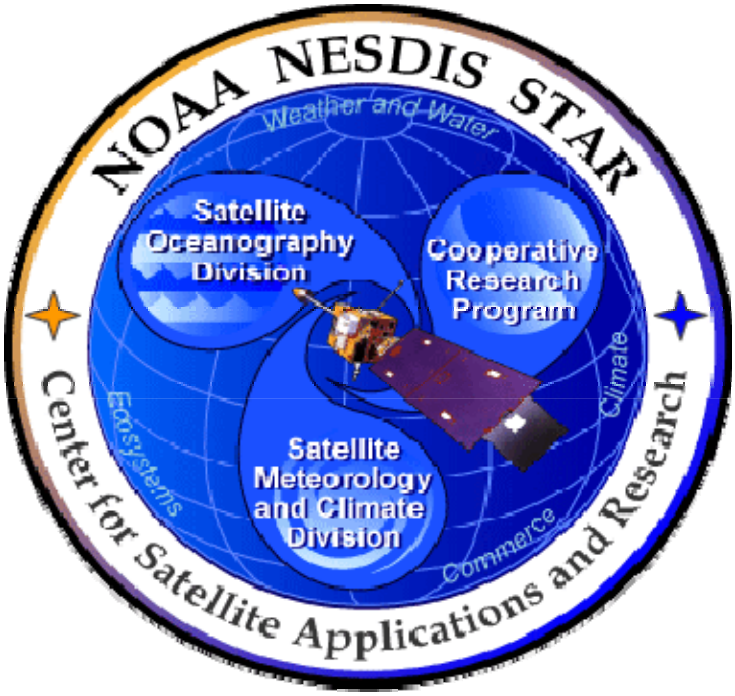

NOAA NESDIS
CENTER for SATELLITE APPLICATIONS and RESEARCH (STAR)

STAKEHOLDER GUIDELINE

SG-12
RESEARCH MANAGER GUIDELINES

Version 3.0

TITLE: SG-12: RESEARCH MANAGER GUIDELINES VERSION 3.0

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VERSION HISTORY SUMMARY

Version	Description	Revised Sections	Date
1.0	No version 1		
2.0	No version 2		
3.0	New Stakeholder Guideline adapted from CMMI guidelines by Ken Jensen (Raytheon Information Solutions)	New Document	12/31/2009

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LIST OF ACRONYMS

ATBD	Algorithm Theoretical Basis Document
BB	Baseline Build
CI	Cooperative Institute
CICS	Cooperative Institute for Climate Studies
CIMSS	Cooperative Institute for Meteorological Satellite Studies
CIOSS	Cooperative Institute for Oceanographic Satellite Studies
CIRA	Cooperative Institute for Research in the Atmosphere
CL	Check List
CLI	Check List Item
CoRP	Cooperative Research Program
CM	Configuration Management
CMMI	Capability Maturity Model Integration
CREST	Cooperative Remote Sensing and Technology Center
DG	Document Guidelines
DPR	Development Project Report
EPG	Enterprise Process Group
EPL	Enterprise Product Lifecycle
G1R	Gate1 Review
G1RR	Gate1 Review Report
G2R	Gate 2 Review
G2RR	Gate 2 Review Report
NESDIS	National Environmental Satellite, Data, and Information Service
NOAA	National Oceanic and Atmospheric Administration
PAR	Process Asset Repository
PG	Process Guidelines
PP	Project Proposal
PRG	Peer Review Guidelines
QA	Quality Assurance
R&D	Research & Development
RCOD	Research Code
RTEST	Research Test Data

SC	Steering Committee
SEI	Software Engineering Institute
SG	Stakeholder Guideline
SPSRB	Satellite Products and Services Review Board
STAR	Center for Satellite Applications and Research
SWA	Software Architecture Document
TD	Training Document
TG	Task Guideline

1. INTRODUCTION

The NOAA/NESDIS Center for Satellite Applications and Research (STAR) develops a diverse spectrum of complex, often interrelated, environmental algorithms and software systems. These systems are developed through extensive research programs, and transitioned from research to operations when a sufficient level of maturity and end-user acceptance is achieved. Progress is often iterative, with subsequent deliveries providing additional robustness and functionality. Development and deployment is distributed, involving STAR, the Cooperative Institutes (CICS[1], CIMSS[2], CIOSS[3], CIRA[4], CREST[5]) distributed throughout the US, multiple support contractors, and NESDIS Operations.

NESDIS/STAR is implementing an increased level of process maturity to support the development of these software systems from research to operations. This document is a Stakeholder Guideline (SG) for users of this process, which has been designated as the STAR Enterprise Product Lifecycle (EPL).

1.1. Objective

The STAR Enterprise is comprised of a large number of organizations that participate and cooperate in the development and production of environmental satellite data products and services. Individual project teams are customarily composed of personnel from these organizations, supplemented by contractor personnel. These organizations and project teams are referred to as the STAR Enterprise stakeholders.

The objective of this Stakeholder Guideline (SG-12) is to provide a detailed description of the standard tasks of a **Research Manager**. The intended users of this SG are management personnel at an organization that is producing research algorithms that may have potential for transition to operations.

A ***Research Manager*** provides project monitoring and control oversight of research projects, including participation in project management (Gate) reviews. Research projects produce R&D algorithms for consideration as potential development projects.

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1 Cooperative Institute for Climate Studies

2 Cooperative Institute for Meteorological Satellite Studies

3 Cooperative Institute for Oceanographic Satellite Studies

4 Cooperative Institute for Research in the Atmosphere

5 Cooperative Remote Sensing and Technology Center

Stakeholder satisfaction is a critical component of the process. The intention is for the process to be more of a benefit that a burden to stakeholders. If stakeholders are not satisfied that this is the case, the process will require improvement.

Comments and suggestions for improvement of the process architecture, assets, artifacts and tools are always welcome. Stakeholders can provide feedback by contacting:

Ken.Jensen@noaa.gov

1.2. Version History

This is the first version of SG-13. It is identified as version 3.0 to align it with the release of the version 3.0 STAR EPL process assets.

1.3. Overview

This SG contains the following sections:

Section 1.0 - Introduction
Section 2.0 - Reference Documents
Section 3.0 - Reviews
Section 4.0 - Project Artifacts
Section 5.0 - Task Descriptions

2. REFERENCE DOCUMENTS

All of the reference documents for the STAR EPL process are STAR EPL process assets that are accessible in a Process Asset Repository (PAR) on the STAR website. http://www.star.nesdis.noaa.gov/star/EPL_index.php.

Process assets include:

- Process Guidelines
- Stakeholder Guidelines
- Task Guidelines
- Peer Review Guidelines
- Review Check Lists
- Document Guidelines

2.1. Process Guidelines

Process Guideline (PG) documents describe STAR's standard set of practices and guidelines for tailoring them to specific projects.

- STAR EPL Process Guidelines (PG-1)
- STAR EPL Process Guidelines Appendix (PG-1.A)

PG-1 and PG-1.A apply generally to each EPL step. Each stakeholder performing tasks during each step can benefit from a familiarity with these documents.

2.2. Stakeholder Guidelines

A Stakeholder Guideline (SG) is a description of how to perform all STAR EPL standard tasks assigned to a given type of stakeholder. For each type of stakeholder, the appropriate SG provides that stakeholder with a complete description of the standard tasks for that stakeholder role, along with references to all appropriate process assets and project artifacts. This functions as a complement to the Task Guidelines (TGs), which provide a completion description of all stakeholder tasks for a specific process step. The relevant SG for **Research Managers** is SG-12 (this document).

2.3. Task Guidelines

The STAR EPL is designed as a sequence of 11 process steps that take a product from initial conception through delivery to operations. These steps are:

- Step 1 - Basic Research
- Step 2 - Focused R & D
- Step 3 - Project Proposal
- Step 4 - Resource Identification
- Step 5 - Project Plan
- Step 6 - Project Requirements
- Step 7 - Preliminary Design
- Step 8 - Detailed Design
- Step 9 - Code & Test Data Development
- Step 10 - Code Test And Refinement
- Step 11 - System Integration and Test

A Task Guideline (TG) is a description of how to perform the tasks of a STAR EPL process step. There is one Task Guideline for each step in the STAR EPL. Table 2.3.1 lists the Task Guidelines that are relevant for **Research Managers**.

TABLE 2.3.1 – Relevant Task Guidelines

ID	Step
TG-1	Basic Research
TG-2	Focused R&D
TG-3	Project Proposal

2.4. Peer Review Guidelines

For each review (c.f. Section 4), there is a Peer Review Guideline (PRG) that describes the objectives of the review, the required artifacts, standards for reviewers, requirements for approval, and options other than approval. Table 2.4.1 lists the Peer Review Guidelines that are relevant for **Research Managers**.

TABLE 2.4.1 – Relevant Peer Review Guidelines

ID	Review
PRG-1	Gate 1 Review
PRG-3	Gate 2 Review

2.5. Review Check Lists

For each review (c.f. Section 4), there is a Review Check List (CL) that captures all the objectives for a review as a set of check list items. Each item in the check list should have a "Disposition" column that contains "Pass", "Conditional Pass", "Defer", "Waive", or "N/A" (Not Applicable). Each item will also have columns for Risk Assessment and for Actions generated. Table 2.5.1 lists the Review Check Lists that are relevant for **Research Managers**.

TABLE 2.5.1 – Relevant Review Check Lists

ID	Review
CL-1	Gate 1 Review
CL-3	Gate 2 Review

2.6. Document Guidelines

There is a Document Guideline (DG) for each standard STAR EPL document. Each DG includes a description of the purpose for the document, a standard document outline (table of contents), a brief description of each subsection in the outline, and an Appendix containing an example document.

Table 2.6.1 lists the Document Guidelines that are relevant for **Research Managers**.

TABLE 2.6.1 – Relevant Document Guidelines

ID	Document
DG-0.1	Document Style Guideline
DG-3.2	Gate 2 Review Report (G2RR)

3. REVIEWS

The relevant reviews for **Development Leads** are:

- Gate 1 Review (G1R)
- Gate 2 Review (G2R)

3.1. Gate 1 Review

Gate 1 is an internal review of Basic Research by the research organization. Its purpose is to determine whether organization funds and resources should be expended on Focused R&D of a new/improved algorithm, leading to a Project Proposal to develop a product for transition to operations.

Standard Gate 1 Review objectives:

- Review the algorithm theoretical basis, software architecture, research code and research test results to determine whether the algorithm should be developed to support a STAR/SPSRB Project Proposal.

Standard Gate 1 Review entry criteria:

- Entry # 1 - An Algorithm Theoretical Basis Document (ATBD) has been written.
- Entry # 2 - A Software Architecture Document (SWA) has been written.
- Entry # 3 – Research code to implement the algorithm has been written.
- Entry # 4 – Test data for the basic research code has been produced.

Standard Gate 1 Review exit criteria:

- Exit # 1 – Algorithm and ATBD are satisfactory
- Exit # 2 – Software architecture and SWA are satisfactory.
- Exit # 3 – Basic research code is satisfactory.
- Exit # 4 – Research test results, documented in the ATBD, demonstrate that the algorithm has operational potential.

- Exit # 5 - Project is ready for the Exploratory phase

Refer to PRG-1 for a more detailed description of the Gate 1 Review. The standard Gate 1 Review Check List Items (CLI) are documented in the process asset CL-1 (c.f. Section 2).

Note that the standard Gate 1 Review objectives, entry criteria, and exit criteria are only recommendations. The research organization is completely free to determine objectives, entry criteria, and exit criteria unique to the organization and/or project. In fact, there is no requirement for the organization to even conduct a Gate 1 Review.

3.2. Gate 2 Review

Gate 2 is a STAR review of a Project Proposal (PP). Its purpose is to determine whether the proposal is compatible with the NESDIS mission and strategic plan, and is technically feasible for development into an operational product. Resource issues are not considered at this time. If a project passes Gate 2, the PP is forwarded to SPSRB for consideration in accordance with the SPSRB process.

Standard Gate 2 Review objectives:

- Review the project proposal and supporting artifacts (algorithm theoretical basis, software architecture, R&D code and R&D test results) to determine whether the algorithm has operational potential.
- Identify a STAR Division and Branch to implement Development

Standard Gate 2 Review entry criteria:

- Entry # 1 - An Algorithm Theoretical Basis Document (ATBD v1r1) has been written.
- Entry # 2 - A Software Architecture Document (SWA v1r1) has been written.
- Entry # 3 – Research code to implement the algorithm has been written.
- Entry # 4 – A Project Proposal (PP) has been submitted to STAR
- Entry # 5 – A User Request has been attached to the PP

Standard Gate 2 Review exit criteria:

- Exit # 1 – Algorithm and ATBD are satisfactory

- Exit # 2 – Software architecture and SWA are satisfactory.
- Exit # 3 – Research test results, documented in the ATBD, demonstrate that the algorithm has operational potential.
- Exit # 4 – Proposed operational products support the NESDIS mission and strategic plan
- Exit # 5 - A STAR Division and Branch has been identified to implement Development
- Exit # 6 - Project is recommended for Development

Refer to PRG-3 for a more detailed description of the Gate 2 Review. The standard Gate 2 Review Check List Items (CLI) are documented in the process asset CL-3 (c.f. Section 2).

4. PROJECT ARTIFACTS

Project Artifacts are a set of items that must be produced by the appropriate stakeholders during the product life cycle to support the reviews. They are established and maintained under Configuration Management (CM) by an Enterprise Process Group (EPG) under the direction of a Steering Committee (SC).

The project artifacts are maintained in a project artifact repository. This is a complete set of configuration-managed artifacts developed by each project in accordance with STAR standards. When a project artifact has been approved at a Technical Review or Gate Review, it is placed in the project artifact repository under CM.

Responsibility for producing project artifacts is assigned to stakeholders during the Plan phase, and may be tailored from the standard assignment. The project artifacts that are usually the responsibility of **Research Managers** are listed in Table 4.1.

TABLE 4.1 – Relevant Artifacts

Artifact	Type
Gate 1 Review Report	Report
Gate 2 Review Report	Report

Gate 1 Review Report: Gate 1 Review Report (G1RR) is the report of the Gate 1 Reviewers. The G1RR should consist of an assessment of the Gate 1 Review artifacts and a yes/no decision on proceeding to the next phase of the EPL. Refer to DG-1.3 for G1RR document guidelines.

Gate 2 Review Report: The Gate 2 Review Report (G2RR) is produced for each project approved for development. It reports the results from the STAR review of the project proposal. It should identify the STAR Branch that will be responsible for development, identify a Development Lead, optionally identify other Development personnel, and identify requested funding for the development project. It should include an initial assessment of project risks, and a preliminary identification of risk mitigation actions. Refer to DG-3.2 for detailed G2RR guidelines.

5. TASK DESCRIPTION

Research Managers participate in the following process steps:

- Step 1 - Basic Research (TG-1)
- Step 3 - Project Proposal (TG-3)

The standard **Research Manager** tasks for each of these steps are described below. **Research Managers** may also refer to the relevant TGs for a complementary task description.

5.1 Basic Research Tasks

Figure 5.1 shows the process flow for step 1.

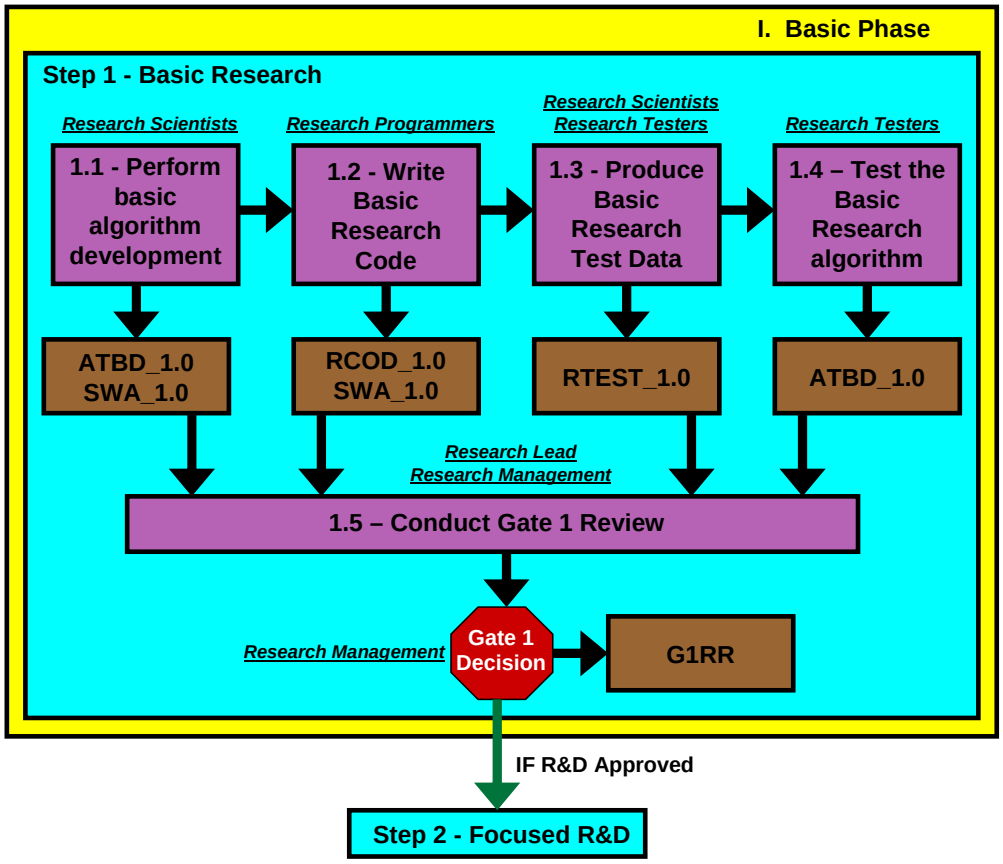

Figure 5.1 – STEP 1 Process Flow

5.1.1 Expected BEGIN State

- Research Scientists are prepared to perform basic research to develop an algorithm that may have operational potential.
- Research Management is aware of this effort, and has provided the resources needed for basic research coding and testing
- A Research Lead has been identified.
- If needed, Research Testers and Research Programmers have been identified
- Step 1 stakeholders understand and accept their tasks

5.1.2 Task Inputs

None

5.1.3 Desired END State

- An algorithm has been developed and documented in an ATBD.
- A software architecture has been developed and documented in a SWA.
- Research code has been written that implements the algorithm well enough to produce prototype data products.
- Research code has been run with research test data to produce data products.
- Research code test results, documented in the ATBD, demonstrate whether or not the algorithm has operational potential.
- A Gate 1 Review decision has been made and documented in a G1RR.

5.1.4 Task Outputs

- Algorithm Theoretical Basis Document v1.0
- Software Architecture Document v1.0
- Basic Research Code
- Basic Research Test Data
- Gate 1 Review Report

5.1.5 Stakeholder Activities

The Basic Research algorithm may be developed in one of three venues:

- STAR. **Research Managers** include STAR Division Chiefs and Branch Chiefs. **Research Lead** is a STAR scientist. **Research Scientists** are STAR scientists. **Research Testers** are STAR scientists. **Research Programmers** may be STAR scientists, or Research Management may designate contractor personnel for these tasks.
- A Cooperative Institute (CI). **Research Managers** are provided by the CI. **Research Lead** is a CI Scientist. **Research Scientists** are CI scientists. **Research Testers** are CI scientists. **Research Programmers** may be CI scientists, or Research Management may designate contractor personnel for these tasks.
- A research organization other than STAR and the CIs (PUSH User). Compliance with STAR EPL standards is at the discretion of the research organization, but the organization should understand that Gate 2 approval shall depend on a demonstration that the algorithm can be developed according to STAR EPL standards.

The Research Lead should notify **Research Managers** when the algorithm is ready to be ready to be presented at a Gate 1 Review. The Gate 1 Review guidelines (PRG-1) and checklist (CL-1) should be consulted to help decide what must be done to prepare the algorithm for the next phase. It is expected that a **Research Scientist** will be the **Research Lead** for this phase, but the research organization may want to select an alternative Lead who specializes in preparing a project for Gate 1 and Gate 2 reviews.

At a minimum, initial versions of an Algorithm Theoretical Basis Document (ATBD) and a Software Architecture Document (SWA) should be produced for the Gate 1 Review. The purpose is to demonstrate to the Gate 1 reviewers that the algorithm has operational potential and should be further developed.

Basic research code and test data may be developed to help demonstrate an operational potential. In that case, **Research Programmers** and **Research Testers** at the research organization may be assigned to the project by **Research Managers**. The extent and maturity of this code and test data is at the discretion of the organization that is developing the Basic algorithm, as it is their decision whether to approve the project for the next phase at the Gate 1 Review.

Gate 1 Reviewers are selected by the **Research Manager**. It is expected that most reviewers will be from the research organization, but external reviewers may be selected at the discretion of the research organization. Reviewers should be familiar with the Gate 1

Review guidelines (PRG-1) and checklist (CL-1). **Gate 1 Reviewers** write a Gate 1 Review Report, following the standards in PRG-1, and notify the **Research Lead** of their decision. If they decide to approve the algorithm for further development, step 2 “Focused R&D” commences. If not, they should include in their report a recommendation that the project be terminated or improved for reconsideration.

Each stakeholder who performed activities during step 1 is encouraged to document an assessment of the experience in a personal record. This assessment should include: what was good, what was bad, what worked, what did not work, what can be improved, how it can be improved. At the conclusion of Development (step 11), the **Development Lead** will collect the final edited personal stakeholder records and incorporate them into a Development Project Report (DPR).

5.2 Project Proposal Tasks

Figure 5.2 shows the process flow for step 3.

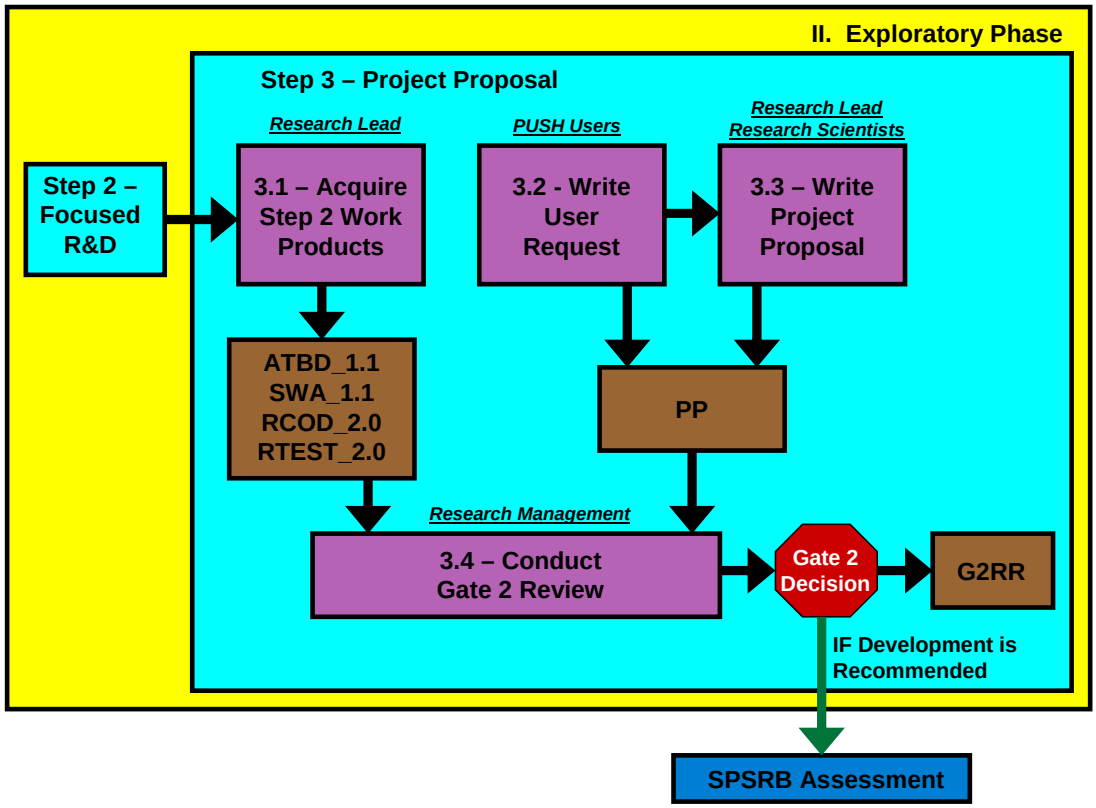

Figure 5.3 – STEP 3 Process Flow

5.2.1 Expected BEGIN State

- The research algorithm has been matured and documented in ATBD v1r1
- A software architecture has been matured and documented in SWA v1r1
- R&D code has been written that implements the algorithm well enough to produce proxy data products to support a Project Proposal (PP) to STAR.
- R&D code has been run with research test data to produce the proxy data products
- R&D code test results, documented in ATBD v1r1, demonstrate whether or not the algorithm's operational potential warrants the submission of a PP.

5.2.2 Task Inputs

Algorithm Theoretical Basis Document v1.1: The Algorithm Theoretical Basis Document (ATBD) provides a theoretical description (scientific and mathematical) of the algorithm that is used to create a product that meets user requirements. The ATBD is typically updated from the v1.0 version, as R&D provides additional maturity. At this step, the algorithm's operational potential has been demonstrated to the satisfaction of the Research organization and is now being further developed to support a research to operations development proposal. The purpose of ATBD v1.1 is to demonstrate that the algorithm should be developed for transition to operations. Refer to DG-1.1 for detailed ATBD guidelines.

Software Architecture Document v1.1: The Software Architecture Document (SWA) complements the ATBD by providing the software architecture for the processing code that will implement the algorithm. The SWA may be updated from the v1.0 version, if the additional algorithm maturity warrants additional and/or more detailed software architecture. Refer to DG-1.2 for detailed SWA guidelines.

R&D Code: Research & Development (R&D) Code (RCOD v2) is research code that implements the algorithm. It should use input data and produce output data that is described in the ATBD and SWA. It should include the processing functionality described in the ATBD and SWA. R&D code is expected to be an upgrade over Basic Research code. Code may include additional functionality to reflect upgraded software architecture and may be revised to comply with SPSRB coding standards. If the project is approved for development, this version of the code will be built into the initial project baseline, It is therefore expected that SPSRB coding standards will begin to be applied to the code. Currently, coding standards exist for Fortran, C, and C++ code, and general programming

standards exist for all code. These standards are found on the SPSRB web site at http://projects.osd.noaa.gov/spsrb/standards_prog.htm

R&D Test Data: R&D Test Data (RTEST v2) are the data files used to test the R&D code, including the input data and output data identified in the ATBD and SWA. They may be upgraded from the Basic Research Test Data, if the upgraded R&D code requires this.

Note that these artifacts are typically included in the first STAR Baseline Build (BB 1.0). BB 1.0 provides the artifacts for the STAR/SPSRB Gate 3 Review. In determining the step 23 artifacts to be developed, and consequently the step 3 activities to authorize, **Research Managers** should consider how the step 3 activities and artifacts support the STAR EPL objectives for the Gate 3 Review. Refer to PRG-5 for Gate 3 Review objectives.

Gate 1 Review Report: Gate 1 Review Report (G1RR) is the report of the Gate 1 Reviewers. The G1RR should consist of an assessment of the Gate 1 Review artifacts and a yes/no decision on proceeding to the next phase of the EPL. Refer to DG-1.3 for G1RR document guidelines.

5.2.3 Desired END State

- A Project Proposal (PP) has been submitted to STAR.
- A User Request has been attached to the PP.
- A Gate 2 Review of the PP has been conducted.
- A Gate 2 Review Report (G2RR) has been written.
- If the project has been recommended for Development, a STAR Division and Branch has been selected to implement Development, and a Development Lead has been identified. This information is included in the G2RR.
- The PP and G2RR have been submitted to the SPSRB for its assessment.

5.2.4 Task Outputs

- Project Proposal
- User Request
- Gate 2 Review Report

5.2.5 Stakeholder Activities

Research Lead takes control of the step 2 work products (ATBD, SWA, R&D code, R&D test data).

Research Lead and **Research Scientists** prepare a Project Proposal (PP), using the step 2 artifacts as references and DG-3.1 for guidance.

PUSH Users, who may be the **Research Scientists,** prepare a User request, using SPSRB standards for guidance. The User Request is attached to the PP.

Research Lead informs **SPSRB** and **STAR Managers** that a proposal is ready for a Gate 2 Review.

STAR Managers decide which Branch of which Division will lead the Gate 2 Review. **STAR Managers** will select a Gate 2 Review team, including a **Review Lead**. The **Review Lead** is nominally the Branch Chief, but an alternative lead can be selected by the Branch Chief in consultation with the Division Chief. PRG-3 should be consulted to ensure that the review team is qualified to assess the PP. It is expected that a **Research Manager** will participate. Reviewers should be familiar with the Gate 2 Review guidelines (PRG-3) and checklist (CL-3).

Gate 2 Reviewers will determine whether the PP demonstrates that the project is compatible with the NESDIS mission and strategic plan, and is technically feasible for development into an operational product. If so, the project is recommended to the SPSRB for Development. If not, the project is either terminated or returned to the research organization with recommendations for improvement and re-submittal. **STAR QA** verifies that the Gate 2 Review was conducted in accordance with STAR EPL standards.

This step culminates with the Gate 2 Review Report. This artifact is written by the **Review Lead** with assistance from the **Gate 2 Reviewers**. Guidelines for this report will be found in DG-3.2. The PP and G2RR are submitted to the SPSRB for its assessment.

Each stakeholder who performed activities during step 3 is encouraged to document an assessment of the experience in a personal record. This assessment should include: what was good, what was bad, what worked, what did not work, what can be improved, how it can be improved. At the conclusion of Development (step 11), the **Development Lead** will collect the final edited personal stakeholder records and incorporate them into a Development Project Report (DPR).

END OF DOCUMENT