

**NOAA NESDIS**  
**CENTER for SATELLITE APPLICATIONS**  
**and RESEARCH**

**DOCUMENT GUIDELINE**

**DG-11.4**  
**VERIFICATION AND VALIDATION REPORT**  
**GUIDELINE**

**Version 3.0**

# NOAA NESDIS STAR

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Version: 3.0  
Date: October 1, 2009

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TITLE: DG-11.4: VERIFICATION AND VALIDATION REPORT GUIDELINE VERSION 3.0

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## VERIFICATION AND VALIDATION REPORT GUIDELINE VERSION HISTORY SUMMARY

Version	Description	Revised Sections	Date
1.0	No version 1.0.		
2.0	New Document Guideline (DG-14.1) adapted from CMMI guidelines by Ken Jensen (Raytheon Information Solutions)	New Document	10/12/2007
3.0	Renamed DG-11.4 and revised by Ken Jensen (RIS) for version 3.		10/1/2009

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## LIST OF ACRONYMS

ATBD	Algorithm Theoretical Basis Document
CDR	Critical Design Review
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
CMMI	Capability Maturity Model Integration
CREST	Cooperative Remote Sensing and Technology Center
DG	Document Guideline
EPL	Enterprise Product Lifecycle
NESDIS	National Environmental Satellite, Data, and Information Service
NOAA	National Oceanic and Atmospheric Administration
OCD	Operations Concept Document
PAR	Process Asset Repository
PDR	Preliminary Design Review
PG	Process Guideline
PRG	Peer Review Guideline
PRR	Project Requirements Review
QA	Quality Assurance
RAD	Requirements Allocation Document
SG	Stakeholder Guideline
SRR	System Readiness Review
STAR	Center for Satellite Applications and Research
STP	System Test Plan
TD	Training Document
TG	Task Guideline
UTP	Unit Test Plan
UTR	Unit Test Report
VVP	Verification and Validation Plan
VVR	Verification and Validation Report

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## 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, CIMSS, CIOSS, CIRA, CREST) distributed throughout the US, multiple support contractors, and NESDIS Operations.

NESDIS/STAR is implementing an increased level of process maturity to support the exchange of these software systems from one location or platform to another. The Verification and Validation Report (VVR) is one component of this process.

### 1.1. Objective

The objective of this Document Guideline (DG) is to provide STAR standards for the VVR. The intended users of this DG are the personnel assigned by the Development Lead to the task of creating a VVR for the project.

### 1.2. The Verification and Validation Report

The VVR is a critical artifact for a project's System Readiness Review (SRR)<sup>1</sup>. It documents the results of testing to ensure that the requirements specified for the product processing system are satisfied by the completed system (Verification) and that the final developed system will satisfy the users' needs and expectations (Validation).

A separate VVR is produced for each distinct project in the STAR Enterprise.

The intended target audiences are customers, product users, system test reviewers, operations personnel, and project managers. Typically, the VVR is prepared by the project's development team, under the direction of the Development Lead and in consultation with quality assurance (QA) and test personnel.

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<sup>1</sup> Refer to the STAR EPL Process Guidelines (PG-1 and PG-1.A) for a description of the STAR EPL gates and reviews.

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The VVR should be developed as a Microsoft Word document. Upon approval, the approved version of the VVR may be converted to an Adobe pdf file for storage in the project artifact repository.

## 1.3. Background

This DG defines guidelines for producing a VVR. This DG has been adapted from Capability Maturity Model Integration (CMMI) guidelines (CMMI-DEV-v1.2, 2006). It has been tailored to fit the STAR Enterprise Product Lifecycle (EPL)<sup>2</sup> process.

## 1.4. Benefits

A VVR developed in accordance with the standards in this DG assists the development team to demonstrate to reviewers, users, and operations that the product processing system is ready to be installed in the operations environment. It is therefore a requirement that a VVR be developed in accordance with the guidelines in this document.

## 1.5. Overview

This DG contains the following sections:

- |               |                            |
|---------------|----------------------------|
| Section 1.0 - | Introduction               |
| Section 2.0 - | References                 |
| Section 3.0 - | Document Style             |
| Section 4.0 - | Standard Table of Contents |
| Section 5.0 - | Section Guidelines         |
| Appendix A -  | Examples                   |
| Appendix B -  | Templates                  |

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<sup>2</sup> For a description of the STAR EPL, refer to the STAR EPL Process Guidelines (PG-1 and PG-1.A).

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## 2. REFERENCE DOCUMENTS

**RAD: Requirements Allocation Document** is a project artifact that is produced by the Project Team for the Project Requirements Review (PRR). Revisions are customarily made for Preliminary Design Review (PDR) and Critical Design Review (CDR). The VVR developer needs this to prepare the System Requirements section of the VVR. This document will be available to approved users in the project artifact repository.

**OCD: Operations Concept Document** is a project artifact that is produced by the Project Team for the PRR. The VVR developer needs this to prepare the System Requirements section of the VVR. This document will be available to approved users in the project artifact repository.

**ATBD: Algorithm Theoretical Basis Document** is a project artifact produced by the algorithm developer. The VVR developer needs this to prepare the Algorithm Description section of the VVR. This document will be available to approved users in the project artifact repository.

**VVP: Verification and Validation Plan** is a project artifact that describes the work products to be verified and validated, the requirements for each selected work product and the verification and validation methods for each selected work product. The VVR developer will find this useful in preparing the System Requirements and Test Description sections of the VVR. This document will be available to approved users in the project artifact repository.

**UTP: Unit Test Plan** is a project artifact produced by the product development team. The VVR developer needs this to prepare the Test Description section of the VVR. This document will be available to approved users in the project artifact repository.

**UTR: Unit Test Report** is a project artifact produced by the product development team. The VVR developer needs this to prepare the Test Results section of the VVR. This document will be available to approved users in the project artifact repository.

**STP: System Test Plan** is a project artifact produced by the product development team. The VVR developer needs this to prepare the System Requirements and Test Description section of the VVR. This document will be available to approved users in the project artifact repository.

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All of the following references are STAR EPL process assets that are accessible in a STAR EPL Process Asset Repository (PAR) on the STAR web site:

[http://www.star.nesdis.noaa.gov/star/EPL\\_index.php](http://www.star.nesdis.noaa.gov/star/EPL_index.php).

**PG-1: STAR EPL Process Guideline** provides the definitive description of the standard set of processes of the STAR EPL.

**PG-1.A: STAR EPL Process Guideline Appendix**, an appendix to PG-1, is a Microsoft Excel file that contains the STAR EPL process matrix (Stakeholder/Process Step matrix), listings of the process assets and standard artifacts, descriptions of process gates and reviews, and descriptions of stakeholder roles and functions.

**PRG-11.1: System Readiness Review Guidelines** are the guidelines for the SRR. It is useful for the developer of the VVR to understand what the reviewers will expect when reviewing the VVR.

**CL-11.1: System Readiness Review Check List** is the check list for the SRR. It is useful for the developer of the VVR to understand the specific Check List items (CLI) that the reviewers of the VVR will be required to approve.

**DG-0.1: STAR Document Style Guideline** is a STAR EPL Document Guideline (DG) that provides STAR standards for the style and appearance of STAR documents developed as Microsoft Word files

**SG-14: STAR EPL Development Scientist Guidelines** provides a description of standard tasks for Development Scientists, including development of the VVR.

**SG-15: STAR EPL Development Tester Guidelines** provides a description of standard tasks for Development Testers, including development of the VVR.

**SG-16: STAR EPL Development Programmer Guidelines** provides a description of standard tasks for Development Programmers, including development of the VVR.

**TG-11: STAR EPL System Integration and Test Task Guidelines** provides a description of standard tasks for process step 11, during which the VVR is developed.

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#### 3.0 ALGORITHM DESCRIPTION

#### 4.0 TEST DESCRIPTION

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    4.2 Test Environments

    4.3 Validation of Requirements

    4.4 System Verification

        4.4.1 Unit Tests

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    4.5 Validation of Operator Needs

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- 7.0 LIST OF REFERENCES

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## 4. SECTION GUIDELINES

This section contains the STAR guidelines for each section of the VVR.

The VVR should follow the STAR standard for style and appearance, as stated in DG-0.1.

### 4.1. Table of Contents

The Table of Contents can be inserted by using Word's Insert → Reference → Index and Tables → Table of Contents function or by pasting the Table of Contents from this DG into your document and updating it for the section headers you make for your document. Use a page break if necessary to ensure that the Table of Contents appears at the top of a page.

### 4.2. List of Figures

A List of Figures should be provided after the Table of Contents. A page break should be used if necessary to ensure that the List of Figures appears at the top of a page. To create a List of Figures, use Word's Insert → Reference → Index and Tables → Table of Figures function, selecting the "Table of Figures" Style. Alternatively, the List of Figures can be created by pasting the List of Figures for this DG into your document.

Figures should be created by using Word's Insert → Picture → From File function or Word's Insert → Object function. Figures should be numbered X.Y, where X is the main section number where the figure resides and Y = 1,N is the ordered number of the figure in the section. Figure captions should have Arial bold 12 point font, should be center justified, and should have a "Table of Figures" Style. A Figure Caption template is provided in Appendix B of this DG.

### 4.3. List of Tables

A List of Tables should be provided after the List of Figures. The List of Tables can appear on the same page as the List of Figures, with three blank lines separating them, provided both lists can fit on the same page. If both lists cannot fit on the same page, a page break should be used to ensure that the List of Tables appears at the top of a page.

To create a List of Tables, use Word's Insert → Reference → Index and Tables → Table of Figures function, selecting the "Table - Header" Style. Alternatively, the List of Tables can be created by pasting the List of Tables for this DG into your document.

Tables should be created with the Table → Insert → Table function. Tables should be numbered X.Y, where X is the main section number where the table resides and Y = 1,N is the ordered number of the table in the section. Table titles should have Arial bold 12 point font, should be center justified, and should have a “Table - Header” Style. A Table Title template is provided in Appendix B of this DG. Table text should have Arial regular 10 point font.

#### **4.4. List of Acronyms**

The use of acronyms is encouraged. A two word or longer name for an item (e.g., Verification and Validation Report) should be given an acronym (e.g., VVR) if the name is used more than once in the document. A List of Acronyms should be provided after the List of Tables. The List of Acronyms should be in alphanumeric order. Use the List of Acronyms in this DG as a template. A page break should be used if necessary to ensure that the List of Acronyms appears at the top of a page.

#### **4.5. Section 1 – Introduction**

The VVR shall include an Introduction Section. This section shall include

- A well-defined purpose and function for the document
- Specific intended user(s)
- How the intended user(s) should use the document
- A responsible entity for generating the document
- A responsible entity for review/approval of the document
- A responsible entity for storage, accessibility, and dissemination
- A brief overview of the contents of each main section

#### **4.6. Section 2 – System Requirements**

Describe the product processing system requirements. This section should explain why the products are being produced, how the products are designed to be produced, and how the

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products are intended to be used. Subsections should include User Needs, Operator Needs, and Requirements Allocation.

- The subsection for User Needs should list the identified product users and state the identified needs for each user. When identifying user needs, keep in mind that the validation of each user need described in this subsection should be reported later in the VVR. User needs typically include:
  - Product components – data formats
  - Product component quality and latency
  - Tools and training for the use of products
  - Delivery and notification procedures
  - Support services
  - Documentation

Be as specific as possible for each user. If the user needs are sufficiently diverse, use separate subsections for each user. If the user needs are mostly similar, separate the common needs from the unique needs – identifying which users each unique need applies to. In the latter case, it may be useful to use separate subsections for Common Needs and Unique Needs.

A table can be useful for presenting user needs. If the number of users is sufficiently small, a common table can be used; otherwise, use separate tables for each user. Alternatively, user needs can be presented as bulleted items.

This subsection should be adopted without revision from Section 2.1 of the STP.

- The subsection for Operator Needs should state the organization that will operate the product processing system and state the identified operator needs. When identifying operator needs, keep in mind that the validation of each operator need described in this subsection should be reported later in the VVR. Operator needs typically include:
  - Procedures for normal operations
  - Procedures for special operations
  - Procedures for normal maintenance
  - Procedures for special maintenance
  - Monitoring and diagnostic procedures
  - Security procedures

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- Tools and training
- Delivery and notification procedures
- Configuration management
- Documentation

A table can be useful for presenting operator needs. Alternatively, operator needs can be presented as bulleted items.

This subsection should be adopted without revision from Section 2.2 of the STP.

- The subsection for Requirements Allocation should explain that all user needs, operator needs, and maintenance needs have been translated into system requirements and the allocation of those requirements to system components and product components. Do not itemize project requirements and requirements allocation; instead, refer to the project RAD where these are documented. Explain that system verification, to be discussed later in the VVR, entails the confirmation that the requirements specified in the RAD are satisfied by the completed product or system that consists of the system components and product components.

This subsection should be adopted without revision from Section 2.3 of the STP.

## 4.7. Section 3 – Algorithm Description

Describe the algorithm that is implemented by the product processing system. Describe the objectives of the algorithm, including the intended output data products and their intended use. State the algorithm process steps and illustrate the algorithm process flow, as documented in the ATBD. This section should explain enough of the algorithm theoretical basis to demonstrate that the algorithm is able to meet the requirements presented in Section 2.

Additional algorithm details are optional. They can be included here at the developer's discretion or by reference to the ATBD and any other pertinent documents. These details include:

- A description of the attributes of the sensing system(s) used to supply data for the retrieval algorithm at a level of detail sufficient for reviewers to verify that the instrument is capable of supplying input data of sufficient quality.

- A description of the fundamental approach for retrieval at a level of detail sufficient for reviewers to determine that the algorithm theoretical description is adequate.
- A listing of the required input data, including primary sensor data, ancillary data, forward models and look-up tables.
- A description of the physical theory.
- A description of the mathematics, including equations.
- Any potential limitations in the intended use of the algorithm and its products.

This section should be adopted without revision from Section 3 of the STP.

## 4.8. Section 4 – Test Description

Describe the tests that have been performed for the verification and validation of the product processing system. These tests should include unit testing of the software units and system testing of the integrated system components and product components. Information in this section should draw from, and be consistent with, the project Verification and Validation Plan (VVP), Unit Test Plan (UTP) and System Test Plan (STP). Subsections should include Test Methods, Test Environments, Validation of Requirements, System Verification, Validation of Operator Needs, Validation of User Needs, and Validation of Products.

- The subsection for Test Methods should describe the verification methods that were used. These should be documented in the VVP, UTP, and STP.
- The subsection for Test Environments should describe the environments in which the tests were performed. Demonstrate that the planned test environments comply with the project's test environment requirements, as documented in the RAD. Adopt information from the project UTP and STP.
- The subsection for Validation of Requirements should describe the steps that were taken to validate the requirements. Requirements validation is concerned with ensuring that the requirements and requirements allocation provide a satisfactory balance between customer/user needs and expectations, NESDIS mission goals, technical feasibility, the available resources and external constraints.

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- Basic requirements are validated by a demonstration that a balance has been established between customer/user needs and expectations, and constraints on the production, distribution and performance of products.
- Derived requirements are validated by a demonstration that they are the best set of requirements to satisfy the basic requirements.
- Requirements allocations are validated by a demonstration that the solution and design provides a feasible, satisfactory implementation for meeting the requirements.
- The plan can be a general plan that applies to all requirements and can also include specific activities that are pertinent to specific sets of requirements. These should be explicitly noted.
- The subsection for System Verification should describe how the system requirements were verified. Verification is the formal process of confirming that the requirements specified for a system are satisfied by the completed system. Verification is customarily performed at the Unit-Layer first and then finalized at the System-Layer following product integration. In that case, there should be separate subsections for Unit Tests and System Test
  - The subsection for Unit Tests should specify the software units that were tested and describe each unit test at a level of detail sufficient for a reviewer to be able to understand the unit test results presented in a later section of the VVR. If desired, use separate subsections for each unit. Adopt information from the project UTP, which should be referenced.
  - The subsection for System Test should describe the verification steps of the system test at a level of detail sufficient for a reviewer to be able to understand the system test results presented in a later section of the VVR. System verification is a comprehensive end-to-end test of the integrated product processing system and all of its components to ensure that all system requirements are satisfied. Adopt information from the project STP, which should be referenced.
- The subsection for Validation of Operator Needs should describe the steps that were taken in the system test to ensure that the operator needs discussed in Section 2.2 of the VVR are satisfied by the product processing system. Each operator need that

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was itemized in Section 2.2 should be traceable to the steps described in this subsection. Adopt information from the project STP, which should be referenced.

- The subsection for Validation of User Needs should describe the steps that were taken in the system test to ensure that the non-product user needs discussed in Section 2.1 of the VVR are satisfied by the product processing system. The product-related user needs are of special importance, so are discussed in their own subsection. Each non-product user need that was itemized in Section 2.1 should be traceable to the steps described in this subsection. Adopt information from the project STP, which should be referenced.
- The subsection for Validation of Products should describe the steps that were taken in the system test to ensure that the product-related user needs discussed in Section 2.1 of the VVR are satisfied by the product processing system. Each product-related user need (e.g. product quality, product latency, product formats) that was itemized in Section 2.1 should be traceable to the steps described in this subsection. Adopt information from the project STP, which should be referenced.

## 4.9. Section 5 – Test Results

Describe the results of the tests that were described in Section 4 in a way that demonstrates the verification and validation of the product processing system. Subsections should include Validation of Requirements, System Verification, Validation of Operator Needs, Validation of User Needs, and Validation of Products.

- The subsection for Validation of Requirements should report on the results of the steps that were taken to validate the requirements. These steps were described in Section 4.3 of the VVR. Show how the results demonstrate that the requirements and requirements allocation provide a satisfactory balance between customer/user needs and expectations, NESDIS mission goals, technical feasibility, the available resources and external constraints. Note any requirements whose validation is incomplete or questionable.
- The subsection for System Verification should report on the results of the tests performed to verify the system requirements. These tests were described in Section 4.4 of the VVR. Verification is customarily performed at the unit level first and then finalized at the system level following product integration. In that case, there should be separate subsections for Unit Tests and System Test

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- The subsection for Unit Tests should report the results of the unit tests that were described in Section 4.4.1 of the VVR. Show how the results demonstrate that the requirements allocated to the software units are satisfied. If desired, use separate subsections for each unit. Note any requirements allocations whose verification is incomplete or questionable. Adopt information from the project UTR, which should be referenced.
- The subsection for System Test should report the results of the verification steps of the system test that were described in Section 4.4.2 of the VVR. Show how the results demonstrate that the requirements allocated to the system components are satisfied. Note any requirements allocations whose verification is incomplete or questionable.
- The subsection for Validation of Operator Needs should report on the results of the steps that were taken in the system test to ensure that the operator needs discussed in Section 2.2 of the VVR are satisfied by the product processing system. These steps were described in Section 4.6 of the VVR. Show how the results validate operator needs. Note any operator needs whose validation is incomplete or questionable.
- The subsection for Validation of User Needs should report on the results of the steps that were taken in the system test to ensure that the non-product user needs discussed in Section 2.1 of the VVR are satisfied by the product processing system. These steps were described in Section 4.7 of the VVR. Show how the results validate non-product user needs. Note any non-product user needs whose validation is incomplete or questionable.
- The subsection for Validation of Products should report on the results of the steps that were taken in the system test to ensure that the product-related user needs (e.g. product quality, product latency, product formats) discussed in Section 2.1 of the VVR are satisfied by the product processing system. These steps were described in Section 4.8 of the VVR. Use separate subsections for each distinct product in the system. For each product, use subsections for Product Description, Product Requirements, and Test Results.
  - The subsection for Product Description should describe the composition of the product, noting each product element that has a testable requirement.

- The subsection for Product Requirements should state the system requirements specific to each testable element in the product description.
- The subsection for Test Results should report on the test results pertinent to each testable product element, showing how the test results validate the product. Note any product elements whose validation is incomplete or questionable.

## **4.10. Section 6 – Summary: Risks and Limitations**

Summarize the results of the verification and validation tests that were described in Section 4 and reported in Section 5.

Itemize requirements whose validation is incomplete or questionable. These should have been identified in Section 5.1 of the VVR. Use a table or bulleted text. Note risks and limitations due to incomplete validation.

Itemize system requirements whose verification is incomplete or questionable. These should have been identified in Section 5.2 of the VVR. Use a table or bulleted text. Note risks and limitations due to incomplete verification.

Itemize operator needs whose validation is incomplete or questionable. These should have been identified in Section 5.3 of the VVR. Use a table or bulleted text. Note risks and limitations due to incomplete verification.

Itemize non-product user needs whose validation is incomplete or questionable. These should have been identified in Section 5.4 of the VVR. Use a table or bulleted text. Note risks and limitations due to incomplete verification.

Itemize product elements whose validation is incomplete or questionable. These should have been identified in Sections 5.5, 5.6... of the VVR. Use a table or bulleted text. Note risks and limitations due to incomplete verification.

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## 4.11. Section 7 – List of References

This section should consist of a List of References that includes all references cited in the document. Include all references deemed useful by the Product Team. References should be listed in alphabetical order. References that begin with an author list should begin with the last name of the lead author. A template is provided in Appendix B.

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## **APPENDIX A - EXAMPLES**

An example of a VVR that follows the STAR standards and guidelines will be developed and placed in the STAR EPL PAR.

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## **APPENDIX B - TEMPLATES**

This appendix contains templates for specific pages and sections of the VVR.

# NOAA NESDIS STAR

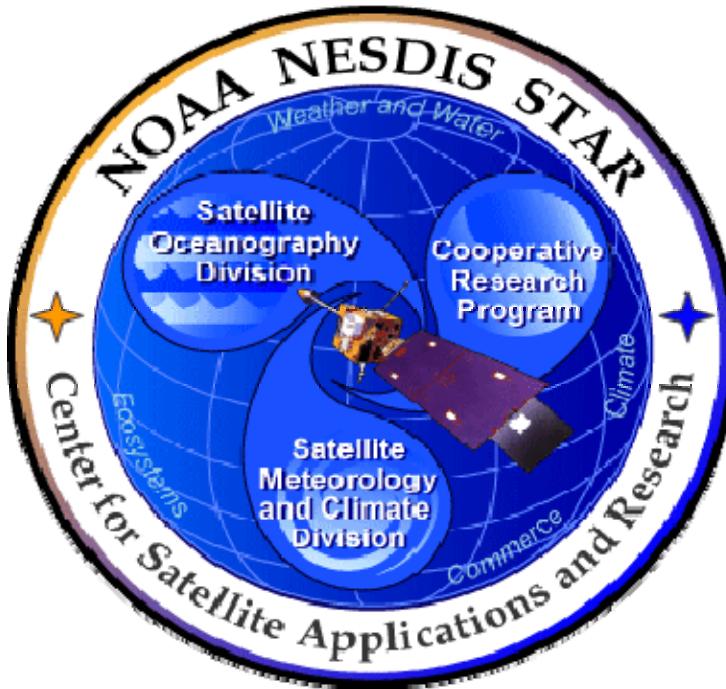
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## B.1 Cover Page Template:

In this template, <X> = 1.0 for version 1, <X> = 1.1 for version 1 revision 1, <X> = 2.0 for version 2 etc. <Project Name> should be the actual approved name of the Project.



# NOAA NESDIS CENTER for SATELLITE APPLICATIONS and RESEARCH

**<PROJECT NAME>**  
**VERIFICATION AND VALIDATION REPORT**  
**Version <X>**

# NOAA NESDIS STAR

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## B.2 Document Header Template:

In this template, <X> = 1.0 for version 1, <X> = 1.1 for version 1 revision 1, <X> = 2.0 for version 2 etc.

In this template, <Project Name> should be the actual approved name of the Project.

In this template, <Y> = the actual page number.

In this template, <Z> = the actual total number of pages

## NOAA/NESDIS/STAR

VERIFICATION AND VALIDATION REPORT

Version: <X>

Date: <Date of Latest Signature Approval>

<Project Name>

Verification and Validation Report

Page <Y> of <Z>

---

## B.3 Document Cover Page Footer Template:

Hardcopy Uncontrolled

## B.4 Document Footer Template:

Hardcopy Uncontrolled

Hardcopy Uncontrolled

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## B.5 Approval Page Template:

In this template, <X> = 1.0 for version 1, <X> = 1.1 for version 1 revision 1, <X> = 2.0 for version 2 etc. <Project Name> should be the actual approved name of the Project.

TITLE: <PROJECT NAME> VERIFICATION AND VALIDATION REPORT VERSION <X>

AUTHORS:

<Lead Author>  
<Co-Author 1>  
<Co-Author 2>  
<etc.>

APPROVAL SIGNATURES:

---

<Name of Project Development Lead> <Actual Signature Date>  
Project Development Lead Date

---

<Name of Project Manager> <Actual Signature Date>  
Project Manager Date

---

<Name of Agency Approver> <Actual Signature Date>  
Agency Date

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## B.6 Version History Page Template:

In this template, <Project Name> should be the actual approved name of the Project.

<PROJECT NAME>  
VERIFICATION AND VALIDATION REPORT  
VERSION HISTORY SUMMARY

Version	Description	Revised Sections	Date
1.0	Created by <Name of Developer(s)> of <Name of Developers' Agency/Company> for System Requirements Review.	New Document	<Actual date of Latest approval signature>
1.1	[As needed] Revised by <Name of Developer(s)> of <Name of Developers' Agency/Company> to describe changes during operations	<applicable sections>	<Actual date of Latest approval signature>
1.2	Ditto	Ditto	Ditto
etc.			

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## B.7 Figure Caption Template:

**Figure 2.3 - <Figure caption in Arial regular 12 point font>**

## B.8 Table Title Template:

**Table 4.5 - <Table title in Arial regular 12 point font>**

## B.9 List of References Template:

Ackerman, S. et al. (1997). Discriminating clear-sky from cloud with MODIS: Algorithm Theoretical Basis Document, Version 3.2.

Asrar, G., M. Fuchs, E. T. Kanemasu, and J. L. Hatfield (1984). Estimating absorbed photosynthetically active radiation and leaf area index from spectral reflectance in wheat. *Agron. J.*, 76:300-306.

Bauer, E., and Kohavi, R., (1998). An empirical comparison of voting classification algorithms: bagging, boosting, and variants, *Machine Learning*, 5: 1-38.

Bonan, G.B. (1995). Land-atmosphere interactions for climate system models: Coupling biophysical, biogeochemical, and ecosystem dynamical processes. *Remote Sens. Environ.*, 51:57-73.

Food and Agriculture Organization of the United Nations, *Digital Soil Map of the World and Derived Soil Properties-Version 3.5*, FAO/UNESCO, Rome, 1995.

Friedl, M. A., and C.E. Brodley (1997). Decision tree classification of land cover from remotely sensed data. *Remote Sens. Environ.*, 61:399-409.

Scepan, J. (1999), Thematic validation of high-resolution global land-cover data sets. *Photogramm. Eng. Remote Sens.*, 65:1051-1060.

Shukla, J., C. Nobre, and P. Sellers (1990). Amazon deforestation and climate change. *Science*, 247:1322-1325.

Wilson, M.F., and A. Henderson-Sellers (1985). A global archive of land cover and soils data for use in general circulation models. *J. Clim.*, 5:119-143.

Wu, A., Z. Li, and J. Cihlar (1995). Effects of land cover type and greenness on advanced very high resolution radiometer bidirectional reflectances: analysis and removal. *J. Geophys. Res.*, 100: 9179-9192.

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END OF DOCUMENT