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Sandia National Laboratories Advanced Simulation and Computing (ASC): Appraisal Method for the Implementation of the ASC Software Quality Engineering Practices

Version 1.0

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**Sandia National Laboratories
Advanced Simulation and Computing (ASC)
Appraisal Method
for the Implementation of the
ASC Software Quality Engineering Practices**

**Version 1.0
January 22, 2008**

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Abstract

This document provides a guide to the process of conducting software appraisals under the Sandia National Laboratories (SNL) ASC Program. The goal of this document is to describe a common methodology for planning, conducting, and reporting results of software appraisals thereby enabling:

- development of an objective baseline on implementation of the software quality engineering (SQE) practices identified in the *ASC Software Quality Plan* across the ASC Program
- feedback from project teams on SQE opportunities for improvement
- identification of strengths and opportunities for improvement for individual project teams
- guidance to the ASC Program on the focus of future SQE activities

Document contents include process descriptions, templates to promote consistent conduct of appraisals, and an explanation of the relationship of this procedure to the SNL ASC software program.

The activities described by this document are under the oversight of Paul Yarrington, SNL ASC Program Deputy Director and Martin Pilch, Deputy, SNL ASC Program.

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Change Log

All changes made to this document will be noted in this change log.

Date	Change Description	Change Approval
3/26/2007	Made sponsor-requested updates to the document.	J. Turgeon
4/30/2007	Updated the characterization and rating scales to reflect changes made by the appraisal team members during the pilot appraisals. Changes were made to allow for more objective results.	J. Turgeon
7/25/2007	General editing and formatting for consistency.	P. Hackney
8/30/2007	General editing and updating to reflect change in follow-up process.	J. Turgeon
9/10/2007	General review with comments	M. Minana
9/11/2007	Format paragraphs/tables for consistently, replace tables 3 & 8, check text refs to Appendix A	P. Hackney
1/4/2008	General review with editing changes.	J. Turgeon

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Executive Summary

This document is the Sandia National Laboratories (SNL) Advanced Simulation and Computing (ASC) Program deployment process of the software appraisal method. This process, which utilizes an interview intensive format, was developed to elicit information from SNL ASC project teams regarding their implementation of the software quality engineering (SQE) practices identified in the *Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan*. The appraisal method gleans best practices from previous SNL ASC site assessments and industry recognized appraisal practices, such as the Standard CMMI Appraisal Method for Process Improvement (SCAMPI) B and C methods as presented in the *Handbook for Conducting Standard CMMI Appraisal Method for Process Improvement (SCAMPI) B and C Appraisals, Version 1.1*. Development of the ASC software appraisal method was conducted under the direction of Paul Yarrington, SNL ASC Program Deputy Director.

This document builds on the assessment strategy for conformance to ASC practices and the associated assessment checklist found in the *Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan*. Software appraisal activities described in this document include scope of an appraisal, associated conduct, and reporting requirements as well as the roles and responsibilities of participants.

Commitment

The SNL ASC Internal Software Appraisal program will follow the processes described in this document and will be guided by the processes, practices, and activities as specified in its companion document *Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan*. The goal of this document is to foster organizational consistency in ASC software quality engineering through the identification of best practices and opportunities for improvement via the appraisal process. SNL ASC management is committed to oversight of the SNL ASC internal software appraisal program.

Approved By

Paul Yarrington
SNL ASC Program Deputy Director

Date

Martin Pilch
Deputy, SNL ASC Program

Date

1 Introduction

1.1 Background

The National Nuclear Security Agency (NNSA) oversees the Stockpile Stewardship Program (SSP) to provide and ensure confidence in the safety, performance, and reliability of the U.S. nuclear stockpile in the absence of underground testing. To this end, NNSA established the Accelerated Strategic Computing Initiative (ASCI) to support the SSP in transitioning from using test-based methods to using more computational and simulation-based methods. The program is now managed by the Office of Advanced Simulation and Computing (ASC) at NNSA Headquarters. ASC is one of six major campaigns under the Campaigns component of the NNSA's Defense Program.

The SNL ASC appraisal program adheres to the specifications for software quality assurance as defined in the SNL site specific tailoring guidelines for software quality engineering (SQE) practices identified in the *Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan* (henceforth referred to as the *ASC SQE Practices*).

1.2 Purpose and Scope

The purpose of this document, the *Sandia National Laboratories Advanced Simulation and Computing (ASC) Appraisal Method for the Implementation of the ASC Software Quality Engineering Practices* (henceforth referred to as the *ASC Appraisal Method*), is to describe the processes that are involved in the SNL ASC software appraisals for fiscal years 2007-2008 (FY07-FY08). The document is organized to provide a clear definition of appraisal types and scope with a description of the planning, conduct, and reporting of software appraisals.

In addition, this document explains the various roles and responsibilities of SNL ASC personnel as they pertain to the appraisal process. These include the oversight by the SNL ASC Program Deputy Director, the responsibilities of the appraisal team members, and the participation of ASC project teams being appraised.

The SNL ASC Program is comprised of approximately 300 full time employees (FTE), of which approximately 250 are within the scope of this appraisal method. During FY06, 65 projects within the 250 FTE scope conducted self-assessments on the understanding and implementation of the *ASC SQE Practices*. These self-assessments did not require the participating projects to provide evidence for their assessment assertions. The results of the self-assessments provided insight into how well the set of 30 practices was understood and how successfully the projects considered these practices to be implemented. The FY07-FY08 appraisals are intended to build upon the project team self-assessments conducted in FY06 by requiring the participating project teams to provide evidence of *ASC SQE Practices* implementation for evaluation by a SQE qualified, independent appraisal team.

For the FY07-FY08 appraisals, Program Element Leads consolidated the FY06 participating projects and removed those that were not appropriate (i.e., a project no longer existed or was identified as not being within the scope of SQE efforts). Based upon this selection process, 42 projects fell within the scope of the FY07-FY08 appraisal process. The provisions of this document pertain to the appraisal of the 42 projects identified by Program Element Leads. A list of project teams participating in the FY07-FY08 appraisals can be found in the *ASC Appraisal Master Schedule* (see Appendix A, Resource 7).

1.3 Roles and Responsibilities

The following table provides a brief description of the roles and responsibilities associated with the appraisal methodology discussed in this document.

Table 1. Appraisal Roles and Responsibilities

Role	Responsibilities
ASC Quality Management Council (AQMC)	Sets policy and strategy for the ASC program.
Appraisal Sponsor	Approves and manages the internal software appraisal process and results; an ASC program manager.
Project Team	Provides objective evidence, participates in interviews and activities as requested, and acts on appraisal results.
Appraisal Project Lead (APL)	Forms appraisal teams, provides training to Appraisal Team Members as needed, plans appraisal with ASC management, plans events for all Appraisal Teams, and reports results of appraisal to sponsor.
Appraisal Team Lead (ATL)	Attends required training, leads conduct of appraisal as described in this document, prepares written feedback delivered to project teams, and assists the Appraisal Project Lead in preparing the final report for the sponsor.
Appraisal Team Member (ATM)	Attends required training, reviews objective evidence, participates in interviews, assists Appraisal Team Lead, and provides information for written feedback delivered to project teams.
Appraisal Coordinator (AC)	Coordinates all logistics of the appraisal, assists the Appraisal Team Leads in all interface activities with the project teams, and schedules all events for appraisals.
Appraisal Team Pool (ATP)	Conducts appraisals during the appraisal period; is comprised of approximately 8-10 individuals, including the Appraisal Team Leads, all of whom are available throughout the appraisal period to assist with conducting appraisals.
Observer	Not an active participant. Possible responsibilities include observation of conduct of appraisal for evaluation or training purposes. Participation as an observer is an acceptable Appraisal Team Member training mechanism.

1.4 ASC Software Appraisal Method Overview

This document describes a gap analysis type of software appraisal that will be used in the FY07-FY08 appraisals. The gap analysis will be performed by an appraisal team based upon the comparison of the objective evidence provided by the participating projects of their implementation of *ASC SQE Practices* and the actual guidelines of the *ASC SQE Practices*. The following table outlines the various aspects of a software gap analysis appraisal.

Table 2. Software Gap Analysis Appraisal

Characteristics	Intended Use
Reviews implementation of practices described in <i>ASC SQE Practices</i> document.	Provide the ASC Program with information to make program level resource allocation decisions.
Identifies organizational level and individual project team level issues.	Identify opportunities for improvement and possible best practices for individual project teams.
Utilizes interviews of project team members to identify implementation of <i>ASC SQE Practices</i> .	Provide the ASC Program with an objective baseline on implementation of the <i>ASC SQE Practices</i> across projects.
Examines both in-progress work products and completed work products, as appropriate.	Gather feedback from project teams regarding ASC Program-wide SQE activities that do (or could) provide value to teams.
Focuses upon both the approach project teams intend to take toward <i>ASC SQE Practices</i> implementation and actual deployment of the approach, where applicable.	Complete a gap analysis on the current state of <i>ASC SQE Practices</i> implemented across ASC projects.

1.4.1 Method Context

Minimal preparation on the part of project teams is expected for the appraisals. The intent is to get an accurate status of *ASC SQE Practices* implementation across projects and to identify issues related to implementation. Because there is no expectation that any particular project team has fully implemented all *ASC SQE Practices*, the appraisals will be interview intensive. Interviews will allow for the gathering of intended or planned approaches to meeting *ASC SQE Practices* where evidence of deployment is not yet available.

The FY07-FY08 appraisals will provide an objective review of the current implementation status of the *ASC SQE Practices* by the ASC project teams. The appraisals will also identify strengths and opportunities for improvement for each project team with respect to their SQE practices. Finally, these appraisals will be used to obtain project team feedback regarding ASC Program SQE activities. Unlike general assessments that are conducted for audit purposes, these appraisals will allow for open communication between the ASC Program and ASC project teams regarding the current status of SQE and the types of support activities that would be helpful to move the ASC Program forward in its implementation of the *ASC SQE Practices*. The appraisals are another step in assisting project teams to demonstrate objective improvements in their practice implementations as well as improve preparedness for external appraisals.

There are four core concepts to the *ASC Appraisal Method*; objective evidence, ratings, appraisal outputs, and appraisal follow-up. These concepts are described in detail in the following sections. Note: Several tools and templates pertaining to the execution of these concepts are also described in these sections but are not shown within the text due to space limitations. However, Appendix A contains links to each of these resources to enable quick access and review.

1.4.2 Objective Evidence

Objective evidence will be collected for appraisal by the participating project teams primarily using the *Evidence Collection Instrument*, a tool created for this purpose. The *Evidence Collection Instrument* was derived from the Assessment Checklist and summary of the practices and artifacts described in the *ASC SQE Practices*. The projects are familiar with the basic format and content of the *Evidence Collection Instrument* because it is similar to the tool used previously by the projects for the FY06 self-assessments.

Three different types of evidence will be reviewed during the appraisals; direct evidence, indirect evidence, and affirmations. Evidence, as defined in the *Handbook for Conducting Standard CMMI Appraisal Method for Process Improvement (SCAMPI) B and C Appraisals, Version 1.1* (henceforth referred to as the *SCAMPI B&C Handbook*) and the *Software Quality Implementation Group (SQUIG) Self-Assessment Instrument for CPR001.3.6, Version 1.0*, will be reviewed for each project team on varying levels depending upon the extent of the *ASC SQE Practices* implementation. Definitions for these evidence types are as follows:

Direct: A primary reference to tangible output that results directly from the implementation of a documented process pertaining to the given process area. Direct evidence is often explicitly stated or implied by the question asked. [SQUIG Self-Assessment Instrument, Instructions, page 8]

Indirect: A secondary reference that is a consequence of performing a specific process or that substantiates its implementation but which is not the purpose for which the process was performed. Often when indirect evidence exists, there is no indication of where it came from, who worked to develop it, or how it is used. [SQUIG Self-Assessment Instrument, Instructions, page 8]

Affirmations: An oral or written statement that confirms or supports the implementation of a practice. Interview responses are examples of face-to-face affirmations. Alternative forms of affirmations could include presentations or demonstrations of a tool or mechanism as it relates to implementation of a practice. [SCAMPI B&C Handbook, Glossary, page 105]

All three types of evidence will be examined during the appraisals as they relate to the *ASC SQE Practices*, and traceability between the evidence from the appraised project team and the practices will be verified. The *Evidence Collection Instrument* will be provided to project teams to manage evidence collection and traceability during the appraisal.

1.4.3 Appraisal Ratings

The *ASC SQE Practices* includes 30 practices that should be implemented to a designated level of formality for each project team in the form of 26 specific artifacts. The implementation of these practices and their resulting artifacts is unique to the needs of a project team. It is important to note that in some situations a project team may have consolidated artifacts to meet a particular set of practices. This is an acceptable method for implementation when done appropriately, and the appraisal team will take this into consideration when rating individual practice areas.

Ratings will be provided for every practice in the *ASC SQE Practices*. Ratings reflect the level of *ASC SQE Practices* implementation within a particular project team based upon review of objective evidence. Appraisal team members will provide statements of weakness in appraisal results to support ratings. Results can be used to identify individual project team improvements from one appraisal to the next. Ratings will also allow for comparison across both the projects and program elements for the ASC Program. The scale in Table 3 will be used to evaluate the level of practice implementation on a project team.

Appraisal ratings are intended to support planning and future SQE activities for the ASC Program; however, they are not necessarily indicators of future success. Success is dependent upon proper implementation of *ASC SQE Practices* within project teams. In addition, high ratings for a particular practice implemented on one project team may or may not be an indication that those highly rated practices will be successful on another project team. Success is dependent upon the context of the implementation.

1.4.4 Appraisal Outputs

Each project team will receive appraisal results in the form of a short (approximately two pages) report that includes a description of observed strengths and opportunities for improvement. Results will be structured in the same format as the *ASC SQE Practices* with the length determined by the amount of information gleaned from the project team appraisal. The completed *Evidence Collection Instrument* will be returned to the project team with the appraisal report.

Appraisal results will be statements of fact based upon evidence reviewed and collected during the appraisal by the appraisal team. Statements of observed weakness must be noted for reviewed evidence. Such statements will generally be annotated in the *Evidence Collection Instrument* and will be specific to reviewed artifacts. Appraisal results will also include, when applicable, project team related recommendations and suggestions for improvement. In addition to appraisal results and recommendations, project teams will also be provided a set of questions to review for discussion during the appraisal follow-up phase. (Information regarding the appraisal follow-up is detailed in the next section of this document.)

Appraisal results will be reviewed with project teams at the conclusion of the appraisal. The method of delivery for this review will generally be a short one hour meeting between the lead appraiser and members of the project team. Other members of the appraisal team may attend; however, any other individuals outside the appraisal team and the appraised project team may only be present at the invitation of the appraised project team. Other methods of delivery (e.g., email, teleconference, and videoconference) may also be reasonable based upon project team request.

Table 3. Appraisal Rating Descriptions

Rating	Rating Description	Evidence
	<p><i>(NOTE: Descriptions below are provided to allow for further clarification on typical expectations at each rating level. These are not intended to be all-inclusive; thus projects may or may not exhibit all characteristics identified in the following descriptions.)</i></p>	
5	<p>Outstanding – the software project team has fully implemented this practice; meaning that a documented process exists for the practice, all team members are fully trained on the process, work products have been produced and managed, and practice plans and results have been shared with all appropriate stakeholders.</p>	<p>Both direct and indirect evidence are a strength</p>
4	<p>Complete – the software project team has implemented a final (not draft) process for conducting the practice and work products are in place supporting this practice. However, there are still a few activities that need to be addressed (e.g., training, finalizing work products, etc.). Most project team members have been trained in the process implementation. Practice results have been shared with some stakeholders.</p>	<p>Direct evidence is a strength, indirect evidence is OK</p>
3	<p>Good – the software project team has partially implemented this practice. For example, a draft of the process for conducting the practice exists or a completed documented process exists with most of the team (but not all) complying with the process. The team has made significant progress in rolling-out an implementation for the process and draft work products that contain significant content exist.</p>	<p>Direct evidence is OK, indirect evidence is a strength, OK, or weak</p>
2	<p>Fair – the software project team has a preliminary process (e.g., a detailed outline; a well-understood ad hoc team process that is not documented, etc.) for implementing this practice. There may be a preliminary plan about how to proceed with the process and implementation and preliminary work products exist.</p>	<p>Direct evidence is weak, indirect evidence is a strength, OK, or weak</p>
1	<p>Limited –the software project team has proposed that this practice be implemented and activities and resources for the practice are in the planning stages. It is evident that the project is committed to implementing this practice. At this level, it is typical that resources have not yet been allocated for fulfillment of the practice.</p>	<p>Direct evidence is non-existent, indirect evidence is a strength, OK, or weak</p>
0	<p>Absent – the software project team has not yet addressed the implementation of this practice.</p>	<p>Both direct and indirect evidence are non-existent</p>
NA	<p>Not Applicable – the software project team determined that this practice is not applicable to its code development environment.</p> <p>Note: A value of NA must be accompanied by an explanation from the team describing why the practice will not be followed.</p>	<p>NA</p>

Appraisal results will be aggregated across the program and reported to the appraisal sponsor. Ratings from project team appraisals will be evaluated at the Program Element level and the ASC Program as a whole to identify strengths and opportunities for SQE improvements. The overall appraisal report will address items listed in the “Intended Use” section of Table 2.

Non-attribution practices will be followed to the extent possible to avoid attributing data directly to project team individuals. The appraisal report will not intentionally create linkages between raw data

(e.g., actual affirmations, issues identified in evidence reviews) and an individual project team member, although it is understood that some inferences may be made regarding sources of such data, especially with smaller sized teams.

1.4.5 Appraisal Follow-Up

Approximately one to two weeks following the delivery of appraisal results to project teams, a representative from the appraisal team will contact the Principal Investigator (PI) of the appraised project team to schedule a follow-up interview. The purpose of the appraisal follow-up is to collect feedback from a project team after the team has had time to reflect on questions regarding the appraisal process, the project’s individual appraisal results, and how the ASC Program as a whole can improve ASC SQE activities.

Appraisal follow-up will also give the project teams the opportunity to ask additional questions regarding recommendations for process improvement. One-on-one consulting to any great extent is not within the scope of this appraisal effort. However, if a project team would like to pursue this, appraisal team members will help secure this type of assistance.

2 Appraisal Phases

The *ASC Appraisal Method* has four distinct phases; plan the appraisal, conduct the appraisal, report appraisal results, and conduct appraisal follow-up. Each phase is comprised of several practices that clearly define activities within a phase. While phases are generally performed consecutively, completion of one phase and its associated practices is not dependent upon entry into the next phase. Initiating these appraisal phases as defined in this method should provide repeatable results regardless of the individuals selected for a particular appraisal team.

Planning is conducted before the appraisal begins although the evaluation of planning continues throughout the appraisal to ensure appraisal activities are completed in a timely manner. While not typical, additional or reduced amounts of time may be necessary to examine appraisal evidence as additional information is discovered during the appraisal. Proper use of the appraisal *Evidence Collection Instrument* should mitigate this situation in most cases. Analysis of the evidence will provide the data necessary to generate appraisal results that are documented and delivered to project teams.

Table 4. Appraisal Phases

Phase	Phase Practices
2.1 Plan the Appraisal	2.1.1 Analyze Requirements 2.1.2 Develop Appraisal Plan 2.1.3 Develop Appraisal Schedule 2.1.4 Select and Prepare Appraisal Team Pool 2.1.5 Prepare Project Teams 2.1.6 Conduct Readiness Review
2.2 Conduct the Appraisal	2.2.1 Examine Objective Evidence 2.2.2 Document Objective Evidence 2.2.3 Verify Objective Evidence 2.2.4 Generate Appraisal Results
2.3 Report Appraisal Results	2.3.1 Deliver Appraisal Results 2.3.2 Contribute to the Appraisal Report 2.3.3 Deliver the Final Appraisal Report 2.3.4 Archive All Appraisal Results
2.4 Conduct Appraisal Follow-up	2.4.1 Follow-up with Appraised Teams 2.4.2 Document Follow-up Responses and Issues 2.4.3 Conduct Lessons Learned

2.1 Plan the Appraisal Phase

The planning phase has two levels of planning that must be managed. The high level planning pertains to overall program planning to ensure projects are identified by ASC Program Element Leads, appraisal teams are assimilated to appraise scheduled projects, and logistics are managed to secure locations for appraisal conduct. This high level planning is generally conducted by the Appraisal Coordinator (AC) with input from the Appraisal Project Lead (APL) and the Appraisal Team Leads (ATL). Project team appraisal planning pertains to logistics required to conduct an appraisal for a particular project team. This planning is generally conducted by the AC with review by the ATL assigned to the project team. High level planning directly impacts project team planning; therefore coordination in both planning areas is essential.

In the planning phase, project teams within the scope of the high level appraisal are identified, appraisal schedules are developed, and readiness reviews are conducted with individual project teams to evaluate preparedness for appraisal conduct. In addition, Appraisal Sponsor input is secured before appraisals begin.

Planning phase practices are identified below. “Responsibility” indicates the role with primary responsibility for ensuring the practice is initiated and completed; however, others will very likely be supporting these efforts as well. Practice elaborations are provided in the sections that follow the table.

Table 5. Plan the Appraisal Phase Practices

Plan Phase Practice	High Level Practice Description	Responsibility
2.1.1 Analyze Requirements	<ul style="list-style-type: none"> Meet with the sponsor to develop the appraisal method requirements Gather input from the sponsor for the appraisal 	APL
2.1.2 Develop Appraisal Plan	<ul style="list-style-type: none"> Develop the appraisal plan based upon the input gathered from analyzing requirements Obtain sponsor approval for the plan Document plan details in the appraisal method and other associated project documents 	APL
2.1.3 Develop Appraisal Schedule	<ul style="list-style-type: none"> Develop and maintain the high level appraisal schedule Develop detailed schedule information for ATLS, ATMs, and project teams Notify appraisal team members and project teams of all dates related to the appraisal period Initiate the <i>Project Team Appraisal Plan</i> 	AC
2.1.4 Select and Prepare Appraisal Team Pool (ATP)	<ul style="list-style-type: none"> Identify qualified individuals to serve in the ATP and solicit their involvement Ensure ATP members meet qualification requirements or are adequately trained to serve in the ATP Train members of the ATP 	APL
2.1.5 Prepare Project Teams	<ul style="list-style-type: none"> Train project teams on appraisal preparation and the overall appraisal process Communicate frequently with project teams to ensure that appraisal preparation is conducted efficiently 	APL, ATLS
2.1.6 Conduct Readiness Review	<ul style="list-style-type: none"> Schedule the Readiness Review with the project team Ensure that the <i>Evidence Collection Instrument</i> is completed Complete the <i>Project Team Appraisal Plan</i> with the project team point of contact (POC) 	ATLS

2.1.1 Analyze Requirements

Requirements are gathered and analyzed continuously between the appraisal sponsor and the APL. This process will occur through meetings, telephone conversations, and written correspondence. This input

will then be documented and maintained in the *ASC Appraisal Method*. The input gathered for planning purposes will, at a minimum, include the following:

- appraisal method definition
- appraisal standard to be used and the scope of that standard
- organizational objectives for the appraisal
- appraisal activity scope for the organization
- projects to be appraised
- appraisal constraints
- identification of the pool of appraisers that will form the appraisal team
- follow on activities planned

Appraisal information that is not included in this *ASC Appraisal Method* and other supporting information regarding budget, cost, and appraisal risks and associated mitigations are planned and managed in the *FY07-FY08 SNL ASC Program Software Quality Process Support Work Proposal*.

2.1.2 Develop the Appraisal Plan

The *ASC Appraisal Plan* for the ASC Program Office will consist of the *ASC Appraisal Method* and other supporting information currently in the *SNL ASC Program Software Quality Process Support Work Proposal*. These documents will be used by the sponsor and the APL to establish agreement regarding the conduct of the ASC FY07–FY08 appraisals. The plan documents will be maintained and updated as needed. The sponsor must approve the *ASC Appraisal Plan* documents before appraisals may begin. The appraisal plan will include all input gathered during the requirements stage. The plan will also include:

- a description of the activities to be performed during the appraisal beyond what is already identified in the *ASC Appraisal Method*
- resources and the overall high level appraisal schedule
- necessary appraisal logistics
- risks and mitigations, where appropriate, to the appraisal planning and conduct

Individual *Project Team Appraisal Plans* will also be developed, as described in Sections 2.1.3 and 2.1.6.

2.1.3 Develop the Appraisal Schedule

Two levels of appraisal scheduling are coordinated by the AC, the high level *Appraisal Master Calendar* and individual project team appraisal schedules. The AC will develop the *Appraisal Master Calendar* concurrently with the Analyze Requirements and Develop the Appraisal Plan practices. Scheduling the availability of ATLS will be critical to ensure coverage for all project teams to be included for each FY. The AC will be responsible for coordination of ATL and ATM scheduling and for communicating with ASC Program Element Leads regarding availability of ASC project teams. Once project team availability is provided, the AC will ensure that appraisal teams are available for each project team. Finally, the AC will initiate the *Project Team Appraisal Plan* by identifying the scope of the project team and the overall appraisal schedule for the project team. The *Project Team Appraisal Plan* will be completed by the ATL and project team POC during the Readiness Review discussed in Section 2.1.6.

In general, the sequential steps toward implementing this practice are described in the list below. Many steps will be conducted concurrently, although a step will often be a prerequisite to the following step. All scheduling information will be maintained in the *Appraisal Master Calendar*, which may be accessed by the AC, APL, ATLS, and the ASC Support Team webmaster. The *ASC SQE Appraisal Checklist* (see

Appendix A, Resource 8) provides further detail on appraisal scheduling and the overall appraisal process.

Table 6. Appraisal Scheduling Step Descriptions

Step	Step Description
1. Identify availability of ATLS for the FY	<ul style="list-style-type: none"> • Note dates when ATLS will be unavailable within a FY • Develop the FY <i>Appraisal Master Calendar</i>
2. Develop high level appraisal schedule plan	<ul style="list-style-type: none"> • Allow four business days for each project team “appraisal period”, generally a Monday – Thursday time frame • Spread appraisals across a calendar month to allow for an even distribution of appraisals during a month, preferably no more than two appraisals conducted in any given appraisal period • Tentatively assign ATLS to each appraisal period in the <i>Appraisal Master Calendar</i> • Contact Program Element Leads to identify project teams available for FY07 and FY08 and to gather any other scheduling details
3. Identify availability of appraisal team members	<ul style="list-style-type: none"> • Provide members of the ATP the dates of appraisal periods scheduled in step 2 • Request pool members to indicate appraisal periods when they will be available as team members
4. Coordinate tentative assignments for appraisal teams	<ul style="list-style-type: none"> • Begin reserving conference rooms/equipment for appraisal periods <ul style="list-style-type: none"> ◦ Appraisal team work room (preference to building/location near the project teams) for two consecutive days ◦ At least one projector available in the conference room ◦ Internet accessibility, either wireless or LAN, for at least two laptops • Provide logistical information to ATMs: <ul style="list-style-type: none"> ◦ ATL and ATM assignments ◦ Appraisal period date range ◦ Conference room locations and reservation reference numbers
5. Confirm tentative schedule with appraisal teams	<ul style="list-style-type: none"> • Confirm appraisal team assignments and schedule with members of the appraisal pool • Update the <i>Appraisal Master Calendar</i> and notify the appraisal team pool of any changes • As changes are made to the schedule, provide notifications of changes
6. Obtain project team names from Program Element Leads	<ul style="list-style-type: none"> • Contact program element leads at beginning of the appraisal year to confirm the list of project teams and their POCs that will be appraised • Create a tentative schedule of when each project team will be appraised based upon the availability of appraisal team pool members from the <i>Appraisal Master Calendar</i> • Update the <i>Appraisal Master Calendar</i> with the project team names • Notify project team POCs of their tentatively scheduled appraisals approximately two months in advance; make schedule adjustments, if necessary and if available, in the <i>Appraisal Master Calendar</i>
7. Notify project teams of appraisal period and prepare appraisal artifacts for ATLS	<ul style="list-style-type: none"> • Notify project team POC at least two weeks in advance to confirm appraisal period dates <ul style="list-style-type: none"> ◦ Contact project team POC to coordinate interview schedules and to complete Section I of the <i>Project Team Appraisal Plan</i> (see Appendix A, Resource 2) • Email the following information to the project team POC preferably no later than two weeks prior to scheduled appraisal <ul style="list-style-type: none"> ◦ Link to the <i>Evidence Collection Instrument</i> with notification of due date for evidence to be sent to ATL (see Appendix A, Resource 1) ◦ Copy the email confirmation to the ATL, ATM(s), APL • Add the project team to the ongoing <i>Appraisal Log</i>

2.1.4 Select and Prepare Appraisal Team Pool

An appraisal team is required for the *ASC Appraisal Method*. The minimum number of individuals on a team is two although additional team members may be added depending upon appraisal team member experience, scope of the project team, and any other issues that may arise requiring the need for additional team members. The appraisal team pool is comprised of approximately 8-10 individuals including the ATLS, who will be responsible for conducting project team appraisals. The intent of the pool is to have an ample number of qualified individuals available to serve on appraisal teams to alleviate scheduling problems that could arise during appraisal planning.

Appraisal pool candidates should meet the following qualification criteria:

- Five years experience in software development (engineering and/or software project management; experience in either discipline may be combined)
- Introduction to CMMI course
- Experience on past software appraisals (either as an appraisal team member or as an appraised project team)

In the absence of all the above criteria, an ATM may still be added to the appraisal team pool on a case by case basis. In such situations, these individuals will need to observe at least one appraisal and participate on a three-member appraisal team before serving on a two-member appraisal team. ATLS must meet all criteria and must have experience as lead appraisers.

While the CMMI is not the model to which project teams will be appraised, training in this area is ideal to ensure the appraisal team pool has a common understanding of industry standard software engineering principles. A common understanding of these principles is a desired attribute of appraisal team members in order to facilitate the appraisal process and reduce time spent discussing rationale and theory behind these principles.

All ATMs must attend appraisal team training before serving on an appraisal team. Team training may be delivered by the APL or the ATLS using the *ASC Appraisal Team Training* materials (see Appendix A, Training 1). Appraisal team training will include the following information:

- *ASC Appraisal Method* overview
- *ASC SQE Practices* overview
- Project team appraisal planning and the *Project Team Appraisal Plan*
- Objective evidence collection and analysis
- Interviewing process and the review of objective evidence with project teams
- Team decision making
- Team roles and responsibilities
- Appraisal confidentiality and non-attribution
- Assignment of practice ratings
- Appraisal output requirements, including the project team appraisal report and follow-up phase procedures

ATLS are responsible for assigning roles and responsibilities for the conduct of each project team appraisal to balance workloads and complete appraisal activities within the allotted appraisal period.

2.1.5 Prepare Project Teams

To facilitate the appraisal process, project teams will be required to assemble objective evidence for appraisal team review prior to the scheduled appraisal. This should cause minimal impact to project teams. Teams are only required to provide existing team evidence; it is understood that in some cases evidence will be incomplete, lacking in detail, or non-existent. Project teams will be required to attend training that covers the appraisal preparation and the overall appraisal process.

All project teams must attend project team training before their scheduled appraisal period. Project team training may be delivered by the APL or the ATLS using the *ASC Project Team Appraisal Training* materials (see Appendix A, Training 2). Project team training is intended to function as both an overview briefing on the appraisal as well as an instructional setting to assist project teams with appraisal preparation and will include the following information:

- Purpose and scope of the appraisal
- Appraisal approach
- Roles and responsibilities of the appraisal team and the project teams
- Schedule of appraisal activities
- Process for completing the *Evidence Collection Instrument*

Multiple group training sessions will be provided for project teams. At a minimum, at least one team member must be present at a training session. If a project team is unable to attend one of the scheduled group training sessions, individual training sessions will be arranged on an as-needed basis.

Use of the *Evidence Collection Instrument* is required and will be used to organize the 26 artifacts identified in the *ASC SQE Practices*. Project teams will receive training on completing the *Evidence Collection Instrument* and guidance regarding the types of objective evidence and the appropriate number of artifacts to provide as evidence for each practice. Quality over quantity will be emphasized when placing evidence in the collection instrument to reduce the misconception that teams must provide every possible piece of evidence to support a particular practice.

ATLS are responsible for ensuring that project teams are prepared for the actual appraisal by conducting a Readiness Review prior to the appraisal. Project teams will receive frequent communications from the AC and their assigned ATL prior to their appraisal period to allow time for answers to questions that may arise. General information regarding the appraisals will be available during the FY07–FY08 appraisal period on the ASC SQE website (<http://www-irm.sandia.gov/ASC/SQE/>) and additional questions can be submitted via email to ASC-SQE@sandia.gov.

2.1.6 Conduct Readiness Review

Readiness Reviews will be conducted with all project teams to mitigate risks that could occur due to lack of proper appraisal preparation. Most importantly, it is necessary to ensure that objective evidence has been collected and identified in advance of the actual appraisal. The timely completion of appraisals during their scheduled appraisal period will be contingent upon thorough project team preparation.

To ensure that project teams are prepared for scheduled appraisals, the assigned ATL will:

- Review Section I of the *Project Team Appraisal Plan* for completeness (received completed from the AC approximately three weeks before the beginning of the appraisal period) and complete Sections II and III with the project team POC
- Conduct at least one Readiness Review to evaluate feasibility of the scheduled appraisal period and document the review in the *Project Team Appraisal Plan*

- Ensure that the *Evidence Collection Instrument* has been completed correctly
 - Amount and type of evidence provided are adequate to begin the appraisal
 - Data are appropriately identified in the collection instrument
- Make adjustments to the appraisal period schedule and communicate these adjustments with the APL and AC as needed

Once the AC notifies the project team and its assigned ATL of the confirmed appraisal period, the ATL will contact the project team POC to schedule the Readiness Review. The Readiness Review should occur the week prior to the appraisal period to allow for general issues to be addressed before the scheduled appraisal period.

Evidence provided in the Readiness Review will be analyzed by the appraisal team during the appraisal period to determine adequacy of the evidence as it applies to the implementation of each ASC SQE practice by the project team. Project teams will be directed to provide a minimal amount of evidence for each ASC SQE practice. The intent is for teams to focus on the quality of evidence rather than quantity. This will allow for appraisals to be conducted in the scheduled appraisal period, as agreed upon with the Appraisal Sponsor.

Project teams will also be directed to provide only evidence that they are currently using for their projects. To ensure a minimal amount of project team time is required to prepare for appraisals, the expectation is that a project will provide only existing evidence in its current state. The intent of these appraisals is not to have a project team spend immense amounts of time “cleaning up” documentation or creating new documentation to satisfy practices that it is not currently using. These appraisals seek honest reflections of work actually being done on project teams. It is hoped that this review will allow the ASC Program Office to identify value-added practices as well as any practices with opportunities for improvement.

The level of formality for the Readiness Review is at the discretion of the ATL and the project team POC. For some project teams experienced with appraisals, the Readiness Review may be conducted via email or telephone conversations to review the *Evidence Collection Instrument* and complete the *Project Team Appraisal Plan*. For less experienced project teams, a face-to-face meeting may be more appropriate to further communicate appraisal expectations and to facilitate questions and answers. Similarly, scheduling of the Readiness Review should also be dependent upon a project team’s appraisal experience. For example, the ATL may request that the Readiness Review occur more than one week prior to an appraisal period to allow for additional preparation activities.

2.2 Conduct the Appraisal Phase

The conduct phase of the appraisal process includes several phase practices, starting with the review of evidence and concluding with the generation of the project team appraisal results.

In the conduct phase, appraisal teams will examine objective evidence provided by project teams. Examination includes review of evidence to understand how project teams have deployed *ASC SQE Practices*. Evidence will include direct and indirect artifacts as well as affirmations from project teams. During project team interviews, the appraisal team will validate to the extent possible assumptions made by the ATMs regarding direct and indirect evidence provided by project team. Project teams are encouraged to spend time up-front preparing their evidence correctly to avoid misinterpretations of the evidence provided in their *Evidence Collection Instrument*. The final conduct phase practice is generating the appraisal results, which include assigning ratings to each SQE practice, completing the *Evidence Collection Instrument* with feedback regarding reviewed evidence, and creating a short (approximately two-page) report.

Observers, especially individuals from ASC, are encouraged to attend appraisals to increase awareness of *ASC SQE Practices* implementation across the Program. However, several conditions must exist to allow observers in an appraisal:

- The project team being appraised must not have an objection to observers being present
- Observers cannot be managers of the project team being appraised and they cannot be in the direct supervisory chain of any project team members participating in the interviews
- Observers may not provide any input on behalf of the project team or the appraisal team during the conduct of the appraisal

The conduct phase practices are identified below. While the ATL has primary responsibility for ensuring a practice is initiated and completed, ATMs play an integral role in completing a practice as well. Conduct phase practice elaborations are provided in the sections that follow the table.

Table 7. Conduct the Appraisal Phase Practices

Conduct Phase Practice	High Level Practice Description	Responsibility
2.2.1 Examine Objective Evidence	<ul style="list-style-type: none"> • Examine both oral statements and written information related to the implementation of <i>ASC SQE Practices</i> • Identify relevant project team evidence and analyze evidence to determine implementation and management of <i>ASC SQE Practices</i> 	ATL, ATM(s)
2.2.2 Document Objective Evidence	<ul style="list-style-type: none"> • Use all required appraisal tools and templates to support consistent appraisal processes across project teams • Documents affirmations heard during project team interviews • Annotate reviewed evidence to indicate sufficiency, strengths and weaknesses throughout the appraisal period • Document any gaps in <i>ASC SQE Practices</i> implementation in reviewed evidence 	ATL, ATM(s)
2.2.3 Verify Objective Evidence	<ul style="list-style-type: none"> • Verify that evidence is reviewed for each of the <i>ASC SQE Practices</i> where the project team provided evidence • Verify that evidence reviewed is sufficient to generate the corresponding rating that will be assigned to each practice • Verify that all statements in appraisal outputs can be supported by objective evidence reviewed or heard during the appraisal period 	ATL, ATM(s)
2.2.4 Generate Appraisal Results	<ul style="list-style-type: none"> • Finalize the <i>Evidence Collection Instrument</i> • Rate each practice area • Generate the final appraisal report 	ATL, ATM(s)

2.2.1 Examine Objective Evidence

Objective evidence that will be analyzed during the appraisal period includes direct artifacts, indirect artifacts, and affirmations. Approximately one week prior to the appraisal period, the project team will provide the ATL with the *Evidence Collection Instrument* that maps *ASC SQE Practices* to existing project team direct and indirect artifacts. This instrument will be reviewed and approved for use in the appraisal during the Readiness Review conducted by the ATL with a project team POC.

The *Evidence Collection Instrument* will be used in multiple ways during the appraisal to provide:

- the ATL with mapped artifacts for the Readiness Review
- the appraisal teams with an instrument to consistently review artifacts for each project team appraised
- the appraisal team with an instrument for providing appraisal results to the project team

2.2.1.1 Document Review

During the appraisal period, the appraisal team will conduct document reviews by examining links to documents in the *Evidence Collection Instrument* provided by the project team. The appraisal team will read documents identified in the instrument to understand the implementation of *ASC SQE Practices* by a project team. As the appraisal team reviews documents, it will note gaps and plan interview questions associated with these gaps. In rare instances, the appraisal team may review a document not supplied in the instrument; however, this will be performed on a case by case basis as determined by the ATL. In special circumstances, document attributes (e.g., document creation dates and frequency of use) may be reviewed, although this practice will be conducted on an as-needed basis based upon ATL request.

When project teams choose to provide evidence beyond what can be reasonably reviewed during the appraisal period, the ATL will determine what evidence is most relevant to the appraisal and the appraisal team will review only that evidence. Thus the appraisal team is not required to review all supplied evidence but only those documents that are deemed relevant to indicate *ASC SQE Practice* implementation.

Documents will generally be either organizational level documents or project specific documents. Organizational level documents are those types that might define processes for the entire organization that all project teams utilize. Examples of these types of documents might be organizational training requirements, Program Element determinations of level of formality (LOF), or Program Element processes for version control and issue tracking. Project specific documents are those that reflect actual work being conducted by the project team. Examples of these types of documents might be testing results, a project plan, or detailed project requirement specifications.

2.2.1.2 Interviews

The appraisal team will also conduct interviews with project teams. Interview discussions serve as part of the collection of evidence to be analyzed along with evidence provided in the *Evidence Collection Instrument*. Interviews will typically be face to face discussions or presentations by individuals from the project team. Questions will initially focus upon gaps identified in the “Direct” and “Indirect” evidence links provided in the *Evidence Collection Instrument*; however as time permits, additional questions may be added for further elaboration on evidence.

Interviewees are identified by the project team POC and scheduled by the AC. This information will be documented in Section I of the *Project Team Appraisal Plan* (see Appendix A, Resource 2). Interviewees will be selected based upon expertise in particular practice areas. Generally, practice areas will be broken down into “Project Management/Training” and “Software Engineering/Software Verification” categories. The project team POC will identify team members appropriate for each category to allow the AC to schedule appropriate individuals.

Interviews will be used to gather corroborating evidence to indicate implementation of *ASC SQE Practices* by the project team, when applicable. In some situations, affirmations gathered from interviews may be the only supporting evidence for practice implementation. These situations should be noted by a lack of any evidence links in the *Evidence Collection Instrument*. The appraisal team will note in the comments section of the instrument the affirmations that indicate what the team is currently doing toward practice implementation, if anything. Interviews will also be used to gather information from project teams that indicate strengths and opportunities for improvement across the ASC Program. The *Appraisal Team Interview Worksheet* (see Appendix A, Resource 4) may be used to identify interview question areas and to document affirmations.

Multiple modes of communication are permissible to allow for flexibility. In addition to traditional interview formats where both an appraisal team member(s) and project team member(s) are physically present, interviews may also utilize teleconferencing and video conferencing capabilities.

A variety of interview formats are also allowed within this method. Traditional interviews occur most often and consist of pre-scheduled times to interview (determined before the appraisal period),

designation of attendees, and a description of topics to be included in the interview. Another format that may be used is the “on-call” interview that is similar to a traditional interview but is scheduled during the appraisal period and typically covers follow-up topics. A third format that may be used is the “office hours” interview, which is typically a quick discussion in the interviewee’s office or on the telephone to review a follow-up topic.

2.2.2 Document Objective Evidence

To ensure the consistent approach to conducting and reporting appraisal activities across all project teams, appraisal team tools and templates will be used to the greatest extent possible. Appraisal artifacts related to project team appraisal conduct include:

- *Evidence Collection Instrument* (see Appendix A, Resource 1)
- *Project Appraisal Results Report Template* (see Appendix A, Resource 3)
- *Appraisal Team Interview Worksheet* (see Appendix A, Resource 4)

Using the appraisal tools and templates allows for traceability of appraisal report statements to evidence reviewed during the appraisal. Project teams will receive the *Evidence Collection Instrument*, complete with annotations made by the appraisal team, along with the final appraisal report that elaborates on certain areas of the instrument and summarizes appraisal team results as they relate to overall *ASC SQE Practices* implementation. *Appraisal Team Interview Worksheets* will not be delivered as appraisal outputs in order to comply with appraisal non-attribution rules. The worksheets are intended to be appraisal team artifacts only that will be destroyed once the *Final Appraisal Report* is completed, if used.

As evidence is reviewed in the *Evidence Collection Instrument*, the appraisal team will characterize sufficiency of the evidence in the appropriate section of the instrument. If evidence is sufficient for a project team’s level of formality (LOF), simply marking “OK” will be acceptable. In cases where the evidence is lacking in some manner, the appraisal team will note this using a “W” accompanied by a description of what weakness was observed and how the weakness relates to *ASC SQE Practice* implementation. In situations where an affirmation is used in place of indirect evidence, the highest characterization that may be earned is a “W.” Project team strengths will also be noted using an “S” and a comment should be added to describe the observed strength. Strengths are considered to be those activities, practices, or other project team behaviors observed during the appraisal that propagate unique, efficient, or exemplary implementation of *ASC SQE Practices*. Strengths might also include a particular method for tailoring *ASC SQE Practices* to address team characteristics that might otherwise cause complications if not addressed (e.g., team size, project scope, funding). If an artifact is not reviewed, “NR” will be annotated beside the artifact. The evidence characterizations are summarized in the following table.

Table 8. Evidence Characterization Descriptions

Evidence Characterization	Characterization Description	Comment Requirement
S	Strength in observed evidence	Comment needed to describe the strength
OK	Evidence is sufficient for project team LOF	No comment necessary
W	Weakness observed in evidence	Comment needed to describe how the weakness affects implementation of the <i>ASC SQE Practices</i>
NE	Evidence is non-existent (or not appropriate for the particular practice)	No comment necessary
NR	Not reviewed; the ATL chose not to review the specific evidence because an overabundance of evidence was provided for a particular practice area	No comment necessary

In some situations, affirmations gathered from interviews may be the only supporting evidence for practice implementation. These situations should be indicated by a lack of any evidence links in the *Evidence Collection Instrument*. The appraisal team will note in the comments section of the instrument the affirmations that indicate what the team is currently doing, if anything, toward practice implementation.

During interviews, if the ATL chooses to use the *Appraisal Team Interview Worksheet* (see Appendix A, Resource 4), the appraisal team will record affirmations that relate to *ASC SQE Practice* implementation and the overall intent of the appraisal from the perspective of the ASC Program Office. Each ATM will have an interview worksheet during the interviews and will write (or type, if the worksheet is used electronically) relevant affirmation statements on the worksheet. General affirmations related to ASC Program Office or other organizational level issues will be recorded in the interview worksheets as well. The interview worksheet will be used to identify areas where affirmation must be gathered, especially those related to lack of direct or indirect evidence in the *Evidence Collection Instrument*. These gap areas will take priority during interview sessions.

2.2.3 Verify Objective Evidence

Using the *Evidence Collection Instrument* for appraisal team comments and observations from document reviews and for recording affirmations from the interview process that correspond to *ASC SQE Practices* will support the verification process. Verification is an ongoing process conducted as the appraisal team completes the *Evidence Collection Instrument* during the appraisal period.

In most cases, non-attributable affirmations heard during the appraisal period will be noted in the *Evidence Collection Instrument*. When affirmations are in conflict with associated documents reviewed by the appraisal team, an affirmation may also be reported in the instrument to indicate this conflicting information. The appraisal team must verify that statements in the appraisal report reflect affirmations heard and recorded during interviews and that discussion of those statements in the final appraisal results report and *Evidence Collection Instrument* are non-attributable to project team members. This may be an ongoing process as the appraisal team generates the project's appraisal results report.

At least one piece of objective evidence must be reviewed or discussed for each *ASC SQE Practice* in order to generate a rating for an individual practice. Objective evidence may be a direct artifact, an indirect artifact, or an affirmation. Affirmations indicating that the project team has not implemented a particular practice on the team are sufficient for this requirement and for assigning a rating.

In preparation for generating the appraisal report, the *Evidence Collection Instrument* should be reviewed as well to ensure that there are no conflicts in appraisal team statements made in the instrument. Conflicts between what was observed in the instrument versus what was heard during project team interviews must also be addressed. Such conflicts should be noted in the *Evidence Collection Instrument* or the final appraisal report. On-call or office interviews may be conducted in order to address such situations to ensure that the appraisal team correctly verified evidence and the associated conflict.

This appraisal method does not include the validation of report contents or comments made in the *Evidence Collection Instrument*. However, project teams who have objections to any final appraisal results may submit their issues in writing directly to the Appraisal Sponsor. This submitted feedback will be reviewed and maintained by the Program Office to provide project teams the opportunity to have their concerns documented. Because validation is not part of this appraisal method, the appraisal team must meticulously practice confidentiality and non-attribution rules to the greatest extent possible.

2.2.4 Generate Appraisal Results

Once the appraisal team has verified all information collected during the appraisal, finalization of the *Evidence Collection Instrument* should begin. Finalization includes the following steps:

- Ensuring all project team supplied evidence has been characterized using characterization guidance described in Section 2.2.2, Verify Objective Evidence
- Ensuring appraisal team comments made in the *Evidence Collection Instrument* are not in conflict with one another
- Removing any appraisal team annotations not intended to be delivered to the project team

After finalizing the *Evidence Collection Instrument* information, the appraisal team will assign ratings based upon evidence characterizations. Rating guidance is found in Section 1.4.3, Appraisal Ratings. While appraisal teams should strive for consensus, consultative decision making prevails in situations where consensus cannot be made. Given the qualifications of the ATLS and their level of involvement with the development and implementation aspects of the *ASC SQE Practices*, it is assumed that their judgment will ultimately be relied upon when issues arise with respect to evidence characterization and rating assignments.

2.3 Report Appraisal Results Phase

The reporting phase has two levels of reporting that must be managed. The high level reporting pertains to the ASC Program Office final report summarizing all project team appraisals conducted over FY07 and FY08. This high level report will be developed by the APL and the ATLS. This report will include a general summary of project team appraisal results as well as ASC Program strengths and opportunities for improving software quality engineering activities.

The other level of reporting pertains to individual appraisal results delivered to each project team. These results will include a completed *Evidence Collection Instrument* with appraisal team comments and practice ratings. It will also include an approximately two-page summary that reflects strengths, weaknesses and opportunities for improvement based upon appraisal observations. Information gleaned from individual project team appraisals will be summarized and compiled into the ASC Program Office final report.

Reporting phase practices are identified below. “Responsibility” indicates the role with primary responsibility for ensuring the practice is initiated and completed but others will very likely be supporting these efforts as well. Practice elaborations are provided in the sections that follow the table.

Table 9. Report Appraisal Results Phase Practices

Report Phase Practice	High Level Practice Description	Responsibility
2.3.1 Deliver Project Team Appraisal Results	<ul style="list-style-type: none"> • Deliver completed <i>Evidence Collection Instrument</i> and <i>Final Appraisal Results</i> to Project Team • Deliver a copy of the <i>Evidence Collection Instrument</i> and the <i>Final Appraisal Results</i> to the APL 	ATL(s)
2.3.2 Contribute to the Final Appraisal Report	<ul style="list-style-type: none"> • Contribute project team specific data to the <i>Final Appraisal Report</i> • Conduct iterative reviews of the <i>Final Appraisal Report</i> • Verify report results with the ATLS 	APL, ATL(s)
2.3.3 Deliver the Final Appraisal Report	<ul style="list-style-type: none"> • Obtain approval to release final report from Appraisal Sponsor • Ensure the report becomes a SAND report • Deliver the <i>Final Appraisal Report</i> to the Appraisal Sponsor 	APL
2.3.4 Archive All Appraisal Results	<ul style="list-style-type: none"> • Ensure that all appraisal results, including those from the project teams, are properly archived 	APL

2.3.1 Deliver Project Team Appraisal Results

Appraisal results will be delivered to project teams at the conclusion of the appraisal. Delivery of the results will generally be in the form of a short one hour meeting between the lead appraiser and the project team POC, usually the PI. Other members of the appraisal team may attend; however, any other individuals outside the appraisal team and the appraised project team may only be present at the invitation of the appraised project team.

Because it is intended that this appraisal involve minimal project team disruptions, other methods for delivery (e.g., email, teleconference, and videoconference) of appraisal results are allowed. Any method is appropriate based upon project team request.

Appraisal results are comprised of the completed *Evidence Collection Instrument*, with evidence characterizations, appraisal team comments, and practice ratings. In addition, appraisal teams will use the *Project Appraisal Results Report Template* (see Appendix A, Resource 3) to summarize appraisal team results and provide improvement recommendations to project teams.

A copy of the appraisal results must also be delivered to the APL. This information will be collected for future input into the *ASC FY07-FY08 Appraisal Report* for the ASC Program Office.

2.3.2 Contribute to the Final Appraisal Report

Appraisal results will be aggregated across the program and reported to the Appraisal Sponsor. Ratings from project team appraisals will be evaluated at the Program Element level and the ASC Program as a whole to identify strengths and opportunities for SQE improvements. The final appraisal report will include non-attributable ratings for all projects included in the appraisal; however Program Element Leads will be given attributable ratings for each project within their Program Element. The overall appraisal report will address items listed in the “Intended Use” section of Table 2, Software Gap Analysis. Inputs from project teams that are collected during follow-up discussions and surveys (Section 2.4, Conduct Appraisal Follow-up) will also be summarized in the report. This information will provide the ASC Program Office with insight into the needs of project teams with respect to SQE activities that might best support their work.

The APL must create and manage the *ASC FY07-FY08 Final Appraisal Report*. ATLS will contribute to the final appraisal report on an iterative basis. The appraisal report will begin in FY07 with a completion date at the end of FY08. Supplementary to the final appraisal report will be individual project team rating reports to the Program Element Leads for projects under their domain.

Before delivering the *ASC FY07-FY08 Final Appraisal Report* to the Appraisal Sponsor, the APL will verify report results with all ATLS. Verification will include the review of reported data. ATLS must assist in ensuring information is non-attributable to individuals in the report provided to the Appraisal Sponsor and properly attributable (project names) in supplemental reports provided to the Program Element Leads. Roll up of information and identification of trends, strengths, and opportunities for improvement will also be verified since this information will be developed on a consensus basis with all ATLS.

2.3.3 Deliver the Final Appraisal Report

The APL and at least one ATL will deliver the *ASC FY07-FY08 Final Appraisal Report* to the Appraisal Sponsor. Delivery of this executive briefing will be a closed session forum where other attendees are present only at the request of the Appraisal Sponsor. This session will likely be followed up with additional planning sessions to prioritize opportunities for improvement and plan for future SQE activities based upon report guidance. Additional final report presentations may be delivered to different audiences (e.g., AQMC, management team meetings) at the request of the Appraisal Sponsor.

2.3.4 Archive All Appraisal Results

All appraisal artifacts must be placed in appropriate repositories for configuration management. Artifacts to be archived will include:

- *ASC FY07-FY08 Final Appraisal Report*
- Program Element Supplementary Reports
- Individual project team results (including both the *Evidence Collection Instrument* and the project team *Appraisal Results* report)
- Appraisal tools, instruments and summaries utilized by appraisal teams during the conduct of appraisals

Repository locations will be confirmed with the Appraisal Sponsor and designated access controls will be identified and established. Interview worksheets will be destroyed upon acceptance of the *ASC FY07-FY08 Final Appraisal Report*.

2.4 Conduct Appraisal Follow-up

The appraisal follow-up phase has two levels of follow-up that must be managed. The high level follow-up pertains to the overall appraisal process and where improvements can be made to the process on an on-going basis. This follow-up, in the form of lessons learned, will be discussed by the ATP periodically throughout the conduct of project team appraisals. Improvements will be made as needed throughout the appraisal process while striving to maintain maximum uniformity in the appraisal process across the projects.

The other level of appraisal follow-up involves gathering additional feedback from project teams. Follow up from the project teams will be two-fold. First, they will be responding to a series of general questions related to ASC Program Office SQE activities that will focus on strengths and opportunities for improvement in ASC Program Office SQE efforts. Secondly, project teams will be requested to complete an *Appraisal Evaluation Form* regarding the appraisal process.

Follow-up phase practices are identified below. Responsibility indicates the role with primary responsibility for ensuring the practice is initiated and completed; however, others will very likely be supporting these efforts as well. Practice elaborations are provided in the sections that follow after the table.

Table 10. Appraisal Follow-up Phase Practices

Follow-up Phase Practice	High Level Practice Description	Responsibility
2.4.1 Follow-up with Appraised Teams	<ul style="list-style-type: none"> • Follow up with project teams at least one to two weeks following delivery of appraisal results • Gather input from the project teams 	APL
2.4.2 Document Follow-up Responses and Issues	<ul style="list-style-type: none"> • Document and maintain project team follow-up responses for inclusion in the <i>ASC FY07-FY08 Final Appraisal Report</i> delivered to the ASC Program Office 	APL
2.4.3 Conduct Lessons Learned	<ul style="list-style-type: none"> • Collect lessons learned throughout the appraisal period • Meet periodically with the ATP to discuss lessons learned and implement improvements where needed • Compile a master list of lessons learned and action items for use in current and future appraisals 	APL, ATLS

2.4.1 Follow-up with Appraised Teams

Approximately one to two weeks following the delivery of the appraisal results to a project team, an appraisal team lead will contact the PI for the appraised project team to schedule a meeting to discuss appraisal follow-up questions. A link to the follow-up questions will be provided (see Appendix A, Resource 5) to allow project teams time to review them. This activity will be conducted by either the APL or another ATL; this individual does not need to be the ATL who conducted the actual appraisal for the project team, although this is the preferential method for conducting follow-up.

The purpose of the appraisal follow-up is to collect feedback from project teams regarding the appraisal process, their individual appraisal results, and how the ASC Program as a whole can improve SQE activities. The intent is to give project teams time to review appraisal results and the follow-up questions before providing feedback; thus allowing them the opportunity to reflect on questions and generate responses together as a team rather than having to provide immediate feedback to unexpected questions during an interview.

Appraisal follow-up will also give the project teams the opportunity to ask additional questions regarding process improvement for their team. While one-on-one consulting to any great extent is not within the scope of this appraisal, this is an opportunity a project team may want to pursue; appraisal team members will assist them in securing this type of assistance if it is desired.

Project teams will also be requested to complete an *Appraisal Evaluation Form* (see Appendix A, Resource 6) to provide feedback specifically about the appraisal process. This information will be used continuously as the ATP reviews its own lessons learned (see Section 2.4.3, Conduct Lessons Learned) and will incorporate suggestions as appropriate.

2.4.2 Document Follow-up Responses and Issues

As feedback is collected from project teams regarding appraisal follow-up questions and appraisal evaluation, the APL will document and maintain this information for use in the *ASC FY07-FY08 Final Appraisal Report*. Information from project teams will be summarized using non-attribution and confidentiality rules.

Feedback will be distributed appropriately throughout the appraisal process. Thus, feedback regarding issues that could immediately be addressed by the ASC Program Office or the ATP will be incorporated before the end of the FY08 appraisals. This information will be reviewed periodically by the APL, ATLs, and the ASC Program Office to determine areas and issues that should receive immediate attention.

2.4.3 Conduct Lessons Learned

Throughout the FY07 and FY08 appraisals, the ATP will convene periodically to discuss the appraisal process. It is expected that as appraisals are conducted, improvements will be identified. The intent of conducting lessons learned continuously throughout the appraisals rather than at the end is to address issues that can provide an immediate benefit to the appraisal process.

Approximately every three to four months during the appraisals, the ATP will meet to have updated training sessions. This allows the ATP to refresh their appraisal process knowledge. In addition, lessons learned will be identified and discussed to enhance the overall appraisal process for both the project teams and the ATMs. At the end of the appraisals in FY08, lessons learned and actions taken will be summarized and reported for use in future ASC appraisals. This information, culminating in a *Lessons Learned for Conducting ASC Software Appraisals* document, will be archived with all other appraisal artifacts as identified in Section 2.3.4, Archive all Appraisal Results.

Appendix A Links to Appraisal Resources

A.1 Resources

1. Evidence Collection Instrument

https://wfsprod01.sandia.gov/intradoc-cgi/idc_cgi_isapi.dll?IdcService=GET_SEARCH_RESULTS&QueryText=dDocName=WFS409496

2. Project Team Appraisal Plan Template

https://wfsprod01.sandia.gov/intradoc-cgi/idc_cgi_isapi.dll?IdcService=GET_SEARCH_RESULTS&QueryText=dDocName=WFS448728

3. Project Appraisal Results Report Template

https://wfsprod01.sandia.gov/intradoc-cgi/idc_cgi_isapi.dll?IdcService=GET_SEARCH_RESULTS&QueryText=dDocName=WFS448730

4. Appraisal Team Interview Worksheet

https://wfsprod01.sandia.gov/intradoc-cgi/idc_cgi_isapi.dll?IdcService=GET_SEARCH_RESULTS&QueryText=dDocName=WFS448805

5. Appraisal Follow-up Questions for Project Teams

https://wfsprod01.sandia.gov/intradoc-cgi/idc_cgi_isapi.dll?IdcService=GET_SEARCH_RESULTS&QueryText=dDocName=WFS454103

6. Appraisal Evaluation Form

https://wfsprod01.sandia.gov/intradoc-cgi/idc_cgi_isapi.dll?IdcService=GET_SEARCH_RESULTS&QueryText=dDocName=WFS459398

7. Master Appraisal Schedule

https://wfsprod01.sandia.gov/intradoc-cgi/idc_cgi_isapi.dll?IdcService=GET_SEARCH_RESULTS&QueryText=dDocName=WFS516122

8. ASC SQE Appraisal Checklist

https://wfsprod01.sandia.gov/intradoc-cgi/idc_cgi_isapi.dll?IdcService=GET_SEARCH_RESULTS&QueryText=dDocName=WFS548938

A.2 Training

1. ASC Appraisal Team Training

https://wfsprod01.sandia.gov/intradoc-cgi/idc_cgi_isapi.dll?IdcService=GET_SEARCH_RESULTS&QueryText=dDocName=WFS459374

2. ASC Project Team Appraisal Training

https://wfsprod01.sandia.gov/intradoc-cgi/idc_cgi_isapi.dll?IdcService=GET_SEARCH_RESULTS&QueryText=dDocName=WFS448727

Appendix B Glossary and Acronyms

For additional related definitions see *Sandia National Laboratories ASCI Applications Software Quality Engineering Practices, Version 2.0* and Section 1.3, Roles and Responsibilities, in this document.

B.1 Glossary

Artifact: A documented process, deliverable or work product. A configuration-controlled artifact is stored in a corporate repository (library) and changes to it are controlled via reported issues. [*ASC SQE Practices*, Glossary and Acronyms, page 41]

Document: A collection of data, regardless of the medium on which it is recorded, that generally has permanence and can be read by humans or machines. This typically includes work products such as organizational policies, procedures, and implementation-level work products. Documents may be available in hardcopy, softcopy, or accessible via hyperlinks in a web-based environment. [SCAMPI B&C Handbook, Glossary, page 104]

Self-Assessment: A project team's appraisal of itself to determine the state of its current software process, to determine the high-priority software process-related issues facing the project team, and to obtain project team support for software process improvement. [Derived from *ASC SQE Practices*, Glossary and Acronyms, page 41]

Direct Evidence: A primary reference to tangible output resulting directly from the implementation of a documented process pertaining to the given process area. Oftentimes, direct evidence is explicitly stated or implied by the question asked. [SQUIG Self-Assessment Instrument, Instructions, page 8]

Indirect Evidence: A secondary reference that is a consequence of performing a specific process or that substantiates its implementation but which is not the purpose for which the process was performed. Oftentimes when indirect evidence exists there is no indication of where it came from, who worked to develop it, or how it is used. [SQUIG Self-Assessment Instrument, Instructions, page 8]

Affirmations: An oral or written statement confirming or supporting implementation of a practice. Interview responses are examples of face-to-face affirmations. Alternative forms of affirmations could include presentations or demonstrations of a tool or mechanism as it relates to implementation of a practice. [SCAMPI B&C Handbook, Glossary, page 105]

Objective Evidence: Qualitative or quantitative information, records, or statements of fact pertaining to the characteristics of an item or service or to the existence and implementation of a process element, which is based on observation, measurement, or test and which can be verified. [SCAMPI B&C Handbook, Glossary, page 104]

Software Appraisal: the process of examining the current level of *ASC SQE Practices* implementation by an independent, qualified team.

B.2 Acronyms

AC	Appraisal Coordinator
APL	Appraisal Project Lead
AQMC	ASC Quality Management Council
ASC	Advanced Simulation and Computing
ASCI	Accelerated Strategic Computing Initiative
ATL	Appraisal Team Lead
ATM	Appraisal Team Member
ATP	Appraisal Team Pool
CMMI	Capability Maturity Model Integration
FTE	Full time equivalent
FY	Fiscal year
HQ	Headquarters
PI	Principle Investigator
POC	Point of Contact
NNSA	National Nuclear Security Agency
SCAMPI	Standard CMMI Appraisal Method for Process Improvement
SNL	Sandia National Laboratories
SQE	Software quality engineering
SQUIG	Software Quality Implementation Group
SSP	Stockpile Stewardship Program

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