In compliance	FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	b Sufficient to demonstrate that applicable specific or pre-approved DOE Authorized Limits will not be exceeded; and 4 That any residual radioactive material within or on the property is in compliance with applicable specific or pre-approved DOE Authorized Limits.						
2.k.(4)	Evaluation of the Need for Maintaining Institutional Controls for Real Property. Real property under evaluation for clearance from DOE radiological controls must be evaluated against the need for maintaining institutional controls or impacting long-term stewardship of adjacent DOE real property. In situations where transfer of the real property to other use would impact long-term radiological protection of adjacent DOE properties, it must be demonstrated that the impact of the property clearance would not result in noncompliance for the adjacent property with the requirements of applicable statutes, regulations or DOE directives.	In compliance	FRCM Chapter 2, Part 4, <i>Release Certification Program for Facilities Containing Radioactive Materials</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>	n/a	n/a	n/a	n/a
2.k.(5)	Process and Historical Knowledge. Contractors responsible for radiological clearance of property, when they rely in part, on process knowledge as a basis for clearance decisions, must establish a documented evaluation process, using a graded approach, for applying process and historical knowledge to determine if property potentially contains residual radioactive material.	In compliance	FRCM Chapter 4, Part 1, <i>Radioactive Material Identification, Storage, and Control</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>	n/a		n/a	n/a
2.k.(5)(a)	This process must include procedures for evaluating operational records and operating history, including the use of any radioactive materials or radiation generating devices.	In compliance	FRCM Chapter 4, Part 1, <i>Radioactive Material Identification, Storage, and Control</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>	n/a		n/a	n/a
2.k.(5)(b)	For real property, this process must address each specific property individually. If several parcels of land are contiguous, or if several structures are located in the same area and have a common operational history, a single evaluation for all of the properties is acceptable.	In compliance	FRCM Chapter 2, Part 4, <i>Release Certification Program for Facilities Containing Radioactive Materials</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>		n/a		

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
2.k.(5)(c)	If available process and historical knowledge cannot demonstrate that property does not contain residual radioactive materials, radiological monitoring or surveys must be conducted to supplement process and historical knowledge evaluations.	In compliance	FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>	n/a	n/a	n/a	n/a
2.k.(5)(d)	If not supplemented by radiological surveys, process and historical knowledge evaluations must be adequate to determine: 1 Whether the property has ever been used for radiological activities or in areas that could have resulted in the presence of residual radioactive material within or on the property or 2 Whether property formerly containing residual radioactive material has been decontaminated and demonstrated to meet DOE Authorized Limits, and has not been used in a manner or in areas that could have resulted in the re-contamination of the property.	In compliance	FRCM Chapter 4, Part 1, <i>Radioactive Material Identification, Storage, and Control</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>	n/a	n/a	n/a	n/a
2.k.(5)(e)	For property that is determined to potentially contain residual radioactive material under paragraph 2.k.(5)(d) <u>1</u> of the Specific Requirements in this CRD or determined to be re-contaminated under paragraph 2.k.(5)(d) <u>2</u> of the Specific Requirements in this CRD, the process and historical knowledge evaluation must also include an assessment of the types and quantities of residual radioactive material and the sources and pathways by which the property became contaminated.	In compliance	FRCM Chapter 4, Part 1, <i>Radioactive Material Identification, Storage, and Control</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>	n/a	n/a	n/a	n/a
2.k.(6)	Authorized Limits.	Outlined in sections below.					
2.k.(6)(a)	Authorized Limits for the clearance of any property with residual radioactive material must provide reasonable assurance that the requirements of paragraphs 2.k.(1) and 2.k.(2) of the Specific Requirements in this CRD are met. Authorized Limits may be applied to property for which process knowledge cannot establish the absence of residual radioactive material and in which the presence of residual radioactive material cannot be determined.	In compliance	FRCM Chapter 4, Part 1, <i>Radioactive Material Identification, Storage, and Control</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i> Radiation Physics Note #109, <i>Radioactivity Release Criteria for Materials, Equipment, and Waste</i>	n/a	n/a	n/a	n/a
2.k.(6)(b)	Authorized Limits must: 1 Be developed in accordance with the ALARA requirements in paragraph 2.d. of the Specific Requirements in this CRD.	In compliance	FRCM Chapter 4, Part 1, <i>Radioactive Material Identification, Storage, and Control</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

[DOE Order 458.1, Chg. 4 \(LtdChg\) – Radiation Protection of the Public and the Environment \(9/15/2020\)](#)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	2 Be based on the applicable dose constraint, supported by a complete exposure pathway analysis using appropriate methodologies, techniques, parameters and models (such as the RESRAD family of codes) that meet DOE quality assurance requirements under the CRD to DOE O 414.1D Quality Assurance, dated 4-25-11. 3 Be expressed in terms of concentration of radioactivity per unit surface area (e.g., dpm per 100 cm ²), radioactivity per unit mass (e.g., pCi per gram) or volume (e.g., pCi per ml), total radioactivity, or DOE controls and restrictions, if applicable. 4 Explicitly state any restrictions or conditions on future use of the property necessary to ensure the basic dose limit and applicable dose constraint are not exceeded. 5 In addition to paragraphs 2.k.(6)(b)1-4 of the Specific Requirements in this CRD for clearance of personal property only: a Be based on expected annual quantity of property to be cleared or b Be based on expected total amount of property cleared over the life of the project for specific remedial action or decontamination and decommissioning projects and c Prior to clearance of metals, the contractor must provide the necessary information to support a determination by the Field Element Manager that there is no practical internal DOE opportunity for reuse or recycle of the material or equipment. 6 Authorized limits must be submitted to the Field Element Manager to obtain DOE approval.		FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i> Radiation Physics Note #109, <i>Radioactivity Release Criteria for Materials, Equipment, and Waste</i>				
2.k.(6)(c)	Applications for DOE approval of Authorized Limits must contain the following: 1 A description of the property. 2 Specific limits proposed for each radionuclide or group of radionuclides and/or external radiation exposure, surrogate metrics, or conditions used to limit radionuclides. 3 Potential collective dose to the exposed population and the potential dose to a member of the public most likely to receive the highest dose for both: actual or likely future use, and plausible future use of the property.	In compliance	FRCM Chapter 4, Part 1, <i>Radioactive Material Identification, Storage, and Control</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i> Radiation Physics Note #109, <i>Radioactivity Release Criteria for Materials, Equipment, and Waste</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	4 ALARA assessments conducted under paragraph 2.d. of the Specific Requirements in this CRD for the proposed clearance action to include, at a minimum, the effects of: a Implementing the proposed Authorized Limits; b Implementing alternative levels of residual radioactive material instead of the proposed Authorized Limits; c Not implementing the proposed Authorized Limits, i.e., not proceeding with the proposed clearance action. 5 A description of the procedures and radiological monitoring or surveys to be used to demonstrate compliance with proposed limits. 6 Identification of any restrictions or conditions on the future use of the property upon which the proposed limits are based, and the means by which the restrictions or conditions will be implemented and maintained. 7 An estimated date for when the property will be cleared and an estimate of when the property will be released from DOE control.						
2.k.(6)(d)	Property covered by Authorized Limits is subject to 10 CFR Part 835 requirements unless the criteria in paragraphs 2.k.(6)(a) through (c) of the Specific Requirements in this CRD have been met and the Authorized Limits have been approved by a Cognizant Secretarial Officer in consultation with the Chief Health, Safety and Security Officer as required by the 10 CFR Part 835 exclusion.	In compliance	FRCM Chapter 4, Part 1, <i>Radioactive Material Identification, Storage, and Control</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i> Radiation Physics Note #109, <i>Radioactivity Release Criteria for Materials, Equipment, and Waste</i>	n/a	n/a	n/a	n/a
2.k.(6)(e)	Revision of Authorized Limits. If established Authorized Limits are found to be not protective, appropriate or practical to apply for a specific type or portion of property, further clearance for that specific type or portion of property must not proceed without revised Authorized Limits. 1 An application for revised Authorized Limits must be submitted in accordance with the requirements in paragraphs 2.k.(6)(a) through (d) of the Specific Requirements in this CRD. 2 In addition to the requirements of applicable paragraphs of 2.k.(6) of the Specific Requirements in this CRD, requests for approval of revised Authorized Limits must include a justification for the need for	In compliance	FRCM Chapter 4, Part 1, <i>Radioactive Material Identification, Storage, and Control</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i> Radiation Physics Note #109, <i>Radioactivity Release Criteria for Materials, Equipment, and Waste</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	<p>the revised Authorized Limits. Justifications for revised Authorized Limits must be based upon one of the following:</p> <p>a Complying with existing Authorized Limits would pose a clear and present risk of injury to general employees or members of the public; or</p> <p>b Complying with existing Authorized Limits, would produce environmental harm (e.g., destruction of artifacts, ecological damage, loss of cultural assets) that is clearly excessive compared to the potential health benefits to persons exposed to affected properties; or</p> <p>c Complying with existing Authorized Limits is unreasonably costly relative to long-term benefits and where the residual radioactive material does not pose a clear present or future potential of exceeding the public dose limit of paragraph 2.b. of the Specific Requirements in this CRD; or</p> <p>d Portions of the project or activity for which the scenarios or assumptions used to establish the existing Authorized Limits are overly conservative, or where more appropriate scenarios or assumptions indicate that other limits are applicable or appropriate for protection of the public and the environment; or</p> <p>e New information which indicates the existing Authorized Limits are not sufficient to meet the protective requirements established by DOE.</p>						
2.k.(6)(f)	<p>Pre-Approved Authorized Limits.</p> <p>1 The following values have been pre-approved by DOE for use as Authorized Limits, and may be used as specified below instead of developing specific Authorized Limits.</p> <p>a For radium-226 and radium-228 in soil - 5 pCi/gram (0.2 Bq/gram) in excess of background levels, averaged over 100 m², in the first 15 cm depth of the surface layer of soil; and 15 pCi/gram (0.56 Bq/gram) in excess of background levels, averaged over any subsequent 15 cm subsurface layer of soil plus an ALARA assessment. If both thorium-230 and radium-226 or both thorium-232 and radium-228 are present and not in secular equilibrium, the appropriate pre-approved limit must be applied to the radionuclide with the higher concentration.</p> <p>b Previously approved guidelines and limits (such as the surface activity guidelines) may continue to be applied and used as Pre-</p>	In compliance	<p>FRCM Chapter 4, Part 1, <i>Radioactive Material Identification, Storage, and Control</i></p> <p>FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i></p> <p>Radiation Physics Note #109, <i>Radioactivity Release Criteria for Materials, Equipment, and Waste</i></p>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	Approved Authorized Limits until they are replaced or revised by Pre-Approved Authorized Limits issued by the Department. 2 Pre-Approved Authorized Limits may be used for any radiological activity instead of developing specific Authorized Limits if their use is documented in the environmental radiological protection program and the specific application of the Authorized Limits is approved by the responsible Field Element Manager.						
2.k.(6)(g)	Documentation of Approved Authorized Limits. Approved Authorized Limits and approved revised Authorized Limits and supporting documentation must be made available to the public.	In compliance	FRCM Chapter 4, Part 1, <i>Radioactive Material Identification, Storage, and Control</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i> Radiation Physics Note #109, <i>Radioactivity Release Criteria for Materials, Equipment, and Waste</i>	n/a	n/a	n/a	n/a
2.k.(7)	Clearance of Environmental Restoration, Deactivation and Decommissioning, and Other Cleanup Materials.	Not applicable to FNAL; FNAL currently has no plan for such activities.					
2.k.(8)	Radiological Monitoring or Surveys.	Outlined in sections below.					
2.k.(8)(a)	All radiological monitoring or surveys performed in support of clearance of property 1 Use methodologies sufficient to meet measurement objectives such as those in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), the Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual (MARSAME) or other methodologies approved by DOE; 2 Meet Measurement Quality Objectives; 3 Use DOE-approved sampling and analysis techniques, if applicable; and 4 Include an evaluation of non-uniformly distributed residual radioactive material, if applicable.	In compliance	FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i> FRCM Chapter 5, Part 5, <i>Radiological Monitoring and Surveys</i>	n/a	n/a	n/a	n/a
2.k.(8)(b)	Instrumentation used for radiological monitoring or surveys must be capable of detecting and quantifying residual radioactive material consistent with the applicable Authorized Limits, and be: 1 Periodically maintained and calibrated on an established frequency;	In compliance	FRCM Chapter 5, Part 5, <i>Radiological Monitoring and Surveys</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	2 Appropriate for the type(s), levels, and energies of the radiation(s) encountered; and 3 Appropriate for existing environmental conditions and routinely tested for operability.		FRCM Chapter 5, Part 6, <i>Instrumentation and Calibration</i>				
2.k.(9)	Documentation and Verification. Any contractor responsible for radiological clearance of property must ensure that final radiological monitoring or surveys are conducted and that documentation is prepared that shows that the clearance meets applicable DOE Authorized Limits, or other applicable requirements including associated restrictions or institutional controls (See DOE P 454.1).	In compliance	FRCM Chapter 2, Part 4, <i>Release Certification Program for Facilities Containing Radioactive Materials</i> FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>	n/a	n/a	n/a	n/a
2.k.(10)	Public Notification of Clearance of Property. Information on approved Authorized Limits, any approved revised Authorized Limits, use of pre-approved Authorized Limits, results of radiological monitoring and surveys of cleared property with type and quantity of property cleared, and independent verification results must be summarized in the Annual Site Environmental Report.	In compliance	Report to the Director on the Fermilab Environment (annual)	n/a	n/a	n/a	n/a
2.k.(11)	Final Clearance Documentation. Clearance of property must be documented. The contents of the documentation or the mechanism for documenting information may be tailored to the need, situation, and type of property being cleared. For ongoing, routine clearances, e.g., clearance of personal property from controlled areas, such documentation may be based on the general process(es) rather than each specific clearance. In general, the documentation must describe the clearance process(es) and the property being cleared. The documentation must serve to demonstrate requirements have been met, show criteria used for clearance, identify the property's destination or disposition, as appropriate, and provide additional confidence to DOE and assurance to other interested parties that the public and the environment are being protected. The documentation must indicate any Authorized Limits, including any revised or pre-approved Authorized Limits, used for the clearance, and include information and data supporting the clearance of property such as radiological certification and independent verification results. An annual summary of cleared property must be prepared and submitted to the Field Element Manager.	In compliance	FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i> -see also, Material Move Request (MMR) form accompanies all material transfers and documents material destination and disposition	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
2.1	Records, Retention and Reporting Requirements. The contractor must establish and implement recordkeeping, retention and reporting procedures and practices to ensure that the following elements are addressed:	Outlined in sections below.					
2.1.(1)	Records must be maintained to document compliance with the Specific Requirements in this CRD.	In compliance	FRCM Chapter 7, <i>Radiological Records</i> This SCP	n/a	n/a	n/a	n/a
2.1.(2)	Required records include the following:	Outlined in sections below.					
2.1.(2)(a)	Information and data necessary to identify and characterize releases of radioactive material to the environment, their fate in the environment, and their probable impact on radiation dose to members of the public, and any impacts on ecological systems.	In compliance	Report to the Director on the Fermilab Environment (annual)	n/a	n/a	n/a	n/a
2.1.(2)(c)	Requests for specific authorization for temporary public dose limits, and subsequent approvals and other related actions.	Not applicable to FNAL; Program policy does not allow such requests. Reference ?					
2.1.(2)(d)	Identification of radiological activities subject to environmental radiological protection program requirements, and descriptions of the measures to be used in implementing these requirements.	In compliance	FRCM Chapter 11, <i>Environmental Radiation Monitoring and Control</i>	n/a	n/a	n/a	n/a
2.1.(2)(e)	Documentation of actions taken to implement the ALARA process identified in paragraph 2.d. of the Specific Requirements in this CRD.	In compliance	FRCM Article 742, <i>ALARA Records</i> -see also, RWPs, ALARA Plans	n/a	n/a	n/a	n/a
2.1.(2)(f)	Documentation of actions taken to demonstrate compliance with the public dose limit (See paragraph 2.e.(1) of the Specific Requirements in this CRD).	In compliance	Report to the Director on the Fermilab Environment (annual) FRCM Article 731, <i>Record Requirements</i>	n/a	n/a	n/a	n/a
2.1.(2)(g)	Documentation of actions taken to implement the BAT selection process in regulating liquid discharges, including documentation of analyses and factors considered to be important, including alternative processes, for the BAT selection process.	Not applicable to FNAL; The only potentially radioactive liquid discharges are: 1) very low levels of tritium to the surface, which are performed in a manner established by the ALARA process and, 2) discharges into sanitary sewers, for which extensive monitoring data exists to demonstrate that levels are far below DCS values.					
2.1.(2)(h)	Effluent monitoring and environmental surveillance information and data, including: 1 Results of effluent monitoring for determining sources of radiation and radioactive material that provide direct exposure to members of the public and releases of radioactive material in liquid or airborne effluent;	In compliance	FESHM Chapters 8000, <i>Environmental Management System</i> FRCM Chapter 11, <i>Environmental Radiation Monitoring and Control</i>	n/a	n/a	n/a	n/a

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
	2 Results of surveys for radiation and radioactive material in the environment; 3 Results of surveys, measurements, and calculations used to determine the dose to members of the public and ecological receptors from external and internal radiation sources; 4 Meteorological data used in assessing dose; and 5 Results of pre-operational monitoring.		Report to the Director on the Fermilab Environment (annual)				
2.I.(2) (i)	Documentation related to the long-term management of radioactive waste and residual radioactive material.	In compliance	FRCM Chapter 4, Part 4, <i>Radioactive Waste Management</i> FESHM 8021, <i>Chemical and Radioactive Waste Management</i> LLWCP	n/a	n/a	n/a	n/a
2.I.(2) (j)	Final documentation for clearance of property containing residual radioactive material.	In compliance	FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i> -see also, Material Move Request (MMR) form accompanies all material transfers and documents material destination and disposition	n/a	n/a	n/a	n/a
2.I.(2) (k)	Documentation of: 1 Approved Authorized Limits for routine clearance of property for unrestricted or restricted use and the scenarios evaluated in selecting the limits; and 2 Approved revised Authorized Limits for clearance of property.	In compliance	FRCM Chapter 4, Part 2, <i>Release and Transportation of Radioactive Material</i>	n/a	n/a	n/a	n/a
2.I.(2) (l)	Annual summaries related to clearance of property.	In compliance	Report to the Director on the Fermilab Environment (annual)	n/a	n/a	n/a	n/a
2.I.(3)	Records required by the Specific Requirements in this CRD must be maintained by, or transferred to, DOE upon cessation of a DOE radiological activity at a site.	In compliance	FNAL will transfer all documents required by the CRD to DOE upon cessation of operations	n/a	n/a	n/a	n/a
2.I.(4)	Records must be retained until final disposition is authorized by DOE .	In compliance	Policy on Records Management ^[10]	n/a	n/a	n/a	n/a
2.I.(5)	Reporting.	Outlined in sections below.					

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
 Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

DOE Order 458.1, Chg. 4 (LtdChg) – Radiation Protection of the Public and the Environment (9/15/2020)

Site Compliance Plan

December 3, 2020

CRD §	Requirements from CRD, Attachment 1	Compliance Status	Method of Compliance	Deliverables*			
				Item	Frequency	Due Date(s)	Recipient (e.g., SSO)
2.I.(5)(a)	Reporting requirements are contained in the CRDs to DOE O 232.2, <i>Occurrence Reporting and Processing of Operations Information</i> , dated 8-30-11, and DOE O 231.1B, <i>Environment, Safety and Health Reporting</i> , dated 6-27-11.	In compliance	FESHM 3000, <i>Investigation and Reporting</i>	n/a	n/a	n/a	n/a
2.I.(5)(b)	The contractor must notify the Field Element Manager within 30 calendar days when it has been identified that any Specific Requirement in this CRD that is not required to be reported under paragraph 2.I.(5)(a) has not been met.	In compliance	FNAL will notify the Field Element Manager should this situation occur.	n/a	n/a	n/a	n/a
2.I.(6)	Units. Unless otherwise specified, the quantities used in the reports and records required by the Specific Requirements of this CRD must be clearly indicated in special units of curie, rad, roentgen, or rem, including multiples and subdivisions of these units, or other conventional units, such as dpm, dpm/100 cm ² , or mass units. The SI units, becquerel (Bq), gray (Gy), and sievert (Sv) may be provided parenthetically for reference with scientific standards.	In compliance	FRCM Article 713, <i>Recordkeeping Standards</i>	n/a	n/a	n/a	n/a

(end CRD)

*Deliverables: Data delivered to DOE or other external agency (e.g., recurring reporting, external database entries)



Fermi National Accelerator Laboratory (FNAL)
Operated by Fermi Research Alliance, LLC for the U.S. Department of Energy

[DOE Order 458.1, Chg. 4 \(LtdChg\) – Radiation Protection of the Public and the Environment \(9/15/2020\)](#)

Site Compliance Plan

December 3, 2020

FNAL Reference Documents

- 1) Memo Weiss to Chrisman, Crosswalk between DOE O 458.1 Requirements and Fermilab's ES&H program, April 2012, ESH-doc-1937
- 2) Fermilab Environmental, Safety, and Health Manual (FESHM)
- 3) Fermilab Radiological Control Manual (FRCM)4)
- 4) Fermilab Environmental Management System (EMS)
- 5) Radiological Work Permit (RWP)
- 6) Fermilab Safety Assessment Document (SAD), ESH-doc-1066
- 7) Report to the Director on the Fermilab Environment (annual), ESH-doc-1847
- 8) Low Level Waste Certification Program (LLWCP), ESH-doc-3046
- 9) Radiation Physics Note #109, *Radioactivity Release Criteria for Materials, Equipment, and Waste*, ESH-doc-2202
- 10) Policy on Records Management, DIRECTORATE-doc-9. More information can be found at <https://ird.fnal.gov/records-management/>

FNAL Site Security Plan (SSP) Measures

Access by members of the public to areas controlled for radiological purposes is limited by locked doors and/or postings and fencing. Members of the public are permitted unescorted access only to a limited area of the Fermilab site, which is enforced by security forces at site entrances as well as security patrols. Areas outside of posted controlled areas are limited by the Fermilab Radiological Control Manual (FRCM) to dose rates of no greater than 0.05 mrem/hr. Based on the SSP controls, members of the public are not assumed to be on site for a length of time that would allow them to approach dose limits listed in the CRD above.