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Los Alamos National Laboratory

Los Alamos Plutonium Operations FY22–FY28 Program Management Plan

September 2021

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Executive Summary

The Department of Energy (DOE) National Nuclear Security Administration (NNSA) plutonium missions are critical to meeting military requirements to ensure the U.S. nuclear deterrent is modern, responsive, and resilient. A major national priority is to reestablish the capability and capacity for pit production. Accordingly, in 2018 NNSA directed Los Alamos National Laboratory (LANL) to deliver a minimum of 30 War Reserve (WR) pits in CY2026.

Los Alamos National Laboratory (LANL) is designated by NNSA as the nation's Plutonium Center of Excellence. LANL has an experienced and skilled workforce, high-hazard nuclear facilities and associated infrastructure, and unique plutonium processing, fabrication, and experimental capabilities. The nation relies on LANL to perform the following:

- Produce plutonium pits for the nuclear weapons stockpile
- Produce radioisotope thermoelectric generators (RTGs) for the nuclear weapons stockpile
- Produce Pu-238 heat sources for use by space exploration and national security
- Evaluate pits and RTGs returned from the nuclear weapons stockpile to support annual stockpile assessments and to inform future pit and RTG designs
- Produce plutonium components for assembly into devices used in subcritical experiments
- Perform fundamental science on the material properties and aging of plutonium
- Process plutonium into forms suitable for disposition to support nonproliferation goals
- Recover americium for the DOE Office of Science

To better support expanding the pit production mission at LANL, in FY21 NNSA combined the LANL portions of the Plutonium Sustainment, Material Recycle and Recovery (MR&R), and Storage programs into a single new program called Los Alamos Plutonium Operations, which is one of several programs and line-item projects within the Plutonium Modernization program portfolio. This new program funds LANL for the scope directly related to achieving the 30 ppy pit production mission.

This document is the Los Alamos Plutonium Operations Program Management Plan (PMP) for FY22 through FY28. FY28 information is limited and is provided in addition to the more detailed FY22–FY27 information to facilitate the start of the FY23–FY28 FYNSP budget planning. This PMP is part of the FY22 Horizon Plan submitted by LANL to NNSA.

LANL manages the other plutonium programs in accordance with LANL's response (dated July 22, 2021) to the memorandum from M. Thompson to T. Wyka, *Prioritization of Programmatic Activities at Los Alamos National Laboratory's (LANL) Plutonium Facility (PF)-4*, dated June 22, 2021 (NNSA-2021-002838) and the associated Contract Officer letter dated June 24, 2021 (MAI: 33TF-2021-003031).

The timeline of the critical goals to achieve steady-state production of 30 ppy is listed below:

(b) (5)

CY2023:
- Produce and diamond stamp the first production unit (FPU) of a WR-quality pit

(b) (5)

CY2024:
- Produce and diamond stamp a minimum of 10 WR pits

(b) (5)

CY2025:
- Produce and diamond stamp a minimum of 20 additional WR pits

(b) (5)

CY2026:
- Produce and diamond stamp a minimum of 30 additional WR pits

(b) (5)

Summarized below are the critical challenges LANL faces and the actions LANL will take to expand pit production. Although the Los Alamos Plutonium Operations program is not fully responsible for all of the challenges listed below, it is a stakeholder for all of them.

Produce a WR pit in 2023.

Production of the first WR pit will use equipment and staff available today with processes that will be matured within the next one to two years.

(b) (5)

Challenge 2: Ensure TA-55 PF-4 is reliably available for all plutonium-related missions.

(b) (5)

Challenge 3: Maintain and update TA-55 PF-4, (b) (5)
(b) (5)

Achieve an annual 30 ppy production rate by 2026.

(b) (5)

Challenge 4: Reconfigure TA-55 PF-4 for efficient pit production.

Path Forward: Complete the ongoing equipment installations and facility modifications to optimize the pit production process flow (b) (5)
(b) (5)

Challenge 5: Recruit, hire, train, and retain the workforce required for the pit production mission.

Path Forward: Execute a LANL workforce strategy that addresses the staffing required for pit production, including the site-wide staffing required for enabling functions. LANL is refining and implementing the plan to recruit, hire, train, and retain the workforce necessary for the pit production mission. The additional workforce requires new infrastructure for offices, parking, training, and production development.

Integrate and execute all plutonium missions efficiently and reliably.

To deliver on all plutonium missions and be responsive to emerging requirements, the business systems and operational methodologies of the plutonium enterprise must be strengthened.

Challenge 6: Enhance, standardize, and implement program management tools.

Path Forward: Integrate all plutonium missions operating at TA-55 using standard project management methods and the scheduling software Primavera P6. Define and document the DOE and NNSA requirements for all plutonium missions at LANL through FY27. Develop and integrate resource-loaded baseline schedules with float to be successful on all plutonium missions. Manage the change control process with appropriate thresholds for LANL, NNSA, and DOE review and approval.

(b) (5)

In this PMP, the Los Alamos Plutonium Operations program scope is discussed in four subsections, sometimes referred to as functional areas:

Pit and SCE Production—Development and production of pits and plutonium components for subcritical experiments (SCEs)

Plutonium Supply Chain—Purification of plutonium metal, recovery of plutonium from production byproducts and waste streams, and nuclear material storage

Operational Support and Equipment Maintenance—Above-base services required to execute programmatic scope (e.g., criticality safety, radiation protection, training, and glovebox maintenance); disposition and shipment of radioactive waste; and maintenance of programmatic equipment

Capital Acquisition Projects—Design, procurement, installation, and D&D required to establish the process equipment and gloveboxes (b) (5)
(b) (5)

The planned workforce and anticipated costs from the resource-loaded Horizon Baseline P6 schedule are shown by functional area in the following figures.

(b) (5)

(b) (5)

Appendix A of this document, the Modernization Uncertainty & Risk Analysis (MURA), discusses the significant risks associated with achieving WR pit production mission requirements during the FY22–FY28 performance period. Appendix A includes the impacts of the COVID-19 pandemic (pursuant to Action 4 of Contract Office Letter U2100767: Plutonium Modernization 10 Pit Capital Equipment – Planning and Performance Expectations, dated July 21, 2021) with notional budgetary and schedule impacts. Several significant risks, uncertainties, and issues are also included for perspective of the other NNSA sites, Los Alamos Field Office, and NNSA Plutonium Program Office (NA-191). The following items are tracked as areas of concern and high-impact uncertainties.

Areas of concern:

(b) (5)

High-impact uncertainties:

(b) (5)

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List of Acronyms

AC	Analytical Chemistry
B&R	Budget and Reporting Code
CAT III	Security Category 3
CCP	Central Characterization Program
CD	Critical Decision
CD-0	Critical Decision 0 (Approve Mission Need)
CD-1	Critical Decision 1 (Approved Alternative Selection and Cost Range)
CD-2	Critical Decision 2 (Performance Baseline)
CD-3	Critical Decision 3 (Start Construction)
CD-4	Critical Decision 4 (Approve Start of Operations or Project Completion)
CER	Complete Engineering Release
CMR	Chemistry and Metallurgy Research (Building)
CMRR	Chemistry and Metallurgy Research Replacement
CSED	Criticality Safety Evaluation Document
D&D	Decontamination and Decommissioning
DA	Design Agency
DB	Drop Box
DEV	Development (phase in product realization process)
DOE	Department of Energy
DPBPS	Defense Programs Business Process System
DSA	Documented Safety Analysis
ECF	Entry Control Facility
EE	Engineering Evaluation
EHT	Equipment Hot Testing
EIL	Equipment and Infrastructure List
ES&H	Environment, Safety, and Health
FDR	Final Design Review
FPU	First Production Unit
FST	Full-Scale Test
FTE	Full-Time Equivalent
FYNSP	Future Years Nuclear Security Program
GB	Glovebox
HENC	High-Efficiency Neutron Counter
HC-3	Hazard Category 3
HRP	Human Reliability Program
IAW	In Accordance With
IPT	Integrated Project Team or Integrated Product Team
IRT	Integrated Review Tool
KCNSC	Kansas City National Security Campus
LANL	Los Alamos National Laboratory

LAP4	Los Alamos Plutonium Pit Production Project
LLNL	Lawrence Livermore National Laboratory
LLW	Low-Level (radioactive) Waste
MAR	Material at Risk
MC	Materials Characterization
MC&A	Material Control and Accountability
MIE	Major Item of Equipment
MMP	Manufacturing Modernization Project
MR	Management Reserve
MR&R	Material Recycle and Recovery
MRT	Milestone Reporting Tool
MT	Metric Ton
NA-10	NNSA Office of Defense Programs
NA-19	NNSA Office of Production Modernization
NA-191	NNSA Plutonium Program Office
NA-50	NNSA Office of Safety, Infrastructure, and Operations
NA-70	NNSA Office of Defense Nuclear Security
NA-APM	NNSA Office of Acquisition and Project Management
NA-LA	NNSA Los Alamos Field Office
NAP	NNSA Administrative Policy
NDA	Nondestructive Assay
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
PA	Production Agency
PF-4	Plutonium Facility Building 4
POC	Pipe Overpack Container
PPI	Process Prove-In (phase in product realization process)
PPIV	Positive Personnel Identification and Verification
ppy	Pits per Year
PRP	Product Realization Process
PRT	Product Realization Team
QER	Qualification Evaluation Release
QUAL	Qualification (phase in product realization process)
RANT	Radioassay and Nondestructive Testing (Facility)
RC3	Re-Categorizing RLUOB to Hazard Category 3
RCT	Radiological Control Technician
RLUOB	Radiological Laboratory Utility Office Building
RLW	Radiological Liquid Waste
RLWTF	Radioactive Liquid Waste Treatment Facility
ROM	Rough Order of Magnitude
S&CL	Standards and Calibration Laboratory
SNM	Special Nuclear Material

SWEIS	Site-Wide Environmental Impact Statement
TA	Technical Area
TLW	Transuranic Liquid Waste
TRU	Transuranic
TTO	Turnover to Operations
TTP	Turnover to Production
TWF	Transuranic Waste Facility
WIPP	Waste Isolation Pilot Plant
WR	War Reserve
XB	Introduction Box

Definition of Terms

Term or Concept	Definition or Meaning
General	
Horizon Baseline	• Per the NA-191 PCPs, the Horizon Baseline is a higher fidelity expression of the FYNSP estimate. • LANL uses the term "Horizon Baseline" when referring to the resource-loaded schedule in Primavera P6 (available as a P6 .XER file)
Horizon Plan	• LANL uses the term "Horizon Plan" to refer to the Horizon Baseline and associated documents, such as this program management plan and other NA-191–required documents.
Plutonium Enterprise	• A system of facilities, utilities, equipment, processes, materials, and workforce that enables the entirety of work with plutonium and other materials and components to deliver on the plutonium missions for the nation. • **LANL plutonium enterprise** includes TA-55 PF-4 as the focal point with RLUOB, CMR, RLWTF, LLW, TWF, RANT, SIGMA and other supporting facilities and capabilities across LANL that are critical to the operations in TA-55 PF-4. • **National plutonium enterprise** comprises DOE/NNSA facilities and capabilities, including LANL, LLNL, SNL, Pantex, NNSS, KCNSC, SRS, WIPP, PNNL, ORNL, and universities and vendors.
(b) (5), (b) (7)(E), (b) (7)(F)	
Staffing	
LANL Staff	• Workers employed by Triad National Security, LLC to perform programmatic (direct-funded) and overhead support (indirect-funded) scope.
Craft	Workers performing maintenance, equipment installation, and line-item and other construction across the LANL plutonium enterprise. • **LANL craft** are managed by LANL through union contracts. • **Subcontract craft** are managed by an outside company to work for LANL. Subcontract craft typically are not authorized to work inside TA-55 PF-4.
Subcontractor	• Workers employed by an outside company to provide services defined in a contract with Triad National Security, LLC, such as the protective force, staff augmentation labor to temporarily supplement LANL staff, and temp-to-hire staff.
Protective Force	• Subcontract staff employed by Centerra-Los Alamos to provide physical security services for LANL. The protective force does not include K-9 handlers or Pro2Serve staff.

1. Introduction

The Department of Energy (DOE) National Nuclear Security Administration (NNSA) plutonium missions are critical to meeting military requirements to ensure the U.S. nuclear deterrent is modern, responsive, and resilient. Reestablishing the country's capability and capacity for pit production is a major national priority. Accordingly, in 2018 NNSA directed Los Alamos National Laboratory (LANL) to deliver a minimum of 30 war reserve (WR) pits in CY2026.

The term "30 ppy" is used throughout this document to capture the requirement that LANL produce *a minimum of* 30 war reserve pits per year starting in 2026. Similarly, other stated quantities or rates, such as (b) (5) **represent the minimum quantities that LANL will produce in a given performance period.**

LANL has an experienced and skilled workforce, high-hazard nuclear facilities and associated infrastructure, and unique plutonium processing, fabrication, and experimental capabilities. Designated by NNSA as the nation's Plutonium Center of Excellence, LANL is relied upon to integrate and perform the following:

- Produce plutonium pits for the nuclear weapons stockpile
- Produce radioisotope thermoelectric generators (RTGs) for the nuclear weapons stockpile
- Produce Pu-238 heat sources for use in space exploration and national security
- Evaluate pits and RTGs returned from the nuclear weapons stockpile to support annual stockpile assessments and to inform future pit and RTG designs
- Produce plutonium components for assembly into devices used in subcritical experiments
- Perform fundamental science on the material properties and aging of plutonium
- Process plutonium into forms suitable for disposition to support nonproliferation goals
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To better support expanding the pit production mission at LANL, in FY21 NNSA merged the LANL elements of the Plutonium Sustainment, Material Recycle and Recovery (MR&R), and Storage programs into a single program called Los Alamos Plutonium Operations, which is one of several programs and line-item projects within the Plutonium Modernization program.

This document is the Los Alamos Plutonium Operations Program Management Plan (PMP) for FY22 through FY28. FY28 information is limited and is provided in addition to the more detailed FY22–FY27 information to facilitate the start of the FY23–FY28 FYNSP budget planning. This PMP is part of the FY22 Horizon Plan submitted by LANL to NNSA, and addresses only the scope funded by the Los Alamos Plutonium Operations program managed by the NNSA Plutonium Program Office (NA-191). Furthermore, this PMP reflects of the current state of program planning maturity and LANL will revise it during FY22 to reflect improved planning.

The timeline of the critical goals to achieve steady-state production of 30 ppy is listed below:

(b) (5)

CY2023: • Produce and diamond stamp the first production unit (FPU) of a WR-quality pit
(b) (5)

CY2024: • Produce and diamond stamp a minimum of 10 WR pits
(b) (5)

CY2025: • Produce and diamond stamp a minimum of 20 additional WR pits
(b) (5)

CY2026: • Produce and diamond stamp a minimum of 30 additional WR pits
(b) (5)

The key FY22 activities for the Los Alamos Plutonium Operations program are listed below:

- Exercise all pit production processes, (b) (5)
- Perform Pit Product Realization Team (PRT) product realization and certification activities per the Pit PRT baseline schedule
- Upgrade and install capital equipment for a reliable (b) (5) capability
- Hire and train staff to expand the workforce for pit production
- Establish, enhance, and maintain business systems for WR pit production
- Develop, implement, and execute equipment maintenance plans
- Increase the inventory of plutonium metal, pit subcomponents, and molds
- Disposition legacy nuclear materials to increase the availability of nuclear material storage

Figure 1 shows the programmatic and line-item project scope funded by the NNSA offices of Defense Programs (NA-10); Safety, Infrastructure, and Operations (NA-50); and Defense Nuclear Security (NA-70) to produce a minimum of 30 pits in CY2026 and to then begin reliable steady-state production at a rate of at least 30 ppy.

(b) (3) UCNI

2. Program Management

LANL manages the Los Alamos Plutonium Operations program in accordance with NA-191 program documents and other contractual requirements (see Section 7). The NA-191 program documents include the *Plutonium Modernization Program FY 2022 Implementation Plan*, project control procedures (PCPs), and the *Risk and Opportunities Management Plan* (ROMP). During FY22, LANL will fully implement these requirements, including the graded approach to earned value management as required for NNSA Enhanced Management B (EM-B) programs.

LANL uses Primavera P6 (P6) to create and maintain baseline schedules, manage field execution schedules, identify resource requirements, track performance, and facilitate reporting. LANL holds budget in reserve within the Los Alamos Plutonium Operations program to provide contingency funding to manage programmatic risk (see Appendix A) and unanticipated events. Budget in reserve is not included in P6 and resides outside the WBS structure.

The FY22 Horizon Plan assumes full funding; in the event of a Continuing Resolution (CR), a revised Horizon Plan may be issued.

3. Scope and Schedule

The NNSA Plutonium Program Office (NA-191) has defined multiyear objectives for Los Alamos Plutonium Operations and provided a funding profile through FY27. These objectives are listed below:

- **Complete product realization activities to qualify the WR production processes**

(b) (7)(E), (b) (7)(F)

- **Establish and improve infrastructure and business systems**

(b) (5)

- **Produce WR pits (pits produced above the requirement can count toward an outyear requirement)**
  - CY2023: Produce the first WR pit
  - CY2024: Produce a minimum of 10 WR pits
  - CY2025: Produce a minimum of 20 additional WR pits
  - CY2026 Produce a minimum of 30 additional WR pits
- **Fabricate and ship plutonium subassemblies for subcritical experiments**

(b) (5)

The Plutonium Modernization national work breakdown structure (NWBS) associated with the Los Alamos Plutonium Operations program was initially defined in the NA-191 Project Controls Procedure (PCP)-01 *Plutonium Modernization Program Work Breakdown Structure (WBS)*. Los Alamos Plutonium Operations is a subset of this NWBS. The LANL contractor work breakdown structure (CWBS) aligns with the NWBS and adds detail down to the work package level. LANL reports costs monthly at the summary account level (level 6 of the NWBS), shown in Figure 2.

In this PMP, the Plutonium Modernization NWBS elements associated with Los Alamos Plutonium Operations program are organized into four functional areas, as shown in Table 1:

- Pit and SCE Production
- Plutonium Supply Chain
- Operational Support and Equipment Maintenance
- Capital Acquisition Projects

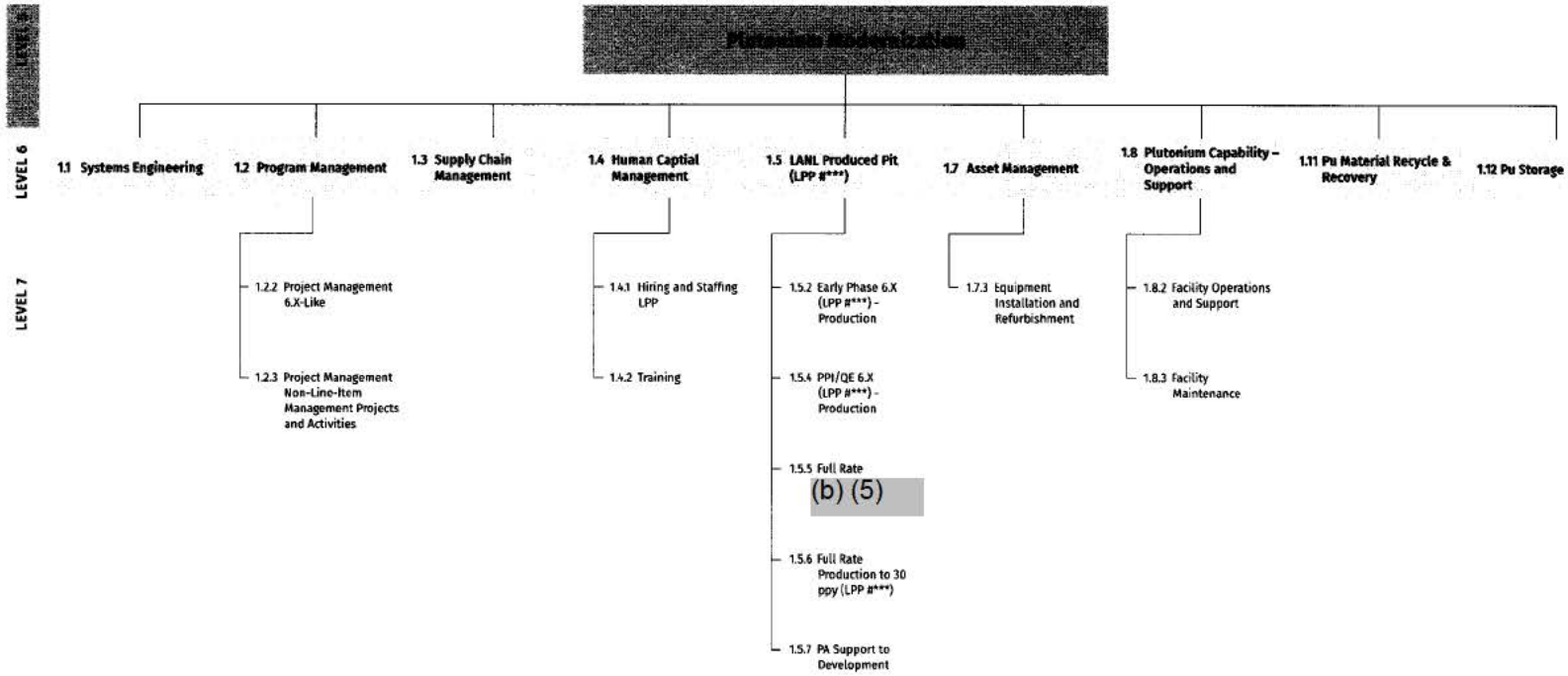


Figure 2. Elements of the Plutonium Modernization NWBS for Los Alamos Plutonium Operations at the NNSA-designated reporting level

Table 1. Description of the NWBS Level 6 elements by PMP functional area

PMP Functional Area	NWBS Element (Level 6)	Description
Pit and SCE Production	1.1 Systems Engineering	(b) (7)(E), (b) (7)(F)
	1.2 Program Management	
	1.3 Supply Chain Management	
	1.4 Human Capital Management	
	1.5 LANL Produced Pit (LPP)	
Plutonium Supply Chain	1.11 Pu Material Recycle and Recovery	
	1.12 Pu Storage	
Operational Support and Equipment Maintenance	1.8 Plutonium Capability—Operations & Support	
Capital Acquisition Projects	1.7 Asset Management	

3.1 Milestones

NA-191 provided the FY22 Level 2 (L2) milestones, shown in Table 2, and additional Tier 1 through Tier 3 milestones, as defined in PCP-04 and shown in Table 3, to support pit production goals. LANL identified additional Tier 2 and Tier 3 milestones, which are in the resource-loaded P6 schedule. Some of these milestones are shown in Table 3.

LANL is required to produce and diamond stamp the first WR pit by December 31, 2023. NNSA may divert subsequently produced WR pits to complete any remaining process qualification or pit certification (b) (5)

The following sections discuss the scope and schedule to achieve these milestones and other requirements.

Table 2. FY22 L2 MRT Milestones for Los Alamos Plutonium Operations

MRT #	MRT Milestone	Grading Criteria	Exit Criteria	Evidence of Completion	P6 Activity IDs
MS-01	(b) (5), (b) (7)(E), (b) (7)(F)				LP.ASSY.1040 LP.MAC.FMP.1051 LP.PY.ERPO.1020 LP.WD.BRZ.1010 LP.WB.LWT.1000 PRT38020 PRT38040 PRT38050
MS-02					LP.40mm.0660 LP.KOL1250
MS-03					LP.ACR.TE.2060 LP.AS.BCW.2090 LP.AS.ELTV.2050 LP.INS.IPH.2070 P.RAD.PRH.2100 LP.FDR.XXX.2070
MS-04					LA.CERT.0610 PRT18205 PRT38030
MS-05					TBD

MRT #	MRT Milestone	Grading Criteria	Exit Criteria	Evidence of Completion	P6 Activity IDs
MS-06	(b) (5), (b) (7)(E), (b) (7)(F)				LP.ASSY.1000 LP.ASSY.1010 LP.ASSY.1020 LP.ASSY.1030 LP.ASSY.1040
MS-07					N/A
MS-08					N/A

MRT #	MRT Milestone	Grading Criteria	Exit Criteria	Evidence of Completion	P6 Activity IDs
MS-09	Operations and Maintenance	(b) (5), (b) (7)(E), (b) (7)(F)			LP.PM04.1130
MS-10	Newly Generated TRU Waste Management				LP.22-TRUW.2001M LP.22-TRUW.2003M LP.22-TRUW.2000M LP.22-WCAT.6000

MRT #	MRT Milestone	Grading Criteria	Exit Criteria	Evidence of Completion	P6 Activity IDs
MS-11	Nuclear Material Capacity Management	(b) (5), (b) (7)(E), (b) (7)(F)			LP22Tier4 LP.22-B24770 LP.22-DISP.1000M LP.22-OXID.3000M LP.22-UED.4074M LP.22-WETF.2010M LP.22-SRLO.100M LP.22-NMMT.3005M LP.22-NMMT.3010M LP.22-NMMT.3025M LP.22-L2.2M LP.22-CPUS.3000M

MRT #	MRT Milestone	Grading Criteria	Exit Criteria	Evidence of Completion	P6 Activity IDs
MS-12	Nuclear Material Storage	(b) (5), (b) (7)(E), (b) (7)(F)			LPST6600 LPST6610 LPST6620 LPST180 LPST1170 LPST1164 LPST1162 LPST1166

Table 3. Tier 1–Tier 3 milestones for the LANL-produced pit

Tier 1			
(b) (5)	at LANL Achieved	(b) (5)	PRT
Pit first production unit (FPU) complete		LFPU	PRT
Tier 2			
(b) (5), (b) (7)(E), (b) (7)(F)			
Tier 3			
(b) (5), (b) (7)(E), (b) (7)(F)			

(1) Upon receipt of M&O feedback to NA-191-PCP-02, Tier 3 CA completion milestones will be identified in this table.

(2) LANL has a series of 50 to 60 equipment installation projects planned to support (b) (5) Each of these projects must have at least one Tier 3 milestone coded to the project (typically TTO)—EP#

3.2 Pit and SCE Production

3.2.1 Pit Production

The LLNL DA completed the product definition and documentation and released the final design and drawings of the pit. In FY22 and FY23, LANL will continue to build pits establishing the capability to produce WR pits, concluding with the first diamond stamped WR pit in CY2023. Over the next three years, LANL will ramp from FPU to a production rate of 30 ppy. The work to establish WR production and ramp to steady-state production provides the basis for the FY22–FY28 Horizon Baseline schedule. Figure 3 shows a simplified version of the pit production flowsheet, organized by major element.

The NNSA-chartered Pit PRT maintains the Horizon Baseline schedule for the product realization activities required to produce the FPU in CY2023. These activities include the establishment of the processes, tooling, inspection, control points, procedures, etc. to produce the pit. The product realization activities are shown in Figure 4. The LLNL DA has specified which pit production processes require evaluation and qualification by the DA through EEs. Following successful completion of the EEs, a quality evaluation report (QER) will be issued to allow LANL, as the production agency, to produce the first WR pit.

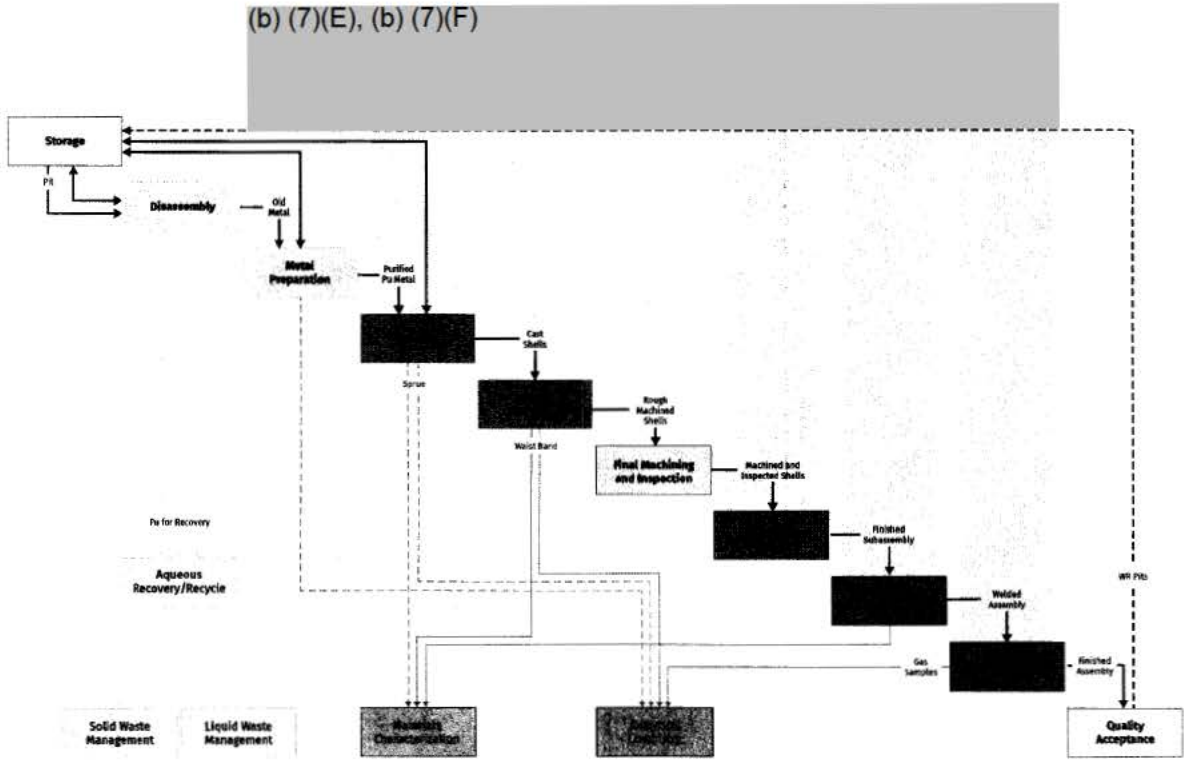


Figure 3. Pit production—high-level flowsheet

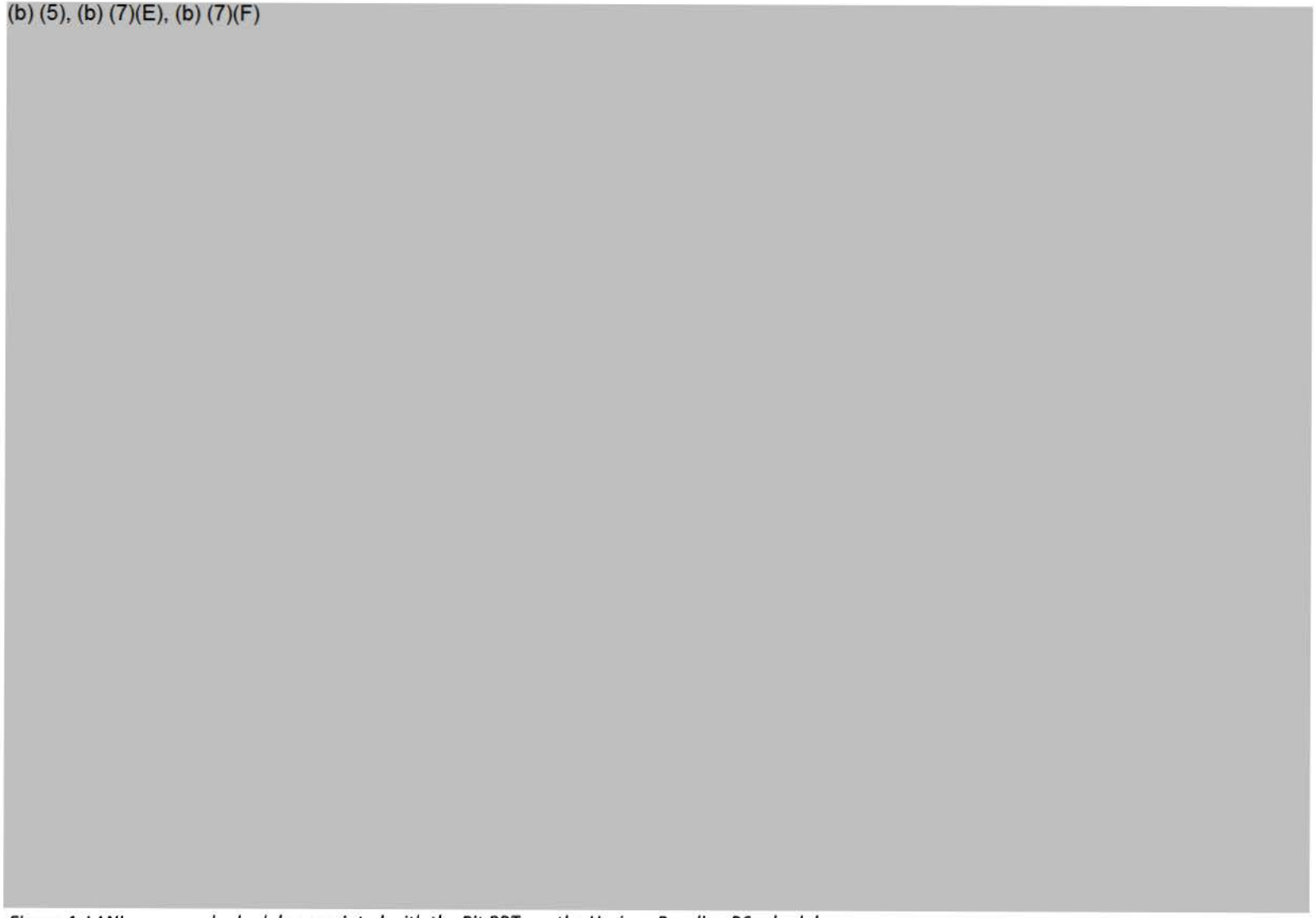


Figure 4. LANL scope and schedule associated with the Pit PRT per the Horizon Baseline P6 schedule

Figure 5 shows the pit build cadence (as planned in the Horizon Baseline) to support the pit production schedule requirements. The production activity for each build is shown in Figure 5 as a line starting with an open circle and ending with a blue diamond. Production activities include the continuous production operations (final machining through final assembly, shown in blue in Figure 3) and quality acceptance that concludes with diamond stamping the pit. (b) (5), (b) (7)(E), (b) (7)(F)

(b) (5), (b) (7)(E), (b) (7)(F)

The planning basis used by LANL for the Horizon Baseline assumes the facilities, equipment, and processes to produce pits will be reliably available for 136 ten-hour production days, spread over 40 calendar weeks per year for day-shift pit production. Routine maintenance and construction activities will occur during the off-shift. As efforts aimed at increasing production availability and 24/7 operations mature, this basis will be adjusted as appropriate.

The planning basis for producing pits takes into account the anticipated yield rates and the risk of equipment and facility outages. LANL will maintain an inventory of critical sub-components and materials to mitigate lower-than-expected yield rates and possible outages. The P6 schedule (available as an P6 .XER file) incorporates the anticipated yield rates and inventory targets as well as the corresponding quantities of metal, mold sets, hemishells, and pits.

The scope required to evaluate and certify pits to execute LANL's proposed Horizon Plan is shown in Table 4.

In order to illustrate the planning basis for production activities, Figure 6 shows the flowsheet associated with the production of rough-machined hemishells which is a portion of the pit production flowsheet. Resources are assigned to each step in the flowsheet to support the production of one unit. The number of unit activities required is determined from production targets and anticipated yield rates.

This approach was replicated for all elements of the flowsheet in Figure 3 to form a basis for the workforce to produce pits. In general, this is hands-on work directly funded by Los Alamos Plutonium Operations to produce the pit. The overall program workforce requirements are discussed in Section 3.5.2.

Figures 7 through 11 show the equipment configurations (b) (7)(E), (b) (7)(F) as LANL transitions from FPU to a reliable production rate of 30 ppy. These configurations represent the equipment and layout required to reliably produce (b) (5) and 30 ppy using a single shift for production. The details associated with qualifying the (b) (5) equipment and 30 ppy equipment for WR use will be provided in a future update to the Horizon Baseline. Details on the equipment installation are discussed in Section 3.4.

LANL has determined the minimum equipment set to produce (b) (5) by December 31, 2024. This critical (b) (5) equipment list is shown in Table 5 along with the required turnover to operations (TTO) date.

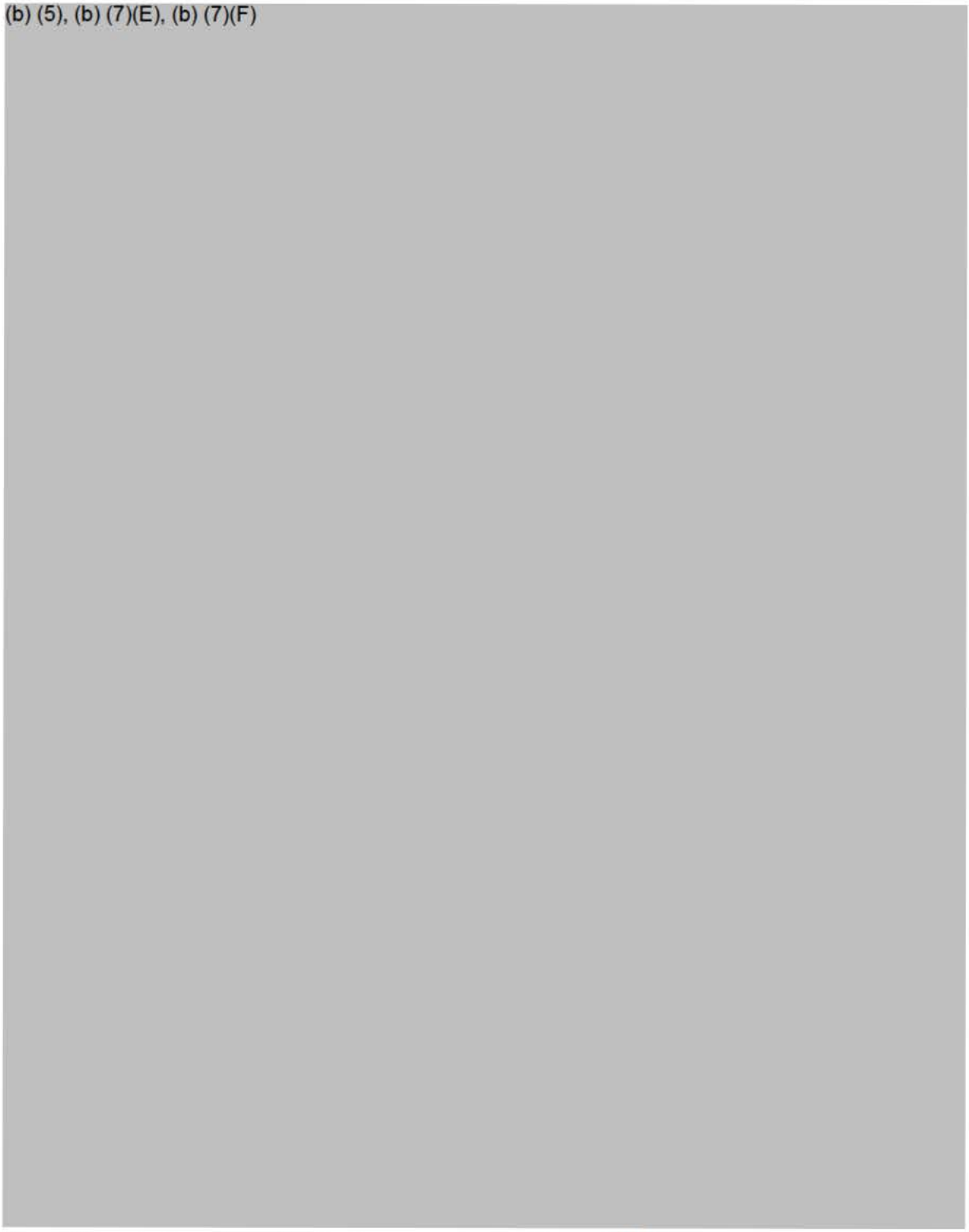


Figure 5. Pit production—planned build cadence to produce a minimum of (b) (5)
(b) (5)

Table 4. Pit evaluation and certification—FY22-FY27 scope

(b) (5), (b) (7)(E), (b) (7)(F)

Table 5. Critical (b) (5) ***equipment and infrastructure projects***

(b) (5), (b) (7)(E), (b) (7)(F)

Figure 7. Planned configuration of the TA-55 PF-4 pit production equipment (b) (7)(E), (b) (7)(F)

Figure 8. Planned configuration of the TA-55 PF-4 pit production equipment (b) (5), (b) (7)(E), (b) (7)(F)

(b) (5), (b) (7)(E), (b) (7)(F)

Figure 9. Planned configuration of the TA-55 PF-4 pit production equipment (b) (5), (b) (7)(E), (b) (7)(F)
(b) (5), (b) (7)(E), (b) (7)(F)

Figure 10. Planned configuration of the TA-55 PF-4 pit production equipment (b) (5), (b) (7)(E), (b) (7)(F)

Figure 11. Planned configuration of the TA-55 PF-4 pit production equipment (b) (7)(E), (b) (7)(F)

3.2.2 Plutonium Components for Subcritical Experiments

The Los Alamos Plutonium Operations program fabricates and ships plutonium components for use in SCEs; this work is coordinated with the NNSA Office of Experimental Science based on specifications provided by the LANL and LLNL DAs. SCEs deliver crucial data to assess the current stockpile and to design and certify new pits. The experiments assess performance and material behavior by using high explosives to drive nuclear material, typically plutonium.

Table 6 and Figures 12 and 13 provide the scope, schedule, and flowsheet for production of plutonium components for the SCE program. Red Sage is made from new flat castings. Excalibur A–D is made from modified existing components, while Excalibur E manufacturing will require process development and new part production. Durandal is made from modified existing parts and new part production. Arondight manufacturing requires process development and new part production. The experimental nature of research and development work necessitates a highly skilled, experienced workforce with ample time allotted for manufacturing development. LANL will assemble and package the plutonium components before shipping them.

Table 6. Subcritical experiments—FY22-FY27 scope

(b) (5)

Figure 12. Subcritical experiments—FY22–FY27 schedule

3.3 Plutonium Supply Chain

The Plutonium Supply Chain functional element dispositions legacy nuclear materials, increases and improves nuclear material storage, and (starting in FY23) provides plutonium metal suitable for pit production. NNSA has directed LANL to take a graded approach to implementing EM-B for these elements of the Los Alamos Plutonium Operations program.

The overall scope is focused on the storage, recycle, recovery, and disposal of nuclear materials including newly generated byproducts from metal purification operations to enable the pit production mission and reduce operational costs and risk. Primary goals through FY27 are to disposition the excess nuclear material at LANL to optimize the use of the TA-55 PF-4 nuclear materials vault and to de-inventory the CMR Facility as analytical chemistry is transitioned from CMR to TA-55. The de-inventory of the TA-55 PF-4 vault provide the essential Security Category I nuclear material vault space required for 30 ppy steady-state production.

(b) (5), (b) (7)(E), (b) (7)(F)

In addition, specific Plutonium Supply Chain scope includes the safe and secure nuclear storage capabilities, while managing the storage requirements across for the pit production mission. The program analyzes, prioritizes, and provides recommendations for any significant changes to existing special nuclear material (SNM) storage capabilities and uses storage health metrics to monitor and ensure effective use and continuous improvement of the storage capability at the LANL. Process modeling, forecasting, and decision analysis tools are used to identify, aggregate, and time-phase storage requirements; provide lifecycle planning and formalized inventory management; and inform decisions regarding upgrades, alterations, and reconfigurations. This includes time-phased storage requirements for feed, by-product, and product materials over at least a 15-year timeline.

A key element is the safety class containerization of the nuclear material to ensure the TA-55 Documented Safety Analysis limits are managed appropriately. Container design and testing (for example the SAVY-400 container) are critical for DSA and worker safety compliance. LANL, as the design authority for the SAVY-4000 series of containers, ensures that the technical basis exists for the intended use of the SAVY container series and defines the requirements for continued surveillance and life extension activities associated with the containers. The routine procurement and surveillance of these containers are managed by the Shared Services program. LANL is evaluating designs as well as alternative nuclear material container and storage solutions to continuously improve both operational efficiency and worker safety, for example, to reduce corrosion during multi-year storage scenarios.

Key activities associated with the Plutonium Supply Chain include the following:

- Produce purified plutonium metal for suitable for use in WR pit production at the quantities required
- Recover and recycle plutonium from legacy sources for use as metal feed
- Recycle, recover, or disposition the plutonium from newly generated byproducts from metal purification.
- Establish additional TA-55 PF-4 vault space through the disposition and consolidation of materials in the vault.
- De-inventory CMR of nuclear materials that are no longer required, including newly generated residues and samples from pit production AC measurements.

- Establish safe and secure nuclear materials storage and containerization including modifying the design of the SAVY-4000 for use in a glovebox to reduce the damage ratio for material stored on the floor

Tables 7 and 8 identify the scope requirements for material disposition, material recovery, vault availability, and container improvements in FY22 and FY22–FY27, respectively. Figure 14 shows the flowsheet used to recovery plutonium from legacy materials and pit production byproducts. Starting in FY23, the activities associated with metal purification, shown in Figure 15, are included in the Plutonium Material Recycle and Recovery NWBS element.

Table 7. Plutonium Supply Chain—FY22 scope

(b) (5), (b) (7)(E), (b) (7)(F)

Table 8. Plutonium Supply Chain—FY22–FY27 scope

(b) (5), (b) (7)(E), (b) (7)(F)

Figure 14. Plutonium recovery—flowsheet

Figure 15. Plutonium metal purification—flowsheet

3.4 Capital Acquisition Projects

NNSA is recapitalizing LANL facilities and equipment to modernize the capability and expand the capacity to produce pits. This is required to produce a minimum of 30 pits in 2026 and then begin reliable steady-state production of 30 ppy. The Los Alamos Plutonium Operations program provides funding and direction for installation of the process equipment and gloveboxes required to reliably produce (b) (5) Equipment for production rates greater than (b) (5) s primarily provided through the line-item project Los Alamos Plutonium Pit Production Project (LAP4); the cost and schedule for the LAP4 project is not discussed in this PMP.

The equipment and gloveboxes are primarily being installed in TA-55 PF-4. The scope includes decontaminating and decommissioning (D&D) legacy process equipment, upgrading equipment and gloveboxes, and installing new process equipment and gloveboxes. Each installation or upgrade has a date that TTO needs to be achieved. This date is determined by assessing when it must be available for use to support pit production. (b) (5)
(b) (5)

Los Alamos Plutonium Operations will also repurpose and upgrade gloveboxes for processing newly generated residues and disposition of legacy materials from the TA-55 PF-4 vault. In addition, TA-55 PF-4 vault upgrades will ensure sufficient and robust storage capabilities for pit production. These infrastructure investments are primarily in two rooms in TA-55 PF-4 and will provide enduring and reliable support for the recycle, recovery, and disposition of plutonium from the byproducts of pit production and other NA-10 plutonium programs.

All equipment projects managed by Los Alamos Plutonium Operations will follow the sequence shown in Figure 16. The NWBS element for Capital Assets starts with project initiation and ends at TTO. The scope and cost associated with transitioning equipment from TTO to WR are included in the NWBS elements associated with pit production. This program follows the *Weapons Production Equipment Lifecycle Guide* to plan and manage capital asset projects and the additional steps and stage gates are shown in the bottom portion of Figure 16.

Figures 17 through 20 show the location of all planned D&Ds and equipment installations on the first floor of TA-55 PF-4, including plutonium supply chain projects. These projects are planned and executed according to the process described in Figure 16.

The notional sequencing schedules being used by LANL to develop detailed baseline schedules in P6 are shown in Figures 21 through 23. Figure 21 (critical equipment to produce 10 pits) is based on completed initial sequencing and planning documentation. Additional sequencing and project-phase detail will be incorporated in the October 29, 2021, submittals (see Contract Office Letter U2100767: Plutonium Modernization 10 Pit Capital Equipment – Planning and Performance Expectations, dated July 21, 2021, Actions 2 and 3). Figures 24 and 25 will be updated in future revisions of this PMP to show the schedule for the phases of the equipment projects shown in Figure 16.

(b) (5)
(b) (5) Some of the existing equipment is at or beyond its service life. In order to maintain an acceptable probability of success to produce 10 pits as planned, an enhanced maintenance strategy is being developed to support an upgraded preventive maintenance plan during the FY22 performance period. This upgraded plan is focused on extending service life and improving probability of equipment uptime. Enhanced maintenance of the existing and critical equipment needed to produce 10 pits is required until the balance of equipment projects to establish a reliable (b) (5) capability is completed, as discussed in Section 3.5.2.

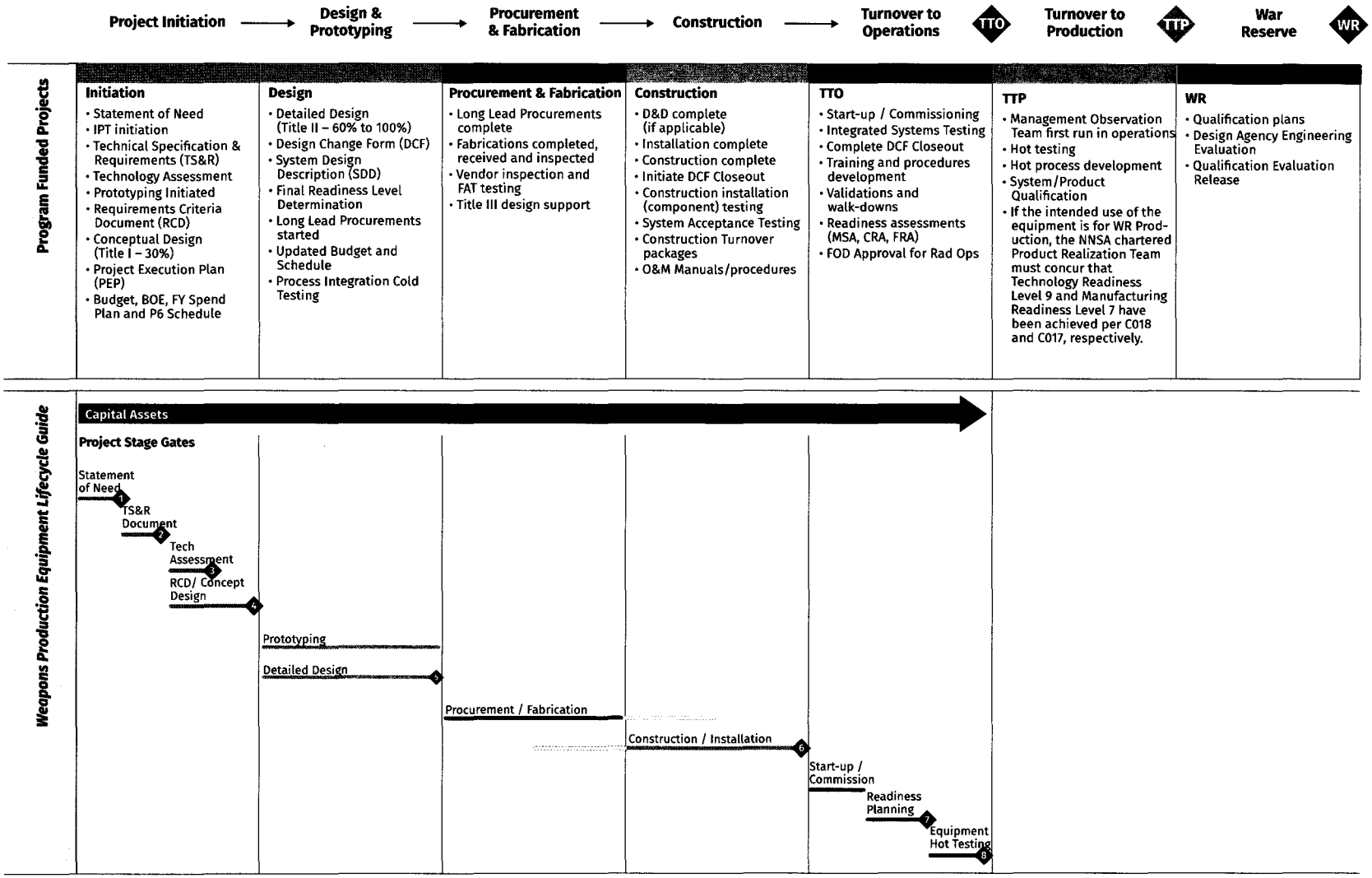


Figure 16. Process for achieving TTO, TTP, and WR, with the key activities, deliverables, stage gates, and decision points by project category. Colors align with project schedules shown in later figures.

(b) (3) UCNI

Figure 17. Los Alamos Plutonium Operations – location of D&Ds (b) (7)(E), (b) (7)(F)

Figure 18. Los Alamos Plutonium Operations – location of D&Ds

(b) (3) UCNI

Figure 19. Los Alamos Plutonium Operations – location of installations(b) (7)(E), (b) (7)(F)

Figure 20. Los Alamos Plutonium Operations – location of installations (b) (7)(E), (b) (7)(F)

Figure 21. Notional schedule for critical equipment to produce (b) (5)

(b) (3) UCNI

Figure 22. Notional schedule for equipment to reliably make (b) (5)

Figure 23. Notional schedule for equipment to reliably make (b) (5) *continued*

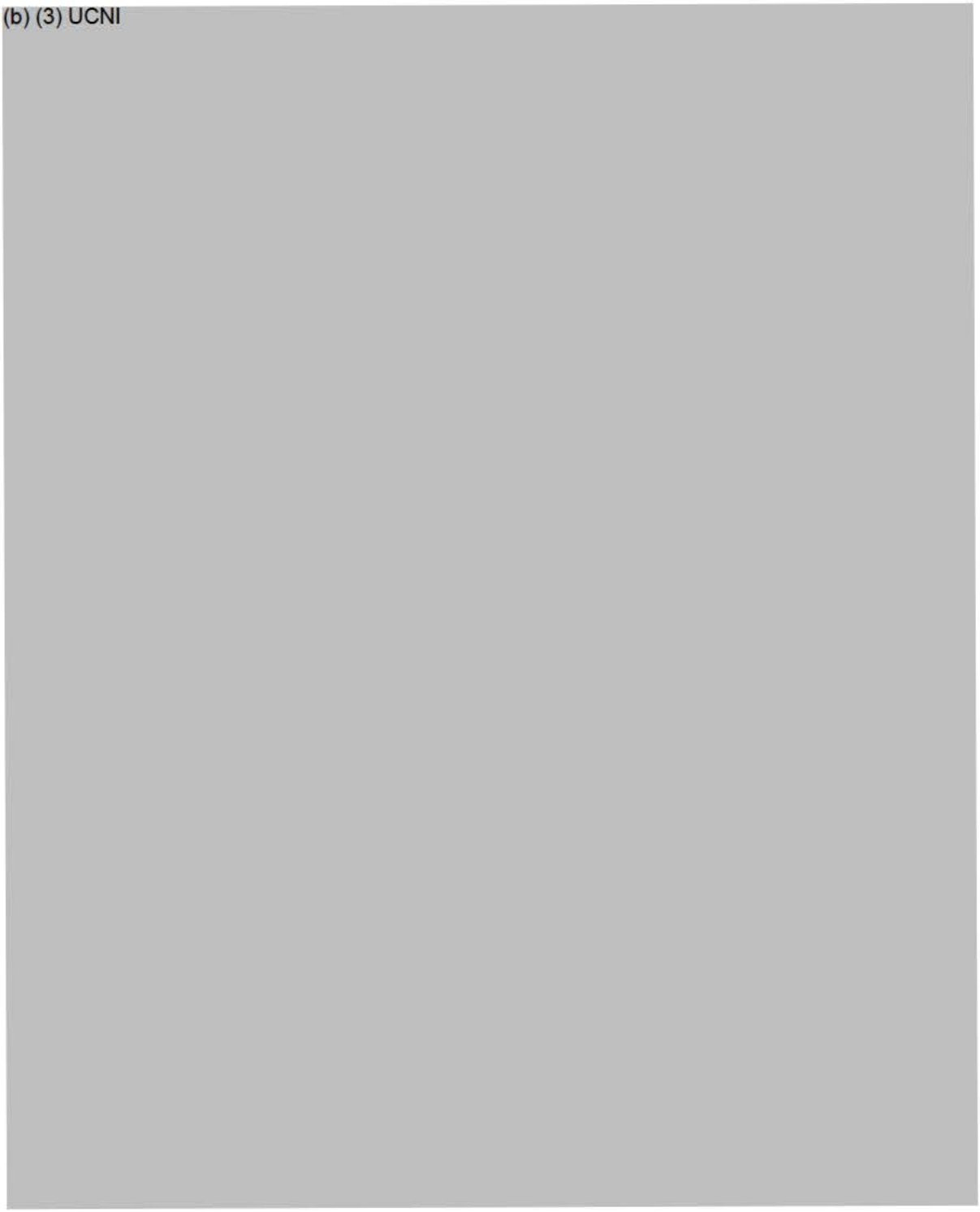


Figure 24. Los Alamos Plutonium Operations – infrastructure investments for plutonium recycle and recovery, purification, foundry, and machining

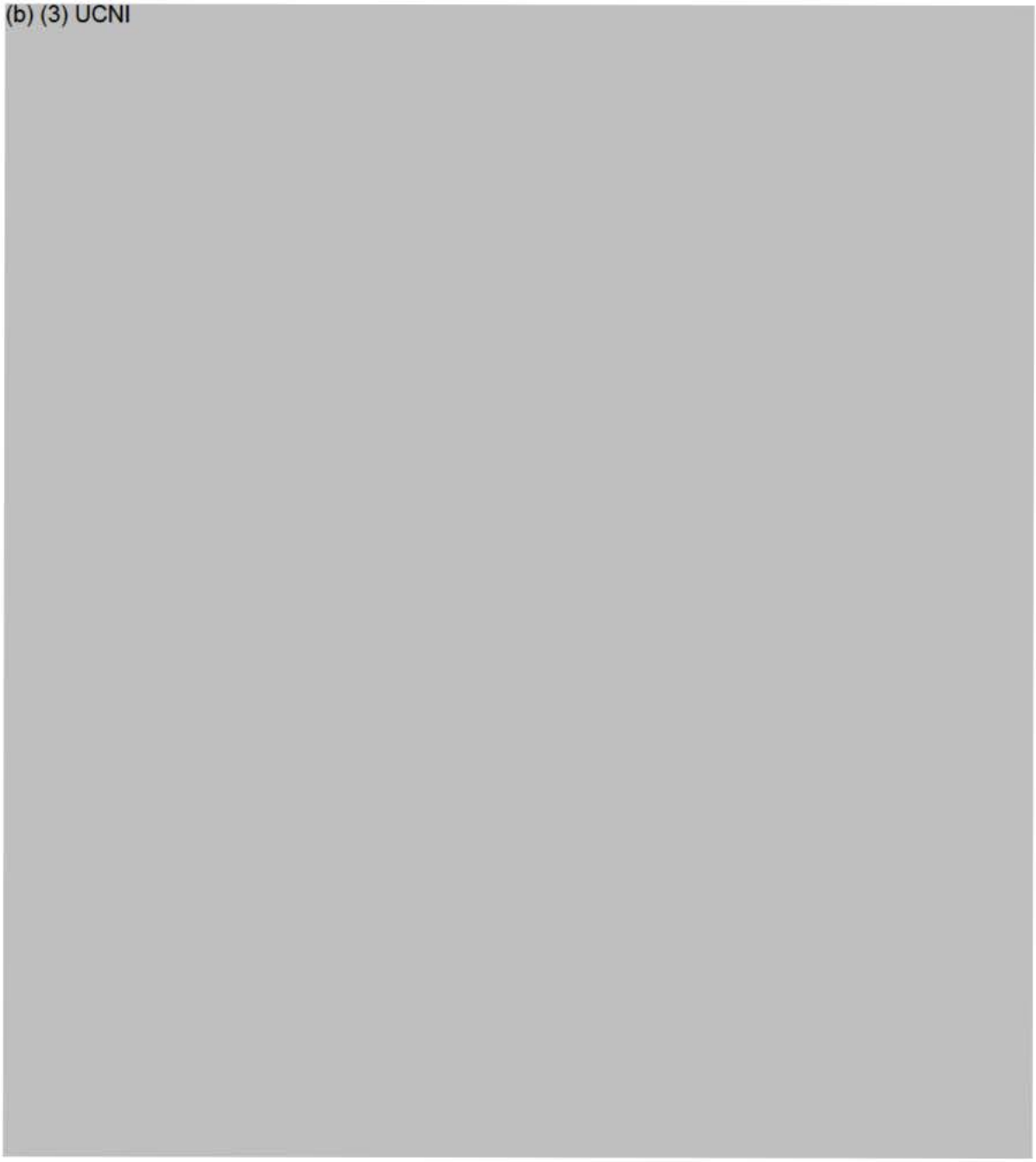


Figure 25. Los Alamos Plutonium Operations – infrastructure investments for inspection, welding, assembly, and other supporting operations

Plutonium Supply Chain

Removal of plutonium impurities through pyrochemistry produces purified metal. Aqueous recovery processes are used to dissolve plutonium by-products and residues in acid to recover plutonium (b) (5), (b) (7)(E), (b) (7)(F)
(b) (5), (b) (7)(E), (b) (7)(F)
(b) (5), (b) (7)(E), (b) (7)(F) Nuclear materials accountability improvements will support electrorefining rate production by proving the sufficiency of a roll-up NDA system. New-start aqueous nitrate line readiness and upgrades of the evaporators and the cementation process controllers are projects needed to return a more robust capability back to service in PF-4.

(b) (7)(E), (b) (7)(F)

(b) (3) UCNI

Foundry

(b) (3) UCNI

(b) (7)(E), (b) (7)(F)

(b) (3) UCNI

(b) (7)(E), (b) (7)(F)

Machining

(b) (3) UCNI

(b) (7)(E), (b) (7)(F)

(b) (3) UCNI

(b) (7)(E), (b) (7)(F)

Inspection

(b) (7)(E), (b) (7)(F)

Assembly, Welding, and NDE

(b) (7)(E), (b) (7)(F)

Materials Characterization and Analytical Chemistry

Analytical chemistry processes analyze plutonium samples to ensure they contain the appropriate amount and concentration of plutonium, and that impurities are below specified limits. Materials characterization processes are directed toward analyzing plutonium metal and samples for physical properties such as grain size, surface chemistry, strength, etc.

(b) (7)(E), (b) (7)(F)

Decontamination and Decommissioning (D&D)

Removal of gloveboxes, equipment, and infrastructure from PF-4 and subsequent packaging and transport for disposal is required to clear space for new or reconfigured equipment.

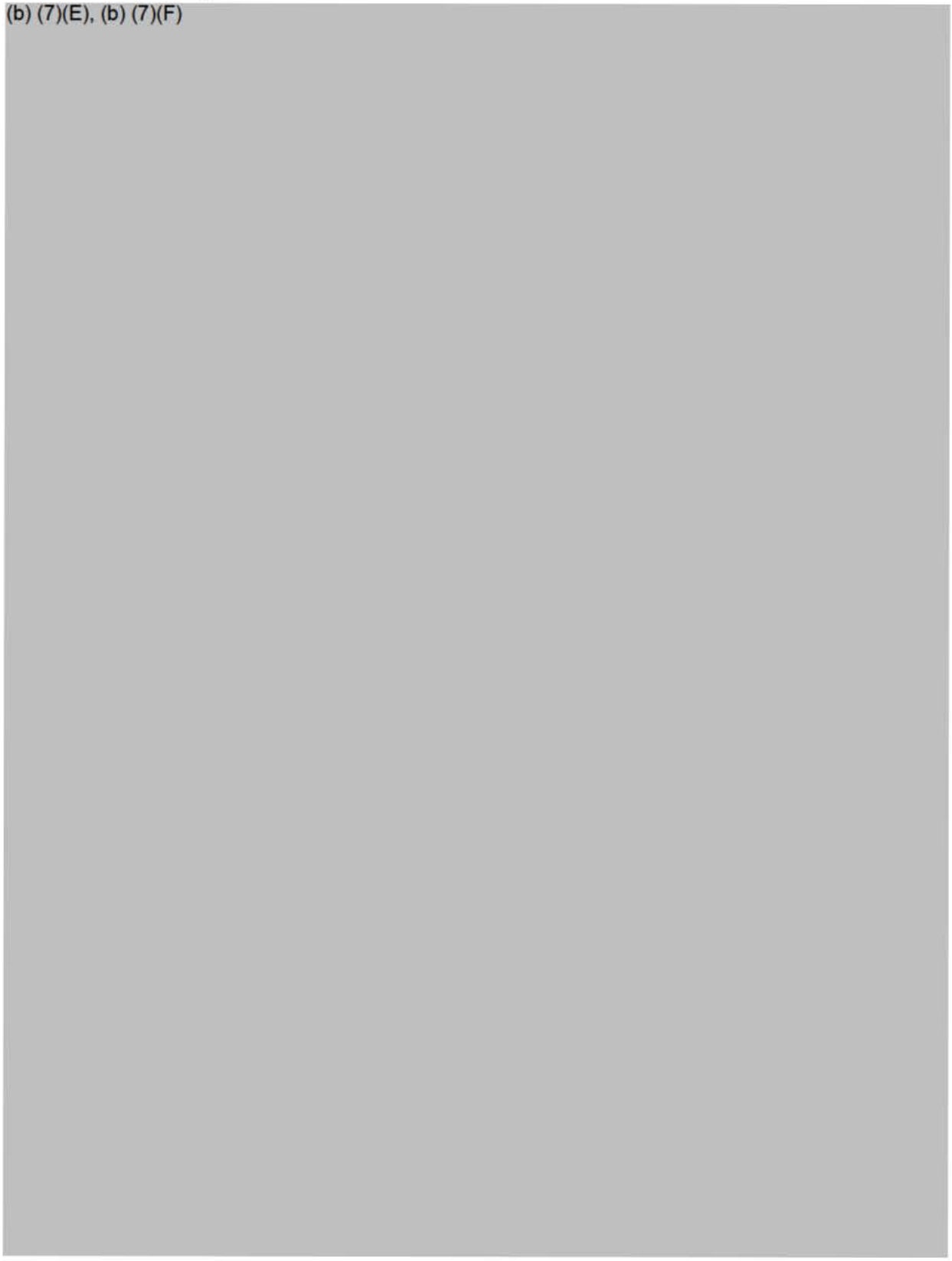
(b) (3) UCNI

(b) (7)(E), (b) (7)(F)

(b) (3) UCNI

Infrastructure and Support Processes

(b) (7)(E), (b) (7)(F)



(b) (7)(E), (b) (7)(F)

3.5 Operational Support and Equipment Maintenance

This functional area is part of the Plutonium Capability—Operations & Support element of the NWBS and includes operational support and maintenance of programmatic equipment used by LANL for the Los Alamos Plutonium Operations program.

3.5.1 Operational Support

LANL identifies support functions as Tier 1 and Tier 2, which are defined and discussed below. NNSA discusses the milestones in the PCPs as Tier 1, Tier 2, and Tier 3 (see Section 3.1). This section addresses the Tier 1 and Tier 2 support functions.

The LANL plutonium enterprise comprises a complex interconnected system of resources, capabilities, and infrastructure. The high-hazard nuclear facilities and associated infrastructure at LANL must be operated and maintained in a safe configuration for reliable program execution. LANL uses a tiered model to manage facility operations, maintenance, and program support.

Tier 1 functions provide core safety programs and other base capabilities to meet operational requirements so that facilities are safe and available for programmatic, maintenance, and construction work.

Tier 2 functions provide above-base services that benefit all programs and projects. The capacity of these services is scaled to meet the volume of planned work for all plutonium programs and projects.

Tier 1 functions at LANL are funded through NA-50 programs.

Tier 2 functions at RLUOB, CMR, and Sigma are funded directly by Los Alamos Plutonium Operations. The scope and budget details for Tier 2 support at these facilities are found in the associated work packages and P6 schedules.

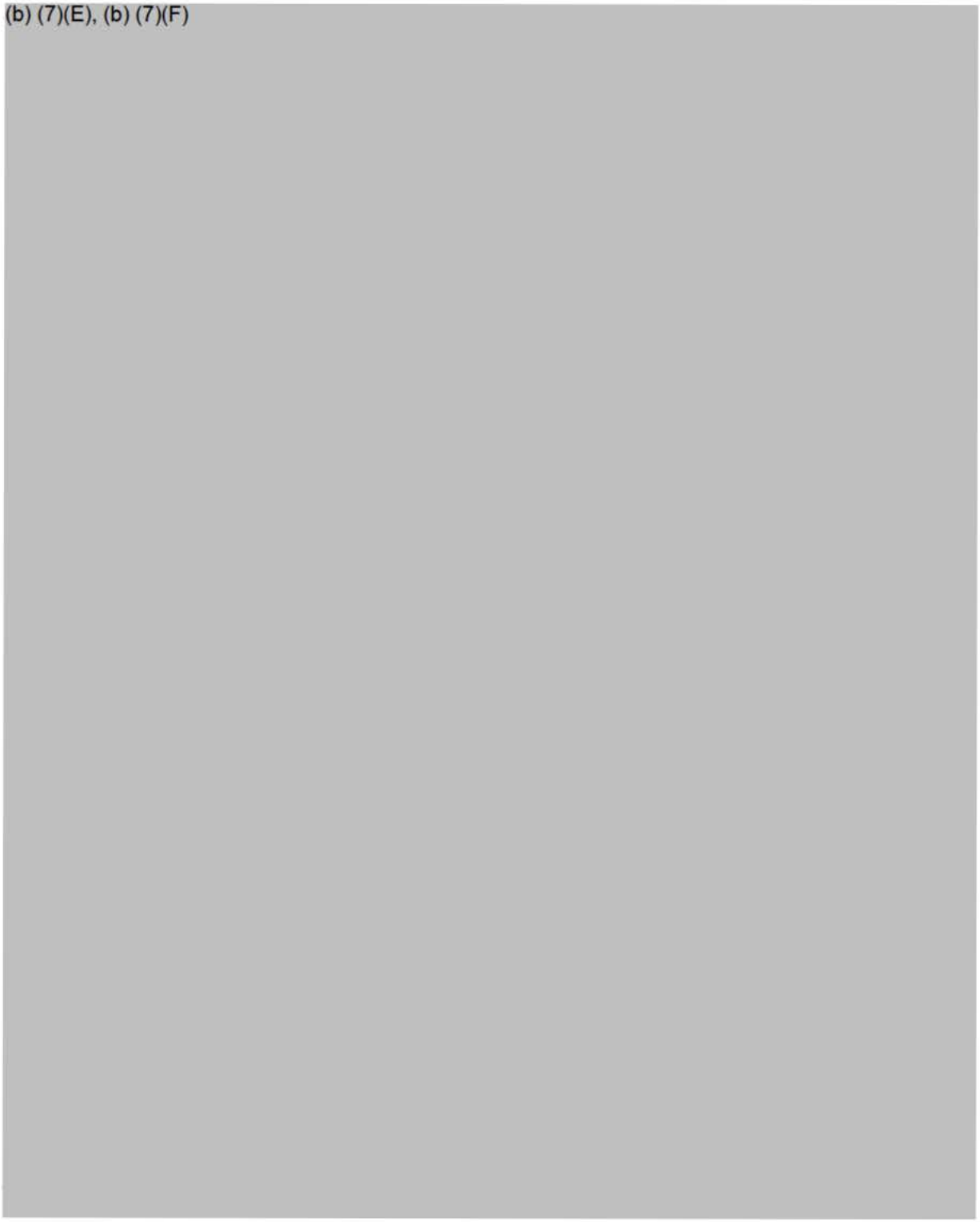
Tier 2 functions within the protected area at TA-55 and at the TRU waste facilities are managed through Shared Services, and costs are distributed among benefitting plutonium programs and projects, including Los Alamos Plutonium Operations. The *FY22–FY27 Plan for Shared Services* provides the basis of the cost estimate for Shared Services and the methodology for distributing costs to the benefiting programs and projects. The costs for Shared Services are distributed based on parameters related to the four top-level Shared Services WBS elements, which are described in Table 9.

Table 9. Description of the four top-level WBS elements in Shared Services

Shared Services WBS Element	Description
Workforce	Tier 2 functions associated with and scalable to the number of craft and LANL staff working in TA-55 PF-4, e.g., training, facility access, and warehousing
Nuclear Material	Tier 2 functions associated with and scalable to the ownership and movement of nuclear material, e.g., nuclear material control and accountability (MC&A), storage, containers, and shipping
Space	Tier 2 functions associated with and scalable to TA-55 PF-4 space usage, e.g., glovebox maintenance, radiological protection, criticality safety, decontamination, and readiness
Solid Waste	Tier 2 functions associated with and scalable to the projected generation of nuclear solid waste, e.g., packaging, accepting, and loading for shipment TRU waste drums

Table 10 provides the full Shared Services WBS along with brief work package descriptions of the elements for the Tier 2 support functions to support all plutonium programs and projects within the protected area at TA-55.

The Shared Services program reports on its status monthly and publishes annual program management and program execution plans.



3.5.2 Equipment Maintenance

LANL maintains the programmatic equipment for nuclear and nonnuclear process systems and equipment that are required for pit production. The current focus is on preventative maintenance for high-risk equipment, which reduces the probability of equipment failure through known fault modes. LANL will expand maintenance to include all equipment and continue to transition from corrective maintenance after failure to predictive and preventative maintenance before failure. This helps to ensure that all equipment will be available to support the reliable steady-state production of 30 ppy.

LANL formed a Maintenance Steering Board to develop, integrate, and oversee the initiatives to improve maintenance for the pit production mission. The Los Alamos Plutonium Operations budget allocated by LANL for maintenance will increase through FY23 to expand the workforce needed to support these initiatives. The focus is to transition maintenance activities from operational organizations (such as the Pit Technologies division) to the Process Maintenance and Decontamination Services group and from the day shift to the off-shift. These two transitions will allow pit production activities to be performed more efficiently and without interruption on the day shift.

The maintenance goals for FY22 are listed below:

- Update the equipment maintenance strategy to support a robust preventive maintenance profile for the critical (b) (5) existing equipment
- Ensure robust maintenance plans are in place for existing critical (b) (5) equipment (see Section 3.4)
- Update the failure mode effects analysis for equipment to inform maintenance plans
- Assess the risk level and life extension potential for existing equipment and incorporate future equipment replacements into the maintenance plan
- Execute preventive maintenance according to the maintenance plans
- Perform corrective maintenance to minimize equipment/system downtime
- Maintain stored programmatic equipment prior to installation
- Support the management of measurement and testing equipment between production control, warehousing, and the standards and calibration laboratory (S&CL)
- Continue to develop equipment-specific maintenance plans and associated procedures
- Continue to establish an inventory of essential spare parts at LANL
- Continue to transition from corrective to predictive and preventive maintenance
- Continue to transition from performing maintenance by the operations organization on the day shift to maintenance organization on the off-shift
- Generate technical documentation for configuration management and work authorization procedures

4. Workforce

LANL is committed to developing and maintaining a robust workforce with the expertise and skills necessary to produce 30 ppy in 2026.

LANL used two approaches to estimate the workforce (LANL staff, craft, and subcontractors) required for Los Alamos Plutonium Operations program execution: (1) staffing analysis interviews conducted from FY19 to FY21 with the line managers of functional organizations and (2) resources loaded into P6 for the Horizon Baseline. The resource-loaded schedules in P6 were developed independently of the staffing analysis. A comparison of the workforce estimates is shown in Figure 26.

The workforce that is resource loaded into P6 for Los Alamos Plutonium Operations program execution is shown in Figure 27. Additional detail for workforce data collected through a series of staffing analysis of interviews with the functional organizations at LANL is provided in the *Workforce Strategy for Plutonium Missions at Los Alamos National Laboratory* (LA-CP-21-20695). The difference between these two workforce estimates is under review by LANL. (b) (5)

The resource loading in P6 is more accurate in FY22 than the outyears. The trends within a WBS element in the resources loaded in P6 are instructive to identify the elements of the WBS that must be addressed in terms of the resources required in the outyears.

The workforce shown by job classification in Figure 28 is a summary of the data at the job title level and is used by line management and HR to guide recruiting and hiring activities and initiative.

(b) (5)

Figure 26. Comparison of FY22–FY27 workforce estimated through staffing analysis interviews versus the resource-loaded P6 schedule. (Estimates do not include the workforce for the Asset Management element of the NWBS.)

Figure 27. FY22–FY27 workforce by Level 6 of the NWBS per the resource loaded Horizon Baseline P6 schedule. (Chart does not include the workforce for the Asset Management element of the NWBS.)

Figure 28. FY22–FY27 workforce by job classification. (Chart and table do not include the workforce for the Asset Management element of the NWBS.)

5. Costs

LANL has developed a resource-loaded (labor and nonlabor) schedule in P6 for FY22 through FY27 to meet the NNSA requirements for the Los Alamos Plutonium Operations program. This resource-loaded schedule provides the cost estimate by WBS element through FY27 and is the Horizon Baseline submitted to NA-191. The resource loading in P6 is more accurate for FY22 than for the outyears.

Figures 29 and 30 provide details on NNSA's budget profile and LANL's planned costs at Level 6 of the NWBS. Additional details are available in the Horizon Baseline (P6 .XER files), which have been provided to NNSA as part of LANL's FY22 Horizon Plan submittal.

(b) (5)

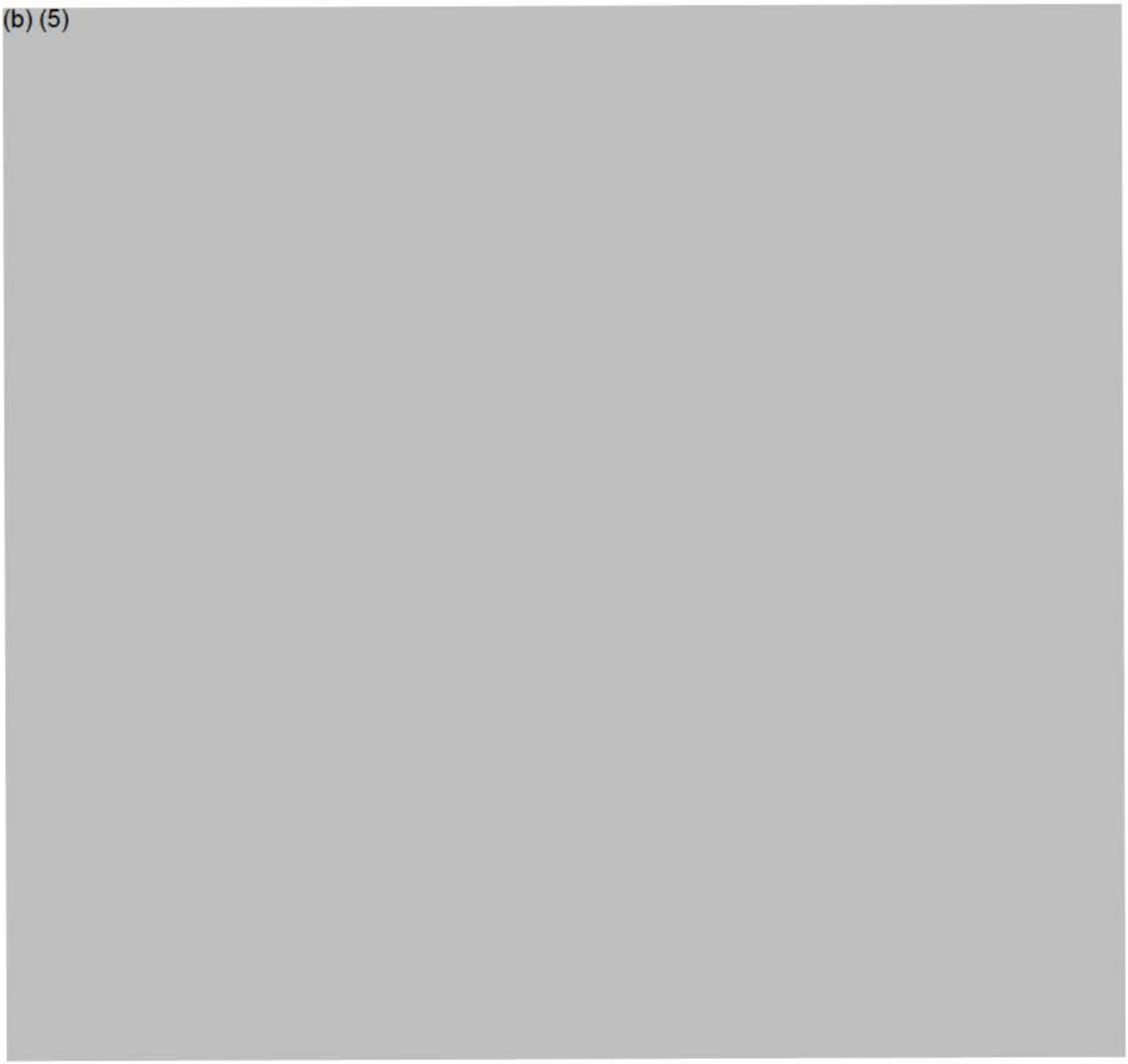


Figure 29. Estimated FY22 monthly costs by Level 6 element of the NWBS per the resource-loaded Horizon Baseline P6 schedule. (Estimated costs shown do not include Management Reserve.)

Figure 30. Estimated costs by Level 6 element of the NWBS per the resource-loaded Horizon Baseline P6 schedule. (Estimated costs shown do not include Management Reserve.)

6. Conclusion

This is the first release of a PMP for the newly formed Los Alamos Plutonium Operations program. This PMP is submitted to NA-191 as part of the FY22 Horizon Plan. It will be updated annually or when significant changes are made within this program.

This PMP summarizes the cost and schedule details in the Horizon Baseline (P6 .XER files) that were also submitted as part of the FY22 Horizon Plan. The future revisions of this plan will include additional details and reflect improved planning to deliver the first WR pit in CY2023 and then to produce a minimum of 30 pits in CY2026.

Notably the cost and schedule details to install the equipment to establish a reliable (b) (5) capability are not included in the PMP at this time.

The Horizon Baseline will be reported on monthly during FY22 as LANL works to be in full compliance with EM-B requirements as outlined in the NA-191 PCP documents.

7. References

Plutonium Modernization Program FY 2022 Implementation Plan, August 6, 2021

NA-191-PCP-00, *Plutonium Modernization Program Overview and Definitions*, Rev. 0, February 1, 2021

NA-191-PCP-01, *Plutonium Modernization Program Work Breakdown Structure (WBS)*, Rev. 0, February 26, 2021

NA-191-PCP-02, *Plutonium Modernization Program Control Accounts and Performance Reporting Structure*, Rev. 0, February 26, 2021

NA-191-PCP-03, Plutonium Modernization Program Work Authorization Document, Rev. 0, February 26, 2021

NA-191-PCP-04, *Plutonium Modernization Program Key Milestone Dictionary*, Rev. 1, February 26, 2021

NA-191-PCP-05, *Plutonium Modernization Program Schedule Requirements*, Rev. 1, February 26, 2021

NA-191-PCP-06, *Plutonium Modernization Program Cost Estimating to Support Modified Performance Reporting*, Rev. 0, February 26, 2021

NA-191-PCP-07, *Plutonium Modernization Program Baseline Change Control and Authority Thresholds*, Rev. 0, February 26, 2021

NA-191-PCP-08, *Plutonium Modernization Program Modified Performance Reporting Data Generation and Submittal*, Rev. 0, February 26, 2021

NA-191-PCP-09, *Plutonium Modernization Program Project Management and Controls Reporting*, Rev. 0, February 26, 2021

NA-191 Plutonium Modernization Program Risk and Opportunity Management Plan (ROMP), February 2021

NNSA Office of Defense Programs, *Program Execution Instructions (DP-PEI)*, Rev. 2, dated June 2019

NNSA Office of Defense Programs (DP) Program/Project Control System Description, *NA-10 Program Management Tools and Processes*, Revision 1, dated May 2020

ALDWP-GUIDE-001, R3, *Weapons Production Equipment Lifecycle Guide*, May 2021

Memorandum from M. Thompson to T. Wyka, *Prioritization of Programmatic Activities at Los Alamos National Laboratory's (LANL) Plutonium Facility (PF)-4*, dated June 22, 2021 (NNSA-2021-002838) and the associated Contract Officer letter dated June 24, 2021 (MAI: 33TF-2021-003031)

Contract Office Letter U2100767: Plutonium Modernization 10 Pit Capital Equipment – Planning and Performance Expectations, dated July 21, 2021 (NNSA-2021-003260)

Workforce Strategy for Plutonium Missions at Los Alamos National Laboratory (LA-CP-21-20695)

Appendix A. Modernization Uncertainty & Risk Analysis

The purpose of the Modernization Uncertainty & Risk Analysis (MURA) as detailed within this appendix is to identify programmatic risk and opportunities, including realized risks, their associated impacts and handling strategies (i.e. mitigation, acceptance, etc.). This Program Management Plan (PMP) Appendix addresses key features consistent with Enhanced Management -'B' (EM-B) implementation plan (dated March 12, 2021) and associated ROMP Revision 0 (dated February 18, 2021). This MURA will be reported on and updated consistent with EM-B requirements, with annual update in association with future year PMP submittals.

Risk realization discussion relative to the force majeure Corona Virus Disease 2019 (COVID or COVID-19) Global Pandemic is included herein, providing response to Action 4 within Contract Officer Letter U2100767: Plutonium Modernization 10 Pit Capital Equipment – Planning and Performance Expectations, dated July 21, 2021. This appendix is divided into five sections:

A.1. Risk Coordination and Working Group

A.2. COVID-19 Risk Realization and Abbreviated Impact Analysis

A.3. High-Impact Uncertainties and Handling Strategies

A.4. Plutonium Modernization Production Process and Capital Equipment Risk Discussion

A.5. Plutonium Modernization General MURA – LANL/NA-191 ROMP Compliance Methodology

Contract Office Letter U2100767: Plutonium Modernization 10 Pit Capital Equipment – Planning and Performance Expectations, dated July 21, 2021, Action 4 reads: *Within the confines of current horizon planning outlined above, incorporate schedule and Budgetary impacts due to COVID-19, specific to 10 Pit Capital Equipment and Plutonium Operations.*

Each of the operational and project related work efforts contained within and supportive of the National Nuclear Security Administration (NNSA or NA-) Defense Programs (NA-10), Section 191 (NA-191), Plutonium Modernization (PuM), at Los Alamos National Laboratory (LANL), have various risk types, their probabilities, impacts, and handling strategies, from very low to very high probability and associated impacts. COVID-19 represents a realized risk as detailed within Section A.1. Of the many work effort risks, several high consequence risk categories, including significant uncertainties, are detailed in Section A.2. The high risk categories are managed within the construct of the attached MURA, but are statused and addressed at an institutional level. In addition to monthly and quarterly reporting frameworks for general MURA detail, these significant uncertainties will be statused independently as 'Uncertainty Management' and will be treated as a subset and separate from general MURA detail.

General budgetary impacts, as a result of COVID, on 10 Pit capital equipment installations is detailed in the Section A.2.4. General schedule impacts are detailed in A.2. COVID-19 Risk Realization and Abbreviated Impact Analysis. Within the body of the PMP text, both budget and schedule impacts are discussed, with schedule impacts outlined in PMP Section 3.4, sequencing diagrams for 10 pit capital equipment.

A.1 Risk Coordination and Working Group

Risk coordination will be governed consistent with detail contained within the NA-191 EM-B Implementation Plan. LANL PuM does not have a Risk Manager as of this submission though actions are underway to onboard date Q1FY22. The Risk Manager will be responsible for all programmatic risks for each of the PuM and Plutonium Enablement (PuE) programs and will coordinate risk and handling strategies with LANL institutional risk management, Mission Assurance (MISSASSUR), as appropriate. The risk coordinator will govern risk and

associated reporting detail as well as facilitating resolution of these risks and their associated proposed risks. Coordinator functions will be supported by Engineering Technology and Design-Process Modeling and Analysis (E-DO, E-2). Until the Risk Manager is hired, the Program Director for Integrated Nuclear Programs (INP-DO) will facilitate the function.

The LANL Mission Assurance organization are detailed elsewhere. Specific detail pertinent to the LANL MURA/NA-191 ROMP as related to most significant and potentially institutional risks, may be jointly tracked in the LANL MURA/NA-191 ROMP and LANL MISSASSUR. Examples of these include force majeure events and high-impact operational upset events.

A.1.1. Accounting for Risk, Concerns, and Uncertainty

This document serves to address general risk via the MURA database, high-impact realized risk (see COVID), portfolio risk as a composite of the MURA database, and high-impact uncertainties. LANL is managing the following portfolio 'risks'. The following portfolio risks blur the bounds between uncertainty, risk, and issues, have a moderate degree of uncertainty and given the known and in process occurrence, are issues. The following are the significant areas of concern for which LANL is identifying and managing portfolio risk:

(b) (5)

A.2. COVID-19 Risk Realization and Impact Analysis

This section focuses on the force majeure global COVID-19 pandemic and associated impact to 10-Pit capital equipment installation and corresponding War Reserve (WR) pit production deliverables, as pertinent through the performance period up to and including calendar year end 2028. COVID has been a work impactor at LANL for 20-months, since February 2020; the full force of COVID impacts at LANL span 16 months from March 2020

("15-day" National Lockdown begins) through June 2020 (NM governor lifts all restrictions effective July 1, 2021), with indeterminate follow-on impact into FY22. LANL, in alignment with NA-191, has not adjusted WR production milestone dates but has instead illustrated impact with reduced probability of meeting the milestone at the currently designated dates. The force majeure nature of the COVID-impacts are such that anticipating and forecasting extended future impacts (beyond September 2021) is speculative, and as such, not included directly in the FY21 Program Execution Plan horizon plan for FY22. Enduring COVID-19 impact realization is included in Section A.3, Table 2.

Within this MURA subsection, current COVID risk realization has been quantified, with forecasted impacts to years beyond FY22. Impacts have been realized in three general ways, all of which directly impact the ability to execute the 10-pit capital equipment installation portfolio, and corresponding WR production milestones:

(b) (7)(E), (b) (7)(F)

LANL prioritized pit production efforts higher than other program performance, in an effort to maintain pit milestones and out year targets. That said, while portions of the pit mission have done better than COVID impacts would suggest, many programs performed worse. The program most impacted over the course of the COVID-impacting work period is 10-pit capital equipment installation, primarily affecting plutonium modernization, though including other supporting programs. All other production-related impacts affecting the Plutonium Modernization portfolio are directly impacted by the 10-pit capital equipment installation profile.

A.2.1. COVID-19 Impact to 10 WR Pit Milestone Targets as a Result of 10 Pit Capital Equipment Installation Delays

Over the 20-month COVID-impacting period (February 2020 through September 2021), the 10-pit capital equipment installation portfolio executed just over 7 months combined planned work (b) (7)(E), (b) (7)(F)

(b) (7)(E), (b) (7)(F)

(b) (7)(E), (b) (7)(F)

This 14-15-month impact directly impacts the ability to reliably produce (b) (5) as well as corresponding shifts out to 30 WR pit targets in 2026 and beyond. Pre-COVID, success probabilities (p') for the key war reserve pit deliverables have been notionally between High, p ≥ 60 < 80%. Post-COVID, added time is needed for 10-pit equipment installations to retain a ≥80% p'. Success probabilities for War Reserve (WR) pit deliverables are impacted as illustrated by decreased success probability (see Table 1). Recovery of these probabilities to pre-COVID estimates are noted in Table 1, Handling Options column. Details supporting Table 1 – War Reserve Production Success Probability, are supported with table notes. Probabilities used herein align with NA-191 MURA Section 3.2.6, Table 1 – Risk and Opportunity Likelihood Ranges.

MURA-Table 1 – War Reserve Production Success Probabilities and Handling Options (Note 11)

Milestone/ Activity Current Targeted Date	Probability Pre-COVID (Note 4)	Probability Post-COVID (Notes 6, 4)	Primary cause	Handling Options to enhance probability to pre-COVID values
FPU (12/23) (Note 10)	High - p≥ 60% < 80%, notionally 80%	High - p≥ 60% < 80%	(b) (7)(E), (b) (7)(F)	
(b) (5)	High - p≥ 60% < 80%	~60%	COVID (Note 1)	Either reduce critical equipment demand and increase preventive maintenance profile → brings success probability to ~75% , or – provide 8-months added schedule to complete needed 10 pit equipment installations → brings success probability to ~75% (Note 4)
30 Pits(12/26)	High - p≥ 60% < 80%	TBD	COVID (Note 2)	TBD (Note 5)

(b) (7)(E), (b) (7)(F)

- Note 2: reduced reliability based on incomplete precursor activities. Equipment installation impactors are based on late installation of risk reduction equipment and late installation of duplicate equipment, designed to support higher rate production reliability needs
- Note 3: potential reduction in non-pit production scope, freeing up personnel and production footprint - see LANL response (dated July 22, 2021) to memorandum from M. Thompson to T. Wyka - Prioritization of Programmatic Activities at Los Alamos National Laboratory's Plutonium Facility 4 associated Contract Officer Letter, dated June 22, 2021 (NNSA-2021-002838) and June 24, 2021 (MAI: 33TF-2021-003031).
- Note 4: schedule additions are 'options' based on forecasted capital equipment installation project completion dates and notional recovery plans, still in development. The post-Covid values reflect an added efforts to more tightly integrate these parallel efforts. proposed recovery schedule additions are designed to bring performance probabilities back to pre-COVID performance probabilities, and do not reflect additional schedule demands to improve performance above that of stated pre-COVID probabilities
- Note 5: The production of 30 WR pits and reliable demarcation at CY28 are follow-on functions of (b) (5) installation needs.

- Note 6: Post-COVID performance probabilities are based on limited items of equipment installed in support of baseline WR milestone needs. These probabilities reflect equipment installation late to need, beyond TTO/TTP dates.

(b) (7)(E), (b) (7)(F)

- Note 8: Improving success probabilities above pre-COVID values is Highly Unlikely within the confines of the current production milestone dates, though additional effort will be targeted to that aim in FY22.

Notional worse-case equipment installation scenarios and bridging actions implemented through the ongoing 'Basis of Estimate (BOE) Improvement Effort' and in accordance to the aforementioned Installation Sequencing diagrams are further detailed Section A.4. Plutonium Modernization, FY21 Process and Capital Equipment, Table 3 .(b) (5) Capital Equipment Installation Impact Analysis.

Prior to implementation if EM-B requirements, the LANL program office provided a separation between COVID related impacts and other PuM realized risks and uncertainties. Related realized impacts and their follow-on uncertainties are provided within Section A.4.6. Plutonium Modernization Risk Detail Attachment (LANL-PMP-A.A.4.6 – insertion) – LANL MURA and as appropriate in Section A.3. High-Impact Uncertainties and Handling Strategies. These and other general risks and uncertainties, if realized will have impacts reflected in baseline change processes, consistent with the LANL-ALDWP baseline change control board (BCCB) and in accordance with NA-191 Project Controls Procedure (PCP)-07, Baseline Change Control and Authority Thresholds.

A.2.2. Recovery Options

Two recovery options are proposed, with LANL preferring Option A, as embedded in this plan submittal and corresponding program files. Both options bring post-COVID p' from ~60% to ~75%.

Option A: LANL performed analysis to determine critical equipment strategy for achieving(b) (5) as scheduled. (b) (5) to 11 base MIEs, the second half of this strategy is to modify the preventive maintenance profile on existing(b) (5) needed equipment to better ensure reliable execution through the (b) (5) performance period. The benefit of this option is that critical national need dates are maintained with limited added performance risk from pre-COVID figures. Added (b) (5)

Option B: provide added schedule to milestone performance of ~14-15 months. Benefits to LANL for adjusting performance targets per Handling Options,(b) (5)
(b) (5)

A.2.3. COVID-19 Impact to (b) (5) Milestone Targets (b) (5)
(b) (5)

(b) (5)

(b) (5), (b) (7)(E), (b) (7)(F)

[redacted]

A.2.4. Budgetary Impact to 10 pit capital Equipment Installation and WR Production Requirements as a Result of COVID-19 – Simplified Quantification Mode

Budgetary impacts to the PuM portfolio is a consolidated composite of three categories:

1. Cost impacts as a result of slowed work performance.
2. Projected future cost impacts to recover to pre-COVID probability. Impacts that reduce performance to schedule result in more cost per planned effort.
3. Projected future cost of additional time needed to complete activities impacted by the COVID-19 global pandemic.

The consolidated impact to cost is the burdened rate for all sunk costs within the COVID impact period February 2020 and as projected through September 2021, is an average composite of 12-13 months of planned and now sunk FY20-FY21 cost, added to 14-15 months planned future cost as an average composite between FY23-FY28.

(b) (5)

[redacted]

(b) (5)

Detailed budgetary requirements for future performance of work in the FY24-FY28 performance periods will be included in respective FYNSP submittals and detailed in future Horizon Planning submittals.

A.3. High-Impact Uncertainties and Handling Strategies

These schedule shifts reflect COVID and related realized risks and their associated impacts, but do not reflect other potential impacts within the MURA Matrix. Coupled with the MURA Matrix, several potential future COVID and related impactors are reflected in qualitative terms of probability for realization and impact if realized. Each of these result in direct impacts to planned scheduled performance. In some cases, potential impact mitigators are known, but have impacts themselves (see Table 1, Note 4), if exercised. Some notional high-impact examples of potential future risk realizations include, but are not limited to those in the table.

MURA-Table 2 - High-Impact Uncertainty Realization Events and Handling Strategies (Note 4)

Notional Event Example	Probability	Impact	Handling Strategy
COVID resurgence or similar force majeure event	Moderate p≥40% < 60%	High - p≥ 60% < 80%	Accept (Notes 1, 2)

(b) (5), (b) (7)(E), (b) (7)(F)

(b) (5)

A.3.1. High-Impact Uncertainty Events and Handling Strategies - Performance Reporting Methodology

Due to the significant NA-191 enterprise and LANL institutional impact if these several uncertainties become realized risks, additional focus on these events will be provided as a function of standard reporting processes. High-impact uncertainties and their associated handling strategies will be reported on consistent with ROMP reporting requirements, and will be detailed at each reporting interval to current status and changes in uncertainty. These events will be tracked on a cover submittal to regular ROMP reporting detail. General

handling strategy detail will be developed to more discrete and actionable strategies. Tactical drivers will be tracked in a corrective-action-plan-like format. As these uncertainties evolve to more discrete and actionable risks, they will be merged with the general body of the MURA risk details and tracked accordingly. As appropriate, these uncertainty events may be tracked as a function of LANL institutional risk management process and incorporated into the approved issues management tool.

As detailed in Table 2, six high-impact uncertainties are detailed in the subsections below.

A.3.1.1. COVID Resurgence or Similar Force Majeure Event

Given current media reporting on COVID and associated variants, COVID bay have follow-on impacts to the LANL PuM portfolio. These impacts are estimated to be similar in immediate response and realization. (b) (5)
(b) (5)
indefinite nature of how long and to what extend COVID and associated variants may impact the LANL PuM and associated missions, assumptive impact is assumed as detailed in Section A.2.1 and in Table 1. For general discussion purposes, impacts are expected to have reduced production by ≥40% and equipment installations by ≥60% for the duration of the impact, as experienced thus far.

Additional force majeure events may occur, though length of impact and magnitude of the impact are unknown, but will be captured as impacting to budget, schedule, and as associated with future production success probability changes, typically downward.

This uncertainty event probability and its associated impact are Moderate p≥40% < 60% and High - p≥ 60% < 80%. The handling strategy is to accept, with handling strategies as denoted by Table 2, Notes 1 and 2.

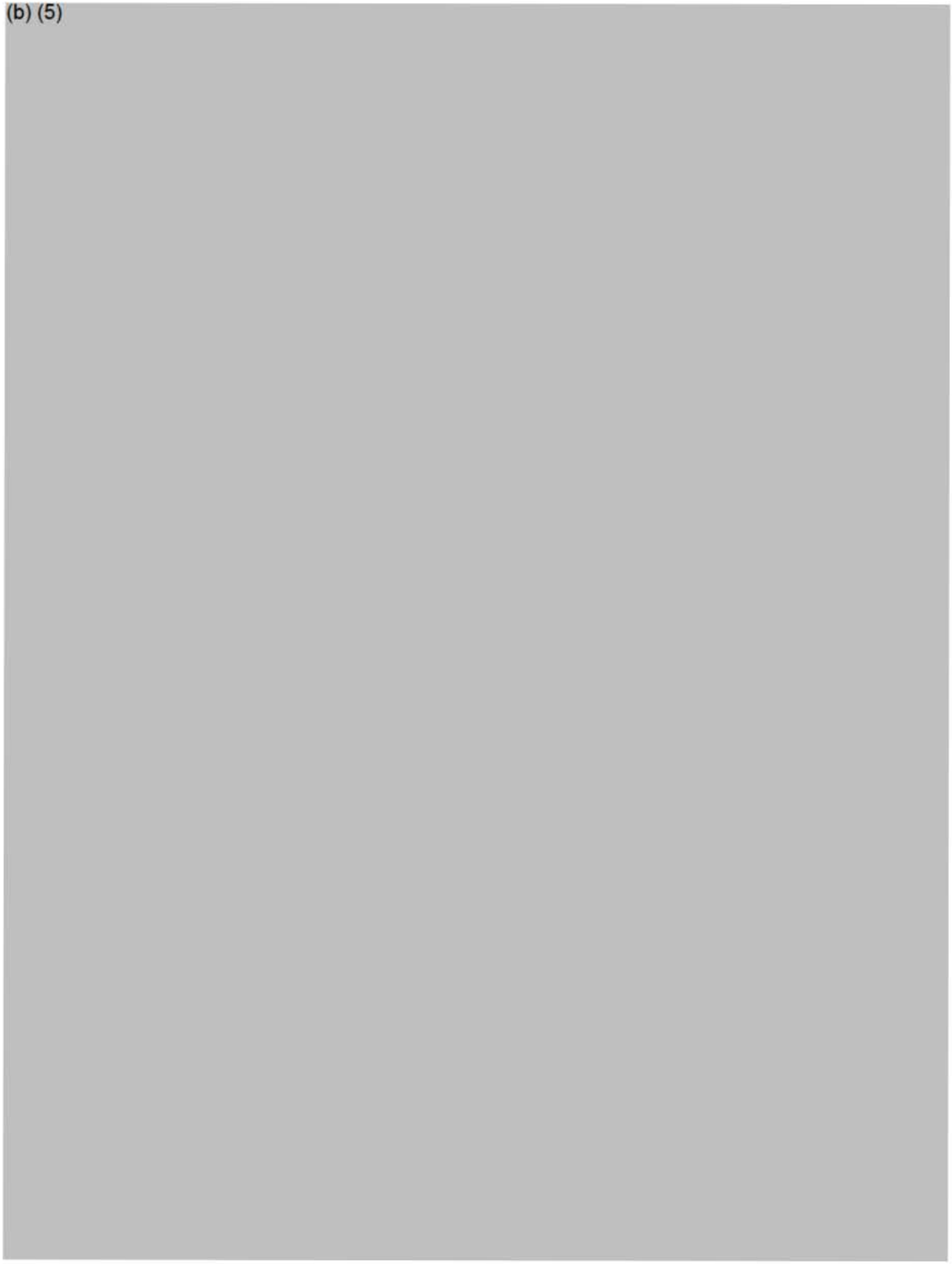
(b) (5), (b) (7)(E), (b) (7)(F)

(b) (5), (b) (7)(E), (b) (7)(F)

(b) (5)

(b) (5)

(b) (5)



(b) (5)

A.4. Plutonium Modernization Production Process and Capital Equipment Risk Discussion

This section focuses on general risks within the PuM production and capital equipment portfolios. Detail is provided for MURA -relative risks for development and production efforts and within two of the three equipment risk views. Equipment risk detail is as a portfolio, as a project, and within the project. Detail as a portfolio and project are provided herein. Detail within the projects are a function of the BOE deliverables associated with the three submittals (b) (5) and as such are not explicitly detailed herein. They will be a function of follow-on annual horizon planning submittals.

A.4.1. Plutonium Modernization and Enablement, Production and Construction Integration

Integration efforts are ongoing to ensure both PuM and PuE production targets are met and that both PuM and PuE capital equipment installation (construction) efforts are executed to support need dates. This complex integration is highly fluid and expected to increase in complexity as rapid expansion, increased production, and overlapping construction efforts are pursued. These integration efforts are embodied within and as a key 'Opportunity' of the MURA:

- Integrated Strategy for Plutonium Missions at LANL.
- Program Management Plans (inclusive of MURA and PEP detail).
- Increasingly integrated and improving fidelity P-6 plans.
- Increasing alignment with other Laboratories and adherence to NWBS requirements.
- Plans of the Month (POM) through Plans of the Week (POW) and Plans of the Day (POD).
- Integration of disparate systems supporting work effort execution and tracking. This specific opportunity is the subject of strategic discussion within and adjacent to Actinide Operations.

While easy to delineate, this tight integration of parallel has posed significant challenge to LANL program management, and is expected to pose increasingly difficult challenge moving into FY22 and beyond.

A.4.2. Los Alamos Pu Pit Production Project (LAP4) Integration Methodology

Integration of the LAP4 and 10 Pit equipment installation efforts are underway currently between Associate Laboratory Director (ALD) Weapons Production (WP) and ALD Plutonium Infrastructure (PI), with ALDWP providing need date information, scoping detail, and integration potentials, and ALDPI providing execution strategies including the facilitation of planning detail supportive of installation efforts from deign through turnover dates. ALDWP provides advanced integration through two program offices INP-DO and Program-Project Interface (PPI)-DO. As ongoing integration strategy efforts emerge, detail will be provided to NA-191 and at the discretion of ALDPI, DOE/NNSA Acquisition and Project Management (APM). LASO and SMEs within NA-191 will participate in final integration strategy development (b) (5)

A.4.3. Worse-Case Performance Impact Analysis and Bridging Strategy (see Section A.3. Table 1)

As a baseline from current installation status to proposed installation targets (see 10 Pit Sequencing Diagrams) LANL Program Office felt it appropriate to detail the production success probabilities as they exist today, using existing capability. This is largely due to three factors:

(b) (5)

2. 10 pit capital equipment includes replacement in kind and upgrades to existing equipment.

(b) (5)

Including the efforts in the three aforementioned factors, October 29, 2021 delivery of final BOE deliverables will be supported by re sequencing efforts to ensure most priority equipment is installed in the most efficacious manner to support production deliverables. (b) (5)

(b) (5)

A.5. Plutonium Modernization General MURA – LANL/NA-191 ROMP Compliance Methodology

Section A.5. is a composite of the general MURA detail, that constitutes the MURA deliverable for the horizon plan submittal and which will be reported on per EM-B requirements. It aligns with, but is separate to the information detailed within other sections of this PMP- MURA Attachment. The following text is taken from the report, PuM FY21 Process and capital equipment risk analysis, dated July 23, 2021 (E-2). This section provides the current status of risk management efforts for Plutonium Modernization Program managed scope at Los Alamos National Laboratory. The implementation of the NA-191 Risk and Opportunity Management Plan along with associated program management procedures is well underway, with the majority of scope expected to be compliant by the completion of FY21.

This scope has been split into two categories; "Process" which consists of the legacy risk program pertaining to Plutonium operations and "New Equipment" comprising PuM funded equipment installation scope. For the Process scope, all Control Account Managers, along with many of the Process Engineers, Project Managers, and Subject Matter Experts have now been interviewed to identify any new technical risks and opportunities not previously captured. All new risks at a minimum have initial scoring used to determine their unmitigated Cost Risk Exposure. These impacts are now being used to prioritize risks to develop handling plans. A cost estimate uncertainty analysis for this scope is expected to be completed this FY following FY22 schedule issuance. Once this analysis is complete and risks and mitigations have been mapped to schedule activities, the Management Reserve forecast will be performed and the Process portion of the scope is expected to be fully compliant with NA-191 risk procedures.

(b) (5)

(b) (5) This consists of performing interviews to identify risk, scoring risks in order to calculate Cost Risk Exposure, and scoring uncertainty in cost estimates to forecast Management Reserve needs. Once these risks have been mapped to their applicable schedules they are expected to be fully compliant with NA-191 risk procedures. Los Alamos will continue to work on the remaining New Equipment scope but does

not believe all equipment projects will be compliant until sometime in FY22 due to the volume of work remaining.

Table 1 below shows the results of the risk analysis to date. For Process scope, the Target CRE (CRE following mitigation) is expected to decrease further as additional risk mitigations are implemented but the total Management Reserve forecast is expected to increase significantly pending the completion of the Cost Uncertainty analysis. New Equipment values will also increase in all categories as additional projects are analyzed. All values are currently on a lifecycle basis but will be separated into FYs upon completion of the analysis.

A.5. Table 1: Analysis Results for Plutonium Modernization Managed Scope

	(b) (5)
Process Scope	
New Equipment Scope	
Totals	

In FY21, the Process Modeling and Analysis group (E-2) identified risks and performed Cost Risk Exposure (CRE) and Cost Uncertainty analysis on Plutonium Modernization (PuM) Program managed New Equipment installations at Los Alamos National Laboratory (LANL) as part of its risk support work package. In addition to New Equipment installations, LANL personnel also conducted CRE analysis for previously identified PuM Program Process risks. Expected impacts and probability of occurrence scores were used to obtain CRE estimates. A CRE estimate is a calculated value used to predict the economic impact of a risk on a project or program. In this report, CRE values have been summed with Cost Uncertainty analysis to determine the overall economic impact of uncertainty and currently identified risks on the PuM Program.

A.5.1. Risk Analysis - Methodology

For the purposes of these analyses, risk is defined as an uncertain event or condition that, if it occurs, has a negative effect on one or more project objectives such as scope, schedule, cost, and performance. In other words, a potential known future event with likelihood of less than 100% that if realized, would negatively affect program goals and objectives.

To identify risk events, an interview took place with the Process Engineer and/or System Engineer, the Project Manager, a LANL Risk Representative and other various personnel with knowledge of the piece of equipment being installed or the process being evaluated. First, the SMEs would explain the project scope. Then, the LANL Risk Representative would moderate a risk brainstorming session, emphasizing risk candidates were unplanned events that could add significant scope to the process or equipment installation.

After the interviews, a list of risks with titles, if/then statements, and descriptions was recorded. SMEs then scored each risk for probability of occurrence and the cost impact. Lastly, the CRE values for each risk were calculated using equation 11.

$$CRE = \text{Likelihood} \times [[(\text{Low Impact \$}) + (4 \times \text{Most Likely Impact \$}) + (\text{High Impact \$})]]/6$$

Ref: PCP-06, Cost Estimating to Support Modified Performance Reporting

For Cost Uncertainty analysis, schedule cost estimates were scored by SMEs to reflect the accuracy of each point estimate. To quantify Cost Uncertainty, these point estimates and Monte Carlo simulations were used to determine the 70th percentile expected cost for each project. (b) (5)

(b) (5)

A.5.2. Risk Analysis – Results

In the risk management process, risks are accompanied by a handling strategy. Two of the most common handling strategies are mitigation and acceptance. If a risk is predicted to have a major impact on the project cost and/or schedule, a mitigation strategy is often implemented to reduce the predicted impact. On the other hand, if a risk is predicted to have a lesser impact on the project cost and/or schedule, the handling strategy may be to accept the risk. Accepting a risk effectively preserves the resources required in implementing a risk mitigation strategy. In some cases, the mitigation strategy for a risk will result in a higher cost impact in order to reduce the schedule impact (i.e. PUM-LANL-R-0026 and PUM-LANL-R-0028).

The results reported in Table 2 represent the outcome of the CRE analysis for PuM Program Process risks. Similarly, Table 3 represents the outcome of the CRE analysis for PuM Program New Equipment risks. As seen in the tables, the PuM Program Process risks generally have a higher unmitigated CRE value compared to the PuM Program New Equipment risks. This can be explained by the higher risk scores for PuM Program Process risks compared to New Equipment risks. As a result, many of the PuM Program Process risks have a planned mitigation strategy while all of the listed PuM Program New Equipment risks have a handling strategy of acceptance. This is why Table 2 lists an unmitigated and target CRE value while Table 3 only lists an unmitigated CRE value.

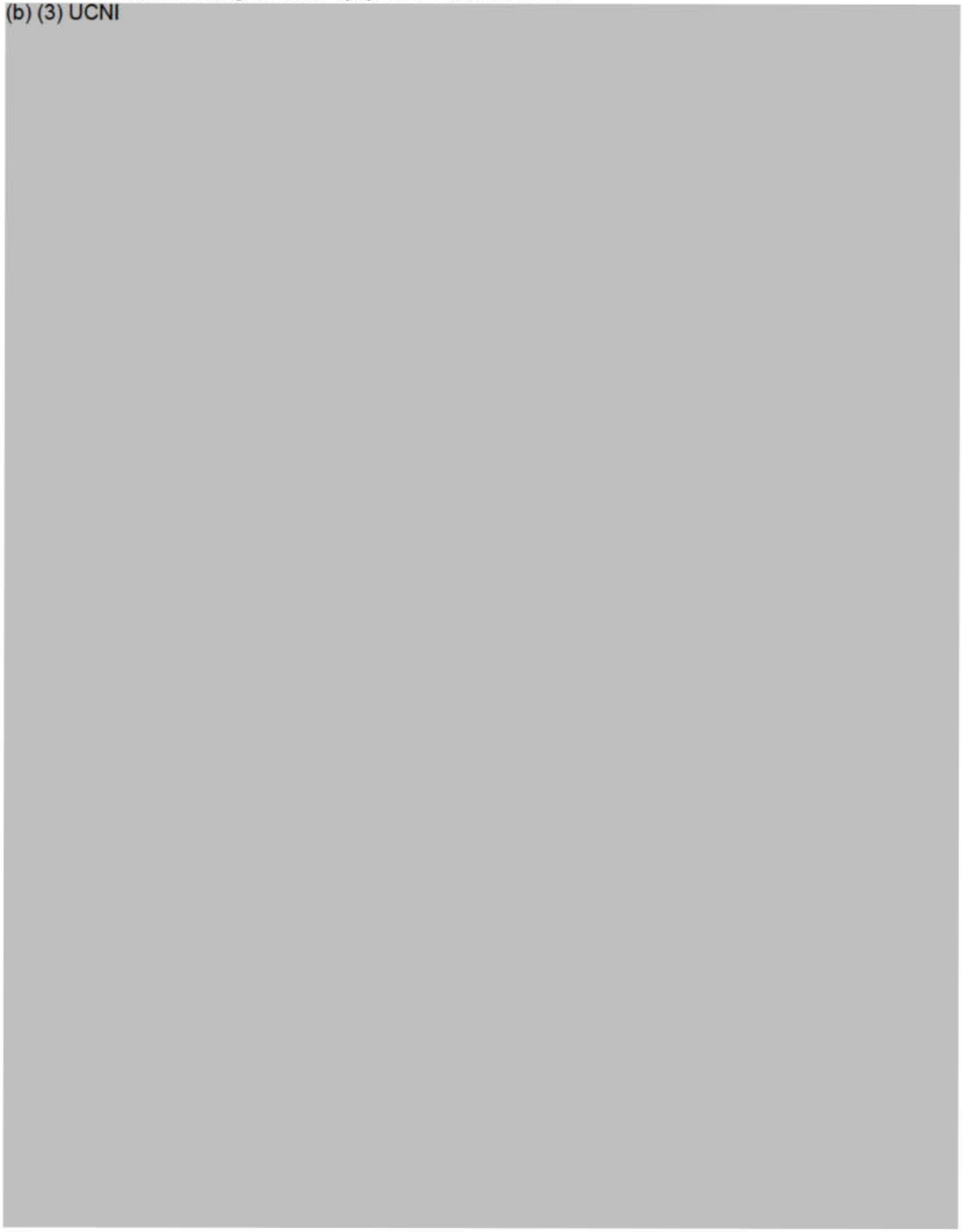
A.5. Table 2: PuM Program Process Risks CRE Values

Risk ID	Risk Name	Unmitigated CRE Value ($k)	Target CRE Value ($k)	Risk Score
(b) (5)				

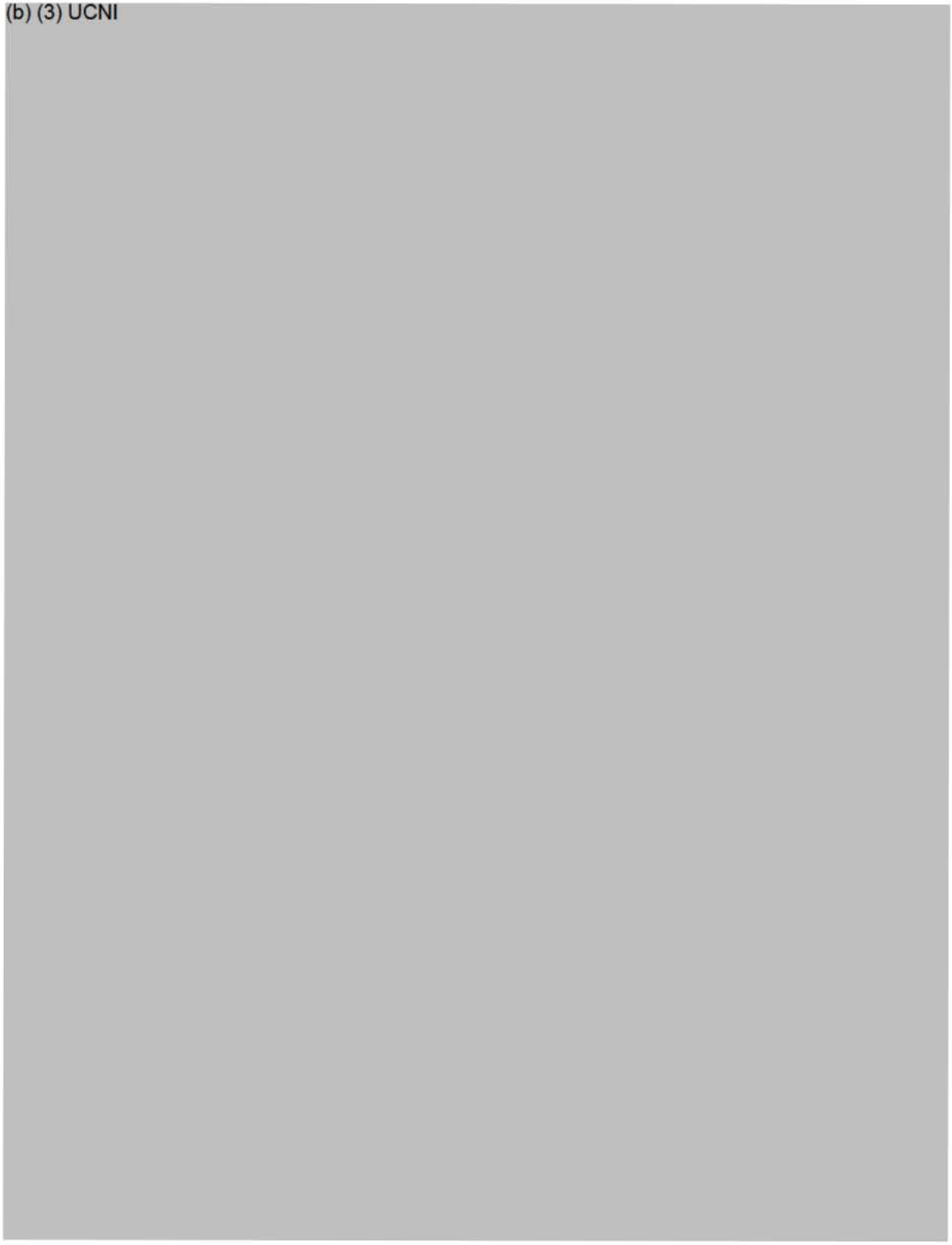
Risk ID	Risk Name	Unmitigated CRE Value ($k)	Target CRE Value ($k)	Risk Score
(b) (5)				

A.5. Table 3: PuM Program New Equipment Risks CRE Values

(b) (3) UCNI



(b) (3) UCNI



(b) (3) UCNI

A.5.3. Risk Analysis - Conclusion

The results reported in Table 1 are the total CRE values for the PuM Program Process and New Equipment risks listed in Tables 2 and 3. Listed are the Unmitigated CRE Totals followed by the Target CRE Totals for PuM Program Process and New Equipment risks. Note, the Target CRE Total remains unchanged for New Equipment since those risks have a handling strategy of acceptance. Conversely, the Process Target CRE Total is reduced significantly compared to its Unmitigated CRE Total due to the mitigation handling strategies.

(b) (5)

Currently, the Process schedules for PuM managed activities have not been available for evaluation of Cost Uncertainty. This is the reason the Cost Uncertainty for the Process scope is yet to be determined. Management Reserve is the sum of a project scope's CRE and Cost Uncertainty. (b) (5)

(b) (5) For Process scope, the Target CRE Total is expected to reduce as additional risk mitigations are implemented while the Target CRE Total for New Equipment scope is expected to increase as more installation projects are analyzed. Cost Uncertainty will increase as Process scope is analyzed which will lead to an overall increase in Management Reserve for the PuM Program. Again, all values are currently on a lifecycle basis but will be separated into FYs upon completion of the analysis.

Ultimately, this analysis is intended to help inform the program manager and laboratory management of the expected risk impact to the PuM Program managed processes and equipment installations analyzed in this

effort. During the performance of this work, and if These general risks and uncertainties are realized will have impacts reflected in baseline change processes, consistent with the LANL-ALDWP baseline change control board (BCCB) and in accordance with NA-191 Project Controls Procedure (PCP)-07, Baseline Change Control and Authority Thresholds.

A.5.4. Plutonium Modernization Risk Detail Insertion – LANL MURA

See Excel files for:

- PuM FY22 Process and Equipment Risk Analysis
- PuM NPCE Portfolio MURA Detail - Notional