



EAST-DRD-1293QE-001

REVISION C

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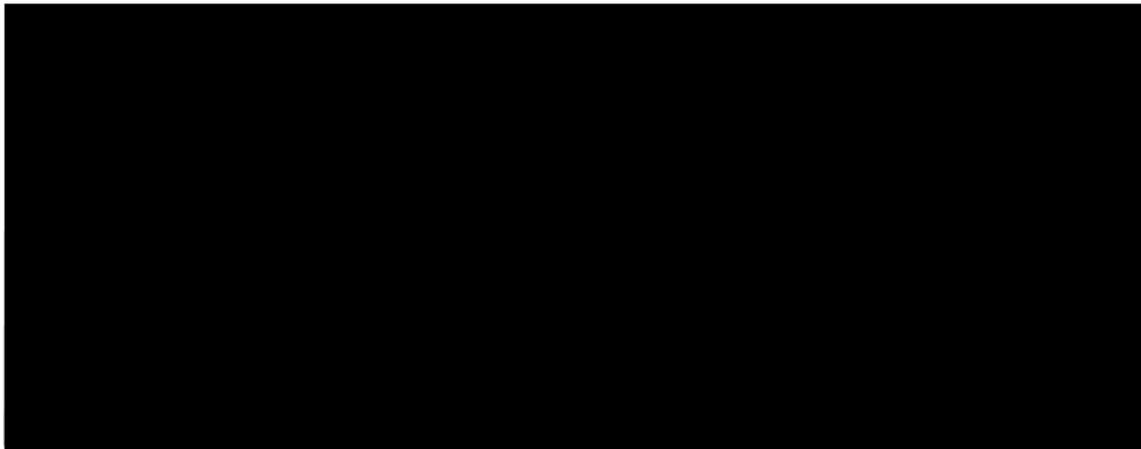
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Data Requirement Description (DRD)

Enterprise Applications Service Technologies (EAST)

Software Engineering Quality Plan (SEQP)

REVISION C



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1.0 INTRODUCTION

1.1 Purpose & Scope

The National Aeronautics and Space Administration (NASA) Enterprise Applications Service Technologies (EAST) Software Engineering Quality Plan (SEQP) provides a framework for ensuring that NASA Enterprise Applications Competency Center (NEACC) systems satisfy end user needs while maintaining a high level of quality. The SEQP also serves to ensure that EAST processes promote the highest level of performance, reliability, and usability of NEACC platforms and applications. This document is closely linked with the EAST Application Point Capacity Management Plan (APCMP), EAST-DRD-1293MA-007 and the EAST Release and Deployment Management Plan (RDMP), EAST-DRD-1293CF-004.

1.2 Applicability

NEACC personnel supporting any NEACC application or ID/IQ Task Order shall be familiar with the SEQP. The SEQP applies to the activities conducted across each NEACC Line of Business (LOB) within the NEACC and to initiatives managed under an Indefinite Delivery/Indefinite Quantity (ID/IQ) task order performed under the EAST contract. While this document places a strong emphasis on describing the EAST approach to ensuring software quality, it also serves the purpose of ensuring that NEACC team members understand how their role fits in to each effort. This document is identified as the EAST Software Engineering Quality Plan, Document Number EAST-DRD-1293QE-001.

1.3 Applicable Documents

- EAST-DRD-1293CF-004, Release and Deployment Management (RDM) Plan
- EAST-DRD-1293MA-007, Application Point Capacity Management Plan
- NASA Procedural Requirement (NPR) 7120.7 NASA Program and Project Management Processes and Requirements
- IS01-NEACC-CF-STD-SW-003, SAP ABAP Development Standards
- IS01-NEACC-CF-ABAP-STD-SW-002, ABAP Development Naming Standards
- NEACC-CF-ABAP-SPEC-SW-001, ABAP Software Requirement Specification
- NEACC-CF-ABAP-STD-SW-002, ABAP Code Signoff Sheet
- Business Warehouse (BW) Query Develop Standards
- BW Object Naming Conventions
- BW Query Naming Convention
- BW Process Chain Naming Convention
- ORACLE PL/Structural Query Language (SQL) CODING STANDARDS, eBudget
- IdMAX Development Standards
- ESB Coding Guidelines
- ESB Security
- ESB Coding Examples
- ESB Style Discussion

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1.4 References

None

1.5 Definitions

Table 1 – Definitions

Term	Definition
Scrum	An iterative, incremental process for developing/supporting any product/system or managing work; derived from a rugby term indicative of close-knit teams

1.6 Acronyms/Abbreviations

Table 2 – Acronyms and Abbreviations

Acronym	Description
ABAP	Advanced Business Application Programming
ABPL	Agency Business Process Lead
AC	Acceptance Criteria
ALV	ABAP List Viewer
APCMS	Application Point Capacity Management System
APO	Agency Product Owner
BPS	Business Process Support
BW	Business Warehouse
CDR	Critical Design Review
CIO	Chief Information Officer
CITA	Center for IT Accommodation
CSI	Continual Service Improvement
DB	Database
DRD	Data Requirement Description
DRM	Data Reference Model
EAI	Enterprise Application Integration
EAST	Enterprise Applications Service Technologies
FFP	Firm Fixed Price
ERP	Enterprise Resource Planning
GSA	General Services Administration
HLD	High-Level Design
HP	Hewlett Packard
ID/IQ	Indefinite Delivery/Indefinite Quantity
IT	Information Technology

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Acronym	Description
ITIL	Information Technology Infrastructure Library
LOB	Line of Business
NASA	National Aeronautics and Space Administration
NEACC	NASA Enterprise Applications Competency Center
NERF	NASA Enhancements Requirements Form
NPR	NASA Procedural Requirement
QMA	Quality Management Analyst
ORR	Operational Readiness Review
PII	Personally Identifiable Information
PDM	Product Delivery Manager
PDR	Preliminary Design Review
PIV	Personal Identity Verification
PL	Product Lead
POC	Point of Contact
POT	Product Owner Team
QA	Quality Assurance
QC	Quality Center
RICEF	Reports, Interfaces, Conversions, Enhancements, Forms
ROM	Rough Order of Magnitude
SAP	System Application and Product
SBU	Sensitive but Unclassified
SEQP	Software Engineering Quality Plan
SIT	System Integration Testing
SLS	Service Level Standards
SME	Subject Matter Expert
SQL	Structural Query Language
SR	Service Request
SRD	System Relationship Diagram
SVU	SAP Version Upgrade
TAE	Test Automation Engineer
TRR	Test Readiness Review
USAB	US Access Board

1.7 Key Team Member Takeaways From This Section

- Understand that the EAST Software Engineering Quality Plan applies to all Software development and maintenance activities across the EAST contract and ID/IQ Task Orders
- Recognize that this plan is a living document and exists for the purpose of helping NEACC and EAST team members understand the EAST quality processes and how these

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processes contribute to successful performance on the EAST contract and increased customer satisfaction

- Understand associated documents, definitions, and related acronyms/abbreviations

2.0 ROLES AND RESPONSIBILITIES

Success of the SEQP relies on an integrated NEACC team working towards a common goal. Multiple roles exist both within – and external to – the NEACC, and address either a requirement (demand) or fulfillment of that requirement (supply). The following table defines the roles and responsibilities that are necessary to ensure that requirements are being met across each EAST LOB Scrum team.

2.1 NEACC Roles Defined

To support the NEACC, eight primary roles have been defined and spread across three missions – Delivery, Direction & Oversight, and Vision & Priorities. The table below identifies the roles and defines the expectations for each role.

Table 3 – Roles and Responsibilities

Mission	Role	Description	Performed By
Delivery	Team Member	<p>The Team Member shall:</p> <ul style="list-style-type: none"> • Commit fully to the team, helps fellow teammates. • Have “skin in the game” and be accountable to team for work. • Possess any skill needed to support NEACC applications. • May be required to perform administrative responsibilities (e.g., assisting team with administrative task management, scheduling Sprint/iteration planning, reviews, etc). 	NASA or EAST
	Scrum Master (For Scrum Efforts) or Team Leader	<p>The Scrum Master or Team Leader shall:</p> <ul style="list-style-type: none"> • Coach, process facilitator, obstacle facilitator, negotiator on behalf of team. • Work closely with EAST LOB Manager and NEACC Product Delivery Manager (PDM) for Sprint/iteration backlog. • Assist the team in removal of obstacles daily, schedules Sprint/iteration planning, reviews, 	NASA or EAST

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Mission	Role	Description	Performed By
		retrospective.	
	EAST Line of Business (LOB) Manager	<p>The EAST LOB Manager shall:</p> <ul style="list-style-type: none"> • Work with NEACC Product Lead in conjunction with NEACC PDM to understand business vision, requirements, and priority. • Work closely with NEACC PDM to set priorities for each LOB Sprint/iteration based on approved backlog and to remove obstacles. • Work with PDM to ensure Product Backlog items are at an appropriate level of detail for team to execute tasking upon entry in to a Sprint/iteration. • Ensure that enhancement Backlog items' Acceptance Criteria are agreed upon with PDM/PL/Agency Product Owner (APO) in Sprint/iteration planning sessions. • Provide oversight and EAST compliance of NEACC Operations for the LOB. • Be accountable to the team for ensuring Agency Product Owner and NEACC Product Lead priorities are understood and resolve conflicts. 	EAST exclusively
Direction & Oversight	EAST Service Delivery Manager	<p>The EAST Service Delivery Manager shall:</p> <ul style="list-style-type: none"> • Work with EAST LOB Managers to ensure that staffing demands are being met which coincide with LOB backlog. • Provide the “administrative and skill development” function for the EAST Competency Center employees. 	EAST exclusively
	NEACC Product Delivery Manager (PDM)	<p>The NEACC PDM shall:</p> <ul style="list-style-type: none"> • Work with NEACC Product Lead to understand business vision, requirements, and priority. • Work closely with EAST LOB Manager to rank priorities for each LOB Sprint based on approved Sprint/iteration backlog and to 	NASA exclusively

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Mission	Role	Description	Performed By
		<p>remove obstacles promptly to enhance team efficiencies.</p> <ul style="list-style-type: none"> • Review and facilitate the Acceptance Criteria for enhancement Sprint/iteration backlog items. • Monitor Sprint teams progress in accomplishing Sprint/iteration backlog items. • Be accountable to the scrum team for ensuring Agency Product Owner and NEACC Product Lead business priorities are understood and resolves conflicts. 	
	NEACC Product Lead (PL)	<p>The NEACC PL shall:</p> <ul style="list-style-type: none"> • Work with Agency Product Owner to understand business vision and requirements and approve enhancement requests. • Provide clarity on business goals, requirements and priorities to NEACC PDM and EAST LOB Manager. • Manage the “up and out” communication stream. • Assist in developing and translating APO business vision in to LOB product backlog. • Assist with obstacle removal. • Participate in Sprint/iteration planning and reviews. • Accept product demonstrated during Sprint/iteration Review as APO designee. 	
Vision & Priorities	Agency Product Owner (APO)	<p>The APO shall:</p> <ul style="list-style-type: none"> • Provide vision, requirements, priorities, and accountability for Agency’s NEACC-managed systems (Agency Business Product Lead (ABPL)). • Work directly with NEACC Product Leads to develop and maintain LOB product backlog and ranking of backlog by priorities. 	NASA exclusively

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Mission	Role	Description	Performed By
		<ul style="list-style-type: none"> • Represent Agency users. • Participate in Sprint/iteration planning and reviews. • Accept product demonstrated during Sprint/iteration Review. 	

Due to the contractual nature of the EAST program, certain roles identified above under “Vision & Priorities” and “Direction & Oversight” can only be performed by NASA while others can only be performed by EAST team members. All roles denoted under the “Delivery” mission above can be performed by either NASA or EAST employees, both of which shall understand their roles at all times. Regardless of which role a particular individual is performing, all team members noted above are expected to understand and apply Agile principles and values to support each self-managing team.

2.1.1 Key Team Member Takeaways from this Section

- Make sure you know which role you are performing on the team
- Make sure you know which roles your colleagues are performing on the team
- Know your Product Owner(s)
- Your role may change over the life of a Sprint/iteration
- Be flexible and open minded as a team member; your colleagues may need to rely on you for help which is outside of your typical “job responsibilities”
- Quality starts at the ground level with each team member – it’s everyone’s job to ensure good quality for the systems we support, not just the Quality Assurance team

3.0 PROCESS

3.1 Agile Software Lifecycle Management

The NEACC is an Agile organization which utilizes multiple software lifecycle development approaches to support operational and project work. In general, NEACC work is completed in iterations (time-boxed work segments also called “Sprints” for pure Scrum projects) and NEACC customers/stakeholders are engaged whenever possible throughout each iteration. Regardless of which Agile practice/approach is used, deliverables (software enhancements or maintenance updates) are demonstrated at the end of every iteration, feedback is collected which is used to plan the next iteration, and teams progressively collect and document lessons learned to incrementally improve team morale, efficiency, and throughput.

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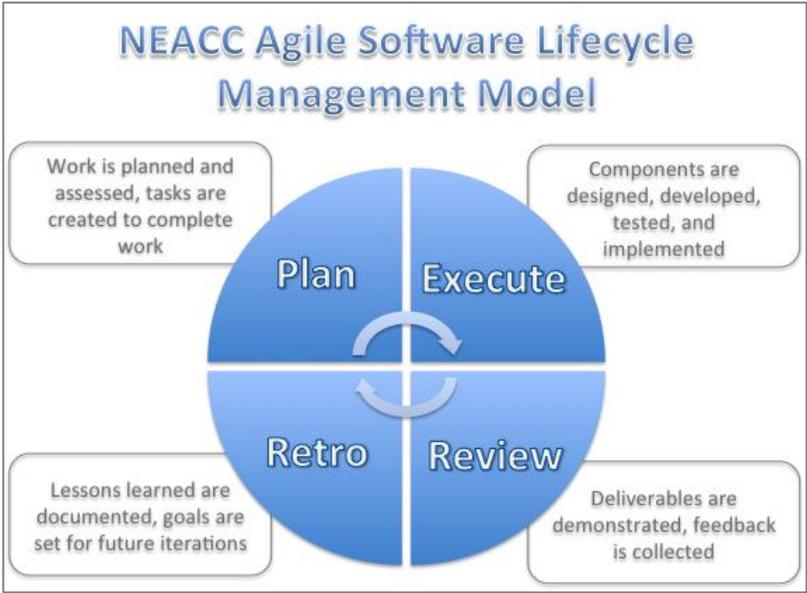


Figure 1 – NEACC Agile Software Lifecycle Management Model

NEACC operational and project work shall be completed in iterations across 4 primary phases: Planning, Execution, Review, and Retrospective. Each Sprint or iteration will have a lifecycle which utilizes each of these 4 phases, and every initiative or operational support activity will have an associated lifecycle which is composed of 1 or multiple iterations. Regardless of the approach used, each NEACC team will utilize these phases to complete Service Requests that flow through the NEACC. While highly encouraged to do so, there will be cases where NEACC LOBs will not regularly conduct retrospectives due to multiple reasons. Some LOBs may choose to perform a quarterly retrospective, while others may perform retrospectives monthly. Conversely, there are some LOB teams that perform multiple sprint reviews per month (e.g., “mini reviews”) so conducting a retrospective every 1-2 weeks may present a challenge or not add much value. In any case, retrospectives are still considered to be an important part of the NEACC process to help ensure continuous service improvement.

The graphic below demonstrates the relationship between the iteration lifecycle and initiative/operational lifecycles.

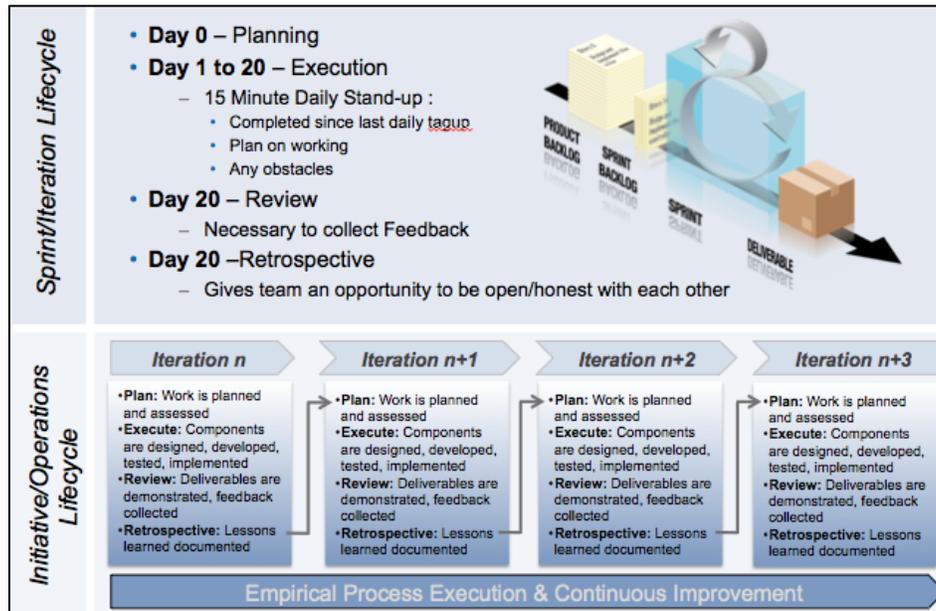


Figure 1 – Initiative & Iteration (How work gets done)

The Agile Scrum process is largely used as a reference model for how NEACC teams accomplish work. Lessons learned from utilizing the Scrum process since 2006 have proven that Scrum works well for clearly defined projects with a mission and reasonably well defined requirements. Conversely, the Scrum process in its purest form is not a good fit for NEACC operational teams supporting day-to-day maintenance and change requests. Further, the NEACC has learned that the Scrum process is not a great fit for initiatives that aren't considered to be “pure” projects (e.g., proof-of-concept initiatives, business case analyses, or other medium-sized maintenance/change request items).

These lessons learned have led the NEACC to adopt two basic implementations of Agile practices for our project and operational support teams. The table below describes these practices and applicability for various work types:

Table 4 – Accepted NEACC Agile Processes

Process	Description	Applicability
Iterative	The NEACC Iterative Process is based on elements of the Agile Scrum process, where the roles and containers of work are utilized but not all rules are followed. The team may decide to plan their work in “Sprints,” and utilize pieces of the Scrum process in executing the work associated with the project. Typically, with each team, work is planned and executed in an iterative fashion across the four Scrum Phases (Planning, Execution, Review, Retrospective) but detailed practices such as the daily meeting and team co-location may	NEACC Day-to-Day Operations and Operational Initiatives

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	not be adopted. This approach is effective in an environment that is largely based on Operations & Maintenance (O&M) activities, where priorities can shift on a daily basis.	
Scrum	Scrum is an Agile practice that surfaced in the 1990s as a software development alternative to a traditional “waterfall” approach. Scrum is based on a simple set of roles and rules that must be followed (daily standup, co-located team, etc). Scrum roles include the Product Owner, Scrum Master, and Scrum Team Members. Work is accomplished in Sprints across 4 distinct segments in an iteration: Sprint Planning, Sprint Execution, Sprint Review, Sprint Retrospective. Work progress is highly visible; tasks are tracked on a board; and burndown and obstacles are updated daily.	NEACC Projects Deemed Applicable for Scrum process

3.1.1 Iterative

As described in the table above, an iterative approach shall be utilized for day-to-day system operations and NEACC operational initiatives. Since many of the principles and practices of a pure Scrum approach are difficult to utilize or not preferable for these types of projects, an iterative approach is well suited towards Proof of Concepts (POCs), business case development efforts, and small-to-medium sized enhancement initiatives with a duration longer than 1 iteration. In an iterative project, the team will decide up-front which Scrum roles and rules will be applied and why. Having the flexibility to determine the practices to be implemented will ultimately lower execution risk and increase implementation success for each iterative effort. More information on how the NEACC utilizes an Agile and Iterative approach to complete work can be found in DRD1293MA-009, NEACC Operations Guide.

3.1.2 Scrum

The Agile Scrum process shall be used to manage NEACC projects when deemed necessary by NEACC Leadership and Project sponsors. The Scrum process is a prescriptive process with very specific rules that must be followed. Many project efforts managed by the NEACC will be well suited to utilize the Scrum process. Effective usage of the Agile Scrum process is the cornerstone for quality to ensure that projects and large operational initiatives do not negatively impact NEACC production systems. Thus, it is paramount for all NEACC team members to understand that system quality is a direct reflection of the consistent execution of the Scrum process whenever the Scrum Process is utilized to support NEACC LOBs and ID/IQ Task Orders.

Numerous materials have been published pertaining to the effective application of the Scrum Process. There are multiple rules and practices that must be followed in order for a Project to be considered a “Scrum” project. These rules include, but are not limited to, the following:

- Self-directed, self-organizing teams (preferably co-located)

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- Assignment of Scrum roles to project team members (Scrum Master, Scrum Team Member, Product Owner)
- Iterative adaptive planning
- Stakeholder/customer involvement
- 30-calendar day iterations (or some other pre-determined increment)
- 15-minute daily stand-up meeting
- Measurement of progress on a daily basis
- Aggressive obstacle removal

For more information regarding Scrum and related processes (e.g., key definitions, workflow & process, roles/responsibilities, planning, success factors, etc), refer to:

- Agile Project Management with Scrum (Microsoft Professional), Ken Schwaber, 2004
- Agile Estimating and Planning, Mike Cohn, 2006
- User Stories Applied: For Agile Software Development, Mike Cohn, 2004
- The ScrumAlliance: <http://www.Scrumalliance.org>

3.1.3 NEACC Operations & Team Utilization of APCMS/Rally Toolset

As of this document’s effective date, all NEACC LOB teams utilize the Rally product to capture work completed for NEACC Service Requests for each Monthly Sprint. The Rally toolset is used for both NEACC Operational support activities as well as NEACC EAST task orders. Rally is an integral component of the NEACC EAST APCMS solution, and provides a centralized repository for all LOB team members to track tasks against backlog items within each LOB. The NEACC work tracking process is detailed in DRD1293MA-009, NEACC Operations Guide. Specifically, Section 4.0 within the NEACC Operations Guide addresses the SR workflow from creation, approval, triage, execution, and closure.

From an individual LOB team member’s perspective, tasks are tracked in Rally and will fall into 4 distinct completion phases for each of the Rally User Stories: Defined (D), In-Progress (P), Completed (C), Accepted (A). These individual work “states” are associated to each SR-user story and serve to determine where the individual SR is in the completion process. Sections 4.4.2, 4.4.3, and 4.4.4 of the NEACC Operations guide cover how this work is captured over the course of the Sprint. Each LOB Scrum team’s primary goal is to ensure that all Sprint backlog items move through each of these phases during the Sprint. Figure 5 below provides a more detailed definition for each of these Rally work phases.

Table 5 – Rally Work Completion Phases

Rally State	Toolset State Identifier	Definition
Defined		Defined represents SRs/milestones that have been triaged, assessed, and added to a LOB Team’s Sprint backlog for work completion. No work has been completed on the request at this point.
In-Progress		In-Progress signifies that work has begun (or is “in flight”) on the SR/milestone. The SR/milestone will remain in this state until all team member tasks have been completed.
Completed		Completed represents SRs/milestones for which all supporting tasks have been completed. SRs in this state are ready to be Accepted.
Accepted		Accepted indicates that the NASA Product Lead or Product Delivery Manager (for change requests) or LOB Manager (for certain maintenance items) has accepted the work item as being complete.

Each LOB team member shall update assigned tasks in Rally on a regular basis to indicate how much effort is remaining for tasks that support an SR/milestone. Once all tasks have been completed for an SR/milestone, the SR/milestone will move into a “Completed” state which indicates that the SR/milestone is ready to be accepted by the NASA Product Lead or Product Delivery Manager or LOB Manager. This process repeats itself in subsequent Sprints and is fine-tuned over time within each LOB.

3.1.4 Approach Applicability and Exceptions

The EAST program shall utilize Agile practices in support of every operational and project initiative. There are very few components to Agile that EAST will not be able to utilize due to specific requirements of the EAST contract. These components include:

- Allowing the LOB Scrum team to define the number of points assigned to a particular backlog item up front, which is handled prior to a backlog item being handed to a team to work. The complexity assessment process was established to address point assignments, however team member input regarding point values will be provided to the NASA Product Lead/Product Delivery Manager and LOB manager prior to, during, and after each Sprint.
- Releasing functionality that corresponds to the end of a Sprint/iteration, as some teams will be releasing to production multiple times prior to the end of the Sprint/iteration. This

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approach is acceptable, but will also require more frequent “release reviews” with the Product Owner(s) and Agency stakeholders.

EAST operations management processes (documented in the EAST Application Point Capacity Management plan, EAST-DRD-1293MA-007) will be utilized for effective execution of EAST operations. Further, the EAST Application Point Capacity Management plan addresses how these items noted above are handled within the NEACC organization.

3.2 Agile Requirements Management & Documentation Approach

There are two primary categories of requirements under the EAST Program: 1) Requirements that flow through the NEACC LOB Scrum teams, and 2) Requirements that are documented for an ID/IQ Task Order or Operational initiative. Regardless of whether a requirement comes from a small operational enhancement request or if it comes from a larger project, the need to ensure that a requirement has been met applies to both. The EAST team will use a straight-forward approach to ensure operational enhancement requirements have been met, whereas a more structured/hierarchical approach will be used for ID/IQ Task Orders and operational initiatives.

3.2.1 Recognizing the Value of Documentation

The EAST team believes the primary focus of all documentation is to facilitate communication between NASA Stakeholders/Product Owners and Agile Team Members who are building or supporting the product. Within the quality guidelines set forth in this document, each LOB Agile team will further determine if other documentation is needed to successfully meet the requirements of each Sprint/Iteration.

While a strong emphasis on user story development is needed at the front-end of a project, a key focus of each team needs to be centered on creating test plans that address all success criteria associated with backlog items. When detail provided on the SR is insufficient for an LOB Agile team to deliver an enhancement request, a completed NEACC Enhancement Requirements Form (NERF), as described in section 3.2.2.1 below) shall be provided with the SR to provide detail needed by the team to deliver the request. In addition, user stories shall be created in QualityCenter for enhancement requests as determined by each LOB, and may be documented for maintenance requests if sufficient detail doesn’t exist as part of the Service Request (SR) description. In cases where verbal agreement between the NEACC PL/PDM and the EAST LOB Manager is not sufficient, detailed acceptance criteria associated with user stories shall be documented and agreed to by the Product Owner and the Scrum teams using the guidance provided in section 3.2.2 and 3.2.3.

3.2.2 Requirements Management, Documentation, and Coverage Approach for NEACC Operational Support

To support the requirements of the EAST contract, the EAST team shall use an approach that consistently demonstrates that requirements flowing through the Application Point Capacity Management System (APCMS) have been satisfied, and that we're not exposing NASA or EAST

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to undue risk if a dispute surfaces regarding the successful completion of an operational enhancement requirement. There may be situations where a dispute arises regarding maintenance requests (unlikely); however, the scope of this section deals with documenting and verifying operational enhancement requests.

3.2.2.1 Utilization of the NEACC Enhancements Requirement Form (NERF)

Beginning in 2011 and still being utilized as of this document’s effective date, the NEACC adopted a new process to better collect end user requirements for Enhancement Service Requests. The primary goal of the NERF is to improve communications and awareness of changes while reducing delivery risk. The implementation of this new process filled a gap that existed between the level of information collected on the SR and what was previously required by the legacy NEACC Change Request Form. While the SR description field (and associated SR fields) is not sufficient for documenting an end-user’s needs, the legacy NEACC Change Request Form was too detailed/prescriptive and often fell short of capturing the pertinent information each of the LOB Agile teams need to fulfill a change request. As such, the NERF was created to capture detail behind 3.2 requirements.

As demonstrated in the figure below, the NERF is a one-page document with 7 fields (see next slide), and focuses on capturing the “why, who, and what” of each change request, while also providing some flexibility to capture the end-user’s perspective on technical considerations and other applicable information. NEACC PLs and BPS personnel are expected to perform a central role in providing requirements to the EAST LOB Agile teams in a “ready” state.

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NEACC Enhancement Requirements Form (NERF)

The purpose of this form is to help the NEACC understand more about the system change that is being requested. Information provided on this form will help the NEACC with planning, designing, developing, and testing this proposed change. All sections below are required to be completed. For sections 4 & 5, "unknown" or "N/A" are acceptable if this information is not known or not applicable.

SR Number: SR-
SR Submitter:

1. Business Need (Why Is This Needed?)
High-level description (255 characters or less) for this requirement.

2. Users Benefitted & Security Considerations (Who Does It Affect?)
List user communities affected by this proposed change and identify security impacts (e.g., new security roles, change to existing security roles, etc).

3. Requirement Detail (What Needs to Happen?)
Information that needs to be provided to add further clarity to your business need (a bulleted or numbered list detailing how the business need is to be addressed).

4. Technical Needs
Identify any known technical considerations or limitations (e.g., requires a change to COTS functionality, S/N, install a software patch, etc).

5. Other Applicable Information
Include any additional value-added information that will help the NEACC with this request (e.g., screen shots, mockups, EUP or training material updates, job aids, etc).

SR Number & Submitter
Why is this needed?
Who does it affect?
What needs to happen?
Technical needs or considerations
Other applicable information

Figure 2 – NEACC Enhancement Requirement Form

Please note, NEACC PL/BPS personnel may engage NASA Center users to assist with completion of the NERF; however, the PL/BPS roles are ultimately responsible for ensuring that the NERF is as complete/accurate as possible prior to the LOB Agile teams beginning work on the change request. Also, there are multiple types of enhancement requests for every LOB that will not need a NERF. These “exceptions” have been documented and are attached on the NEACC NERF job aid which can be found on the NEACC bReady Portal.

3.2.2.2 User Stories and Acceptance Criteria

Large operational change requests (e.g., initiatives and NEACC projects) will have an associated user story in HP Quality Center if deemed necessary by the LOB and supporting Quality Assurance personnel. Working with the NASA Product Delivery Manager and/or Product Lead, the Agile team shall assign one or more Acceptance Criteria (AC) to this user story at the beginning of the Sprint/Iteration if it is determined that formal Acceptance Criteria is required. Many NEACC LOBs will not need to formally document Acceptance Criteria since verbal agreement at the beginning of the Sprint/Iteration will suffice. If Acceptance Criteria are required over the course of the Sprint/Iteration, each Acceptance Criteria shall be linked to a User Story so that the Scrum team can demonstrate that the fulfillment of that particular User Story has been successfully addressed.

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Additionally, test plans will be linked to the AC (same approach used in section 3.2.3 below) that will further provide evidence that the LOB Scrum team has satisfied each criteria that NASA has agreed upon at the beginning of the Sprint. Prior to an enhancement request being accepted, the Scrum team shall then provide a coverage report to the NASA PLs and PDMs showing that their requirements have been successfully tested as documented. Note, this report cannot be provided for LOBs that choose not to document AC and associate these criteria to user stories.

An example of how this process can be implemented is as follows:

Table 6 – Test Plan Coverage Report Example

Test Plan Coverage Report (Example)
<p>Sprint/Iteration Planning:</p> <ol style="list-style-type: none"> 1. A user story and associated AC for the enhancement being delivered will be documented in QC at the beginning of the Sprint/Iteration (example below): <ol style="list-style-type: none"> 1.1. <i>User Story: As an SAP Budget Maintainer, I need to be able to run a report using ad hoc data which shows which funds expiring at the end of Fiscal Year (FY) 2012</i> <ol style="list-style-type: none"> 1.1.1. AC 1 (documented at beginning of Sprint): <i>The expiring funds report selector screen contains an input field which allows the user to enter the current (or historical) Fiscal Year selector field</i> 1.1.2. AC 2 (documented at beginning of Sprint): <i>The expiring funds report will contain all 23 fields that it currently contains today</i> 2. All user stories and AC for a Sprint shall be reviewed and approved/revised by the LOB Product Owner(s) (interchangeable with Product Owner Team, or POT). The EAST LOB Manager shall ensure that the AC for a Sprint/Iteration has been reviewed and agreed to by the LOB Product Owner Team. Any backlog negotiations will happen at this point.
<p>Sprint/Iteration Execution (After Planning, Prior to Sprint Review)</p> <ol style="list-style-type: none"> 1. Test plans shall be created (if new capability) or modified (if existing capability) in QC during the Sprint/Iteration (Agile team determines when) to ensure that the detailed process for addressing the user story has been tested (i.e., needed to arrive at “done”) 2. As developers have portions of their work ready, each day the team will be involved in “pseudo” informal testing to incrementally assess progress towards the AC and reference material needed to develop thorough test plans. 3. The Scrum Master/Team Leader and team members shall work closely with the LOB Product Owner throughout the Sprint/Iteration to ensure that the team understands a particular user story and/or requirement is in line with the APO business vision for the requested functionality. 4. If the requirement has changed during Sprint execution, or if Product Owner feels that the solution will not satisfy the end users needs due to external/uncontrollable factors, the

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Test Plan Coverage Report (Example)
Product Owner shall work closely with the Scrum Master/Team Leader and Agile Team to renegotiate the backlog, including re-prioritizing if needed.
End of Sprint/Iteration (Immediately Prior to Sprint/Iteration Review)
<ol style="list-style-type: none"> 1. If an LOB chooses to document formal AC and link these criteria to Test Plans, acceptance and coverage reports shall be executed out of QC prior to the enhancement milestone being accepted by the NASA PL or PDM 2. The LOB Manager (or designee) shall present to the Government for acceptance a report demonstrating that EAST has successfully addressed the requirements of each milestone based on the AC documented

3.2.3 Requirements Management, Documentation, and Coverage Approach for New Projects & Operational Initiatives

The process described below documents the NEACC EAST Requirements management approach for new projects and operational initiatives.

1. For all new projects & operational initiatives, an Agile approach to documenting and managing requirements shall be utilized to better capture users’ needs while providing for a cleaner traceability picture. All system requirements for new projects and large operational initiatives shall be captured using the “Themes, Epics, & User Story” hierarchy (see figure below). The value of using this approach is that it brings the documentation of requirements closer to the user (e.g., users can more readily identify, articulate, and improve requirements when this process is used).

2. For Projects that will fall under NASA Procedural Requirement (NPR 7120.99) or for larger initiatives outside the scope of NPR 7120.99, an initial set of user stories shall be documented and presented to the Scrum team. Ideally, this will happen during the business case development activity, which will precede startup of the project or initiative. The Scrum team shall then use the initial set of user stories to build out the Agile Requirements structure that will contain Business Process Themes, Epics, User Stories, and AC. This process is further defined in Appendix B, ID/IQ Task Order Approach.

The figure below demonstrates the relationship between Themes, Epics, User Stories and AC.

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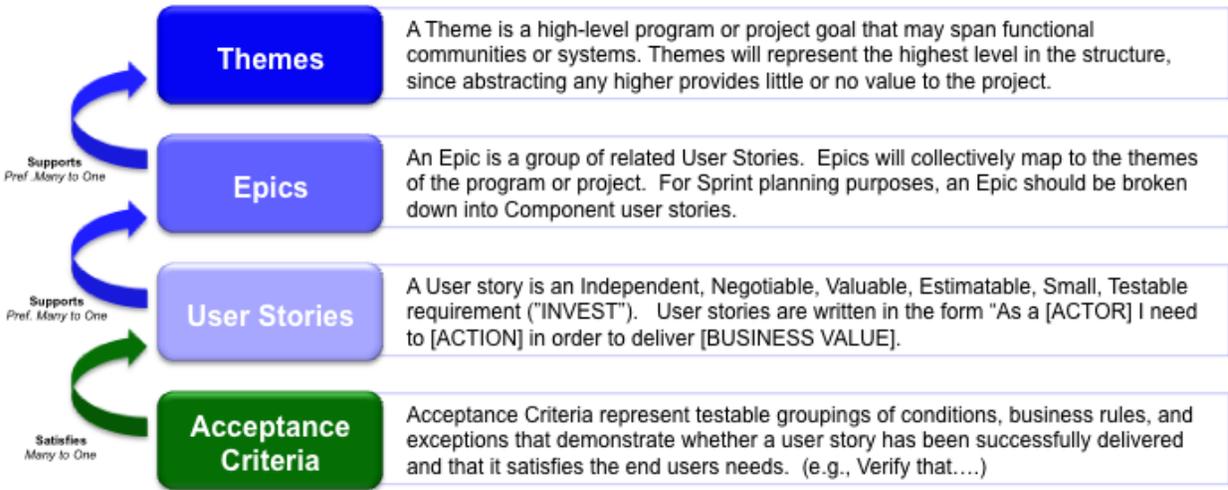


Figure 3 – Themes, Epics, User Stories, and AC

- AC will be utilized and will be associated to User Stories. AC & associated test plans will demonstrate system coverage & user acceptability of these requirements. All system business rules will be captured within an AC and/or test plan and in many cases will only be found in the test plan due to the volume of business rules that many systems may have for a specific function (e.g., complex authentication capability such as Personal Identity Verification (PIV)).
- The scrum team shall store all requirements in the Agile requirements structure repository, and shall assign linkages at the AC level. The Scrum team shall ensure that detailed success criteria are understood and tested prior to delivery of the software component. A primary benefit of this approach is that an independent observer will be able to validate that all business rules have been captured and adequately tested. Functional specifications may also be used to capture the requirements of certain reports or screen layouts. These specifications will be stored in Hewlett Packard (HP) QC as document attachments associated with the requirements for these specifications.
- The NEACC shall continue to use HP QC for the storage and management of all Themes, Epics, User Stories, AC, Business Rules, and Test Plans. The QC requirements module will be structured in a hierarchical fashion where Themes will represent the highest level, Epics will be a subset of each single Theme, and User Stories will be components of each single Epic. AC will be created and linked to test plans and will address a system’s business rules. This approach to documenting requirements can be used at any point at the discretion of the Scrum team. We will also utilize the QC version control functionality to allow the natural evolution of user stories and their associated test plans over time.

The figure below demonstrates an example of how Themes, Epics, and User Stories are documented and connected.

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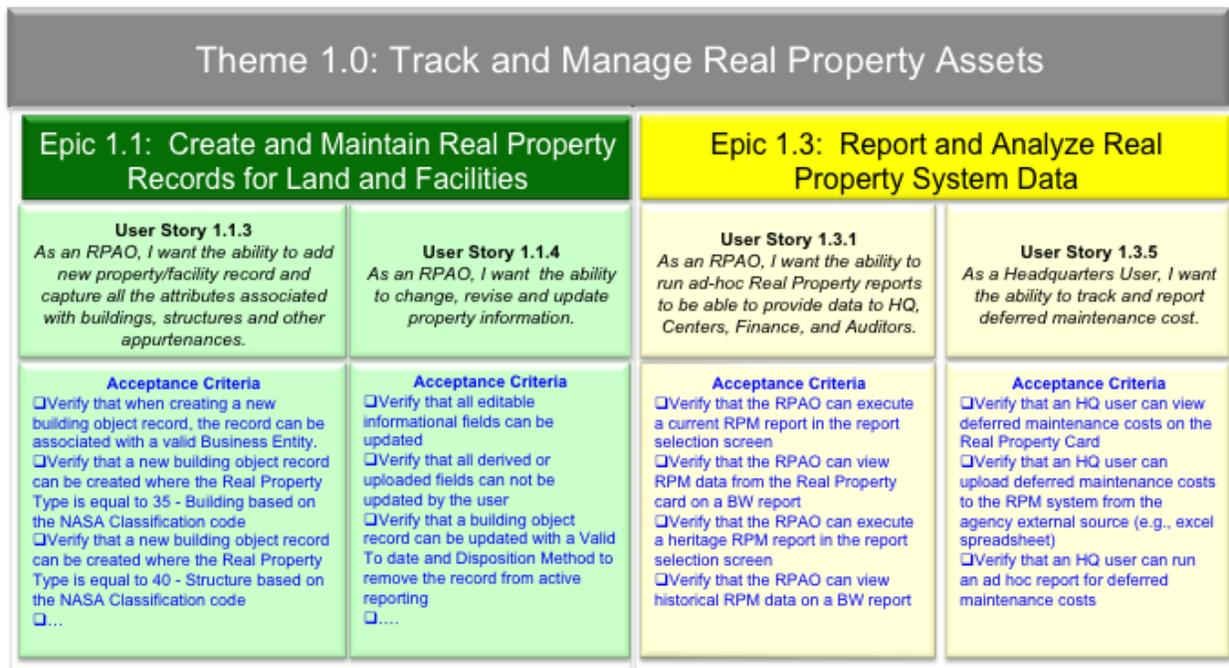


Figure 4 – Themes, Epics, User Stories, and AC (NEACC Project)

Testing coverage of all Agile Requirements (User Stories) will be demonstrated through the AC. In addition to being a “child” element to a User Story, each AC will be linked to one or more associated test plans, and will only be 100% addressed if all linked test plans have been successfully marked to “Passed.” A report can then be executed from HP QC to determine which User Stories, Epics, and Themes have been covered by associated Test Plans.

Following the same approach outlined for operational enhancement requests as documented in 3.2.3, the Scrum team shall be responsible for validating that requirements have been successfully satisfied at the end of each Sprint.

3.2.4 Business Process/Workflow Modeling

The purpose of business process and workflow modeling is to define the business process that the applications under development will support. If the Scrum team deems that business process modeling will be beneficial to the project effort, project Team Members shall work with a Subject Matter Expert (SME) and/or stakeholders to define a standardized business process, or set of processes. Assuming business value exists to create process models; the QA Solution Architect and/or Business Analyst shall take completed user stories and create a workflow model using the Enterprise Modeling toolset (ProVision) or other tools such as MS Visio. Again, business process models are not a requirement for any project, but are encouraged for projects that involve complex process operations.

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3.3 Test Management

This section is closely related to Sections 3.2.2 and 3.2.3 noted above. All testing performed at the NEACC will be *value added*; that is, every test that is executed will demonstrate a certain level of assurance that didn't exist prior to a test being run. The EAST team believes the value of testing lies in recognizing that the delivery of quality systems relies on testing and validation. System testing within the Scrum approach involves performing complete functional and unit testing within each Sprint.

Test plans will be created early in the Sprint iteration and stored in HP QC, regardless of the type of requirement being tested (e.g., operational enhancement or new project). In order to demonstrate coverage of requirements, test plans or test scenarios shall always be linked to AC, which can then demonstrate whether requirements or user stories have been addressed. The Quality Management Analyst (QMA) shall assist the Sprint team in ensuring that all Test Plans are kept accurate and up-to-date. The QMA shall also assist the Sprint team in the compliance of the NEACC SEQP processes.

3.3.1 Testing Standards

All NEACC Scrum teams shall adhere to the Test standards defined in this section. It is very important for each team to understand the value in using common testing standards. There are many reasons why testing standards add value to the NEACC, the most applicable/recognizable of which is the assurance that changes introduced to production systems & new projects 1) work as designed to meet requirements, and 2) do not break a configurable/development item that previously worked correctly. At a minimum, each "functional test" (defined as System Integration Tests, Regression Tests, and Automated Tests in the sections below) shall have a documented purpose, prerequisites, test data, and detailed steps to allow non-SMEs to execute the required test plan. Please reference Appendix G for further information on Test Plan requirements.

3.3.2 Developer Tests

Developer tests are Unit Tests created to test specific functions at their base level as they are implemented to support the feature requirements. The tests shall be created first and shall pass before the code may be checked into the source code control system. All development teams shall execute and document unit tests as part of ongoing operational enhancement, maintenance, or project activities. Development standards for unit testing are defined in the related Application Development documents identified in section 1.3 above. The QA team shall check to ensure that unit tests have been executed as appropriate for all development items. EAST development team members shall ensure that developer tests are executed in accordance with applicable development team testing standards. The EAST Quality organization shall periodically review the development standards unit testing sections to ensure that they comply with current QA SEQP processes.

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3.3.3 System Integration Tests

System Integration Testing (SIT) and Regression Testing activities for all NEACC releases have associated entrance and exit criteria documented in each releases test strategy document that have to be met for the successful test execution and completion. Entrance criteria define conditions shall be satisfied prior to the commencement of testing. Likewise, exit criteria will define the conditions that need to be satisfied prior to the completion of testing. The EAST Application Functional team shall execute testing using the test plans documented and grouped in HP QC’s Test Lab module. Test execution and test statistics will be directly correlated with requirements loaded into QC for the requirements repository.

3.3.4 Regression Testing

Regression testing shall be performed as new functionality is prepped for release into the production environment to ensure that all new/modified components work together with the existing production environment code/functionality. Regression testing is traditionally conducted at a higher level of granularity than the proceeding unit and system integration tests.

3.3.5 Automated Testing

Automated testing shall be conducted using HP’S Quick Test Professional product. With the commencement of the NASA EAST contract, a strong emphasis has been placed on the automation of manual functional tests as part of the overall approach to test execution. A Test Automation Engineer (TAE) shall be assigned to each scrum team and shall work directly with the teams to develop and implement automated test scripts. Each TAE shall analyze the functionality that is being developed/tested in each LOB Sprint, and shall work with the LOB Manager and QMA to understand the priority that will be assigned to each automated test development effort.

The TAE shall work with the LOB Scrum teams to execute the automated tests within each Sprint. It is the EAST team’s goal to automate as many manual tests as possible that offer the greatest return in terms of business value & productivity increases. Please reference the EAST Test Automation team’s approach and automation lifecycle shown in Appendix H.

3.3.6 Performance Testing

Performance testing shall be executed for NEACC initiatives that require a Performance testing assessment. The NASA Technical Infrastructure and Engineering Manager may request performance tests when an application or landscape has experienced problems or significant changes that may necessitate the execution of a performance test. The NEACC EAST QA team will support performance testing initiatives, capacity permitting. Performance tests will be executed using the HP Load Runner application. A TAE from the QA team will work with the LOB Scrum team to determine the process or transaction that needs to be performance tested. An analysis will be performed and the TAE will provide a recommended approach. The TAE

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will then complete the test and provide results and recommendations to the LOB stakeholders for action.

3.3.7 Compliance and Accessibility Testing/Assurance

The EAST process for ensuring compliance and accessibility is documented in Appendix I.

3.4 Defects Management

The management of defects across the NEACC stems from the practices defined in the previous section, Test Management. All defects will be associated to a test (manual, automated, performance, etc) execution/run/step level. Defects logged during testing for a release will also be considered as a key component by level of severity to the entry and exit criteria defined for a given release type. Entry and exit criteria will be defined for each major Integration Test Cycle (ITC) and will be communicated to NEACC management prior to each test cycle. Further, entry and exit criteria for projects held to NPR 7120.99 can be found in the NPR 7120.99 requirement.

3.4.1 Defect Statuses

Defects will be managed within QC and shall be entered by testers as defects are identified. Prior to a major release test cycle, a Defect Manager will be identified to ensure that defects are appropriately dispositioned. As such, the Defect Manager shall ensure that the defects are updated in QC, and all defects shall be tracked by their status, which include:

- **New:** Initial creation and default value (New) when adding defects.
- **Open:** Project and Defect managers shall review and determine if a defect shall be worked or closed. If a defect is closed – it is assumed that no work/action required.
- **In Process:** Being worked by configuration or development teams.
- **Ready To Retest:** Solution delivered by configuration or development and unit test performed.
- **Fixed:** Solution tested and passed, meaning that results meet expectations.
- **Closed:** When defects are not the result of release related configuration/code (i.e. current situation in production, known defect being worked outside release – note SR and Close defect, etc.) In addition, defects that turn out to be the result of an incorrect test plan or user error.

3.4.2 Defect Severity Levels

Each defect shall also be prioritized by its severity level:

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- **Severity 1:** A problem which cannot be circumvented, i.e. there is no work-around available, and which impacts the operation of the affected application. The problem requires that a change be made on an immediate-response basis.
- **Severity 2:** A problem which requires that a change be made by a specific date. If the change is not implemented by the specific date, the problem would materially affect testing causing an immediate and substantial impact. Failure to implement the change on the specific date will cause the defect to automatically escalate to a Severity 1.
- **Severity 3:** A problem which requires that a change be made by a requested date. If the change is not implemented by the requested date, the problems caused would not be materially damaging but would cause a serious impact.
- **Severity 4:** A problem which may require that a change be made. It is not critical to the operation of the application and a date for correction will be negotiated.

Scrum team members play a large role in ensuring that defects have been assigned the proper severity level and that defects that are ready to be migrated to production are in the proper status. The changing of defect severities will be limited to only a small number of defect/test managers to ensure integrity.

3.5 Key Team Member Takeaways from this Section

- Recognize that EAST will be measured by the quality of the systems we are supporting, so a healthy balance needs to exist between quality and quantity of delivered application points
- The EAST team believes that documents required under this section – and all other sections in this document – create value for NASA. It is up to each LOB Scrum team to determine if the creation and maintenance of other documents adds value
- User stories shall be created for enhancement requests (operational or project) at the discretion of the Product Lead, Product Delivery Manager, and Line of Business Manager, and shall be associated to AC which represent AC when created
- Testing shall be performed to demonstrate that each AC has been successfully met
- Defects shall be created and resolved to ensure that each test successfully demonstrates the request functionality has been accomplished
- Reports shall be generated at the end of a Sprint and provided to NASA for acceptance of completed work

4.0 SYSTEMS QUALITY ASSURANCE & CONTINUOUS IMPROVEMENT

Systems QA under EAST is performed using both proactive and reactive measures. In industry, these two views on Quality are typically referred to as Quality Assurance (proactive) and Quality Control (reactive) as noted in the first 3 sections to this document; the EAST Team believes that

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the most significant contribution to quality is the processes used to produce a product or service, which is Scrum for the entire EAST team. Based on the standards set forth by the International Organization for Standards (ISO) 9000 specification, Quality Control refers to the operational techniques and activities that are used to fulfill requirements for quality, whereas Quality Assurance addresses planned and systematic activities implemented to provide adequate confidence that an entity will fulfill requirements for quality.

The table below further defines the difference between the two:

	Quality Assurance	Quality Control
<i>Functions</i>	Process Proactive Staff function Prevent Defects	Product Reactive Line Function Find Defects
<i>Examples</i>	Quality audit Defining process Selection of tools Training	Walkthrough Testing Inspection Checkpoint Review

Figure 5 – Knowing the Difference Between Quality Assurance and Quality Control

4.1 Quality Assurance

Under EAST, all LOB scrum teams are expected to utilize an Iterative process (for Operations and Maintenance work) or the Agile Scrum process for project work (reference section 3.0). Two key points during the Sprint that aid in QA efforts are the Sprint Review and Sprint Retrospectives. The Sprint Review and Retrospective will provide opportunities for the team to learn what worked well and what did not. Scrum teams are expected to utilize knowledge gained from previous Sprints to improve performance and productivity on future Sprints. Scrum teams are also expected to assess the usability, supportability, and performance of all applications that fall under the management for a particular LOB. The QA Solution Architect and/or QMA assigned to a LOB will assist with this evaluation.

4.2 Quality Control

The second approach to improving NEACC system quality relies on reactive measures. In addition to Service Level Standards (SLS) data being produced, each EAST LOB team shall be measured by quality metrics that represent effectiveness pertaining to requirements, testing, and defects encountered. Some of these metrics include, but are not limited to:

- Requirements coverage analysis for both operational and project activities (evaluates the Requirements -> Acceptance Criteria -> Tests results chain)
- Number, type, status of test executed and defects logged
- Ratio of defects to total tests executed

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- SLSs, specifically pertaining to Contractor Caused Incidents (CCIs) and other SLS quality measures

These metrics will be continuously evaluated by the Quality Assurance team and other supporting EAST teams relative to the business value provided by each. As such, these metrics will likely change over time.

4.3 Information Technology Infrastructure Library (ITIL) & Continuous Improvement

With the commencement of the EAST contract supporting NASA’s NEACC, Continual Service Improvement (CSI) will be conducted in accordance with the ITIL 3.0 requirements. The EAST support team shall provide continual service improvements across all supported products and services, including their strategies, design, transformation and operation.

4.4 Key Team Member Takeaways from this Section

- There are two views on quality: QA and Quality Control
- The most significant contributions to good quality come from effective Quality Assurance practices (effective usage of the Scrum process)
- Both QA and Quality Control factor significantly into Continuous Service Improvement activities
- Metrics will be utilized to measure quality performance across all LOBs
- Keep an open mind about the things each team is doing – be supportive if it adds value, push for removal if something doesn’t add value
- Do not get caught up in the rush to deliver application points at all costs
- Assist each LOB in pushing for more test automation – everyone’s job becomes more manageable when the tests we’re executing are automated
- Every team member is encouraged to provide new ideas and opportunities for improvement. If unsure where to provide this feedback, start with the LOB Manager for a LOB and EAST QA Manager.

5.0 DEVELOPMENT STANDARDS AND PRACTICES

5.1 Coding Standards, Conventions, Practices, and References

The EAST Application Development team maintains standards for coding practices, conventions, and processes for each Application Development team. Please reference the EAST Application Development documents listed at the beginning in section 1.3 for more information regarding specific development requirements.

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5.2 Key Team Member Takeaways from this Section

- Systems quality depends on sound practices across all application development teams
- Development standards exist which help to ensure that NEACC systems are developed using quality practices

6.0 ARTIFACTS MANAGEMENT

Software Engineering artifacts related to requirements and testing shall be formally managed in the NEACC's Quality & Testing tool, HP QC. Artifacts that support Software development will be managed utilizing tools that are currently in place to support each of the NEACC's development areas that include Enterprise Resource Planning (ERP) Development (e.g., SAP), Enterprise Application Integration (EAI)/Web Development (e.g., JAVA, Web Development, Integrations, etc), and Business Intelligence development.

6.1 Artifact Types, Descriptions, and Maintenance Approach

More specifically, the following table defines each of the key NEACC Software Engineering artifacts by delivery function, the value that it provides, and the drivers that necessitate creation, deletion, or update of each artifact.

Table 7 – Artifacts Management

Delivery Function	Artifact Title	Description	When Required	Where Stored	Drivers to Create/Update/Archive	Change Control? Yes/No
QA	Agile Requirements	Includes documents/statements that are created to reflect an end-user's needs. Also includes process flows generated to depict a business process flow or set of functions. Follows the Requirements Management approach outlined in section 3.0 of this document.	When new functionality is requested or an existing requirement is modified and approved to work in the backlog	QC	Mandatory/Optional. New project/initiative; change to existing functionality; functionality no longer needed. <i>While potentially beneficial to end users, process flows are not mandatory and will be developed based on the discretion of the Scrum team.</i>	Yes
	Acceptance Criteria	Defined at the beginning of a Sprint and	Sprint Planning Backlog definition	QC	Mandatory.	Yes

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Delivery Function	Artifact Title	Description	When Required	Where Stored	Drivers to Create/Update/Archive	Change Control? Yes/No
		reviewed/approved by the NASA PDM or PL.				
	Functional Test Plan	Represents a testable set of steps normally grouped into like functions (Test Sets). Will be logically written to demonstrate that a system requirement (either Legacy or Agile) has been addressed.	Sections to support each Sprint iteration and migration	QC	Mandatory. New project/initiative; change to existing functionality; functionality no longer needed	Yes
	Unit Test Plans	Represents a testable set of steps applicable to a component of software code, configuration, or infrastructure. Will be logically written to demonstrate that a software component is functioning appropriately.	Each portion of code developed during Sprint iteration and migration	QC	Mandatory. New project/initiative; change to existing functionality; functionality no longer needed	No
	Functional Specifications	Assists with communicating an end-user need which typically deals with visual elements & layouts. Examples include web screens, portal layouts, and enterprise reports.	When approved to the product backlog and finalized during Sprint iteration	QC	Optional. New project/initiative where visual requirements not clearly understood; change to existing functionality involving existing specs that have been written.	No

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Delivery Function	Artifact Title	Description	When Required	Where Stored	Drivers to Create/Update/Archive	Change Control? Yes/No
Application Development (ERP/BW)	Reports, Interfaces, Conversions, Enhancements, Forms (RICEF) Repository	All Reports, Interfaces, Conversions, Extensions, and Form objects supported by ABAP team detailed in an excel file (see BW Query Develop Standards; BW Object Naming Conventions; BW Query Naming Conventions; BW Process Chain Naming Conventions)	Annual Update of Object Lists, updated if new object identified	Docu mentum	Mandatory. New project/initiative; change to existing functionality; functionality no longer needed	No
Application Development (EAI/Web)	High-Level Design (HLD)	The HLD document is a technical outline describing the design approach proposed by the software designer. The HLD document provides technical solution traceability to the Functional User Stories. The known source systems (client) and destination systems (service provider / event receiver) are provided as well as any known dependencies and notification requirements. Additionally, the HLD contains a technical process flow diagram and a process step table that describes the software components and information flow.	Prior to integration development	Subversi on	Mandatory. New project/initiative; change to existing functionality; functionality no longer needed	Yes
	Physical Landscape	The Physical Landscape	Updated when new application	bReady	Mandatory. New	Yes

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Delivery Function	Artifact Title	Description	When Required	Where Stored	Drivers to Create/Update/Archive	Change Control? Yes/No
	Topology	Topology graphically represents the hardware, communication protocol, network connectivity, and operating system utilized by the application systems at the infrastructure level.	or system is added, reviewed every 6 months		project/initiative; change to existing functionality; functionality no longer needed	
	System Relationship Diagram (SRD)	The SRD graphically represents all of the system entities, communication protocols, and transport methods involved in the project implementation at the application level. Both internal and external system entities are represented.	Updated when new application or system is added, reviewed every 6 months	Ready	Mandatory. New project/initiative; change to existing functionality; functionality no longer needed	Yes
	Logical Integration Topology	The Logical Integration Topology graphically represents the integration scope in terms of the number of application systems and the integrated components of those systems. Additionally, the Logical Integration Topology depicts integration pattern, integration trigger, and the logical flow of information between the components.	Updated when new application or system is added, reviewed every 6 months	Metahouse	Mandatory. New project/initiative; change to existing functionality; functionality no longer needed	Yes

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Delivery Function	Artifact Title	Description	When Required	Where Stored	Drivers to Create/Update/Archive	Change Control? Yes/No
	Data Reference Model (DRM)	<p>The DRM is a framework whose primary purpose is to enable information sharing and reuse across the agency via the standard description and discovery of common data and the promotion of uniform data management practices. The DRM provides a means of standardizing what the data represents, who owns the data and how the data is shared.</p> <ul style="list-style-type: none"> •Data Description (Entity, Attributes) •Data Ownership (System of Record) Data Sharing (Systems and/or Groups that use the data) 	Updated when new project/initiative or change to existing functionality changes or is not needed	bReady	Mandatory. New project/initiative; change to existing functionality; functionality no longer needed	Yes

New artifact types will be created as project or operational needs arise. Existing artifacts will be kept current as the need for change arises. In the event that an artifact has not changed during an 18-month period, a review cycle will be initiated with each delivery area responsible for a given group of artifacts to determine relevancy to current operations.

6.2 Key Team Member Take aways from this Section

- Artifacts will be created as defined in the table above
- Know which artifacts you are responsible for and ensure that you maintain artifacts in accordance with your team’s expectations

7.0 ADHERENCE TO NPRS & STANDARDS

7.1 Compliance with NPR 7120.99

NASA Procedural Requirement (NPR) 7120.7 has been superseded by interim NPR directive 7120.99. All previous references to NPR 7120.7 have been replaced with NPR 7120.99.

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NPR 7120.99 identifies requirements and obligations that certain Institutional NASA projects are required to meet. For projects that are subject to the requirements of NPR 7120.99, the EAST team shall continue to adhere to these applicable project and requirements. While NPR 7120.99 seems to be more aligned with a traditional “waterfall” software development approach, the EAST team shall be utilizing a model that is based on the Scrum process, while also addressing the requirements of NPR 7120.99. For more information on NPR 7120.99, please reference

<http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=7120&s=7>

Each Scrum/Iteration activity that is subject to the requirements of NPR 7120.99 will rely on the project Sprints/Iterations to feed each 7120.99 obligation as required. The figure below illustrates this concept:

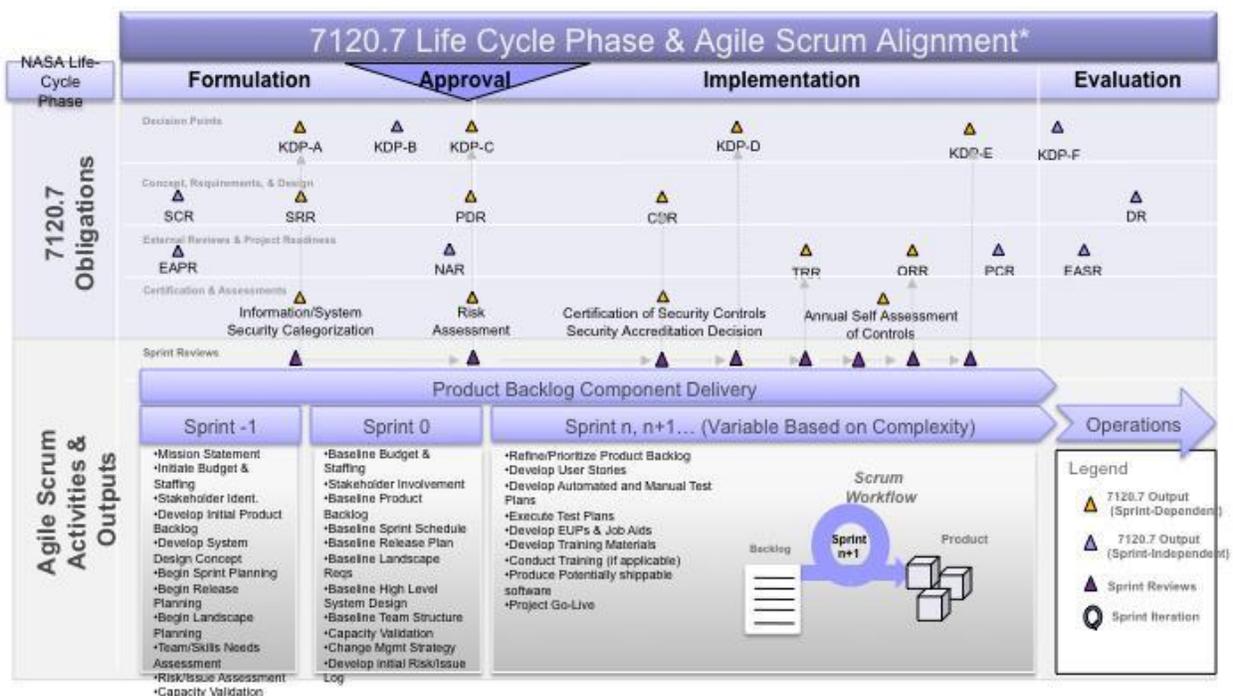


Figure 6 – 7120.99 Life Cycle Phase & Agile Scrum Alignment

More information on milestone reviews can be found by referencing the NPR standard at the link noted above. Note that while the graphic above still references 7120.7, the milestones referenced above still apply for 7120.99 projects.

7.2 Key Team Member Takeaways from this Section

- EAST shall continue to utilize NPR 7120.99 for projects that meet the pre-defined NPR 7210.99 thresholds

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- The Scrum process shall be utilized on all NPR 7120.99 projects and shall support the requirements defined by NPR 7120.99

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8.0 RECORDS

Table 7 – Records Applicable to This Document

Name of Record	Storage Location	SBU/PII*	Retention Schedule	Responsible Party	Email	Phone No.
Sprint/Iteration Review		No	2/27/C/2/a (2800)			
Test Plans		No	2/27/K/2 (2800)			
User Stories		No	2/27/K/2 (2800)			
APAP BW Query Develop Standards, Object Naming Conventions, Query Naming Conventions, Process Chain Naming Conventions		No	2/27/K/2 (2800)			
EAI-Web High-Level Design		No	2/27/K/2 (2800)			

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Name of Record	Storage Location	SBU/PII*	Retention Schedule	Responsible Party	Email	Phone No.
Physical Landscape Topologies	[REDACTED]	No	2/27/K/2 (2800)	[REDACTED]	[REDACTED]	[REDACTED]
System Relationship Diagrams		No	2/27/K/2 (2800)			
Logical Integration Topology		No	2/27/K/2 (2800)			
Data Reference Model		No	2/27/K/2 (2800)			

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APPENDIX A– ID/IQ TASK ORDER APPROACH

A.1.0 INTRODUCTION

The EAST Team will utilize a collaborative, repeatable, and reliable approach to successfully plan and implement any initiative that falls under the scope of an indefinite ID/IQ task order.

Close customer collaboration and utilization of the Scrum set of practices is critical to making each solution assessment and ID/IQ task order initiative a success. The EAST team will continue to use a collaborative and iterative approach, based on the Agile Scrum set of practices, to conduct solution assessment activities to better understand and document ID/IQ task order requirements. Each ID/IQ solution assessment will be conducted using the Scrum approach to manage activities, milestones, and deliverables. Utilization of Scrum for each solution assessment will provide a much better understanding of requirements, constraints, risks, and completion criteria to address NASA’s requirements and is consistent with our core approach to EAST operations management, technical, staffing, and safety and health requirements.

The normal solution assessment period will span 30 days and will be conducted using two Sprints, each with duration of 14 days and a Sprint review on Day 14 or 15 of each Sprint. The solution assessment model schedule contains initiation and planning activities that are necessary to produce deliverables that are needed to execute the requirements of the task order. The EAST ID/IQ solution assessment approach is based on three core processes: 1) Leverage Scrum’s iterative set of practices to develop the task order plan, 2) Collaborate with NASA and NASA NEACC management to validate task order solution assessment progress and assumptions, and 3) Utilize the solution assessment Sprint review process to provide clarity and direction.

The EAST Team shall utilize the Scrum approach for conducting any ID/IQ solution assessment to lower ID/IQ task order execution risk; improve understanding of the ID/IQ task order scope, and lower operational transition risk to NASA by conducting more thorough up-front planning in a collaborative fashion. Outputs to the solution assessment for the sample ID/IQ initiative (as well as for all future ID/IQ and planning initiatives) will include a proposed schedule, staffing plan, and FFP estimate of cost that directly correlate to the ID/IQ task order backlog. The EAST team understands that a solution assessment approach based on Scrum will yield the highest quality staffing plan, schedule, and Firm Fixed Price (FFP) estimate of cost.

The figure below represents the EAST Team’s detailed ID/IQ solution assessment approach:

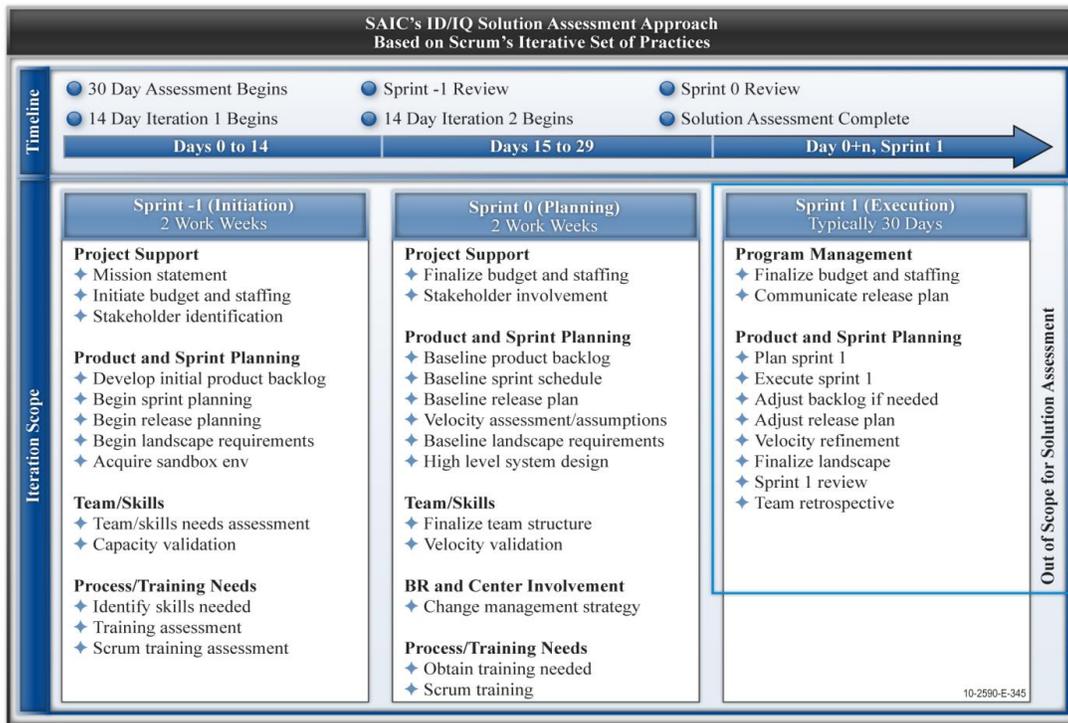


Figure 7 – EAST Team’s Detailed ID/IQ Solution Assessment Approach

The figure below represents the EAST Team’s Solution Assessment detailed process:

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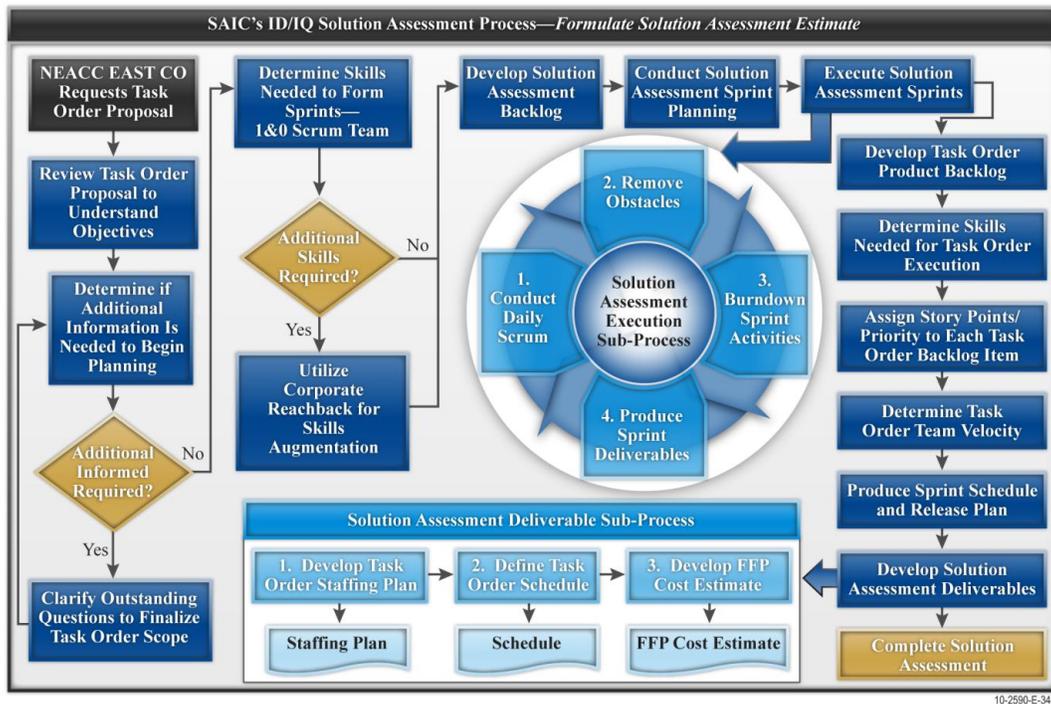


Figure 8 – EAST Team’s Solution Assessment Detailed Process

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APPENDIX B – SPRINT/ITERATION PLANNING GUIDELINES

- Scrum/Agile Team Product Owner (or delegate) shall work with the LOB Manager to set priorities and address AC for completed work
- LOB Manager needs to coordinate and facilitate Sprint/Iteration planning based on prioritized backlog & Product Owner’s input
- All team members that have a task in the Sprint/iteration need to participate (or have a representative plan tasks) to ensure all tasks needed to support the definition of “done” are accomplished during the Sprint/iteration planning sessions
- Sprint planning process – Scrum/Agile team decomposes backlog into tasks that can be completed in the Sprint/Iteration timeframe window
- LOB Scrum/Agile team determines preferred Sprint/Iteration execution “medium” – APCMS Rally solution will be used to document all team members tasks, Sprint/iteration backlog and capacity for the team

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APPENDIX C – SPRINT EXECUTION GUIDELINES (FOR SCRUM PROJECTS)

- All team members are empowered to do what it takes to deliver the team agreed to Sprint backlog items
- All team members need to attend the daily Scrum when they have a task in that Scrum
- If a team member does not have a task in the Scrum, he/she does not need to attend
- In keeping with Scrum’s principles, all team members shall stand during the daily Scrum
- Team members shall communicate progress made on tasks since the prior tag up, expectations of dependent tasks (i.e., “I plan on working on task b provided that team member y completes their related task.”) to each other – not the Scrum Master or LOB Manager
- The 3 questions each team member needs to address is:
 1. What have I accomplished since the last daily Scrum?
 2. What will I accomplish between now and the next daily Scrum?
 3. Do I have any obstacles?, preventing me or the team for accomplishing the task or backlog item in this Sprint iteration
- The Scrum Master acts as a facilitator during the daily Scrum, keeping the team on task, limiting time spent on tangents and brief discussions on how teams will resolve obstacles discussed during tag up

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APPENDIX D – SPRINT/ITERATION REVIEW – EXAMPLE FORMAT

Introduction

- Welcome & opening announcements

Purpose

- Reminder of Sprint review purpose and encourage participation and questions
- Remind participants that feedback will be collected and dispositioned

Schedule Review (if applicable)

- Cover any schedule points & dependencies
- Identify and address key milestones relevant to Product Owner & Stakeholder community

Functionality Demonstrations (e.g., “tell the story”)

- Use the “tell a story” concept to demonstrate functionality
- Ensure the audience understands the “who, what, why, and how” of each demonstration
- Take it slow – rushing through demonstrations tends to discourage feedback opportunities
- Remember that all feedback is good feedback, regardless if it is good or bad

Wrap-Up

- Highlight key points & action items raised during Sprint review
- Reminder of next Sprint review date/time

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APPENDIX E – SPRINT/ITERATION RETROSPECTIVE GUIDELINES

- Only team members with tasks are invited to facilitate open communications within the team
- Provides an opportunity for the team to look back on the Sprint and talk about lessons learned and areas for improvement
- Can be an event where the team celebrates their successes while also talking about what didn't work well so improvements can be made
- During the retrospective, the team will always try to set “team goals” for the next Sprint on how they can improve as a team and a metric to show improvement
- Team members shall be honest, open, and respectful during this session
- Necessary to ensure “closure” for successes and failures of the team during the Sprint; aids in building “high-performing” teams

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APPENDIX F – FUNCTIONAL TEST PLAN STANDARDS

- **Purpose**
 - Each test script will have a purpose
 - The purpose will be short, distinct, and to the point
 - Avoid writing more than 2 or 3 sentences to describe the purpose
- **Description**
 - Will state why the test is needed
 - What it will validate
 - Requirements that are associated with test
- **Prerequisites**
 - Prerequisite conditions will exist and be well defined for all test scripts.
 - If assumptions are made about the test script, it will be noted in the prerequisite conditions documented for the test
 - An example would be that another test has already been run, data has been established, a particular security role is needed, etc.
- **Test Data**
 - Test data will be established and will be stored in a document that is easily shared
 - Excel, word, PowerPoint are acceptable as long as the data is easily shareable/transportable
- **Steps**
 - Each test will have a list of logical steps that an independent tester can follow
 - Each step will be easy to understand while also preserving enough technical detail to give the tester enough information to execute the step
 - The steps will make sense and will represent the logical order in which the test will be executed
 - Test steps that do not make sense will be rewritten

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APPENDIX G – EAST TEST AUTOMATION APPROACH AND LIFECYCLE

The EAST Test Automation lifecycle that will be conducted within each LOB & ID/IQ Task Order Sprint is as follows:

- **Plan**
 - Goals, expectations, test strategy, requirements, resources, timeline, etc.
- **Develop**
 - Create automated tests, debug runs
- **Execute**
 - Official test runs from test suite
- **Deliver**
 - Hand-off to end user, training, EUP, support
- **Maintain**
 - Update automated tests as needed

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APPENDIX H – EAST COMPLIANCE AND ACCESSIBILITY ASSURANCE PROCESS

H.1.0 NEACC SECTION 508 POLICY AND APPROACH

H.1.1 NEACC ACCESSIBILITY AND COMPLIANCE ASSURANCE POLICY

Application accessibility holds an important place in the NEACC’s development and quality assurance processes. The NEACC will ensure that our custom-developed and certain Commercial Off the Shelf (COTS) configured applications meet Section 508 requirements when feasible to do so without loss of functionality or undue burden. Our goal is two-fold: 1) to develop and provide fully accessible applications for NEACC end-user communities, and 2) to achieve full Section 508 compliance for all NEACC custom-developed applications. We will do this by working with various user communities across the NASA Agency to test applications and provide input throughout our development and operations processes.

We realize that there are cases where some of our applications may have non-compliant functions or capabilities due to technology limitations or user functionality requirements. In these cases, our policy is to formally document and manage the deficiencies and the need for exceptions. In addition, simply meeting Section 508 compliance doesn’t always imply that an application is fully accessible, so our goals reflect the NEACC’s need to ensure both compliance and accessibility.

H.1.2 BACKGROUND & PURPOSE

A key area of software compliance for Federal departments and agencies is the Section 508 Amendment to the Rehabilitation Act of 1973 (aka “Section 508). Section 508 requires that Federal departments and agencies that develop, procure, maintain, and use electronic and information technology assure that the technologies provide access to information and data for people with disabilities. The US Access Board (USAB) and General Services Administration (GSA) provide technical assistance to the Federal government concerning the section 508 requirements.

The Access Board’s responsibilities include developing and maintaining accessibility requirements for electronic and information technology, providing technical assistance and training on these guidelines and standards, and enforcing accessibility standards for federally funded facilities. GSA’s Office of Government-wide Policy, Center for IT Accommodation (CITA) is charged with educating Federal employees and building the infrastructure to support Section 508 implementation.

H.1.3 SCOPE & APPLICABILITY

This document applies to development and testing activities utilized for all custom-developed and vendor-provided applications supported by the NEACC. All 3rd party vendor applications are

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required to be 508 compliant, although applicable exceptions should be documented. The NEACC’s Compliance Assurance strategy seeks to address the accessibility needs of users across all user segments while defining the various types of applications we support.

H.1.3.1 NEACC User Segments

NEACC users typically fall into one of three categories: users of NEACC public applications, users of applications utilized only by NASA, and users of applications utilized only by the NEACC. Definitions of each and examples are provided in the list below:

1. **Public Application Users** – Users of applications supported by the NEACC and utilized across the agency and outside of NASA. Examples include NAIS, people.nasa.gov
2. **Agency Application Users** – Users of agency applications supported by the NEACC and utilized across the Agency. These applications may be for one Center, multiple Centers, or all Centers. Examples include SAP, PRISM, WebTADs
3. **NEACC Application Users** – Users of applications that are used exclusively to support the NEACC’s operations. Examples include HP Quality Center, Rally.

H.1.3.2 NEACC Application Categories

The NEACC provides support of NASA’s mission-based and business applications. There are 3 general categories of applications that are supported by the NEACC:

1. **Type 1: Non-customized COTS applications** – applications that are provided by the vendor and not customized by the NEACC. Examples include Approva, etc.
2. **Type 2: Customized COTS applications** – vendor-provided applications that are customized by the NEACC. Examples include SAP, PRISM, ALDS
3. **Type 3: Custom-developed applications** – software applications that are custom-developed by the NEACC including open source applications. Examples include e.g., StaRS, Mobile apps, etc

Based on the application categories noted above, the following table defines the NEACC’s position for Section 508 compliance for each application type.

Table 8 – NEACC Position for Application Type

Application Type	Action	Accessibility & Compliance Position
Type 1 – Non-customized COTS Applications	No action required	Vendor is responsible for providing statement of compliance and ensuring product is compliant or a waiver has been granted, if applicable.
Type 2 – Customized COTS Applications	Limited action may be required	Vendor is responsible for providing statement of compliance and ensuring product is compliant or a waiver has been granted, if applicable. However,

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		NEACC may “extend” or “configure” user interface components which may have a usability impact. In these cases, the NEACC will follow 508 Compliance Assurance process for development and testing of these applications. NEACC will be responsible for reviewing customizations only and will not seek to test vendor-provided functionality for compliance.
Type 3 – Custom-Developed Applications	Action required	NEACC will ensure accessibility and compliance based on Section 1.0 policy and goals stated above.

The guidelines set forth below are only applicable to NEACC Type 3 applications. The USAB maintains all standards referenced in this document at <http://www.access-board.gov/sec508/standards.htm>. At present, the NEACC will only be evaluating Section 508 compliance based on Technical Standards 1194.21 (Software Applications and Operating Systems) and 1194.22 (Web-based intranet and internet information and applications)

H.1.3.3 Exceptions

A Federal agency does not have to comply with the technology accessibility standards if it would impose an undue burden to do so. This is consistent with language used in the Americans with Disabilities Act (ADA) and other civil rights legislation, where the term ‘undue burden’ has been defined as “significant difficulty or expense.” However, the agency must explain why meeting the standards would pose an undue burden for a given procurement action, and must still provide people with disabilities access to the information or data that is affected.

Section 508 contains a limited exemption for national security systems as defined by the Clinger-Cohen Act of 1996. These are systems used for military command, weaponry, intelligence, and cryptology activities. The exemption does not apply to routine business and administrative systems used for other defense-related purposes or by defense agencies or personnel.

H.1.4.0 SECTION 508 COMPLIANCE DEVELOPMENT GUIDELINES

This section contains the application development guidelines that will be followed when any development activity is conducted at the NEACC. It is expected that all development and testing team members fully understand requirements in the tables contained in section 4.2 and 4.3, as these requirements were derived from the USAB’s 1194.21 (Software Applications and Operating Systems) and 1194.22 (Web-Based Intranet and Internet Information and Applications) technical standards. Other technical standards defined in section 1194 (e.g., 1194.23, 1194.24, 1194.31, etc) are not applicable to the NEACC’s 508 Compliance Assurance process due to the scope of each of these subsections.

In all cases, NEACC development team members must ensure that each standard below has been considered and addressed when designing, developing, and implementing applications. In

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addition, developers are expected to refer to the NEACC list of defined best practices as described on the bReady portal at <http://bready.nasa.gov>.

H.1.4.1 Technology Applicability for Section 508 Compliance

NEACC applications can be classified across six primary technology domains: Enterprise Resource Planning (ERP), Business Intelligence (BI), Web Development, Mobile Development, Client-Server, and Infrastructure. All of the NEACC’s supported applications will reside under one of these technology domains. The table below identifies each of these domains, representative NEACC applications, and associated testing tools required for each. This table seeks to identify all NEACC technologies, platforms, and programming languages that may impact accessibility and/or Section 508 compliance. The NEACC updates the information in this list frequently as new technologies are added or removed from use or support.

Table 9 – NEACC Technology Applicability

Line of Business	Technology Domain	Representative Example Applications	508 Testing Tools Required	Impact of Technology Use
BI	ERP	SAP	Will vary depending upon technology. WAVE for Web, manual testing utilizing JAWS for non-Web	Type 2 NEACC applications within this domain. NEACC will test customized portions of Type 2 applications only. No NEACC 508 testing required for vendor-delivered (e.g., core) functionality due to vendor 508 compliance responsibility.
	Business Intelligence	Cognos	Will vary depending upon technology. WAVE for Web, manual testing utilizing JAWS for non-Web	Type 2 NEACC applications within this domain. NEACC will test customized portions of Type 2 applications only. No NEACC 508 testing required for vendor-delivered (e.g., core) functionality due to vendor 508 compliance responsibility.
ESB	Web	WAT, ESB, bReady Storefront	WAVE (Required) Total Validator (As Deemed)	Type 1 & 3 NEACC applications within this domain. Technologies for new development work

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			Necessary by LOB)	include JAVA, HTML 5, PERL, FLEX. Limited operational support for other technologies' provided (e.g., Cold Fusion for OE)
	Mobile	Space365, Apps@NASA	Pending	Pending assessment based on infancy of mobile accessibility determinations and tools required
Financial	ERP	SAP Financial	Will vary depending upon technology. WAVE for Web, manual testing utilizing JAWS for non-Web	Type 2 NEACC applications within this domain. NEACC will test customized portions of Type 2 applications only. No NEACC 508 testing required for vendor-delivered (e.g., core) functionality due to vendor 508 compliance responsibility.
	Web	MdM	WAVE (Required) Total Validator Pro (As Deemed Necessary by LOB)	Type 3 NEACC applications within this domain. Technologies for new development work include JAVA, HTML 5, PERL, FLEX. Limited operational support for other technologies' provided (e.g., Cold Fusion for OE)
HCW	Web	ALDS, StaRS, HR Portal, WebTADS,	WAVE (Required) Total Validator Pro (As Deemed Necessary by LOB)	Type 2 & 3 NEACC applications within this domain. Technologies for new development work include JAVA, HTML 5, PERL, FLEX. Limited operational support for other technologies' provided (e.g., Cold Fusion for OE)
	Mobile	WebTADS Mobile	Pending	Pending assessment based on infancy of mobile accessibility determinations and tools required
ICAM	Web	LaunchPad,	WAVE	Type 1, 2, & 3 NEACC

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		Card Management System, PKI	(Required) Total Validator Pro (As Deemed Necessary by LOB)	applications within this domain. Technologies for new development work include JAVA, HTML 5, PERL, FLEX. Limited operational support for other technologies' provided (e.g., Cold Fusion for OE)
NSS	Web	JIRA, HP QualityCenter	N/A	Type 1 & 2 NEACC applications. As of 2012, NSS applications are out of scope for 508 Compliance Testing.
	Client-Server	Remedy	N/A	Type 1 & 2 NEACC applications. As of 2012, NSS applications are out of scope for 508 Compliance Testing.
	Infrastructure	Oracle	N/A	Type 1 & 2 NEACC applications. As of 2012, NSS applications are out of scope for 508 Compliance Testing.
OE	Web	OEPM, OSSI	WAVE (Required) Total Validator Pro (As Deemed Necessary by LOB)	Type 1, 2, & 3 NEACC applications within this domain. Technologies for new development work include JAVA, HTML 5, PERL, FLEX. Limited operational support for other technologies' provided (e.g., Cold Fusion for OE)
Logistics	ERP	SAP MM, SAP PM	Will vary depending upon technology. WAVE for Web, manual testing utilizing JAWS for non-Web	Type 2 NEACC applications within this domain. NEACC will test customized portions of Type 2 applications only. No NEACC 508 testing required for vendor-delivered (e.g., core) functionality due to vendor 508 compliance responsibility.

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	Web	N-PROP, DSPL, OSCAR	WAVE (Required) Total Validator Pro (As Deemed Necessary by LOB)	Type 1, 2, & 3 NEACC applications within this domain. Technologies for new development work include JAVA, HTML 5, PERL, FLEX. Limited operational support for other technologies' provided (e.g., Cold Fusion for OE)
	Mobile	Mobile Inventory (URL)	Pending	Pending assessment based on infancy of mobile accessibility determinations and tools required
PLM	Web	Windchill, Cradle, ARM	WAVE (Required) Total Validator Pro (As Deemed Necessary by LOB)	Type 1, 2, & 3 NEACC applications within this domain. Technologies for new development work include JAVA, HTML 5, PERL, FLEX. Limited operational support for other technologies' provided (e.g., Cold Fusion for OE)
Procurement	ERP	SAP Purchasing	Will vary depending upon technology. WAVE for Web, manual testing utilizing JAWS for non- Web	Type 2 NEACC applications within this domain. NEACC will test customized portions of Type 2 applications only. No NEACC 508 testing required for vendor-delivered (e.g., core) functionality due to vendor 508 compliance responsibility.
	Web	CMM/PRISM, NAIS, EPDW, Bankcard	WAVE (Required) Total Validator Pro (As Deemed Necessary by LOB)	Type 1, 2, & 3 NEACC applications within this domain. Technologies for new development work include JAVA, HTML 5, PERL, FLEX. Limited operational support for other technologies' provided (e.g., Cold Fusion for OE)

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NEACC development best practices are available at [REDACTED]

H.1.4.2 Guidelines for Technical Standard 1194.21 (Software Applications and Operating Systems)

The standards defined in the table below have been extracted from the USAB’s Section 508 compliance guide at <http://www.access-board.gov/sec508/guide/1194.21.htm>.

Table 10 – Guidelines for Technical Standard 119.21 for Software Applications and OSs

1194.21 Standard	Compliant	Noncompliant
1194.21 (a) Executing Function from Keyboard		
When software is designed to run on a system that has a keyboard, product functions shall be executable from a keyboard where the function itself or the result of performing a function can be discerned textually.	<ul style="list-style-type: none"> All functionalities of application can be operated using the keyboard. 	<ul style="list-style-type: none"> Functionality requires mouse only or mouse keyboard combination.
1194.21 (b) Accessibility Features		
Applications shall not disrupt or disable activated features of other products that are identified as accessibility features, where those features are developed and documented according to industry standards. Applications also shall not disrupt or disable activated features of any operating system that are identified as accessibility features where the application programming interface for those accessibility features has been documented by the manufacturer of the operating system and is available to the product developer.	<ul style="list-style-type: none"> Accessibility features that are “built-in” the software cannot be disabled once the application has been started. 	<ul style="list-style-type: none"> Accessibility features that are “built-in” the software can be disabled once the application has been started.
1194.21 (c) Input Focus		
A well-defined on-screen indication of the current focus shall be provided that moves among interactive interface elements as the input focus changes. The focus shall be programmatically exposed so that assistive technology can track focus and focus changes.	<ul style="list-style-type: none"> Assistive technology can track “input focus” and any of the changes to the “input focus”. 	<ul style="list-style-type: none"> Assistive technology cannot track “input focus” and any of the changes to the “input focus”.
1194.21 (d) User Interface Element		

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1194.21 Standard	Compliant	Noncompliant
Sufficient information about a user interface element including the identity, operation and state of the element shall be available to assistive technology. When an image represents a program element, the information conveyed by the image must also be available in text.	<ul style="list-style-type: none"> When an image represents a program element (i.e. Button checkboxes, menus, toolbars, scroll bars, and any other feature of a program that is intended to allow the user to perform some action.) the information conveyed by the image must also be available in text. 	<ul style="list-style-type: none"> When an image represents a program element (i.e. Button checkboxes, menus, toolbars, scroll bars, and any other feature of a program that is intended to allow the user to perform some action.) the information conveyed by the image IS NOT available in text.
1194.21 (e) Bitmap Images		
When bitmap images are used to identify controls, status indicators, or other programmatic elements, the meaning assigned to those images shall be consistent throughout an application's performance.	<ul style="list-style-type: none"> When a .bmp file format is used to identify controls, status indicators, or other programmatic elements, the meaning assigned to those images shall be consistent throughout an application's performance. 	<ul style="list-style-type: none"> When a .bmp file format is used to identify controls, status indicators, or other programmatic elements, the meaning assigned to those images IS NOT consistent throughout an application's performance.
1194.21 (f) Textual Information		
Textual information shall be provided through operating system functions for displaying text. The minimum information that shall be made available is text content, text input caret location, and text attributes.	<ul style="list-style-type: none"> The text should be written to the screen through the operating system. (text content, text input caret location, and text attributes) 	<ul style="list-style-type: none"> The text is not available for the screen through the operating system.
1194.21 (g) User Selected Attributes		

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1194.21 Standard	Compliant	Noncompliant
Applications shall not override user selected contrast and color selections and other individual display attributes.	<ul style="list-style-type: none"> Users can select personalized settings which cannot be disabled by software programs after the application has started. (includes user selected contrast and color selections and other individual display attributes.) 	<ul style="list-style-type: none"> Software programs override personalized settings after the application has started. (includes user selected contrast and color selections and other individual display attributes.)
1194.21 (h) Animation		
When animation is displayed, the information shall be displayable in at least one non-animated presentation mode at the option of the user.	<ul style="list-style-type: none"> This provision requires that in addition to the animation, an application shall provide an option to turn off animation 	<ul style="list-style-type: none"> Animation cannot be turned off.
1194.21 (i) Color Coding		
Color coding shall not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.	<ul style="list-style-type: none"> Some other method of identification for actions on the screen, such as text labels, can be combined with the use of color. 	<ul style="list-style-type: none"> Color is the only way to identify the actions on the screen.
1194.21 (j) Color and Contrast Settings		
When a product permits a user to adjust color and contrast settings, a variety of color selections capable of producing a range of contrast levels shall be provided.	<ul style="list-style-type: none"> The application has a variety of color and contrast settings. 	<ul style="list-style-type: none"> The available choices does not allow for different levels of contrast.
1194.21 (k) Flashing or Blinking Text		
Software shall not use flashing or blinking text, objects, or other elements having a flash or blink frequency greater than 2 Hz and lower than 55 Hz.	<ul style="list-style-type: none"> Software shall not use flashing or blinking text, objects, or other elements having a flash or blink frequency greater than 2 Hz and lower than 55 Hz. 	<ul style="list-style-type: none"> Software uses flashing or blinking text, objects, or other elements with a flash or blink frequency greater than 2 Hz and lower than 55 Hz.
1194.21 (l) Electronic Forms		

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1194.21 Standard	Compliant	Noncompliant
When electronic forms are used, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.	<ul style="list-style-type: none"> When electronic forms are used, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues. 	<ul style="list-style-type: none"> When electronic forms are used, the form does not allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.

H.1.4.3 Guidelines for Technical Standard 1194.22 (Web-based intranet and internet information and applications)

The standards defined in the table below have been extracted from the USAB’s Section 508 compliance guide at <http://www.access-board.gov/sec508/guide/1194.22.htm>.

Table 11 – Guidelines for Technical Standard 1194.22

1194.22 Standard	Compliant	Noncompliant
1194.22 (a) Text Tags		

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1194.22 Standard	Compliant	Noncompliant
A text equivalent for every non-text element shall be provided (e.g., via "alt", "longdesc", or in element content).	<ul style="list-style-type: none"> • Every image, Java applet, Flash file, video file, audio file, plug-in, etc. has an alternate description, transcript, or other textual equivalent. • Complex graphics (graphs, charts, etc.) are accompanied by detailed text descriptions. • The alternate descriptions succinctly describe the <i>purpose</i> of the objects, without being too verbose (for simple objects) or too vague (for complex objects). • <i>Alt</i> descriptions for images used as links are descriptive of the link destination. • Decorative graphics with no other function have <i>empty alt</i> descriptions (alt= ""), but they never have <i>missing alt</i> descriptions. 	<ul style="list-style-type: none"> • A non-text element has no alternate textual equivalent. • Complex graphics have no alternative text, or the alternative does not fully convey the meaning of the graphic. • <i>Alt</i> descriptions are verbose, vague, misleading, inaccurate or redundant to the context (e.g. the alt text is the same as the text immediately preceding or following it in the document). • <i>Alt</i> descriptions for images used as links are not descriptive of the link destination. • Decorative or formatting graphics have <i>alt</i> descriptions that say "spacer", "decorative," or other unnecessary wording.
1194.22 (b) Multimedia Presentations		
Equivalent alternatives for any multimedia presentation shall be synchronized with the presentation.	<ul style="list-style-type: none"> • Multimedia files have synchronized captions. 	<ul style="list-style-type: none"> • Multimedia files do not have captions, or captions which are not synchronized.
1194.22 (c) Color		
Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup.	<ul style="list-style-type: none"> • If color is used to convey important information, an alternative indicator is used, such as an asterisk (*) or other symbol. • Contrast is good. 	<ul style="list-style-type: none"> • The use of a color monitor is required. • Contrast is poor.
1194.22 (d) Readability		

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1194.22 Standard	Compliant	Noncompliant
Documents shall be organized so they are readable without requiring an associated style sheet.	<ul style="list-style-type: none"> • Style sheets may be used for color, indentation and other presentation effects, but the document is still understandable (even if less visually appealing) when the style sheet is turned off. • Non-HTML web documents (i.e. .pdf, .doc, etc.) are presented in an organized readable format. 	<ul style="list-style-type: none"> • The document is confusing or information is missing when the style sheet is turned off. • Non-HTML web documents are not presented in an organized readable format.
1194.22 (e) Server-Side Image Maps		
Redundant text links shall be provided for each active region of a server-side image map.	<ul style="list-style-type: none"> • Separate text links are provided outside of the server-side image map to access the same content that the image map hot spots access. 	<ul style="list-style-type: none"> • The only way to access the links of a server-side image map is through the image map hot spots, which usually means that a mouse is required and that the links are unavailable to assistive technologies.
1194.22 (f) Client-Side Image Maps		
Client-side image maps shall be provided instead of server-side image maps except where the regions cannot be defined with an available geometric shape.	<ul style="list-style-type: none"> • Standard HTML client-side image maps are used, and appropriate alt text is provided for the image as well as the hot spots 	<ul style="list-style-type: none"> • Server-side image maps are used when a client-side image map would suffice.
1194.22 (g) Simple Data Tables		

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1194.22 Standard	Compliant	Noncompliant
<p>Row and column headers shall be identified for data tables.*</p> <p>* This standard does not apply to tables used solely for formatting purposes. Although no standard requires it, a summary attribute should be added to <table> tags to provide a brief description of the table and an empty summary attribute (summary="") should be used to indicate all formatting tables.</p>	<ul style="list-style-type: none"> Data tables have the column and row headers appropriately identified (using the <th> tag) or using Accessible Rich Internet Applications (ARIA) markup. Tables used strictly for <u>layout purposes</u> do NOT have header rows or columns. 	<ul style="list-style-type: none"> Data tables have no header rows or columns. Tables used for layout use the header attribute when there is no true header.
1194.22 (h) Complex Data Tables		
<p>Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.*</p> <p>* This standard does not apply to tables used solely for formatting purposes. Although no standard requires it, a summary attribute should be added to <table> tags to provide a brief description of the table and an empty summary attribute (summary="") should be used to indicate all formatting tables.</p>	<ul style="list-style-type: none"> Table cells are associated with the appropriate headers (e.g. with the id, headers, scope and/or axis HTML attributes) or using Accessible Rich Internet Applications (ARIA) markup. 	<ul style="list-style-type: none"> Columns and rows are not associated with column and row headers, or they are associated incorrectly
1194.22 (i) Frames		
<p>Frames shall be titled with text that facilitates frame identification and navigation.</p>	<ul style="list-style-type: none"> Each frame is given a title that helps the user understand the frame's purpose 	<ul style="list-style-type: none"> Frames have no titles, or titles that are not descriptive of the frame's purpose
1194.22 (j) Flicker Rate		

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1194.22 Standard	Compliant	Noncompliant
Pages shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.	<ul style="list-style-type: none"> No elements on the page flicker at a rate of 2 to 55 cycles per second, thus reducing the risk of optically-induced seizures. 	<ul style="list-style-type: none"> One or more elements on the page flicker at a rate of 2 to 55 cycles per second, increasing the risk of optically-induced seizures

1194.22 (k) Text-Only Alternative

A text-only page, with equivalent information or functionality, shall be provided to make a web site comply with the provisions of this part, when compliance cannot be accomplished in any other way. The content of the text-only page shall be updated whenever the primary page changes.	<ul style="list-style-type: none"> A text-only version is created only when there is no other way to make the content accessible, or when it offers significant advantages over the "main" version for certain disability types. The text-only version is up-to-date with the "main" version. The text-only version provides the functionality equivalent to that of the "main" version. An alternative is provided for components (e.g. plug-ins, scripts) that are not directly accessible. 	<ul style="list-style-type: none"> A text-only version is provided only as an excuse not to make the "main" version fully accessible. The text-only version is not up-to-date with the "main" version. The text-only version is an unequal, lesser version of the "main" version. No alternative is provided for components that are not directly accessible.
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1194.22 (l) Scripts

When pages utilize scripting languages to display content, or to create interface elements, the information provided by the script shall be identified with functional text that can be read by assistive technology.	<ul style="list-style-type: none"> Information within the scripts is text-based, or a text alternative is provided within the script itself, in accordance with (a) in these standards. All scripts (e.g. JavaScript pop-up menus, form elements) are either directly accessible to assistive technologies (keyboard accessibility is a good measure of this), or an alternative method of accessing equivalent functionality is provided (e.g. a standard HTML link). 	<ul style="list-style-type: none"> Scripts include graphics-as-text with no true text alternative. Scripts only work with a mouse, and there is no keyboard-accessible alternative either within or outside of the script. Visible Text is not accessible to assistive technologies
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1194.22 (m) Applets and Plug-ins

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1194.22 Standard	Compliant	Noncompliant
When a web page requires that an applet, plug-in or other application be present on the client system to interpret page content, the page must provide a link to a plug-in or applet that complies with §1194.21(a) through (l).*	<ul style="list-style-type: none"> • A link is provided to a disability-accessible page where the plug-in can be downloaded. • All Java applets, scripts and plug-ins (including Acrobat PDF files and PowerPoint files, etc.) and the content within them are accessible to assistive technologies, or else an alternative means of accessing equivalent content is provided. 	<ul style="list-style-type: none"> • No link is provided to a page where the plug-in can be downloaded and/or the download page is not disability-accessible. • Plug-ins, scripts and other elements are used indiscriminately, without alternatives for those who cannot access them
1194.22 (n) Electronic Forms		
When electronic forms are designed to be completed on-line, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.	<ul style="list-style-type: none"> • All form controls have text labels adjacent to them. • Form elements have labels associated with them in the markup (i.e. the <i>id</i> and <i>for</i>, HTML elements). • Dynamic HTML scripting of the form does not interfere with assistive technologies 	<ul style="list-style-type: none"> • Form controls have no labels, or the labels are not adjacent to the controls. • There is no linking of the form element and its label in the HTML. • Dynamic HTML scripting makes parts of the form unavailable to assistive technologies.
1194.22 (o) Navigation Links		
A method shall be provided that permits users to skip repetitive navigation links.	<ul style="list-style-type: none"> • A link is provided to skip over lists of navigational menus or other lengthy lists of links. 	<ul style="list-style-type: none"> • There is no way to skip over lists of links.
1194.22 (p) Time Delay		
When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.	<ul style="list-style-type: none"> • The user has control over the timing of content changes. 	<ul style="list-style-type: none"> • The user is required to react quickly, within limited time restraints

H.1.5.0 508 COMPLIANCE TESTING GUIDELINES

For development items that require a 508 Compliance Assessment, a member of the QA team will perform a 508 Compliance test once development has been completed prior to migration to production. The QA team will document and load tests into QC for each 1194.21 and 1194.22 standard as documented above, and will utilize the test when checking for 508 compliance. The

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QA team member will ensure that each technical specification noted above will be addressed using the assessment criteria noted below:

Assessment	Definition	Action Required
Compliant	Application is compliant for related 1194 technical specification.	No further action required.
Non-Compliant with work-around	Application does not fully meet technical specification, but a work-around solution is available.	Work around solution will be documented and will be approved/disapproved by NASA/EAST authority.
Non-Compliant with no work-around	Application does not meet technical specification, and a work-around solution is not available.	Evidence of non-compliance will be documented and will be presented to NASA/EAST authority for disposition.

H.1.6.0 ACCEPTABLE 508 COMPLIANCE TOOLS

The following 508 Compliance Tools are acceptable for use by both the developers and testers when performing 508 compliance validation and testing.

Table 12 – Acceptable 508 Compliance Tools

Tool	Type	Description & Function Performed
Web Accessibility Evaluation Tool (WAVE)	Code Evaluation	Current version 1.1.18. Evaluates websites for accessibility. http://wave.webaim.org/
Total Validator Pro	Code Evaluation	Current version 7.5.2. Add-on to Firefox to perform web site evaluations. http://www.totalvalidator.com
AccChecker	Code Evaluation	Current version 2.0 for Windows applications http://acccheck.codeplex.com/
Inspect	Code Evaluation	http://msdn.microsoft.com/en-us/library/dd318521%28VS.85%29.aspx Requires installation of the Windows Active Accessibility SDK and works on Windows 7, Vista, and 8
JAWS	Assistive Technology / Screen Reader	Current version 14.0. Most common screen reader in use today. http://www.freedomscientific.com/products/fs/jaws-product-page.asp

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WAVE, Total Validator Pro, AccChecker, & Inspect are the available tools that will be utilized for all code evaluations depending on the code being evaluated, with WAVE being utilized as the primary tool for user accessibility. JAWS will also be utilized as an alternative for LOB teams that wish to test using an “experience-based” approach to get a better understanding of how a Screen Reader will convey information to the user.

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APPENDIX I – POINTS OF CONTACT

Table 8 – Points of Contact

Name	Position	Center	Phone Number
	Document Owner	NEACC	

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