Science Ready Data Products

Program Management Plan
Project 530
Draft

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Change Record

VERSION	DATE	BY	REASON
.01	9/13/2019	Treacy, Kern	initial draft
.02	10/16/2019	Treacy, Kern	
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.05	3/20/2020	Treacy	Global edits from pre CoDR review

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1. OVERVIEW

The Science Ready Data Products (SRDP) Program Office is under the Science Support and Research (SSR) Department and serves to leverage Project Management and Systems Engineering practices to establish and refine processes for which SSR is typically responsible. Once the project goals are met, the steady state support transitions to the appropriate SSR team or role.

The program began with NRAO's SRDP initiative, which evolved from a single project to include several related efforts, each of which is a unique project. Managing these efforts as a single project was considered and rejected. Although the projects are closely related, they are sufficiently different that Project Management (PM) and Systems Engineering (SE) processes must be tailored for each project. The need for organizing these parallel efforts under a program became evident as process similarities were recognized, yet it became impractical to manage all the projects from a single set of project planning documents.

Approaching these projects as a program offers increased efficiency and consistency within the PM and SE processes while providing the required flexibility. In addition, this consolidated approach improves engagement with stakeholders that are frequently identified with more than one of the SRDP managed projects, and leverages the successful engagement model developed by the SRDP project. To avoid ambiguity, the SRDP project has been renamed the Science Ready Archive and Operations (SRAO) project. Projects currently managed under the SRDP Program Office include:

- Science Ready Archive and Operations (SRAO)
- Telescope Time Allocation Tools (TTAT)
- Very Large Array Sky Survey (VLASS)
- Unlocking the Radio Sky with Next-Generation Survey Astronomy

Note: "Unlocking the Radio Sky with Next-Generation Survey Astronomy" is the NRAO sub award of the Canadian Initiative for Radio Astronomy Data Analysis (CIRADA).

1.1. Reference Documents

[RD01] SRDP Project Charter 530-SRDP-001-MGMT (note: legacy title and doc. number)
[RD02] TTA Tools Charter 530-SRDP-039-TTAT
[RD03] VLASS Project Charter NRAO-305-146
[RD04] MOU between CIRADA and AUI (Mar 23, 2018)
[RD05] SoW: Unlocking the Radio Sky with Next-Generation Survey Astronomy Doc. No. 2018.585.006
[RD06] VLASS Transition Plan 623-VLASS-001-MGMT
[RD07] SRDP Risk Register 530-SRDP-006-MGMT (Program level document)
[RD08] NRAO Observatory Risk Management PMD00163
[RD09] SRDP Lexicon and Acronyms 688-TTAT-028-MGMT
[RD10] PMD SOP Project Reviews Process PMD00219

1.2. Acronyms

AD Assistant Director

ALMA Atacama Large Millimeter-Submillimeter Array
AUI Associated Universities Inc.
BI Broader Impact
CASA Common Astronomy Software Applications
CIRADA Canadian Initiative for Radio Astronomy Data Analysis
CIS Computing Information Services
CoDR Conceptual Design Review
DO Director's Office
EDP Enhanced Data Products
FTE Full Time Equivalent
L0 Concept, Use Case, and Stakeholder Level Requirement
L1 System Level Requirement
L2 Subsystem Level Requirement
LOE Level of Effort
LSP Legacy Science Program
LST Local Sidereal Time
MBSE Model Based Systems Engineering
MOU Memorandum of Understanding
MVP Minimum Viable Product
NRAO National Radio Astronomy Observatory
NSF National Science Foundation
PDR Preliminary Design Review
PM Project Management/Manager
PMD Program Management Department
POP Program Operating Plan
QA Quality Assurance
QSU Quarterly Status Update
R&D Research and Development
RACI Responsible Accountable Consulted Informed (matrix/chart)
RID Review Item Discrepancy
RVTM Requirements and Verification Traceability Matrix
SE Systems Engineering/Engineer
SOW Statement of Work
SRAO Science Ready Archive and Operations
SRDP Science Ready Data Products
SSA Science Support & Archive
SSR Science Support & Research
TPM Technical Performance Measure
TTAT Telescope Time Allocation Tools
VLA Very Large Array
VLASS VLA Sky Survey
VLBA Very Long Baseline Array

2. PURPOSE

The purpose of the SRDP Program Management Plan is to briefly outline each of the projects currently in the program, describe the relationships between them, and identify elements and processes commonly applied to each. The SRDP Program Plan serves as a top-level entry point to the documentation set for each of the projects. Each project may be subject to separate internal or external reviews; therefore, the program plan is critical to each project since it defines structures and processes that apply to each. This documentation structure also positions the SRDP Program to more easily launch new projects and close existing ones, with minimal impact to other project's documentation under the program. A full description of the goals and objectives for each of the following program components is provided in the respective project documentation. This program plan does not attempt to duplicate that information, the reader is directed to the project documentation for those details. The reference documents provided in this plan serve as a starting point for descending into project documents.

Project management and systems engineering processes are necessarily moving toward Model Based System Engineering processes and tools. This presents as much an opportunity as it does a challenge on several fronts. In the interest of expediency, the design team works best in the electronic modeling domain; where observatory culture is more comfortable with traditional processes and document hierarchy. SRDP seeks to bridge these somewhat disparate expectations to meet the needs of all stakeholders. The use of various tools for communication, issue tracking, and design are referenced throughout this document for the purpose understanding how critical processes are accomplished. Any tools mentioned are not mandated, as best practices continue to evolve and better tools are found to improve processes.

3. SRDP PROGRAM COMPONENTS

3.1. Science Ready Archive and Operations (SRAO)

The SRAO project (in collaboration with existing observatory management structures) will develop and implement the software tools, scientific heuristics, and operations structures to deliver science quality data products to the NRAO user community, both as it exists now, and the foreseen expansion of the community to include non-traditional radio astronomers. To that end, the SRAO has established a forward-looking roadmap to deliver capability incrementally. Delivery is planned on an annual cadence, which currently supports expanded capability for VLA and ALMA data products. Since SRDPs are a new concept for the NRAO, the project is structured to be flexible with changes to requirements and scope, which will come through experience from early deployments. Discussions suggest that scope may be expanded in the future to include VLBA. Refer to project documents for more details, beginning with the SRAO Project Charter [RD01].

3.2. Telescope Time Allocation Tools (TTAT)

The NRAO has undertaken a rewrite of the Telescope Time Allocation Tools (TTAT), upon which both observatory operations and the SRAO project are critically dependent. The development timeline for the TTAT effort is expected to be rather short compared to delivering the full SRAO roadmap. The goal for delivering TTAT is to be lean, only creating additional documents and processes as needed to address differences in the programmatic approach. Data Management and Software (DMS) has adopted a disciplined iterative design approach for this project, which will be progressively implemented in

development phases.. Refer to project documents for more details, beginning with the TTA Tools Project Charter [RD02].

3.3. Very Large Array Sky Survey (VLASS)

New Mexico Operations launched the VLA Sky Survey (VLASS) prior to initiation of the SRDP Project. A major objective of the VLASS is to showcase capabilities of the VLA, following its commissioning as the Jansky Very Large Array, creating a synoptic survey of the entire observable sky. VLASS was a pathfinder for SRDP and operationally is very similar to the SRAO operations. The VLASS products are produced through coordinated efforts of the New Mexico Operations (NM-Ops) and the SRDP Project. DMS plays an enabling role providing the tools, algorithms, and computing capabilities required to execute the survey. SRDP is responsible for the overall project delivery. Refer to project documents for more details, beginning with the VLASS Project Charter [RD03]

3.4. Unlocking the Radio Sky with Next-Generation Survey Astronomy

The Canadian Initiative for Radio Astronomy Data Analysis (CIRADA) will establish an archive to provide enhanced data products from several sources, including VLASS images. The VLASS team under NRAO provides a supporting (in-kind) role in accordance with the agreement under the MOU between CIRADA and AUI [RD04] and NRAO deliverables to CIRADA defined in the SoW [RD05]. This project is NRAO's internal project to deliver these in-kind contributions. In summary, deliverables to CIRADA include requirements needed for archive access, ability to ingest external catalogs, re-processing to support production of external Advanced Catalogs, time cutouts and visibility data from RealFast, transient alerts, QA and reporting. Refer to project documents for more details, beginning with the MOU [RD04] and SoW [RD05].

4. PROGRAM OFFICE ORGANIZATION

The internal organizational chart of the SRDP Program Office is shown in Figure 1. Note: the project office roles for CIRADA are simply the Project Director and PM, not shown in the organizational chart.

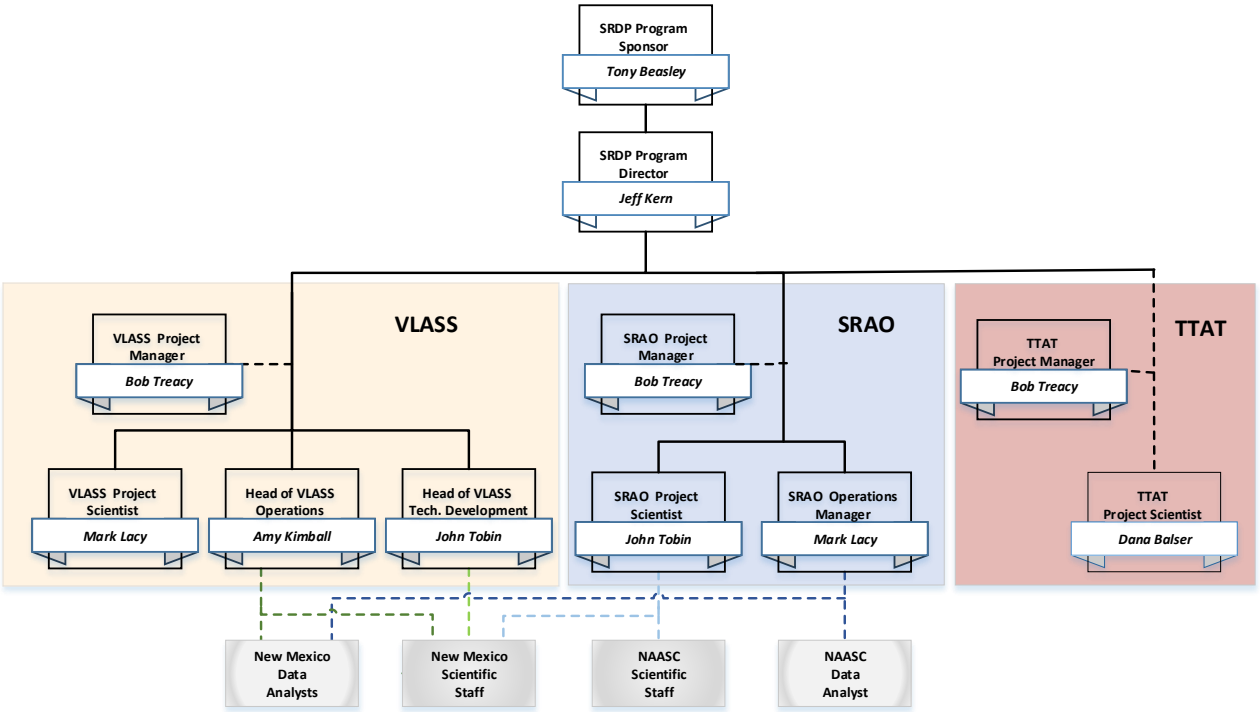

Figure 1 SRDP Program organizational chart showing direct and matrixed lines of reporting. Colors designate NRAO departments.

5. COMMON PROGRAM AREAS

5.1. Management Processes

SRDP projects are all defined at the highest level with a Project Charter (or as with CIRADA, the charter level document is a Memorandum of Understanding). SRDP project plans each address the primary constraints (budget, schedule, and scope). SRDP Projects are funded through existing operations funds, relying on departmental contributions of FTEs. SRDP Projects are therefore fundamentally priority and spend rate limited and must be managed through scope and schedule. Budgets are calculated in terms of the requested resources (not dollars). Resources for SRDP Projects are requested at the annual NRAO Budget and Resource Summit and allocated against other observatory objectives and priorities. Although not always explicitly stated in each of the project charters, they may also address secondary constraints (risk, quality, and resources), assumptions, and a definition of success. The purpose of the charter is to establish the preliminary baseline, identify key stakeholders and stakeholder groups, and get commitments from line managers for matrixed resources. Documents beneath the Project Charter develop plans, metrics, and tracking mechanisms to the degree needed to meet project objectives.

5.1.1. Stakeholder Management

SRDP Projects identify and engage internal and external stakeholders through the processes and plans defined under each project. Project communication plans include the schedule and venue for stakeholder communication, while the RACI Matrix (Responsible, Accountable, Inform, and Consent) identifies the

stakeholder roles and level of engagement.

SRDP Stakeholders have been identified within various groups both internal and external to NRAO as anyone that SRDP Project work has the potential to impact. Primary groups include NRAO Scientists, Data Analysts, management, developers, and Operations Staff; both within VLA and ALMA. External to NRAO are the CASA Users Committee, the NRAO Users Committee and the users they represent, AUI, and of course NSF. Stakeholder management includes work within various project requirements committees, which serves as a proxy for communicating needs from the user communities to the projects. Needs within the stakeholder base inform the project communication plans, as well as the requirements management plans. The Project Office leverages every opportunity to socialize objectives of SRDP, manage expectations within the user community, inform NSF through the Program Operating Plan and QSU reporting, and through EPO. Some projects, namely the TTAT, also involve partnering with the Green Bank Observatory, as a separate AUI observatory. Details for engaging the user community, other stakeholders, and project partners are addressed in project stakeholder and communications plans.

5.1.2. Scope Management

Apart from documentation and reports, nearly all of the SRDP Project deliverables are software or data products. With cost as the secondary constraint for most of these projects, scope is managed within the availability of resources. For projects such as SRAO, overall project scope is established as a long term capability roadmap and delivered incrementally in successive annual development cycles. Deliverables for each cycle are negotiated with stakeholders in advance and used to baseline deliverables within the planning horizon for the current development cycle.

Scope for TTA Tools is well characterized in advance, however the capability is delivered incrementally for test and integration in order to provide early assessment of capabilities. Scope is managed to meet schedule through use of a Minimum Viable Product (MVP). An MVP is established for the immediate planning horizon as well as for the overall project scope.

Although scope for VLASS and the CIRADA sub award was well established prior to being absorbed into the SRDP program, any future changes to scope are subject to change control processes defined in this document. The working baseline for VLASS was established with significant uncertainty regarding single epoch image production, where the challenge is to secure adequate processing resources for image production within an acceptable delivery schedule. Processing constraints have a potential for changes to VLASS scope. CIRADA deliverables have a dependency on VLASS image production, which will certainly be delayed but will likely meet the intended scope.

5.1.3. Schedule Management

Most SRDP projects commit to progressive delivery, where the overall project schedule is contained in the Capability Roadmap. The Roadmap is partitioned to reflect capability intended for delivery within each planning horizon. As described in Sec. 5.1.2 on Scope, the minimum capability is defined within the MVP. SRDP projects are managed using a hybrid approach (neither waterfall, nor strictly agile). Overall scope is defined and allocated to progressive deliveries, within each delivery the details and priorities are managed in a more agile manner. The MVP bridges these two approaches, defining the minimum capability that must be met to realize the schedule baseline for the current planning horizon. This allows the schedule to be maintained with the minimum usable scope delivered. Simply meeting the MVP is a highly undesirable outcome, since the remaining work needs to be carried forward and introduces risk of

further slips. Simply meeting MVP raises a flag that problems must be addressed to avoid putting the project in jeopardy.

A computer based scheduling tool is used to manage schedules at the project level. This is coupled with lower level tasks scheduled in Jira, where Jira issues map to schedule tasks and roll up to project milestones. The milestones are markers in the schedule baseline which are used to monitor overall progress and inform reporting.

5.1.4. Cost and Resource Management:

Project resources for SRAO, TTA Tools, VLASS, and CIRADA are matrix managed from other departments across the observatories and thus direct budgetary authority resides in those departments and sites. The SRDP program will maintain a staffing model within project level cost management plans as a means to inform other departments of the resource needs to meet SRDP project objectives. The SRDP Program Office does not have direct supervision of resources within departments, therefore detailed budgeting and cost tracking is done within the department providing deliverables to the SRDP projects. Although project deliverables are the responsibility of the SRDP Program Office, projects have a critical dependency on sustained commitment of departmental resources. SRDP typically manages requirements, validation, and overall project planning, but implementation by DMS is a key deliverable to the SRDP projects. Project costs are largely driven by staffing levels. There is no direct procurement anticipated within the SRDP Project Office (See Sec. 5.1.8). Costs are tracked through the use of the following subsidiaries, appended to business units from which effort is contributed. SRDP and TTA Tools use "SRDP", VLASS uses "VLASKY", and CIRADA uses "CIRADA".

- CIRADA – This is a special case regarding cost tracking. NRAO In kind contributions to CIRADA are defined in a budget included in the SoW [RD05]. Actual costs must be compiled and provided in the financial report to CIRADA as defined in [RD05].

5.1.5. Communication

Communication is first defined at the program level, given the related topics with team members supporting multiple SRDP projects. The Program Communication Plan (table in APPENDIX A – COMMUNICATION PLAN) highlights various meeting cadence, venue, and participation; reporting by frequency, media, and audience, and other outreach of benefit to the overall SRDP program and stakeholders. Project planning under SRDP also includes a communication plan with similar criteria that is unique to each specific project.

5.1.6. Reporting

- **Monthly** – Monthly reports to the Observatory Director's Office are four square exception reports. These are with respect to the project's Performance Measurement Baseline (PMB). The PMB has a strict definition under an earned value system, where cost, schedule, and scope are integrated into a structure that allows tracking and forecasting. To date, SRDP projects have not instituted earned value, but have used alternate methods to establish the project baseline. This has typically been done through a slide deck of project briefing slides, which describe the project

baseline, milestones, risk, and other project information. The four square report is included in the slide deck, which is updated when a four square is required, or quarterly for projects with less frequent activity and submitted to the Assistant Director of PMD. NRAO Reports to CIRADA, on a monthly cadence, hours that have been charged to the CIRADA subsidiary.

- **Quarterly** – The NRAO Program Operating Plan (POP) is written annually and reviewed quarterly by NSF. Projects under CSA funding include a description of their goals and objectives, with major milestones identified in the POP. Four Square exception reports are used for the POP also, and need only be submitted if POP milestones are jeopardized, added, or changed in some way. A "single page" bulleted list of SRDP achievements is compiled and distributed to the "NRAO coord" email list, to keep ADs apprised of progress. NRAO reviews the observatory risk registers on a semi-annual basis, selected risks from the program risk register are promoted to the Observatory Risk by the Program Director and AD-SSR. Risks on the Observatory Register are managed following the observatory process
- **Annual** – SRDP contributes to an annual report to NSF on overall performance against the POP. NRAO Reports annually to CIRADA, a compilation of the in-kind contribution from NRAO to CIRADA, expressed in Canadian dollars.
- **AUI Presentations** – The Observatory Director presents on observatory activity to the AUI Board twice a year and to the AUI Executive Committee four times a year. SRDP contributes material to these presentations.
- **User Community** – The SRDP Project Office looks for a variety of interactive opportunities to engage the user community; some are formal, others ad hoc. Scientists on the team present at conferences, participate in User Community meetings, and engage the AUI Visiting Committee and ALMA Board when opportunities arise. Members of the User Communities are solicited for requirements input and are typically invited to serve on project review panels. Each project defines the proper level of reporting to and engaging the user community.

5.1.7. Risk and Issue Management

Risks and opportunities are continually maintained for each of the SRDP Projects in the SRDP Program Risk Register [RD07], a format matching the NRAO Risk Register, a subsidiary document to the NRAO Risk Management Plan [RD08]. Scores and weight assigned to project risks use the same scale as the observatory risk register. Each project reviews their risk register in detail at least twice a year in preparation for the NSF quarterly POP review, where summarized, high priority risk is reviewed every other quarter. The NRAO Risk Register is a deliverable document to NSF and is submitted annually with the Observatory Program Operation Plan. The Project Director, Project Manager, and Assistant Director for SSR review the project risk registers for risk that should be escalated to the observatory level.

Triggered Risks become active issues and are entered into the issue log tab, retaining the Risk ID number. Issues that are not sourced from triggered risk shall have a separate ID notation. Active issues are incorporated into the project plan and may impact the baseline, therefore a plan to manage an active issue may be subject to change control. Triggered risk that that can be completely addressed as an active issue should be retired. Risk that is partially triggered or has residual risk (secondary, tertiary) is reassessed, perhaps redefined, and maintained as an open risk. Active Issues are carried in the issue log until they have been fully incorporated into the revised project plan. Issues are retired or become inactive upon approval of a documented plan for resolution and need not be maintained in the issue log through final resolution. The issue owner may not be the same entity as the risk owner. All issues shall

have an owner until the issue becomes inactive.

5.1.8. Procurement Management

The SRDP program does not foresee a need for an independent procurement process. Computing resources are supplied by the DMS department as part of the observatories overall computing capabilities. Individual computing resources (desktops) will be provisioned following the standard NRAO process. Shared resources (cluster nodes, lustre storage, network infrastructure) will be provisioned by the DMS department.

5.2. Documentation

Project management processes are evolving to exploit collaborative work environments and shared computing environments that support these tools. This presents both an opportunity and a challenge to balance effort spent generating documents vs. using information within various tools as the record of authority. Each project includes a document set established as a result of process tailoring during project initiation. This document set is listed in a project log for each project, documents are maintained in a shared network folder, and version control is used to manage document changes. The legend for document numbering is provided in the document log. Day to day activities, task tracking, and team communications are managed within collaborative environments.

5.3. Decision Authority and Change Management

SRDP Change Management is typically defined on several levels as follows; however each project may have additional criteria defined for particulars cases:

- Decisions can arise as the result of tradeoffs, issue resolution, priorities, resource conflicts, and a number of other sources. Decisions are not at a level of needing change management. However, significant decisions are captured in a decision log with the discussion record, date, and list of stakeholders associated with each decision. The Project Director holds approval authority for all project decisions captured in the project log.
- Changes to controlled documents which do not impact the project baseline are approved in accordance with the document content. In order to ensure documentation conforms to project standards, all documents shall be approved by the Project Manager and Project Director. In addition to these approvals, the following also applies:
    - Documents with scientific content or implications shall also be approved by the Project Scientist
    - Documents that have operational impact shall be approved by the Project Operations Manager
    - Note that some documents may have both scientific and operational impact
    - Documents with potentially broader impact are also subject to approval by the Project Sponsor, this step is at the discretion of the Project Director.
- Changes to documents that define the project baseline and the proposed changes alter the approved baseline shall be approved by the Project Manager, Project Director, and the Project Sponsor and shall subsequently be submitted to the NRAO Change Control Board

Changes to Configuration are addressed under project systems engineering processes, documented in the respective sections in project documentation on Configuration Management.

5.4. Engineering Processes

- **Requirements Elicitation –** Stakeholders associated with any particular project span multiple disciplines, represent internal and external entities, and respond to different types of engagement. Therefore, the elicitation process and supporting documents can look different across individual projects. Experience in the program has shown that establishing concept level use cases provides a good starting point to capture requirements in narrative, which are decomposed to formal stakeholder level requirements. A weakness in this approach is that uses cases do not capture non-functional requirements very well. Translation of use cases to requirements requires analysis, which includes the elaboration of non-functional requirements. Mechanisms for gathering and documenting stakeholder input include but are not limited to formal committee appointments and concept documents; stakeholder collaboration via wiki, Confluence, Jira, or other on line environments; whitepapers, memos, and memo series; and any other ad hoc engagement with stakeholders. This elicitation process is followed by analysis and decomposition to formal requirements. The record of authority for verification and validation becomes the approved requirement hierarchy described below. In the case of requirements managed in a database, the record of authority is the data base and any generated documents are a secondary artifact. In the case of requirements managed in a document structure, the requirements document is the record of authority.

- **Requirements Management** – The Requirements Management Process will ensure that the defined scope (and only the defined scope) will be delivered. Requirements are typically defined and managed on three levels, L0, L1, and L2.
    - L0 - System Concepts are first captured in a narrative, then translated to use cases and requirement statements
    - L1 - System Level Requirements are decomposed from L0 requirements, analyzed for conflicts, non-functional, and other derived or implied requirements.
    - L2 - Implementation level requirements are decomposed from L1 requirements using a similar analysis as for L1 requirements for each planning wave. Requirements at this level inform the development tasks which are typically implemented and verified within DMS.

- **Architectural Design**
    - Design is ideally conducted on three levels; conceptual, logical, and physical. Requirements are to be allocated to architectural design elements such that the design is constrained to match the scope, as defined in requirements:
        - All requirements are allocated
        - All architectural elements trace to requirements
        - Architectural elements to be added must reflect a revision to requirements

- **Verification**
    - Verification tests include unit tests, integration tests, and should satisfy not only the "happy path" but also a broad set of test parameters which are generally chosen to represent boundary conditions.
    - Verification is largely performed within DMS, with test procedures and compliance criteria subject to project approval.

- **Validation**

- Validation tests are ultimately formed to validate the uses cases. However, a full validation of L0 requirements may not be realized until capability has been commissioned for some time.
- Validation is typically progressive as functionality is delivered within the test environment. Incremental validation of L1 (child) requirements is used as a measure of progress toward full validation of the L0 (parent) requirement, where validation of the L0 parent requirement is considered complete when all child requirements have been validated.
- Validation is the responsibility of the Project Scientist, with support from data analysts and other scientists working in operations.

- **Reviews** – Each project is subject to periodic reviews, as defined within the lifecycle for each project. General guidance for conducting reviews is found in [RD10] PMD SOP Project Reviews Process. As each project's needs differ, the review profile is tailored to fit the project. Reviews are an opportunity for ensuring individual projects align with overarching programmatic strategy, observatory priorities, and also for engaging external user inputs.

5.5. Quality Management:

To avoid confusion, it is important to recognize that there are several types of quality management associated with SRDP projects. Several quality management descriptions follow:

- Data Product Quality Management (or Quality Assurance): The objective of this process is to ensure the quality of every data product delivered from the SRDP Program. The Data Product Quality Management will be described in project level documentation, as it applies to each project.
- Data Process Quality Management: This is the quality management of the process of delivering products to the user community. Again, this process will be described in project level documentation, as it applies to each project.
- Project Quality Management defines the process by which we ensure the quality of the deliverables from the project. The quality of the deliverables from the projects are measured by the extent to which they achieve the key drivers. We will use a metric driven approach to measure and track project quality, on timescales commensurate with the implementation phases. The applicable metrics are defined for each project within the requirements management processes.

5.6. Broader Impact, Education, and Public Outreach

SRDP projects support observatory goals for Broader Impact (BI), and Education and Public Outreach (EPO) by engaging staff in these areas as key project stakeholders.

6. PROJECT EXECUTION

The execution of project plans leverages various tools for planning and tracking. Although not mandated, the use of tools has been converging along common lines. The following list identifies current tool use across the program (note that DMS makes additional use of some of these tools, which is not included in this list):

- Microsoft Project – scheduling tool
- SharePoint
  - Document repository

  - Approval workflows
- Jira – used for a variety of tracking needs which include the following:
  - General action item tracking
  - Implementation of L2 requirements (managed within DMS)
  - Roll up implementation tasks to Epics for project level milestone tracking
  - Validation Test tasks against L1 requirements
  - RID Management during project reviews
- Confluence
  - Meeting agendas and notes
  - Decision log
  - Requirements elicitation
  - Communicate project plan execution to team
  - Team Calendar
  - Project Reviews
  - Links to project document repository
- Microsoft Excel
  - Risk Register (Based on Observatory template)
  - Cost and Resource Projections
- Cameo
  - Requirements Management data base
  - Requirements Validation Tracking Matrix (RVTM)
  - Architectural modeling
  - Integration of requirements, design, verification, and validation

7. OPERATIONS

The SRDP Program Office largely exists to establish new processes, drive process improvement changes, and transition the same to operational routines. The SRAO project provides incremental capability to the user community, which necessitates that operational processes must come on line early in the project phase. Similarly, the VLASS project is in a defined finite operational phase, although continued development is ongoing. Thus SRDP projects may have an operations component within the project office that will matrix resources from New Mexico and ALMA Operations. Operations and Transition Plans incorporate necessary elements for a smooth and gradual handover from the project office to observatory operations. In contrast, the TTA Tool deployment will not result in appreciable operational changes to warrant an operational plan. Although the new tools may be significantly enhanced, they are functionally equivalent and are not expected to drive any process changes in operations.

Operations Management plans are developed as applicable to the specific project, to achieve goals and objectives defined in the project charter and planning documents. Operations Plans include Data Quality and Data Process Quality Plans and defined processes to meet quality goals.

8. CLOSEOUT

Project management strategies that establish SRDP processes typically yield to operational strategies, which will allow for continuous enhancement and improvement to the operational processes established in each project area. A project closeout report shall be submitted to the Project Sponsor and NRAO Director affirming that an SRDP project has met all high-level deliverables. The report shall address the degree to which the project performed against its original plan, budget, schedule and technical

parameters and also capture lessons learned.

For the current set of SRDP projects, we anticipate TTA Tools, VLASS, and Unlocking the Radio Sky with Next-Generation Survey Astronomy will close normally and completely with transition planning for each included in closeout. SRAO will incrementally handoff new processes to operations as capability is delivered. At the time the initial capability roadmap nears completion, our current direction is to close the project out through a Transition Plan. Given the uncertainty of community acceptance, there may be ongoing demand for continued SRAO enhancements. A decision to extend the current management strategy in response or to launch a new project to meet ongoing community needs cannot be made at this time.

APPENDIX A – COMMUNICATION PLAN

Program Communication Plan							
Communication Type	**Objective of Communication**	**Medium**	**Frequency**	**Audience or Participants**	**Owner**	**Deliverable**	**Format**
SRDP Project Administration Meeting	Inform flow to team leads, escalate issues to PD	Face to Face Conference Call	Weekly	Project Team leads	PD	Meeting notes	Confluence
SRDP/DMS Coordination meeting	Inform flow to team members, escalate issues to PD	Face to Face Conference Call	Weekly	Project Team Members and Project Office	DMS Lead	Meeting notes	Confluence
SSA Quarterly Planning Meeting	Agree on global priorities for SSA development in the next three-month period	Face to Face Conference Call	Quarterly on 1st Fri of the month	DMS staff and PD	SSA Group Lead	Meeting notes	Confluence
CASA Stakeholder Meeting:	Agree on global priorities for CASA development	Face to Face Conference Call	Monthly	SRAO PS VLASS Dev Lead	CASA PS	CASA Development Priorities	Confluence
DO Report	Exception reporting to NRAO DO	Report	Monthly	NRAO DO	PD/PM	Four Square	PPT slides
POP Report	Exception reporting to NSF	eReport	Quarterly	NRAO DO NSF	PD/PM	Four Square	PPT slides

NRAO Users Committee	Solicit feedback from NRAO Users Community	Face to Face Conference Call	Semi-Annual	Program Office (as appropriate)	NRAO Director	Review Report	Written Report, PPT slides
AUI Visiting Committee	Review of NRAO Management and Operations	Face to Face	Annual	PD	AUI President	Review Report	Written Report, PPT slides
NSF Annual Program Review	Review previous POP goals and new direction	Face to Face Conference Call	Annually	NRAO DO, NRAO Ads, NSF	PD	Annual Report	Written Report, PPT slides