ELECTRONIC RECORDS ARCHIVES

QUALITY MANAGEMENT PLAN (QMP)

(TOMP VER 2.0, TASK 4.3.9)

for the

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

ELECTRONIC RECORDS ARCHIVES PROGRAM MANAGEMENT OFFICE (NARA ERA PMO)

Final
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ERA QUALITY MANAGEMENT PLAN (QMP)

Signature Page

Program Director

I recommend approval of the Quality Management Plan (QMP).

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Quality Management Plan (QMP)

1.0 Introduction

Quality Management Plan (QMP) documents how an organization will plan, implement, and assess the effectiveness of its quality planning, quality assurance, quality control, and quality improvement operations. The following quality methods will be used by the Electronic Records Archives (ERA) Quality Management Plan (QMP) to manage and support ERAs Program Management Office (PMO) quality actions:

- Quality Planning: The process that identifies the relevant quality standards and determines how to satisfy them,
- Quality Assurance: Are all planned and systematic activities implemented in the quality system to provide confidence that the ERA project will satisfy the quality standards,
- Quality Control: Monitoring specific ERA project results to see if they comply with relevant quality standards, and
- Quality Improvement: To use output indicators to help identify better standards in order to increase ERA's effectiveness and efficiency.

The plan outlines Quality Management (QM) activities to be performed in support of the National Archives and Records Administration (NARA) ERA system acquisition.

1.1 Purpose

The purpose of this document is to provide details on a QM strategy for information technology activities (software, hardware, and procurement) to be performed in support of the ERA system. This document is to provide a basis for planning, performing, managing, monitoring, and measuring the ERA quality management activities.

The primary intent of the plan is to provide a basis for the PMO evaluation of performance quality. It has been proven that oversight of Contractor performance will improve quality performance. This plan affords the PMO a mechanism to preclude major deficiencies in quality, provides input for annual contractor past quality evaluations, and enables decision making whether to exercise further contract options.

This *QMP* defines the QM principles and the QM activities to be performed during the life cycle of the ERA system. It supplies a systematic method for identifying, tracking and resolving all quality issues. It also describes the responsibilities and authorities for accomplishing the planned quality management activities and identifies the required coordination of quality management activities with other program activities. Finally, it identifies the tools and the physical and human resources required for the execution of the plan. Each of the contractors will develop a "working" Quality Assurance Plan (QAP) after contract award, based on the contents of this *QMP*.

The QMP is a program level document and is applicable to ERA quality activities in the acquisition life cycle, as documented in the *ERA Acquisition Strategy (AS)* and the systems development lifecycle as defined in the *ERA Life Cycle (ELC)* documents. The methodology is based on a tailored version of IEEE-STD 730-1998 IEEE Standard for Software Quality Assurance Plans.

1.2 ERA Program Overview

ERA will be a comprehensive, systematic, and dynamic means for preserving virtually any kind of electronic record, free from dependence on any specific hardware or software. The ERA, when operational, will make it easy for NARA customers to find records they want and easy for NARA to deliver those records in formats suited to customers' needs.

The success of the ERA Program Management Office (PMO) in building the ERA system will depend in large part on the maturity level of the program and program management with an emphasis on QM principles.

1.3 Scope

The scope of QM is to provide processes that are required to ensure the ERA PMO that the quality program implemented will satisfy the delivery of the ERA system and associated documentation. The overall management determines quality policy, objectives, and responsibilities; implementation is conducted under the mantles of Quality Planning (QP), Quality Assurance (QA), and Quality Control (QC), with the ultimate goal of producing a quality product while facilitating/fostering Quality Improvement. Avoiding mistakes and reworks will save valuable time, effort and resources. QM provides the mechanisms for paying close attention to details so those tasks are completed correctly and accurately every step in the ERA life cycle.

This QMP reinforces the concept that quality is part of the normal business infrastructure, not a separate discipline that directs both the management of the ERA program and the product of the program. Continuous quality improvement becomes a result of this approach as the management process focuses on measuring and reviewing performance and acting on results.

1.4 QM Principles

QM is based on principles established by the ERA PMO and NARA. In general, a QM principle can be described as a supporting rule or belief for leading and operating an organization.

The ERA PMO bases its activities on the following specific QA principles, and applies proven methodologies, tools, and techniques to carry out the quality program to attain quality and excellence:

- Empowerment of program team members to make improvements within their areas of expertise;
- Total commitment from the PD and communication of that commitment;

- A focus on the customer and the notion that achieving customer satisfaction is an ongoing process while still addressing the needs of all stakeholders;
- A commitment to continuous process and product improvement over the long term;
- Emphasis on monitoring, inspection, prevention; and
- Independence in order to objectively present findings.

Note: The above principles are also essential for the Integrated Product and Process Development (IPPD).

1.5 Quality Management Policy Statement

All ERA activity is required to include QM activities as an integral part of processes used to develop and deliver product and services to the PMO. QM policy statements are listed in the **Policy Statements** section of the *ERA Quality Management Guidance (QMG)* document.

1.6 Definitions and Acronyms

The technical terms used in this plan are defined in IEEE Std 610.12-1990, *IEEE Standard Glossary of Software Engineering Terminology*. **Table 1-1, Acronyms Lists,** contains a list of acronyms used herein.

ACRONYM	DEFINITION
AI	Action Item
AS	Acquisition Strategy
AUG	Action Item Tracking Database Users Guide
AS	Acquisition Strategy
CAAD	Cost Analysis Assumption Document
CASE	Computer Aided Software Engineering
CCB	Configuration Control Board
CD-ROM	Compact Disk – Read Only Memory
CDR	Critical Design Review
CI	Configuration Item
CM	Configuration Management
CMP	Configuration Management Plan
COR	Contracting Officer's Representative
CPP	Configuration Management PVCS Procedures
CSC	Computer Software Components
CSCI	Configuration Software Configuration Item
ECN	Engineering Change Notice
ELC	ERA Life Cycle
ERA	Electronic Records Archives
ERB	Engineering Review Board
ERP	ERA Research Plan
FAT	Functional Acceptance Testing

ACRONYM	DEFINITION
GRS	General Records Schedules
GUI	Graphic User Interface
HWCI	Hardware Configuration Item
ICD	Interface Control Document
IDD	Interface Design Document
IEEE	Institute of Electrical and Electronics Engineers
IPPD	Integrated Product and Process Development
IPT	Integrated Product Team
ISO	International Organization for Standardization
I&T	Integration and Testing
IVVP	Independent Verification & Validation Plan
MP	Metrics Plan
N/A	Not Applicable
NARA	National Archives and Records Administration
ORR	Operation Readiness Review
PD	Program Director
PDL	Preliminary Design Library
PDR	Preliminary Design Review
PMBOK	Project Management Body of Knowledge
PMO	Program Management Office
PMP	Program Management Plan
PR	Peer Review
PRP	Peer Review Process
PVCS	Polytron Version Control System
PWS	Performance Work Statement
QA	Quality Assurance
QAP	Quality Assurance Plan
QM	Quality Management
QMG	Quality Management Guidance
QMP	Quality Management Plan
RAM	Random –Access Memory
RFP	Request for Proposal
RKM	Risk Management Plan
RQM	Requirements Management Plan
RR	Requirements Review
RTM	Requirements Traceability Matrix
SDD	System Design Documents
SDF	Software Development Files
SDR	System Design Review
SDS	System Design Specifications
SOO	Statement of Objectives
SRR	System Requirement Review

ACRONYM	DEFINITION
SRS	System Requirement Specifications
Std	Standard
RR	Requirements Review
TBD	To be determined
TEP	Technical Review Process
TRA	Training Needs Assessment
TRP	PMO Training Plan
TRR	Test Readiness Review
TSP	Testing Management Plan
VVP	Verification and Validation Plan
VVR	Verification and Validation Reports
WBS	Work Breakdown Structure

Table 1-1: Acronyms & Definitions

2.0 References

The standards, guidelines, and documentation used to develop the *QMP* are described in the sections that follow.

2.1 ERA PMO Documents

The following ERA PMO documentation was used to support the generation of this document:

- Metrics Plan (MP) Version 2.0,
- Testing Management Plan (TSP) Version 2.1,
- Program Management Plan (PMP) Version 1.2,
- Requirements Management Plan (RQM) Version 2.0,
- Peer Review Process (PRP) Version 1.1,
- Configuration Management Plan (CMP) Version 2.0,
- Cost Analysis Assumption Document (CAAD), Version 0.01
- Risk Management Plan (RKM) Version 2.1,
- PMO Training Plan (TRP) Version 1.0,
- Training Needs Assessment (TRA) Version 2.0,
- ERA Research Plan (ERP) Version 1.1,
- ERA File Plan (FP) In-Progress,
- Independent Verification & Validation Plan (IVVP), Version 0.01
- Acquisition Strategy (AS) Version 3.0, and
- Action Item Tracking Database Users Guide (AUG) Version 1.2.

2.2 Standards and Guidelines

The standards and guidelines used in preparation of this document are listed below.

- NARA Regulations in the Code of Federal Regulations, Subchapter B - Records Management (Parts 1220 –1238)
- General Records Schedule (GRS) 24 – Information Technology Operations and Management Records
- IEEE Std. 730 – 1998, IEEE Standard for Software Quality Assurance Plans
- IEEE Std. 829 – 1998 IEEE Standard for Software Test Documentation
- IEEE Std 610.12-1990, IEEE Standard Glossary of Software Engineering Terminology
- IEEE Std. 1062-1998, IEEE Recommended Practice for Software Acquisition
- The Project Management Body of Knowledge (PMBOK Guide), 2000 Edition
- DOD Std 2176A Defense System Software Development, Appendix B – Requirements for Software Coding Standards
- Classic System Solutions Inc., GUIguide ™ 3.1
- International Organization for Standardization (ISO) 15939, Software Engineering – Software Measurement Process
- ISO 15489-1:2001 - Information and Documentation – Records Management
- ISO 14721:2003 - Reference Model for an Open Archival Information System
- Governance, Control and Audit for Information and Related Technology, Control Objectives for Information and related Technology (COBIT)

3.0 Management

The ERA PMO QM Organization consists of the following representatives in each of the following roles:

- PMO,
- Program Director (PD),
- QM Specialist,
- QM Team,
- CM Specialist,
- Development Contractor, and
- Risk Officer.

3.1 Organizational Structure

The ERA organizational structure as it relates to QM is illustrated in **Figure 3-1, ERA PMO QM Organization Chart**.

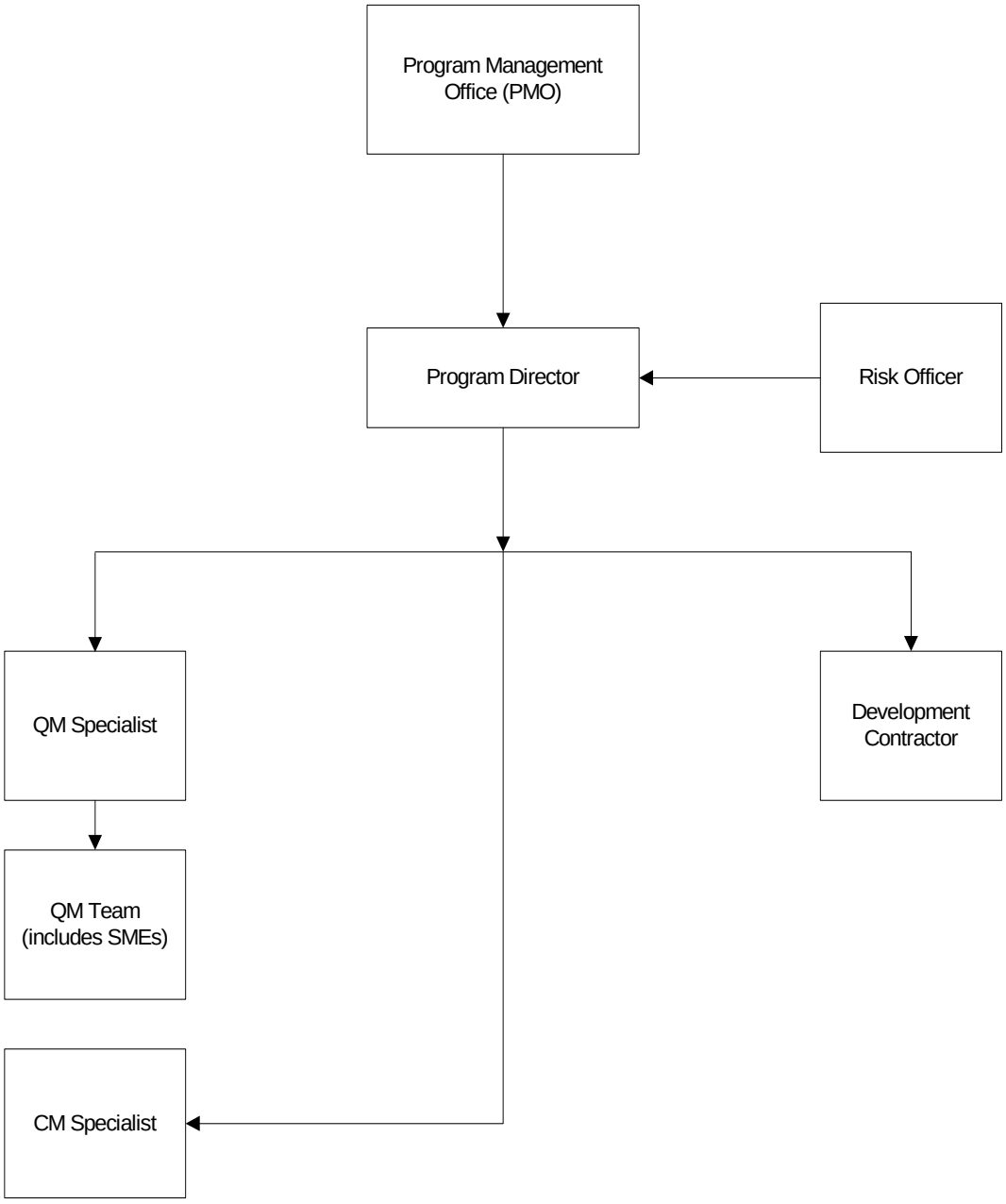

Figure 3-1: ERA PMO QM Organization Chart

3.2 Roles and Responsibilities

Table 3-1, PMO QM Organization Roles and Responsibilities, list the primary responsibilities of each role as it relates to QM.

Roles	Required Responsibilities
Program Management Office	• Identifying standards, best practices and conventions for life cycle management of electronic records. • Identifying any formal (written) standards, and then ensuring that the standards are being followed. • Ensures compliance with QM program audits • Manages the overall performance to ensure QM activities are conducted. • Ensures that acquisition activities adhere to relevant standards, best practices and conventions. • Ensures response to deficiency reports from QA reviews. • Ensures plan content, currency, accuracy, and quality. • Ensures the QMP is updated or revised, as needed, to reflect the state of Quality activities in the program and delegate the task of updating or revising the document to the QM Specialist.
Program Director	• Review, provide feedback and approve the QM Plan. • Ensures the independence of the QM function. • Make available staff & other resources as needed to support QM. • Provide the QM team with the standards, policies, and procedures applicable to the program. • Support QM activities by confirming QM responsibilities and authority. • Assure that the QM staff has the appropriate QM skills and training. • Ensures the development of and implementation of approaches to tasks that the WBS enumerates. • Ensures technical requirements are fulfilled

Roles	Required Responsibilities
	by the completion of tasks. • Process and product improvements as a result of information gathered from QM reviews and audits. • Approves tools and methodologies.

QM Specialist	**Mentor:** (Trusted counselor or guide)
	• Ensures that training is provided to program teams on QM Program, QM processes (peer reviews) and key process tools (metrics).
	• Implement, with teams, processes and procedures that fit program size, scope and priorities and meet quality standards.
	• Ensures the team has access to standard tools and training materials pertinent to their role(s).
	• Provide new and transfer team members a "hands-on" introduction to program processes and organizational goals necessary to perform their role(s):
	  • Ensure Quality Improvement Awareness;
	  • Perform Inspections (Audits);
	  • Ensure Peer reviews; and
	  • Perform Defect Tracking.

	Quality Advocate: (Defends or maintains a cause) • Develop and maintain QM Plan for ERA; obtain program management approval. • Provide consultation during preparation of the Program Management Plan (PMP), including review of the plan, standards, procedures and processes. • Participate in peer reviews. • Participate in strategic planning activities to gain insight into the program environment. • Perform process and product audits and reviews to ensure compliance with standards, and procedures. • Work with teams to define processes and procedures and foster implementation.

Roles	Required Responsibilities
	• Report deviations from documented policies, processes, procedures and standards to program management, and work with the program teams to develop an action plan to correct deviations. • Report results of the process and product audits and reviews to Management with recommendations for corrective action. • Collect metrics and create reports for ERA management to assist in quality control. • Conduct functional and physical audits of configuration items.
	Change Advocate: (Defends or maintains a cause) • Report potential areas for change to Program Director. • Work with other QM leaders to coordinate and leverage program-level changes. • Enable team members to identify process changes. • Evaluate recommended organizational process changes and provide input to the PMO. • Update QM tools to accommodate new and revised processes. • Tailor ERA processes to meet program specific needs. • Facilitate new process change within and across teams. • Ensure that the program's continuous process improvement activities are captured, documented, and forwarded to Configuration Management (CM).
QM Team	• Participate in peer reviews and conduct audits. • Coordinate with customers, stakeholders, and program team members in understanding ERA policies and procedures. • Support the QM Specialist in developing and implementing ERA policies and procedures.

Roles	Required Responsibilities
	• Communicate with other NARA program and program managers and others who may propose improvements to QM practices. • Identify areas for process improvement.
CM Specialist	• Coordinate configuration audit responsibilities with the QM Specialist. • Identify ERAs configuration items to be controlled. • Perform version control on all configuration items and storing them in a configuration library (repository). • Storing records (reviews) and artifacts (audits) generated by QM activities. • Manages the deployment of ERA system.
Risk Officer	• Establish ERA risk management policy, process and practices to ensure ERA Program integrity and stability. • Ensure goals, objectives, and requirements are consistent with risk management, as well as measurable performance criteria. • Monitor risk management performance of ERA staff and report status to the PD. • Develop and maintain ERA's risk assessment strategy.
Development Contractor	• Participate in reviews and audits. • Identify areas for process improvement. • Perform all quality activities as specified by the standards, policies, and procedures applicable to the program. • Implement development contractors QAP.

Table 3-1: PMO QM Organization Roles and Responsibilities Table

Note: Development contractor's roles and responsibilities will be documented in their individual QAP.

3.3 Tasks

QM activities are designed to prevent and uncover defects in the product or the processes that are used to develop the product. All QM specific tasks are integrated into the ERA life cycle, as

illustrated in **Figure 2-2, ERA Development Life Cycle Release Detail** in the *ELC* document. QM milestones are the same as program milestones. Tasks that support this function include the following; defining applicable standards, procedures, and processes to help ensure that system is well designed, technically sound and thoroughly documented. Conducting and documenting quality assurance reviews, assessements/audits, traceability analysis, and evaluations. Tasks include follow-up of required corrective action, identifying and help in mitigating program risk and providing program management and ERA PMO members with visibility into ERA life cycle activities. These tasks apply to each phase of the ERA life cycle, beginning with the Concept Exploration phase. The QM Specialist assigns each particular task and is responsible for its completion and the reporting of the results. This plan establishes program guidelines that produce complete, accurate and easily understood products within the framework of the ERA life cycle model.

3.4 Status Reports

QM activities are reported on a regular basis to the PD, program management, development teams, and other affected groups. These status reports delineate areas where evaluation is raising issues concerning system configuration or system functionality, as well as those areas where evaluation is changing to accommodate the changes in system requirements or design.

The frequency and process for posting these reports is consistent with the **Progress Reporting** section defined in the *ERA Program Management Plan (PMP)*. The format is consistent with the ERA Program Monthly Status Report template. The content of these reports is as follows.

- **Accomplishments** for the reporting period. For example, completed audits and reviews for a specific area of functionality.
- **Activities** for the reporting period. For example, current activity compared to scheduled tasks.
- **Issues** during the reporting period. For example, any concerns about audits/assessments, risks, open issues, or action items.
- **Performance Metrics** during the reporting period. For example, number of milestones completed this period, number of milestones overdue.

3.5 Life Cycle Phase and QM Activities

Refer to **Appendix A**, **Life Cycle Phase and QM Activities** for ERA life cycle phases and corresponding QM activities. Refer to **Figure 3-2, ERA Systems Development Lifecycle** in the *ERA AS* for additional information on life cycle phases and activities.

4.0 QM Documentation

All documentation governing the planning, development, verification and validation, implementation, use, and maintenance of the ERA system are subject to QM review as defined in this QM plan. This plan defines the requirements for document production quality criteria used

to determine the quality of each document in terms of achieving its purpose, covering the intended subject and scope, and providing appropriate level of detail.

4.1 Purpose

All documents are subject to QM control and become records of the ERA PMO which are managed in accordance with NARA Regulations in the 36 Code of Federal Regulations (Parts 1220 –1238), Subchapter B - Records Management. Documents will be checked for accuracy and adequacy through reviews (e.g., peer reviews) and product audits. Reference **Section 6.0, Reviews and Audits** for additional information.

4.2 Minimum Documentation Requirements

Documentation is necessary to ensure ERA activities are planned, monitored, and controlled to verify the adequacy of processes used to develop and/or deliver products/services.

The following plans are required to assure the quality of the ERA program.

- Configuration Management Plan (CMP) - The Configuration Management Plan defines the schedules, functions, responsibilities and procedures for controlling the system configuration during the development, testing, and deployment.
- Program Management Plan (PMP) - The Program Management Plan furnishes the methodology and standard processes and procedures to achieve consistent quality management throughout the ERA program.
- Requirements Management Plan (RQM) – The Requirements Management Plan describes the schedules, functions, responsibilities and procedures and also covers all requirements work beginning with the development of the ERA Vision, through the development of ERA requirements.
- Metrics Plan (MP) – The Metrics Plan describes the schedules, functions, responsibilities and procedures for all metrics activities within ERA.
- Risk Management Plan (RKM) – The Risk Management Plan describes the procedures and methods, as well as any tools used, to manage risk in ERA.
- Testing Management Plan (TSP) – The Testing Management Plan will define the types of tests that are to be conducted, what is to be tested, the data to be used in testing, the expected results, the test environment, the procedures to be followed in testing, and the management of ERA testing activities. Verification and Validation Plan (VVP) and Verification and Validation Reports (VVRs) are not specifically addressed in this TSP but will be viewed as a testing consideration for the ERA PMO.
- PMO Training Plan (TRP) – The PMO Training Plan describes what training is required for ERA PMO staff to build a successful ERA.
- ERA Research Plan (ERP) – The ERA Research Plan describes how the ERA PMO will manage research activities which addresses NARA's critical requirements for life

cycle management, preservation, and accession of historically valuable electronic records of the U.S. Government.

- Independent Verification & Validation Plan (IVVP) - The Independent Verification & Validation Plan describes how the independent organization will perform the process of determining whether the products (plans and procedures) or requirements are complete and correct.
- Additional plans and reports will be added to this list as required.

5.0 Standards, Practices, Conventions, Metrics, and Activities

The ERA PMO is responsible for identifying standards, best practices and conventions for life cycle management of records that will be implemented in the ERA system. Whenever the PMO stipulates any formal (written) standards, a Quality Planning activity is established to ensure that all relevant activities and products adhere to those standards. Measurements are essential to QM, if not generated; there is no way to tell if quality goals are being maintained. Metrics collected from quality activities is intended to identify weak areas in the process, measure system quality, product characteristics, and monitor the status of the work products. Metrics and associated procedures are documented in the *ERA Metrics Plan (MP).*

5.1 Purpose

The purpose of standards is to ensure that system acquisition activities adhere to relevant standards, best practices and conventions.

5.2 Content

Table 5-1, Standards, Practices, Conventions, Metrics, and Activities, lists the minimum standards, practices, conventions, and metrics used to ensure system acquisition activities.

Standards
• Records Management Standards – ISO 15489-1:2001 Information and Documentation – Records Management
• Information Transfer Standards – ISO 14721:2003 Reference Model for an Open Archival Information System
• Project Standards – The Project Management Body of Knowledge (PMBOK)
• Documentation Standards – ERA.PMO.dot (Template)
• Coding Standards – DOD-STD-2167A: Defense System Software Development (Appendix B – Requirements for Software Coding Standards)
• GUI Development Standards – GUIguide ™ 3.1 – GUI standards for Web & Client/Server development
• Test Documentation Standards – IEEE Std. 829-1998 Standard for

Software Test Documentation
• Measurement and Analysis Standards – ISO/IEC 15939 Software Engineering – Software Measurement Process
• Product Control Standards – Control Objectives for Information and related Technology (COBIT)
• Adherence to agreed upon standards
• Risk Assessment Standards – See *ERA RKM*
Practices
• Testing
• Industry "best practices"
• Recording Defects, and collecting Metrics
• Checking In & Checking Out
• Enforce adherence to agreed upon practices
• Record Keeping and Business
Conventions
• Requirement numbering Conventions – Reference the *ERA Requirements Document (RD)*
• Naming Conventions – Reference the Naming Configuration Item section in the *ERA Configuration Management Plan (CMP)*
• Documentation Conventions - Reference the For Document section of the *ERA Configuration Management Plan (CMP)*
• Testing Conventions – *Reference the ERA Testing Management Plan (TSP)*
• Action Item Form Naming Conventions – Reference the *ERA Action Item Tracking System Database Users Guide (AUG)*
• Data Element Conventions – NARA Life Cycle Data Elements Guide
• Configuration Item Naming Conventions - Reference the Naming Configuration Item section in the *ERA Configuration Management Plan (CMP)*
• Adherence to agreed upon Naming or numbering Conventions
Metrics
• Reference the *ERA Metrics Plan (MP)*
Activities
• Reference the *ERA Program Management Plan (PMP).*

Table 5-1: Standards, Practices, Conventions, Metrics, and Activities

6.0 Reviews and Audits

QM reviews are used to determine if the program is using the processes, procedures, standards and plans to help prevent or remove defects from work products and processes. Audits are used to identify deviations in process performance, identify noncompliance items, validate process improvement, and to provide reports to management.

6.1 Purpose

The work products generated during the ERA life cycle are reviewed and/or audited on a planned basis to determine the extent of progress, and to evaluate the adequacy of the work and its conformance to requirements and standards. Reviews and audits serve the purpose of providing an objective assessment and are to be used by management as a QM tool for identifying areas for improvement and technical adequacy. The QM team participates in technical and managerial reviews, and conducts process audits with respect to plans and schedules. Corrective action from non-compliance (requirements) or non-conformance (contractual) are documented and addressed in **Section 8, Problem Reporting and Corrective Action**.

6.2 Minimum Required Reviews and Audits

The QM Team will be responsible for conducting a process evaluation to ensure the review process is being followed and performs a product evaluation to ensure the document follows required standards and for technical adequacy. At a minimum, the following reviews and audits shall be conducted:

- Program Management Plan Reviews,
- Contract Review,
- Documentation Reviews,
- Technical Reviews,
- Others, and
- Internal Assessment/Audits.

6.2.1 Program Management Plan (PMP) Reviews

The PMP reviews support execution of program management best practices, continuous process improvement, and implementation of quality principles. The PD and the QM Team will compare the PMP with the corresponding practices to ensure that the program team is adhering to the documented procedures and policies, and to examine the necessity for plan modifications. The QM Team and PD will use collected metrics and performance measurement data to evaluate whether additional activities must be added to the PMP.

If the program team is not following the procedures and policies outlined in the PMP, the QM Team will document the discrepancies and examine the necessity for modifying those plans and implementing quality improvements.

If the PD and the QM Team concur that plan modifications are necessary, the PD will delegate revision responsibility to another team member. When the modified draft is complete, the QM Team will schedule a Program Management Plan Peer Review.

6.2.2 Contract Review

Immediately upon award, the QM group shall review the contract, including all referenced required documentation to identify QM requirements. A QM milestone chart will be developed when program milestones are identified and then placed under CM control. A QM contract summary will be generated and contain a summary of all pertinent quality information such as:

- Data requirements,
- General specification requirements,
- Quality documentation requirements, and
- Quality Specification requirements.

A summary will be distributed to all QM Team members and key personnel in the ERA PMO.

6.2.3 Documentation Reviews

The PMO will conduct all ERA related Documentation Reviews as described in the *ERA Peer Review Process (PRP)* document.

Documentation Reviews are held to ensure the document meets the end user needs and follows program standards.

The PD may schedule interim Peer Reviews to assess progress, but the ERA schedule will incorporate at least one Documentation Review for each technical deliverable.

6.2.4 Technical Reviews

Refer to the *ERA Technical Review Process (TEP)* document for information on the following reviews:

- Requirements Review (RR),
- System Requirements Review (SRR),
- System Design Review (SDR),
- Increment System Requirements Review,
- Release System Requirements Review,
- Preliminary Design Review (PDR),
- Critical Design Review (CDR),
- Test Readiness Review (TRR), and
- Operational Readiness Review (ORR).

6.3 Other

Other possible Quality Assurance (QA) reviews may be included but are not limited to those described in the following sections.

6.3.1 Peer Reviews

QM methodologies are integrated sets of tools and techniques. The peer review process is the PD's initial methodology choice for QM. The tools include, but are not limited to, checklists, standards, forms and documentation. The Peer Review (PR) is a general method for reviewing development work products in order to eliminate defects as early in the development life cycle as possible. It can be applied to any type of development work product including designs, code, scenarios, test scripts, test cases, and documentation.

The PR, when properly conducted at various points during development, can be the single most effective way to uncover and correct errors while they are still inexpensive to find and fix. Peer reviews allow program personnel to evaluate work products against program standards as documented in the peer review checklists (e.g., Appendix B & C in the *ERA Peer Review Process* document). It can be perceived as a "filter" for the software engineering process. The PR is an iterative process, supporting continuous improvement in achieving the plan mission. Each PR is a formal meeting conducted by technical staff with the sole purpose of uncovering quality problems. The type of PR dictates who will attend; the review chair (facilitator) exercises discretion concerning whom to invite. A complete peer review process description can be found in the *ERA Peer Review Process (PRP)* document. **Figure 6-1, Peer Review Standard Process**, shows the basic steps that comprise the peer review process:

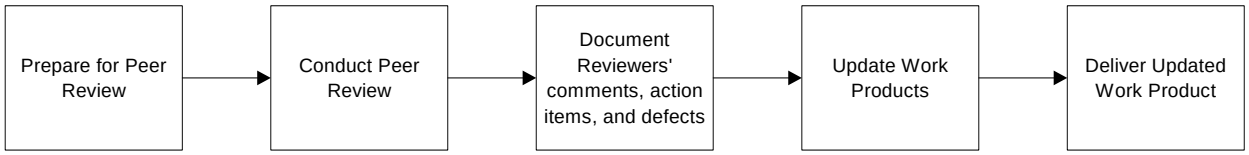

Figure 6-1: Peer Review Standard Process

6.3.2 Managerial Review

Managerial Reviews are assessments of the execution of the QM Plan. All QM activities are evaluated. Managerial reviews of the status and adequacy of the ERA QM program are accomplished through the following:

- Periodic review of quality performance reports,
- Major program review meetings,
- Scheduled program and product audits, and
- Scheduled program reviews/monthly meetings.

Review findings are documented, including any exceptions to the process stated in the QM plan, which may result in recommended changes or improvements to the plan.

6.3.3 Process Improvement Reviews

The Process Improvement Reviews lend support to the whole QM concept in that they are held to evaluate metrics from the development effort. Their findings provide information needed to determine if processes need to be modified to prevent or reduce quality related problems in the future of the program or in new efforts. This type of review generates process improvement recommendations.

6.3.4 Post-Implementation Review

The Post-Implementation Review is held after the completion or cancellation of the program or any part thereof. It compares all planning information with metrics collected on work completed, effort expended, and funds expended and uses the resulting analysis to determine improvements needed in areas such as resource utilization and quality systems. A Post-Implementation Review Report is generated at this time.

6.3.5 Internal Assessments/Audits

The QM Team will perform the following activities when conducting assessments/audits:

- Define the scope and purpose of the assessment/audit within the assessment/audit plan,
- Prepare assessment/audit procedures and checklists for the assessment/audit,
- Examine evidence of implementation and controls,
- Interview personnel to learn the status and functions of the processes and the status of the products,
- Prepare and submit an assessment/audit report to functional area task lead,
- Discuss findings with the technical staff and task leader, and
- Refer unresolved deviations to functional area task lead for resolution.

A product assessment/audit is an independent examination of work product(s) to assess compliance with specifications, standards, customer requirements, or other criteria. Product assessments/audits are used to ensure that the product was evaluated before it was delivered to the customer, that it was evaluated against agreed upon standards, procedures, or other requirements, that deviations are identified, documented and tracked to closure and to verify corrections.

A process assessment/audit is a systematic and independent examination, to determine whether quality activities and related results comply with planned standards, policies and procedures and whether these are implemented effectively and are suitable to achieve ERA's objectives.

6.3.5.1 Purpose

The purpose of assessments/audits is to identify deviations in process performance, identify noncompliance items that cannot be resolved at the technical support or program management level, these items will be escalated to the PD, to validate process improvement/correction action achievements, and to provide relevant reports to all management levels.

6.3.5.2 ERA Assessment/Audit Procedures

The following steps are in the assessment/audit process.

1. Clearly understand and adhere to Assessment/Audit scope
2. Conduct preparation meetings in advance of the Assessment/Audit
   - Define areas to be reviewed
   - Define Review criteria
3. Conduct an overview meeting in advance of the Assessment/Audit
4. Understanding of ERA organization, products, and processes
5. Conduct the planned meetings, interviews, samples, etc,
6. Review the preliminary findings from the Assessments/Audits
7. Verify and classify findings from the Assessment/Audit
8. Validate Assessment/Audit report for the Assessment/Audit client
9. Prepare the Assessment/Audit report for the Assessment/Audit client
10. Provide recommendations on request only
11. Follow-up corrective action/process improvement
12. Improve the Assessment/Audit process

6.3.5.3 ERA Assessment/Audit Exit Criteria

The following items are in the assessment/audit exit criteria process.

- Each element within the scope of the audit has been examined;
- Findings have been presented to the audited organization;
- Response to draft findings have been received and evaluated;
- Final findings have been formally presented to the assessed functional area and initiating entity;
- The assessment/audit report has been prepared and submitted to recipient designated in the assessment/audit plan;
- Assessment/Audit findings and recommendations have been documented and reported to Program Director;
- The recommendation report, if required by the plan, has been prepared and submitted to recipients designated in the assessment/audit plan; and
- All of the assessing organization's follow up actions included in the scope of the assessment/audit has been performed.

7.0 Testing

Testing prior to piloting or deployment ensures that Quality Control (QC) of the product is sufficient to support the planned functionality that unresolved problems are known, and workarounds are developed before the cost of piloting or deployment is incurred. The Testing team uses a combination of unit testing, integration testing, system testing, production acceptance testing, operation acceptance testing, and installation acceptance testing to achieve those objectives. The management of all testing activities is described in detail in the *ERA*

Testing Management Plan (TSP). The QM Team's responsibilities include, but are not limited to the following:

- Ensuring that the test environment and related test tools are calibrated, certified and documented prior to testing;
- Witness Testing;
- Reviewing plans procedures and reports for compliance to contract requirements and ERA standard procedures;
- Certifying testing results on all deliverables products; and
- Acceptance testing with user.

Note: Calibration is the comparison of a device against a known standard in order to establish the accuracy or error of the device. Certification involves conducting a dry run of the equipment to be used in any test as a pre-cursor to formal testing to ensure its accuracy, i.e., it is the verification that the tool works as expected prior to its use in a formal test.

8.0 Problem Reporting and Corrective Action

This section describes the procedures to be followed for reporting, tracking, and resolving problems identified in both software/hardware items and software/hardware development and maintenance processes. Problems encountered during planning and development may result from defects in software, hardware, and supporting and development processes. Because of this diversity, the determination of the sources of a problem and the appropriate corrective action requires a centrally controlled system for monitoring problems and determining root causes.

The QM Team will address the following in order to support the problem reporting and corrective action process:

- Problem reporting to program management on QM activities,
- Deficiency reporting and corrective action,
- QM feedback mechanisms,
- Metrics analysis, and
- Organizational Responsibilities.

Each of these areas is described in detail in the following sections.

8.1 Problem Reporting

Currently the ERA PMO tracks and stores problems in the ERA Action Item Tracking System database, which is reported on a regular basis to PD, division heads, IPT teams, and other affected groups. The purposes of these reports are listed below:

- To delineate those areas where processes are being followed correctly and are working effectively,
- To delineate those areas where processes are being followed but are not working effectively, and
- To delineate those areas where processes are not being followed.

The frequency and process for posting these reports will be consistent with the **Progress Reporting** guidance contained in the *PMP*. The format will be consistent with the ERA Action Item Tracking form template. A sample of the database form template is shown in the *ERA Action Item Tracking Database Users Guide (AUG)* document for instructions on completing the fields on the Action Item database form. The content of these reports will be as follows:

- Accomplishments for the reporting period, e.g., completed QA reviews or audits;
- Activities for the reporting period, e.g., specific QM activities accomplished or current activity compared to scheduled tasks; and
- Issues and/or problems during the reporting period, e.g., issues that surfaced during QA reviews or audits) are reported to Program Management for review.

The focus of the program management meetings is the overall status of the program, the opportunity for information sharing across the integrated parts of the program, and to address issues which have been raised through the problem reporting of the individual program teams.

8.2 Deficiency Reporting and Corrective Action

During the conduct of QM activities, deficiencies are identified in both the software/hardware work products as well as adherence to program standards, policies, and procedures. Their problems must be itemized, documented, tracked to closure, and reported by the QM team. The QM team must verify all problems were tracked to closure and must provide continuing feedback to management and the technical support team concerning the status of the problem. The process for reporting and escalating these deficiencies is as follows:

- Deficiencies (non-compliance) that can not be resolved with the producer are reported in detail via an action item to the appropriate project manager;
- Problems are resolved with the direct producer or the appropriate task leader, when possible;
- The PD follows up deficiencies that can not be resolved with the project manager. The PD determines the appropriate corrective action and forwards a written description of the correction to the QM team within a negotiated time frame (e.g., five business days) of the initial deviation report; and
- The QM team reviews the response.
  - If the corrective action is deemed satisfactory, the QM team accepts it and forwards it to the appropriate project manager for implementation.
  - If the corrective action is deemed not satisfactory – the QM team reports the deviation in detail to the PD via a QM status report.
  - The QM team schedules a follow-up audit upon completion of the corrective action to ensure that the deviation has been satisfactorily resolved.
  - Deficiencies that have been referred to the project manager are reviewed weekly until they are resolved. Items that cannot be resolved by the project manager will be elevated to the Engineering Review Board (ERB) for resolution. (refer to the **ERB Responsibilities and Procedures** section of the *CMP*).

Listed below are examples of the types of information that will be recorded for reporting of QM deficiencies. Reference the *ERA Action Item Tracking Database Users Guide (AUG)* document for instructions on reporting deficiencies.

- Project Type
- AI Type
- AI Number
- Severity
- Action Required (Topic)
- Creation Date
- Requested By
- Assigned To
- Date Assigned
- Due Date
- Current Status

8.3 QM Feedback Mechanisms

The PD will schedule a meeting with the QM Specialist to discuss status, address issues, and plan work for the next period. The PD will include the key points of these discussions as part of the reporting mechanism to program management. Meeting minutes of these discussions will be stored in the ERA Action Item Tracking database and according to the General Administration section of the *ERA File Plan*.

Note: The file plan describes the categories of records to be filed.

8.4 Metrics Analysis

The following metrics will be tracked by the QM Team and reported to the PD:

- Numbers of product and process audits and activity reviews compared to the plan,
- Completion of milestones of QM activities compared to the plan,
- Status of action items open/closed/on-hold,
- Status of non-conformance items identified,
- Number of days to correct and close a non-conformance item,
- Lessons learned,
- Trends for process improvement, and
- Customer satisfaction levels relating to product and service quality.

8.5 Configuration Control Board Responsibilities

The ERA Configuration Control Board (CCB) is the responsible group for authorizing and implementing problem reporting and corrective actions, and submission to unresolved issues to management for resolution. The ERA CCB is composed of representatives from the ERA PMO; refer to the **CCB Responsibilities and Procedures** section of the *CMP*, for additional

information. The Program Director will determine who these representatives are and their responsibility and role. The chairperson will manage the ERA CCB meeting in such a manner that discussion is encouraged from all attendees. If any issue cannot be resolved, it is referred to the Program Director, who will make a final decision.

9.0 Special Tools by Process Area

This section identifies the special tools to be used to support QM. **Table 9-1, Special Tools by Process Area,** is used to aid in the evaluation of program quality. The choice of tools is dependent upon the type and scope of activities required in the current process area. The table below contains the process area and their related tool(s).

Process Area	Tools
Acquisition	• Microsoft Word - Review Checklist • Rational - RequisitePro
Program Management	• Microsoft Project • WBS Chart Pro • PERT Chart Expert • Microsoft Access – Action Item Tracking Database
Requirements Management	• Rational - RequisitePro
Design/Development	• Microsoft Word • CASE Tools
Testing	• Microsoft Word • Automated Testing Tools
Peer Review	• Microsoft Word - PR Action Item forms, Plan Review Checklist • Microsoft Access – Peer Review Action Item Tracking System Database
Quality Management	• Microsoft Word- In-Process Report Form • Microsoft Word – Assessment/Audit Checklists • Microsoft Word - QM Process Assessment/Audit Report Form • Microsoft Word - QM Product Evaluation Form • Microsoft Word – ERA Documentation Review Comment Form
Metrics	• Microsoft Word • Microsoft Excel
Configuration	• Microsoft Access – Change Request Tracking Database

Process Area	Tools
Management	• PVCS Version Manager
Risk Management	• Microsoft Access - Risk Radar

Table 9-1: Special Tools by Process Area

10.0 Code Control

Code control is the process that is used to protect or ensure the validity of completed code. Baselined code is stored in the configuration library under configuration control and provides storage of and controlled access to software. Details on storing and controlling Configuration Items (CIs) are addressed in the *ERA Configuration Management PVCS Procedures (CPP)* document. Refer to **Section 8.5, Configuration Control Board Responsibilities**, above, for additional information on who is responsible for controlling the development of code. The contractor will be responsible for defining their own tool for maintaining, storing, and securing version control over CIs, but it must integrate (see quote below) with that of the ERA PMO.

As stated in the *ERA Request for Proposal (RFP),*

> *"NARA desires a collaborative working relationship with the development contractor that integrates with the processes, procedures and tools used by the ERA Program Management Office (PMO) in the areas of requirements management, quality management, configuration management and test and evaluation."*

11.0 Media Control

Computer program media is defined as those media on which computer data are stored such as CD-ROM, RAM disks, or tape cartridges. Media control covers storage, handling, packaging, shipping, and external distribution of hardware/software and associated documentation. Media Control is addressed in the **Storing Configuration Items** section of the *CMP*.

The QM team shall review the following media activities to ensure that they are being addressed:

- Proper handling of media to prevent physical, electrostatic or environmental damage while stored;
- Proper packaging for shipment to prevent physical, electrostatic, or environmental damage during transit;
- Proper labeling of all media and documents;
- Action to prevent mismatched or unmarked media from being stored or shipped; and
- Verification that the correct media is being shipped.

12.0 Supplier QM Control

The ERA Supplier QM program includes elements to ensure selection of qualified suppliers, adequate transmission of adequate and complete requirements to procurement documents, evaluation of purchases, effective feedback and requests to supplier for corrective action, and

assistance to suppliers in meeting established requirements. The ERA PMO will provide guidance and oversight for supplier control on the ERA program.

12.1 Supplier QM Policy

Potential suppliers of critical, complex, or costly items or services will, prior to the award of a contract, be evaluated to ascertain that they have the capability to provide items or services that consistently conform to technical and quality requirements of the procurement. The ERA PMO will ensure that the goods or services provided by the supplier are acceptable for the intended use.

12.2 Supplier QM Evaluation Procedure

The ERA PMO must determine if the prospective suppliers have a QAP that assures the quality of the requested items or services. Refer to the Software CIs section of the *ERA Cost Analysis Assumption Document (CAAD)* document for a list of 16 software CIs currently identified for the ERA system. The ERA PMO will conduct the assessment of a supplier's QAP. The evaluation will be based upon the results of one, or a combination of the following:

- Review of the supplier's quality history;
- Review of the supplier's quality history in providing the same or similar items or services to other government agencies; and
- Survey the supplier's facility for the purpose of investigating and evaluating various factors, including:
  - Financial position,
  - Technical capability,
  - Experience, and
  - Quality practices.

Note: See Annex A, Checklist 3, Supplier Evaluation, for ideas on evaluating supplier capabilities, as documented in IEEE Std. 1062-1998 IEEE Recommended Practice for Software Acquisition.

Prior to the assessment, background information that pertains to the procurement will be obtained by the assessment team. They will include:

- Description of the items and its requirements;
- Description of the QM requirements;
- Required quantity and delivery schedule;
- Description of any measurement or test equipment requirements;
- Description of any critical process, or material requirements;
- Knowledge of the seller's quality history; and
- Names of key seller personnel.

13.0 Records Collection, Maintenance, and Retention

All documentary materials that control, report, and demonstrate execution of the QM function will be managed as records of the PMO. The QM Specialist and QM team members will collect and retain adequate and proper records of QM activities. All QM records will be maintained in accordance with General Records Schedule (GRS) 24 – Information Technology Operations and Management Records, when authorized, or an applicable NARA-specific schedule for records not covered by the GRS (e.g., GRS 24, items 1a and 1b).

The CM Specialist maintains applicable files and reports as listed below and stores them in the Configuration Library. See **Table 13-1, QM Documents and Storage Location**, for their exact location, as listed under the heading "Where Stored."

- Peer Review Meeting Minutes
- Policies, Standards and Processes
- Software Development Files (SDFs)
- Metrics
- Status reports
- ERA Schedule
- Training Session files
- Program Plans
- Tools and Methodologies

Table 13-1, QM Documents and Storage Location, lists the proper records of QM activities and the person(s) responsible for maintaining that information.

Documentation Required	Frequency	Where Stored S:\ERAPMO\	Responsible Person	Documentation Description
Peer Review Action Item Log Form	Ad hoc	ERA PMO New Structure\Docs Under Dev'l\4.3.9 Quality Management (QAP)\PR Forms & Checklists	QM Specialist	Captures results of peer reviews, Action Items, Defects, and Issues.
ERA Documentation Review Comment Form	Ad hoc	ERA PMO New Structure\Delivered Documents\4.3.9 Quality Management	QM Specialist	Captures review comments from Government reviewers.
ERA Assessment/Audit Checklist	Every 6 months	ERA PMO New Structure\Delivered Documents\4.3.9 Quality Management\Assessment and Audits	QM Specialist	Checklist is used to identify deviations in process performance.

Documentation Required	Frequency	Where Stored S:\ERAPMO\	Responsible Person	Documentation Description
ERA Assessment/Audit Report	Every 6 months	ERA PMO New Structure\Delivered Documents\4.3.9 Quality Management\Assessment and Audits	QM Specialist	Report is used to report the findings of the assessment/audit.
Risk/issue files	Ad hoc	ERA PMO New Structure\Docs Under Dev'l\4.3.6 Risk Management (RKM)\Risk Radar	Risk Officer	Identify and assess risks and issues.
Policies, Standards and Processes	Ad hoc	ERA PMO New Structure\PVCS POST\ERA-POSTdb	Program Director	Process and procedure documents
Software Development files	Ad hoc	Configuration Library (TBD)	Developer or CM Specialist	Software Code
Metrics	Monthly	ERA PMO New Structure\Delivered Documents\4.3.2 Program Control Metrics\Metrics Report\2003	QM Specialist, CM Specialist	Collect metrics to evaluate activities.
Status Reports	Monthly	ERA PMO New Structure\Delivered Documents\4.3.2 Program Control Metrics\Monthly Status Report	Program Team members	Reporting the status of tasks completed problems and issues.
ERA Schedule	TBD	ERA PMO New Structure\ERA WBS and Schedule	Program Control	Displays program scheduled activities (WBS).
Training session files	TBD	Training\Training Schedule	Training Officer	Stores training schedules.
Program Plans	Ad hoc	Configuration Library (TBD)	Program Director	Provide applicable program standards.
Tools and Methodologies	N/A	N/A	Program Director	Tools needed to collect and store metric data and deciding on a managerial process.

Table 13-1: QM Documents and Storage Location

14.0 Training

The QM Team establishes process training areas that are needed to carry out all tasks included in the QMP, for a list of those areas refer to **Appendix B, ERA PMO Training Needs Assessment**

Criteria Summary, Table II, Process Training (Quality Management), in the *ERA Training Needs Assessment (TRA)* document. Training needs are determined by matching skill requirements for a specific task against the skills of the assigned personnel. QM Team members must be able to evaluate and report the quality of the following areas:

- Documentation;
- Standards, practices, conventions, metrics, and activities;
- Peer Reviews;
- Assessment and Audits;
- Problem reporting and corrective action;
- Code, media, and supplier control;
- Records collection, maintenance, and retention;
- QMP evaluation;
- Quality management; and
- Use of automated tools.

NOTE: Training for non-QM activities is covered in the *ERA PMO Training Plan* (TRP).

15.0 Risk Management

The QM Team is responsible for identifying and assessing risks that arise during any phase of the ERA life cycle covered by the QMP. The risks include technical, economic, schedule, and managerial which are evident during the life cycle phase. Each risk will be justified and the level of risk (low, medium, and high) assessed. The QM Team will report risks and required risk management data to the ERA Risk Management Officer. The risk process for QM is covered in the *ERA Risk Management Plan (RKM).*

16.0 Plan Maintenance

The ERA QM Specialist is responsible for this plan. As a part of process improvement (e.g., IV&V assessments, lessons learned, QM assessments), the QMP and the overall quality management approach will continue to evolve. The plan will be updated as needed to maintain current and sufficient quality management activities. The plan will be placed under CM control following its initial approval by the ERA PMO. Updates to the QMP will be controlled by the Configuration Control Board (CCB).

Appendix A: Life Cycle Phase and QM Activities

Phase	Inputs	Outputs	QM Activities
Concept Exploration	• Develop program management documents • Develop requirements definitions • Prepare RFP • Evaluate proposals • Award Contract • Process documents	• AS • BCA • CCA • CMP • AoA • Conops • MRR • LAR • PMP • QMP • RD • SLP • SSP • RFP • Contract • TSP	• Review program management documents • Generate Assessment/Audit reports • Participate in requirements allocation • Review proposal/contract documents • Participate in Peer Reviews
Requirements & Design	• Allocation of requirements • System/Software design • Test planning • Requirements Document • SSP • Conops • LAR • MRR • TSP	• SyRS • IRD • IRS • SDD • IDD • System Test Plan (Draft) • Acceptance Test Plan (Draft • SRS	• System requirements review • Attend Preliminary design reviews • Attend Critical design reviews • IV&V document reviews • Review System Acceptance and Verification Specs • Participate in requirements allocation review
Implementation & Test	• Software coding • Acceptance Test Plan (Draft) • Integration testing • System Test Plan (Draft) • Acceptance	• Code & Documentation • Test cases • Test procedures • Test results • User documentation	• Attend Test Readiness reviews • Review test cases and procedures • Attend code reviews

Phase	Inputs	Outputs	QM Activities
	Testing	• Final ATP & STP	• Attend test reviews • Review test results • Participate in functional audits • Participate in acceptance testing • Review revised documentation • Attend CCB meetings
Installation & Checkout	• Site preparation • System Installation • Operational testing • User documentation • Facilities plan	• Installation package • Operating procedures • Operations test plan • Operation test procedures • Test results • Operation readiness review	• Conduct Physical Audit/checkout • Conduct CCB • Review operating procedures • Validate product acceptance • Test readiness review • Review other documents as needed
Operations & Support	• Process Change Request • Assessments Audits • Process Problem Reports	• Problem Reports • Assessment Audit reports • CCB reports	• Conduct CCB • Review of activity/problem reports and support as Appropriate