***Title*:** QSU2 FY2019	***Author*:** Thisdell/ADs	***Date*:** 05/09/2019
		***Version*:** Final

National Radio Astronomy Observatory

Quarterly Status Update (QSU) 2 FY2019

January – March 2019

PREPARED BY	ORGANIZATION	DATE
Thisdell/ADs	Director's Office	05/09/2019

APPROVALS (Name and Signature)	ORGANIZATION
Nicole Thisdell Nicole Thisdell Digitally signed by Nicole Thisdell Date: 2019.05.16 13:24:29 -04'00'	NRAO
Tony Beasley Digitally signed by Tony Beasley Date: 2019.05.16 14:30:50 -04'00'	NRAO
Dave Curren Date: 2019.05.17 16:44:32 -04'00'	AUI

NRAO Quarterly Status Update
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POP Milestone	Milestone	Completion Date	Q1 Performance Assessment			Q2 Performance Assessment		
			Cost	Schedule	Scope	Cost	Schedule	Scope
2.5	**NA ALMA Operations**							
	NAASC							
1	Create Position of Deputy Division Head within the NAASC	12/31/2018						
2	Finalize the NAASC Reorganization	12/31/2018						
3	ALMA Ambassador applications will be advertised to the community	12/31/2018						
4	Run and organize the ALMA Ambassadors program in Charlottesville	3/30/2019						
5	TORUS 2018: The Many Faces of AGN Obscuration meeting	12/31/2018						
6	Exploring our Cosmic Origins: New Results from the Atacama Large Millimeter/submillimeter Array	3/30/2019						
9	Cycle 7 Call for Proposal and user documentation and ALMA Science portal updates/edits	12/31/2018						
		3/30/2019						
10	Preparation of the ALMA Cycle 7.5 Call for Proposals	12/31/2018						
11	Instructional video on the subtleties of ALMA operations	3/30/2019						
12	Conduct an investigation into the apparent fall off in publication rate of NA ALMA users	12/31/2018						
		3/30/2019						
14	Pipeline initial requirements	12/31/2018						
15	Validate CASA 5.5/6.0	3/30/2019						
18	NAASC staff will develop and implement the raw data pilot program	12/31/2018						
19	Venue for ALMA APRC7 finalized	12/31/2018						
21	P2G prepared and review all NA Phase 2 SBs	12/31/2018						
		3/30/2019						
22	ObsMode Cycle 8 planning, meeting and follow-up process in coordination with JAO	3/30/2019						
	Development							
24	FY2020 (Cycle 7) Call for Study Proposals	3/30/2019						
26	Band 6 Upgrade project Proposal	12/31/2018	Cancelled					
	Maintenance, Renewal, and Warranty Claims							
27	Begin cabin temp control project (all 25 antennas)	12/31/2018						
29	Deliver reworked FEHV 1 to JAO	12/31/2018						
	NRAO-Chile Office							
31	Renewal of office lease	12/31/2018						
32	Catering, cleaning and maintenance contract	3/30/2019						
33	Accounting tool Blackline	12/31/2018						
		3/30/2019						
35	Survey and assessment of NA infrastructure	12/31/2018						
36	Study on provision of power to non-ALMA projects	12/31/2018						
		3/30/2019						
37	Introduction of new ETK	12/31/2018						
38	Streamlining of HRIS	12/31/2018						
		3/30/2019						
39	Lessons learned from 2018 collective bargaining	12/31/2018						
		3/30/2019						
40	Application of 2018 collective contract clauses	3/30/2019						
42	Sister Cities and Observatories: strengthening of STEAM	12/31/2018						
		3/30/2019						
43	Galileo Teachers Training Program: global meeting in Chile	12/31/2018						
		3/30/2019						

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			Cost	Schedule	Scope	Cost	Schedule	Scope
44	Kick off role model series/campaign	12/31/2018						
		3/30/2019						
45	Hour of Code sessions (2)	12/31/2018						
3.3	**New Mexico Operations**							
	Very Large Array							
	Operations							
1	Define VLA GO and SRO capabilities to be offered for semester 2019B	12/31/2018						
3	Update VLA documentation to support 2019B Call for Proposals, perform proposal technical reviews	3/30/2019						
5	Determine baselines and pointing for antennas moving into their C configuration locations	12/31/2018						
6	Determine baselines and pointing for antennas moving into their B configuration locations	3/30/2019						
9	Reconfigure from D to C array	12/31/2018						
10	Reconfigure from C to B Array	3/30/2019						
	Development							
14	VLASS1.1 Single epoch continuum imaging complete	12/31/2018						
17	VLASS special session at winter AAS meeting	3/30/2019						
19	VLASS/CIRADA definition complete	12/31/2018						
	Maintenance and Renewal							
22	Perform preventive maintenance on each of two transporters prior to array reconfiguration to B	12/31/2018						
27	Perform preventive maintenance on the next configuration VLA antenna transformers prior to array reconfiguration to B	12/31/2018						
	Technical Upgrades and Enhancements							
43	Design and build PCB for refrigerator variable frequency drive	3/30/2019						
45	Frequency averaging promoted from SRO to GO	3/30/2019						
46	Phase-binned pulsar observing promoted from SRO to GO	3/30/2019						
48	Wind prediction software requirements	12/31/2018						
50	Implementation of conditional Scheduling Blocks in OPT	3/30/2019						
	Very Long Baseline Array							
	Operations							
52	Define VLBA general and shared risk capabilities to be offered for semester 2019B	12/31/2018						
54	Update VLBA documentation to support 2019B Call for Proposals, perform proposal technical reviews	3/30/2019						
	Development							
58	Install Mark6 4 Gbps recording equipment at the 10 VLBA sites	3/30/2019						
	Technical Upgrades and Enhancements							
63	Build and install L404B synthesizers in one VLBA antenna.	3/30/2019						
65	Install one E-Rack at a VLBA site	3/30/2019						
4.6	**Next Generation Very Large Array**							
	Astro2020 Preparations							
1	Conduct documentation reviews for ngVLA Reference Design	3/30/2019						
2	Receipt and review of final results of Costed Antenna Reference Design	12/31/2018						
3	Reference Design Packet ready for submission to Astro2020 process.	3/30/2019						
	Community Engagement							
4	Publication of findings for second round Community Studies	12/31/2018						
5	Formal Publication of ngVLA Science Book through ASP	12/31/2018						
7	Host a Special Session at 2019 URSI National Radio Science Meeting	3/30/2019						
8	Host a special session at 2019 Winter AAS	3/30/2019						

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POP Milestone	Milestone	Completion Date	Q1 Performance Assessment			Q2 Performance Assessment		
			Cost	Schedule	Scope	Cost	Schedule	Scope
9	Develop ngVLA flyover animation	12/31/2018						
	Conceptual Design and Development							
12	Reference Observing Program	3/30/2019						
15	Preliminary Operations Plan	3/30/2019						
16	Preliminary Transition Plan	3/30/2019						
22	Antenna Optical Design	3/30/2019						
25	Composite Antenna Structures PDR	12/31/2018						
26	Composite Antenna Structures Study Complete	3/30/2019						
27	Wide Angle Feed Prototype	9/30/2019						
30	Integrated Receiver Development Prototypes	3/30/2019						
	Project Administration and Management							
34	Develop initial draft of Project Execution Plan	12/31/2018						
36	Conduct a review of software solution options and determine best-fit solutions	12/31/2018						
37	Implement the selected software solutions	3/30/2019						
38	Internal Project Office review of the ngVLA cost model.	12/31/2018						
39	Prepare a risk-adjusted, fully costed and documented cost estimate for the reference design; formatted for Decadal Survey Astro2020 submission.	12/31/2018						
41	Provide final versions of systems engineering process planning and documentation	3/30/2019						
5.3	**Central Development Laboratory**							
	Repair, Maintenance, Production, and Support							
1	Build and test Band 1 amplifiers	12/31/2018						
		3/30/2019						
		6/30/2019						
2	Build and test Band 1 Local Oscillators	12/31/2018						
		3/30/2019						
3	VLA/VLBA multi-chip module support	12/31/2018						
		3/30/2019						
4	CUP ASIC devices (prototype)	9/30/2019						
5	CUP Circuit card assemblies	6/30/2019						
	Research and Development							
7	Evaluate upgraded balanced IF amplifiers	6/30/2019						
8	Wide flare angle horn prototype(s) for ngVLA	12/31/2018						
9	Ka-Band feed horns for VLBA	3/30/2019				Cancelled		
11	Design of the ngVLA Central Signal Processor	12/31/2018						
12	Test SADC prototype ASIC	6/30/2019						
13	Test W-band DSSM-DOMT receiver	6/30/2019						
15	Advanced reflectionless filter implementations	6/30/2019						
6.7	**Science Support and Research**							
	Telescope Time Allocation							
1	CfP for Semester 2019B	3/30/2019						
2	SRP and Tech Review Process, Semester 2019B	3/30/2019						
5	TAC Meeting, Semester 2019A	12/31/2018						
7	Update SW Tools Requirements for TAC 2019A	12/31/2018						
8	Update SW Tools Requirements for PST 2019B	3/30/2019						
11	Update Documentation for CfP and Tools 2019B	3/30/2019						
13	TTA SW Tool Suite Requirements	12/31/2018						

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POP Milestone	Milestone	Completion Date	Q1 Performance Assessment			Q2 Performance Assessment		
			Cost	Schedule	Scope	Cost	Schedule	Scope
14	eXtra-Large Proposals	12/31/2018						
	Science Ready Data Products							
15	SRDP Operations Planning Complete	3/30/2019						
	Scientific User Support							
19	NM Symposium	12/31/2018						
20	CASA Validation	3/30/2019						
21	CASA Guides	3/30/2019						
	Reference Services							
26	NRAO Papers requirements	12/31/2018						
28	Development of U.S. Radio Astronomy	12/31/2018						
	Scientific Staff and Jansky Fellows							
29	SciStaff Performance Reviews Completed	12/31/2018						
30	SciStaff Promotions Reviews Completed	3/30/2019						
31	Post Tenure Reviews Completed	3/30/2019						
33	Jansky Fellows Selection Completed	12/31/2018						
34	Jansky Fellows Appointments Completed	3/30/2019						
	Student Programs							
35	Summer Student Selection and Offers	3/30/2019						
36	Student Observing Support Selection (VLA)	12/31/2018						
39	Reber Predoc Selection	3/30/2019						
7.5	**Data Management and Software**							
	SIS							
2	Oracle Virtual Machine installation	3/30/2019						
3	Upgrade of NGAS storage for VLA	3/30/2019						
6	Moab cluster scheduler optimization	12/31/2018						
	ALMA Systems Software							
8	ALMA Cycle 7 release	3/30/2019						
	VLA							
11	Support 2018B observing	3/30/2019						
13	Support 2019A commissioning	3/30/2019						
15	Support Frequency averaging to GO	3/30/2019						
18	Conditional SBs in OST/OPT	3/30/2019						
	CASA							
20	CASA 5.5 release	3/30/2019						
21	CASA 6.0 release	6/30/2019						
23	MSv3 report	3/30/2019						
	CASA Pipeline							
24	Pipeline Cycle 6 release	12/31/2018						
	SSA							
27	PST/OPT Proposal/Observing Update	12/31/2018						
29	PHT TAC update	3/30/2019						
8.5	**Program Management Department**							
	Headquarters							
1	HQ PM/SE Project Leadership	12/31/2018						
		3/30/2019						

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POP Milestone	Milestone	Completion Date	Q1 Performance Assessment			Q2 Performance Assessment		
			Cost	Schedule	Scope	Cost	Schedule	Scope
2	HQ Proposal Development	12/31/2018						
		3/30/2019						
3	HQ Documentation Support	12/31/2018						
		3/30/2019						
4	HQ Continuing Education	12/31/2018						
5	Program Management Software Requirements Collection and Analysis	12/31/2018						
7	Multicancha Mass Concrete Works Complete	12/31/2018						
8	Multicancha Beams Erection Complete	12/31/2018						
9	Multicancha Membrane Installation Complete	3/30/2019						
10	Multicancha Sport Flooring Installation Complete	3/30/2019						
	New Mexico Operations							
14	NM PM/SE Project Leadership	12/31/2018						
		3/30/2019						
15	NM Proposal Development	12/31/2018						
		3/30/2019						
16	NM Documentation Support	12/31/2018						
		3/30/2019						
17	NM Continuing Education	12/31/2018						
		3/30/2019						
21	VLBA St. Croix Repairs - Develop RfP for Steel Repairs and Antenna Painting	12/31/2018						
22	VLBA St. Croix Repairs - Issue Contracts for Steel Repairs and Antenna Painting	3/30/2019						
23	Manage and track Astro2020 Decadal Survey submission package content for ngVLA	3/30/2019						
	Central Development Lab							
25	CDL PM/SE Project Leadership	12/31/2018						
		3/30/2019						
26	CDL Proposal Development	12/31/2018						
		3/30/2019						
27	CDL Documentation Support	12/31/2018						
		3/30/2019						
28	CDL Continuing Education	3/30/2019						
29	ALMA Band 1 LNA Quarterly Report	12/31/2018						
		3/30/2019						
	ALMA Development							
31	ALMA Correlator Upgrade ASIC Vendor Contract Award	12/31/2018						
33	ALMA Band 6v2 Receiver Upgrade Project Kickoff	12/31/2018				Cancelled		
9.5	**Education and Public Outreach**							
	News and Public Information							
1	Full editorial guidelines for new news homepage	12/31/2018						
		3/30/2019						
2	Consensus from ngVLA/VLASS teams on topic for AAS press reception	3/30/2019						
	Multimedia Engagement							
3	Plan for workflow for VLASS Quick Look	12/31/2018						
4	Research and development for VLASS image inclusion across various platforms	3/30/2019						
5	Developing and testing first Data2Dome feed	12/31/2018						
8	Pipeline research and development	3/30/2019						

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POP Milestone	Milestone	Completion Date	Q1 Performance Assessment			Q2 Performance Assessment		
			Cost	Schedule	Scope	Cost	Schedule	Scope
9	Develop ngVLA flyover animation and science case visuals	12/31/2018						
10	Establish test site for launch of new NSF logo guidelines	9/30/2019						
11	Create VLBA webpage	12/31/2018						
	STEAM							
12	San Pedro participants travel to NM	12/31/2018						
13	NM participants travel to San Pedro	3/30/2019						
14	Revised programming plan	3/30/2019						
16	Survey of Charlottesville and Socorro for community needs	12/31/2018						
10.4	**Computing and Information Services**							
	Observatory-Wide Support							
1	Completion of Windows 10 rollout	12/31/2018						
2	Mac OS upgrade	3/30/2019						
4	Virtual Machine management evaluation	3/30/2019						
9	Cyber security program review	3/30/2019						
	Site Specific Facilities Infrastructure							
13	System area network upgrade for NAASC	3/30/2019						
14	Replacement of filer storage system in NM	12/31/2018						
	Maintenance and Renewal							
15	Evaluation of video system replacement	3/30/2019						
11.3	**Office of Diversity and Inclusion**							
	Local and National Programs							
1	Diversity Council Meeting and Diversity and Cultural Awareness (DCA) activities	12/31/2018						
		3/30/2019						
2	NAC and LSAMP – Recruitment & Summer Program Initiation	3/30/2019						
3	RAMP-UP	12/31/2018	Cancelled					
	International Partnerships							
6	ODI Chile Undergraduate Recruiting	12/31/2018						
7	ODI Chile Undergrad Research Experience Completed	3/30/2019						
12.7	**Human Resources**							
	Training and Development							
1	Observatory Leadership Cohort Pilot	12/31/2018						
		3/30/2019						
2	Mid-Career Management Training	3/30/2019						
	Compensation							
3	JDE Comp Management Module Implementation	12/31/2018						
4	Total Rewards Benchmark Study Debrief	12/31/2018						
	Benefits							
7	New Medical Carrier Implementation.	12/31/2018						
	Recruitment Employment							
9	Enhanced branding on LinkedIn, Glassdoor, and Stack Overflow	3/30/2019						
	Human Resources							
10	Employee Climate Survey	3/30/2019						
13.2	**Science Communications**							
1	Redesign science community exhibits	12/31/2018						
2	Update Research Facilities brochure	3/30/2019						

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POP Milestone	Milestone	Completion Date	Q1 Performance Assessment			Q2 Performance Assessment		
			Cost	Schedule	Scope	Cost	Schedule	Scope
14.6	**Administration**							
	CAP							
2	Install Recordkeeping Software	12/31/2018						
	ESS							
3	Download existing ES&S data to Recordkeeping system	3/30/2019						
4	Hire EMS Specialist for VLA	12/31/2018						
	TTO							
6	Participate in winter I-Corps cohort	3/30/2019						
15.1	**Budget**							
1	Worker's Comp Vendor Visit to GBO	12/31/2018						
2	Position Control Definition	12/31/2018						
4	Implement FY2019 Budget	12/31/2018						
5	NSF Spring Budget Meeting	3/30/2019						
8	FY2019 ICC Final Rate Submission	3/30/2019						
16.3	**Spectrum Management**							
1	CPM, Geneva	3/30/2019						
2	WP 7D, Geneva	3/30/2019						
17.2	**Director's Office**							
	ALMA							
1	ALMA Board Meeting	12/31/2018						
2	ALMA Director's Council	3/30/2019						
	Corporate Meetings							
3	AUI Board of Trustee Meeting	12/31/2018						
4	AUI Executive Committee Meeting	12/31/2018						
		3/30/2019						
	Science Community							
6	Appoint new Users Committee Members	12/31/2018						
	Management Reviews							
8	NSF Annual Program Review	12/31/2018						
9	All Hands Meeting	3/30/2019						

Color code: Cost/Schedule/Scope Cells

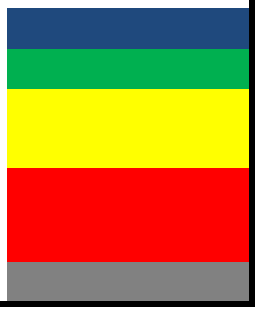
Blue - early

Green - on track

Yellow - expected to miss an upcoming milestone and/or not meet scope, and/or be underspent or overspent on

Red - not completed by due date and/or overspent on budget, and/or unable to perform to the scope

Grey - completed

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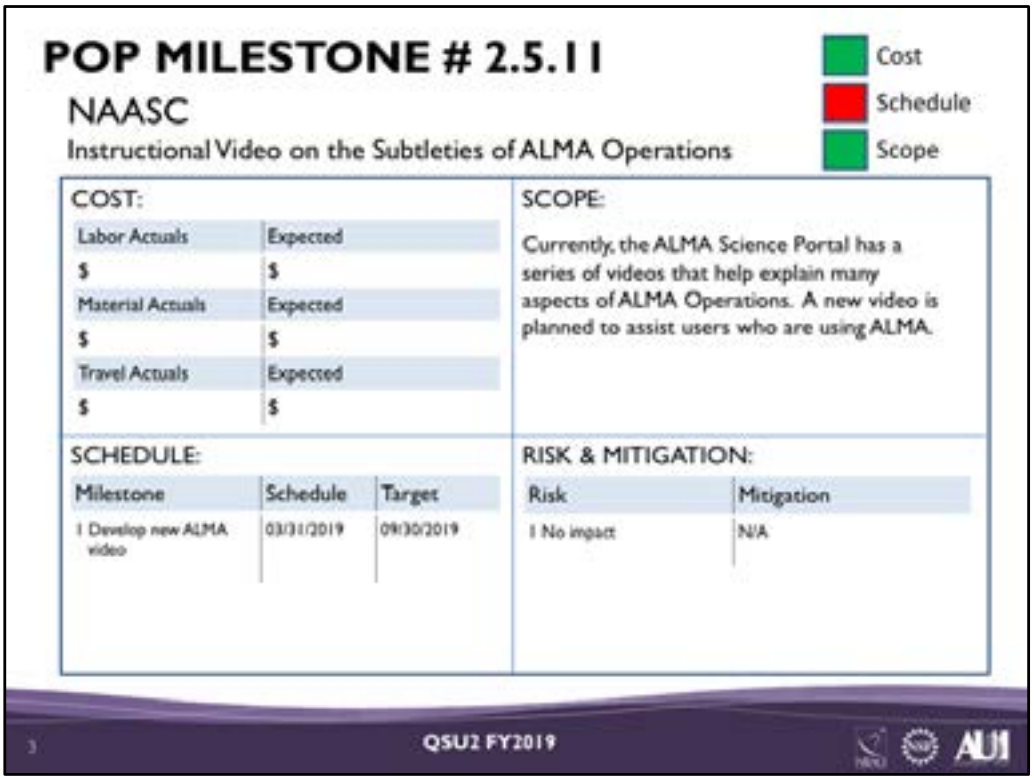
AUI

FY2019 Milestones

Milestone Progress
Total Q2 2019 milestone deadlines: 111
Total completed on time: 89
Percent of total completed on time: 80.2%
Total Q1 2019 milestone deadlines: 106
Total completed on time: 91
Percent of total completed on time: 85.6%

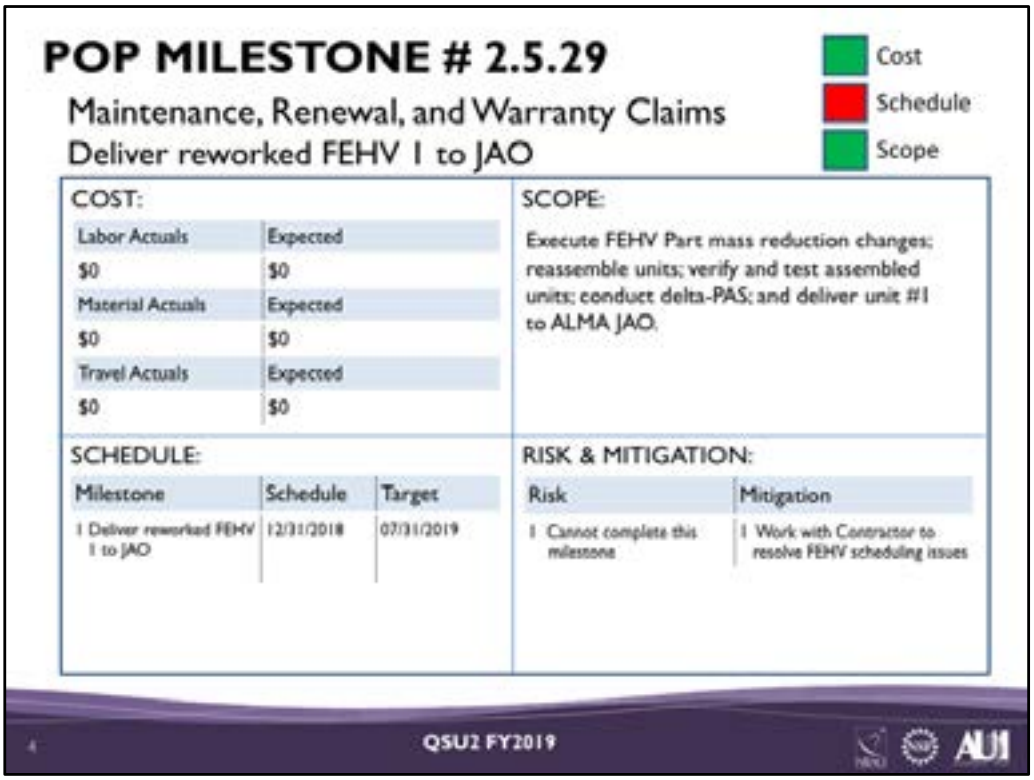


COST: No impact.

SCOPE: No impact.

SCHEDULE: Given other priorities from our colleagues at the NRC in Canada, they were not able to generate a new video for the NAASC before the end of the quarter. There are still plans to make a new video so we are moving the deadline out another six months to have it ready before the start of ALMA Cycle 7.

RISK & MITIGATION: Since these are all added value products, there is no risk to not achieving this milestone in the second quarter.

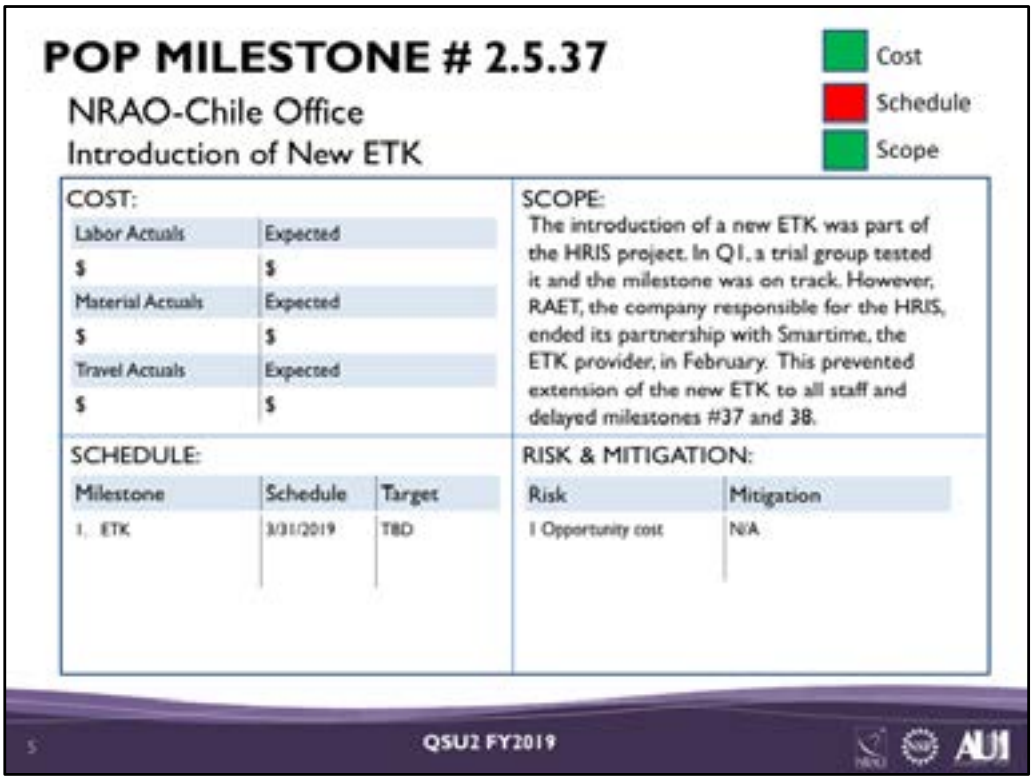


COST: No impact.

SCOPE: No change in scope; delivered FEHV to incorporate welding improvements and mass reductions.

SCHEDULE: Mass reduction efforts have been completed on all applicable components of the remaining three FEHV units and re-assembly work is now progressing on the three units (literally) in parallel with the re-assembled first unit continuing to be used in Valdivia as the "Parent Unit" during the re-assembly process (as note in the QSU1 Report);. Progress appears to be sufficient to meet the planned target delivery goal of 31 July 2019 for all four units. This milestone replaces FY2018 carryover milestone 2.5.32.

RISK & MITIGATION: Until the installations are completed, observationally verified, and all units are working reliably, risk will remain. This risk is primarily borne by the vendor, and is being mitigated by close observational and engineering verification of the work.

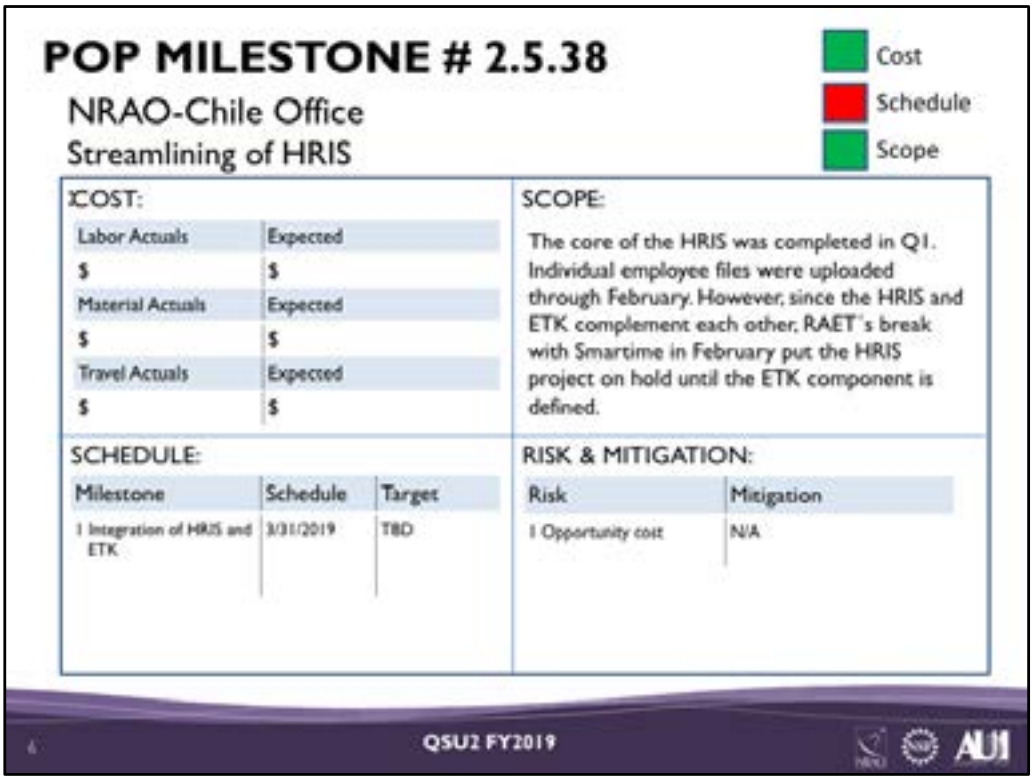


COST: There are no costs associated to missing this milestone. RAET is offering to reimburse project costs or continue working with them as they identify a new ETK partner.

SCOPE: Although there no changes in the project scope, the ETK provider will change in the future.

SCHEDULE: Once OCA, together with JAO HR, make a decision regarding staying with RAET, or changing HRIS provider, a schedule will be defined for the introduction of a new ETK.

RISK & MITIGATION: There is no risk as such, since we have a working (yet outdated) ETK system, but there is an opportunity cost related to the effort spent.

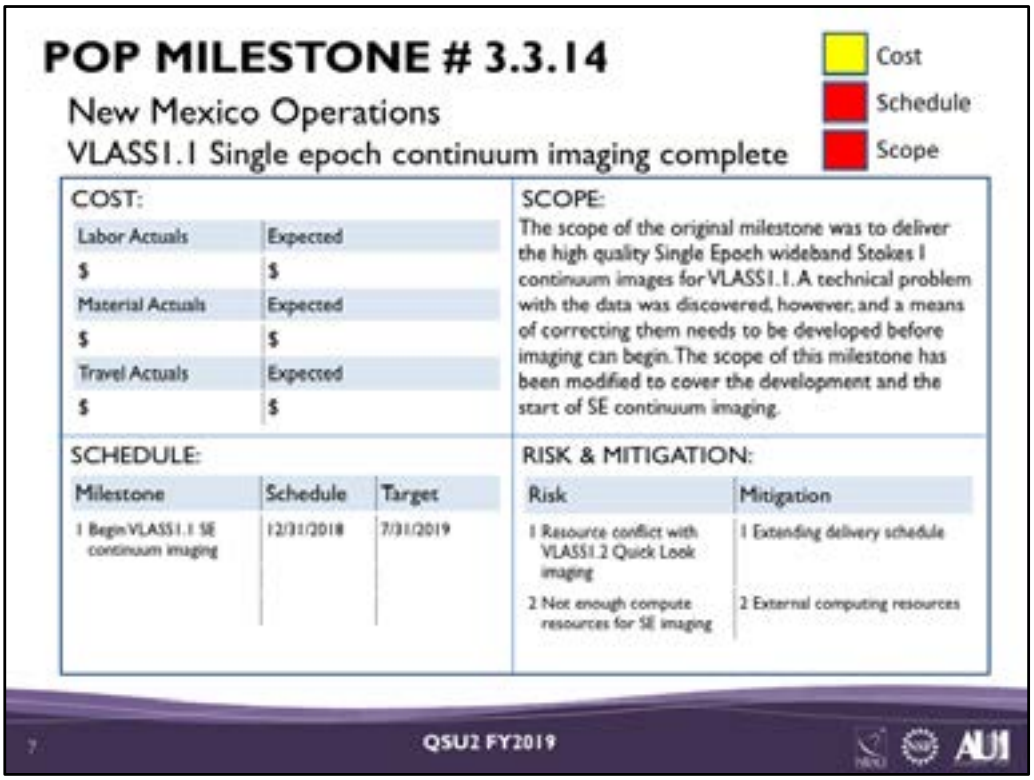


COST: There are no additional costs associated with this milestone. Approximately CLP14M have already been spent. RAET is offering to reimburse this expense since it cannot deliver the full HRIS product, which included the ETK system, or continuing to work with them as they identify a new ETK provider.

SCOPE: The definition of project scope going forward depends on the decision regarding RAET, i.e. get reimbursement and change HRIS provider or continue working with them. OCA and JAO HR are jointly analyzing the pros and cons of these options and will make a decision shortly.

SCHEDULE: By March 31st we should have had an HRIS available to managers and employees, both for ETK as well as managing employee files in a centralized fashion. With the vendor´s failure to deliver, we are currently analyzing next steps.

RISK & MITIGATION: No risk as such, but opportunity cost of effort devoted by OCA and JAO HR to HRIS project (especially if decision is made to change provider). Decision will affect milestone #37 as well.

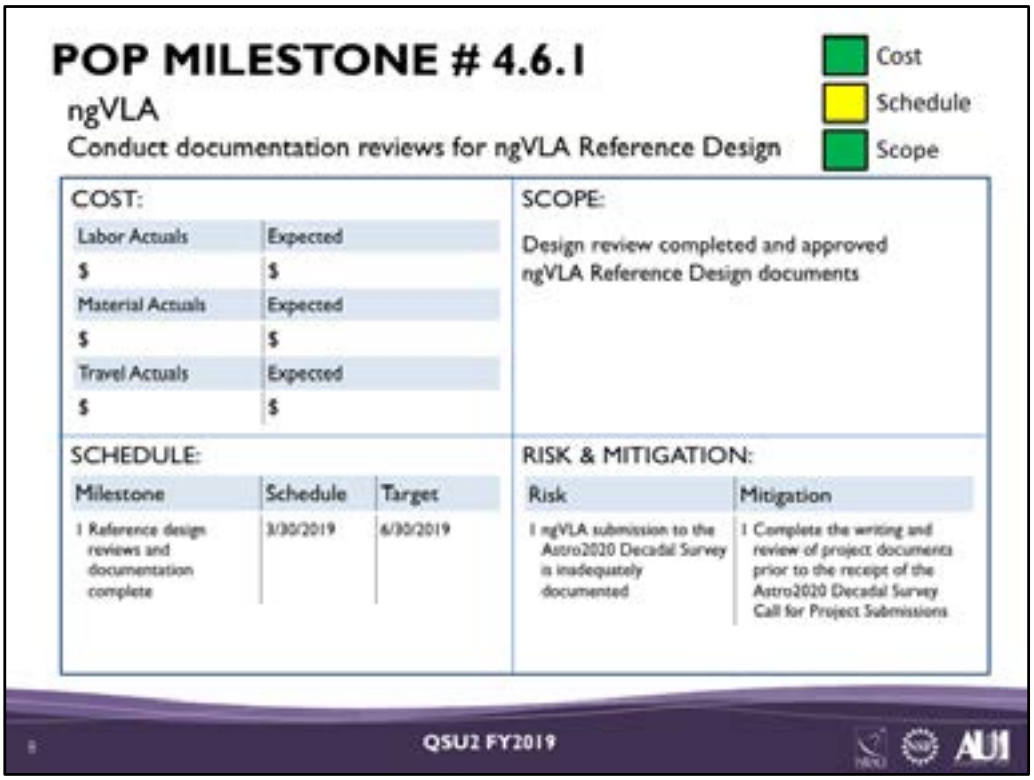


COST: Current tests of the algorithms being developed indicates additional compute resources will be needed to support VLASS1.1 SE imaging, but the precise cost has not yet been determined.

SCOPE: A problem with VLASS1.1 data associated with the pointing of two thirds of the VLA antennas was discovered after the FY2019 Program Operating Plan was written, and a means of correcting those data needs to be developed before Single Epoch imaging can begin. In addition, it has been determined that w-term corrections (corrections for direction-dependent correlation geometry errors) are needed to provide accurate source positions, flux densities, and spectral indices; these algorithms require significantly larger compute resources than the Quick Look images. Given these issues, the scope of this milestone was modified in Q1 to cover the development of the data correction algorithms and methods for managing external computing resources, through to the start of SE continuum imaging.

SCHEDULE: The imaging algorithms including pointing corrections are expected to be delivered in a CASA 5.5.1 patch. These will then be incorporated into the imaging pipeline, with a goal of starting the SE wideband continuum imaging for VLASS1.1 by the end of July.

RISK & MITIGATION: The delay in starting the SE imaging for VLASS1.1 causes a potential resource conflict now that VLASS1.2 observing has begun. The computing requirements for the SE imaging algorithms will add additional resource pressure. Both these problems will be mitigated by a combination of using external computing resources, and extending the overall delivery schedule of VLASS images to the community.

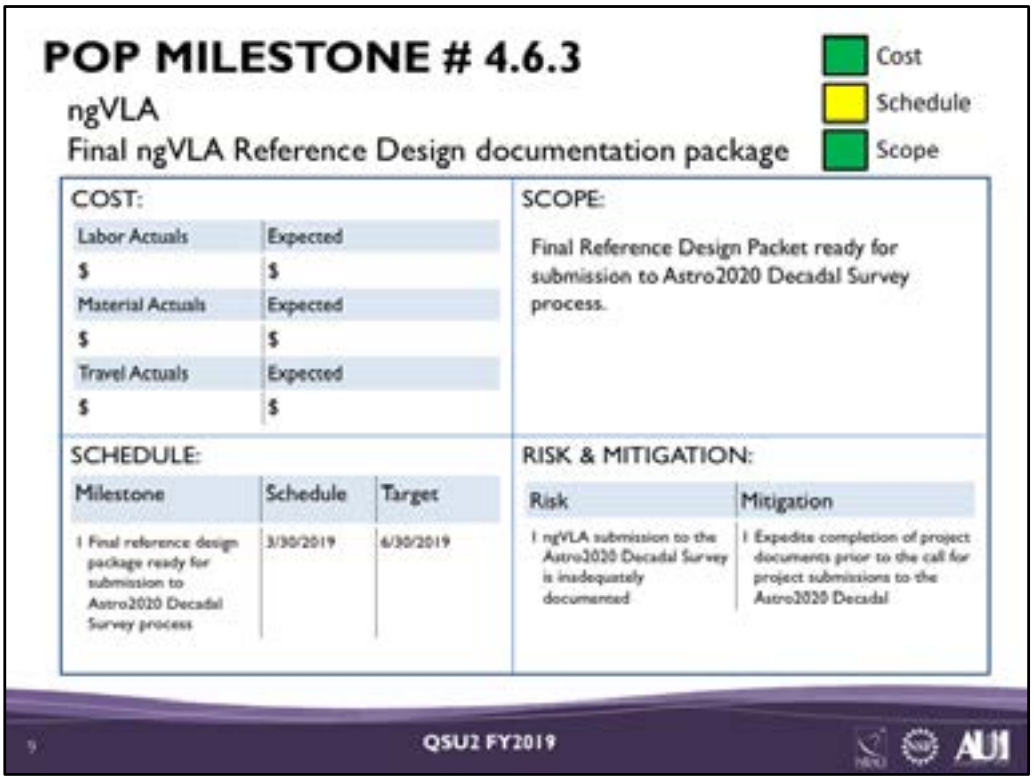


COST: No impact.

SCOPE: No impact.

SCHEDULE: To demonstrate that the NRAO understands the technical risk and cost of the proposed facility, the ngVLA Project Office is preparing a reference design for the array that describes the system architecture and a viable concept for each major element within the ngVLA system. The selected concepts have quantifiable technical risk and a sound cost basis, typically an engineer's estimate with component-level historical analogs or vendor quotations. This reference design was largely complete by the end of CY2018, with minor refinements at the sub-system level for architectural coherence expected in Q1 CY2019, incorporating feedback from the review conducted the prior fiscal year. The final reference design proposal documentation, including the supporting cost model documentation, will be delivered in response to the Astro2020 DS call for project submissions with an anticipated submission date of July 2019.

RISK & MITIGATION: Complete the writing and review of project documents prior to July.



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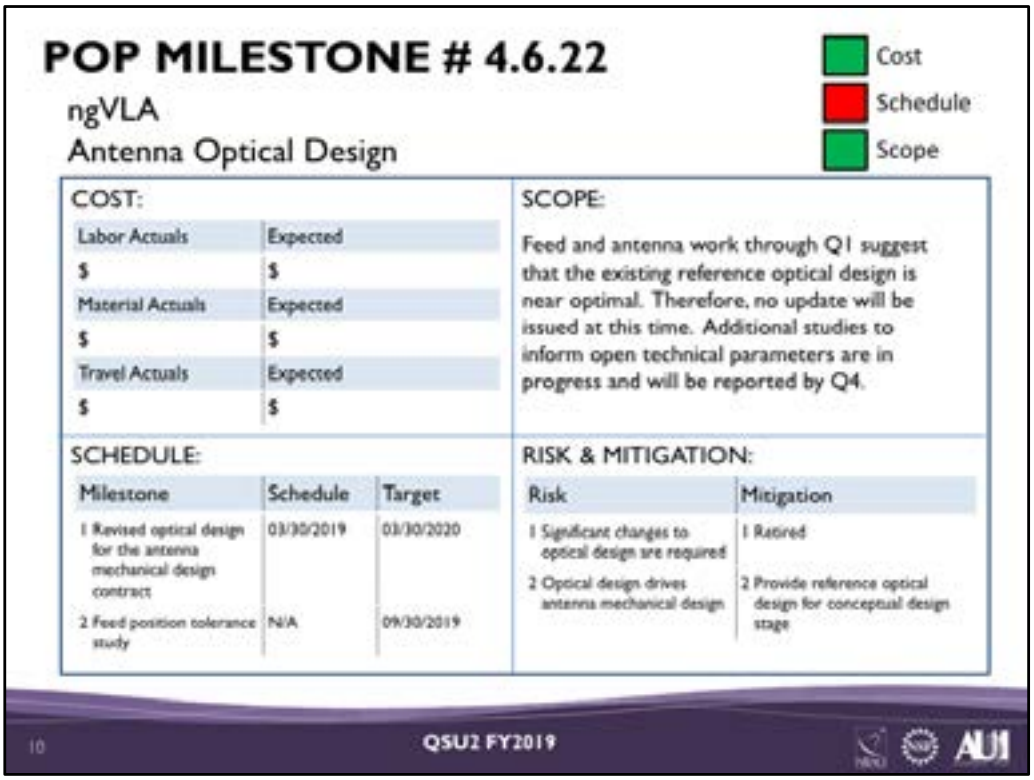
SCOPE: No impact.

SCHEDULE: To demonstrate that the NRAO understands the technical risk and cost of the proposed facility, the ngVLA Project Office is preparing a reference design for the array that describes the system architecture and a viable concept for each major element within the ngVLA system. The selected concepts have quantifiable technical risk and a sound cost basis, typically an engineer's estimate with component-level historical analogs or vendor quotations. This reference design was largely complete by the end of CY2018, with minor refinements at the sub-system level for architectural coherence expected in Q1 CY2019, incorporating feedback from the review conducted the prior fiscal year. The final reference design proposal documentation, including the supporting cost model documentation, will be on-going through the package submission to the Astro2020 Decadal Survey in Q4 FY2019.

RISK & MITIGATION: Expedite completion of project documents prior to the call for project submissions to DS2020.



COST: No impact.

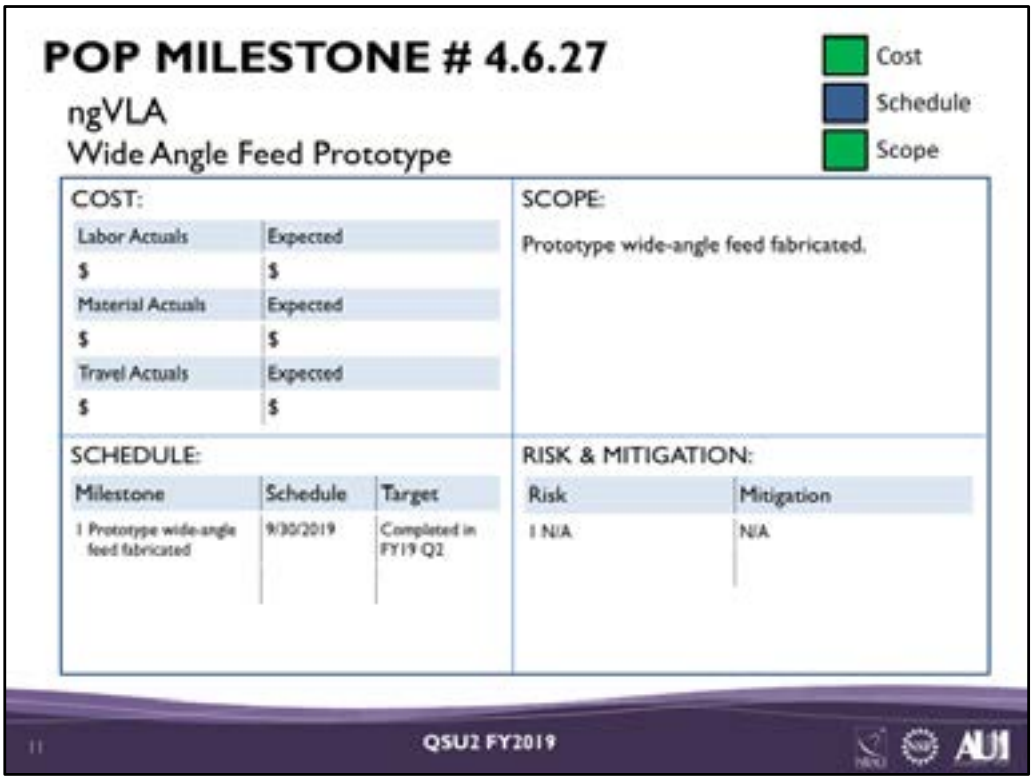
SCOPE: Antenna Optical Design: A reference antenna optical design was developed in FY2018. This included a preliminary down-select of major optical parameters, and also shaping profiles (mapping functions) to optimize G/TSYS with Gaussian feed horns. We planned to revise this optical design, with an emphasis on the down-select of major optical parameters given lessons learned from antenna design activities through Q1, and issue this revised optical design as an input to the next antenna mechanical design contract.

The conclusions from the design activities through FY2019 Q1 is that the reference optical design is near optimal. Small changes in the opening angle (emphasis on 55-58 degree opening angles) and mapping function are currently being investigated, but the main aperture size, subreflector size, f/D, and tilt angle all remain unchanged after this analysis. Focused studies into the optimal opening angle and mapping function are underway and will be reported by Q4. The final optimization for the feed opening angle and mapping function is not expected to have a material impact on the conceptual design of the antenna and we will therefore keep these parameters open for an additional calendar year, with an update expected in Q2 FY2020.

SCHEDULE: The new milestones associated with this work are:

1) A report on feed position tolerances, with input to final opening angle and mapping function selection, will be delivered by Q4 FY2019.
2) An updated (or confirmed) optical prescription will be provided to the antenna designer by Q2 FY2020.

RISK & MITIGATION:
The most significant risk associated with this deliverable is that large changes are required to the optical design based on lessons learned in the front end and antenna design efforts. This risk is effectively retired, with the parameter space narrowed sufficiently to permit a robust conceptual design exploration on the mount. Should the parameters of the optical design prove too demanding structurally, the project now has the tools in place to analyze changes to the RF design and work in concert with the antenna designer on an optimized solution, using the reference optical design as the baseline.



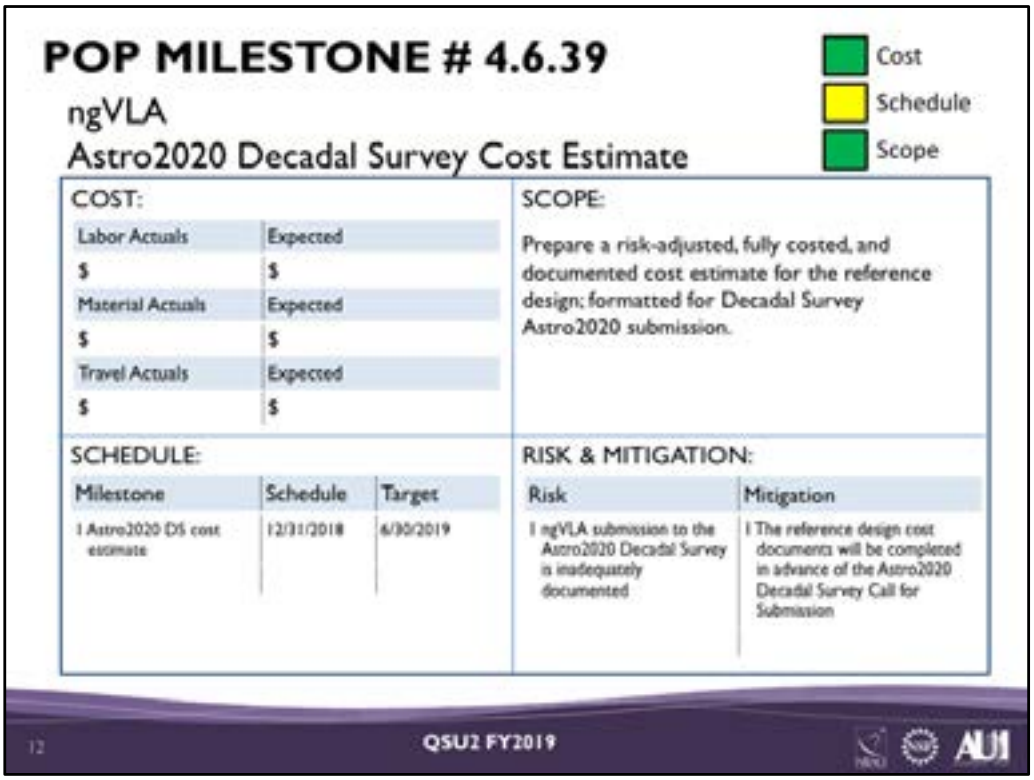
Owner: Dana Dunbar

COST: No impact.

SCOPE: **Wide Angle Feed Design:** A wide-angle axially corrugated feedhorn will be built, consistent with the reference design. The main aim of this activity is to adopt newer design techniques and develop an understanding of the electromagnetic behavior of feeds with wide illumination angles (90–110 degrees). A more detailed understanding of the polarization response and cross-polarization power will inform the polarization calibration strategy. The design was developed in FY2018, with fabrication expected by Q3 and final test reports by Q4. The fabrication was completed in Q2 FY2019 and the unit is in testing.

SCHEDULE: Fabrication scheduled to be completed in Q4 FY2019; Completed in Q2 FY2019.

RISK & MITIGATION: No impact.

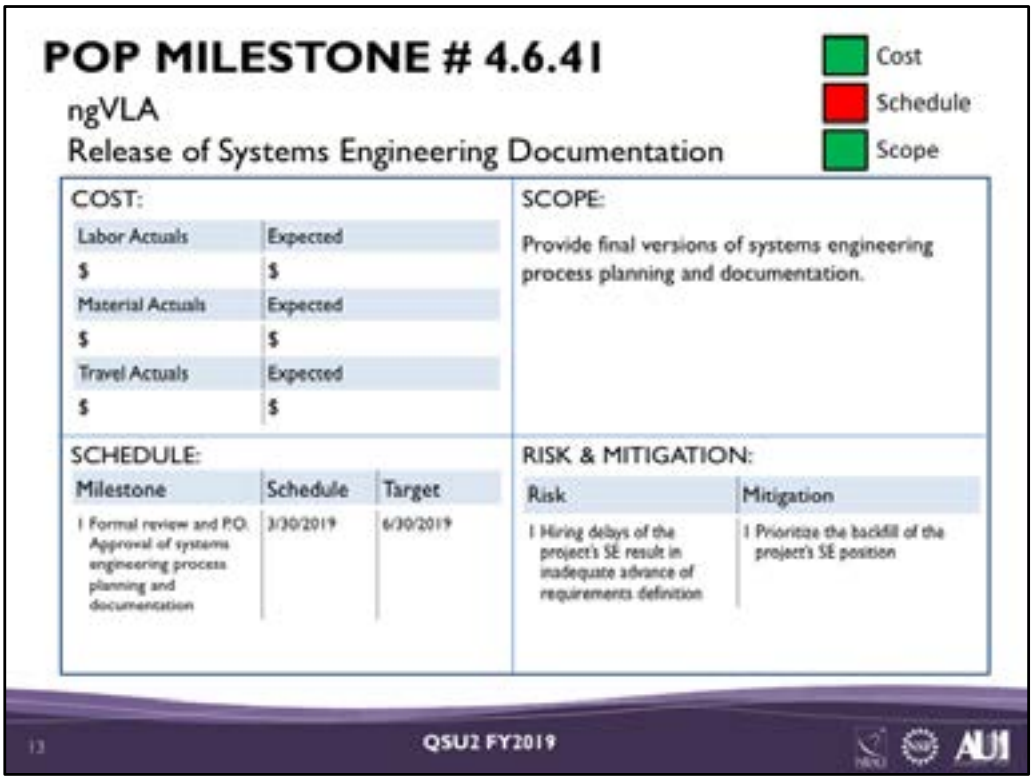


COST: No impact.

SCOPE: No impact.

SCHEDULE: The scheduled completion date for this milestone was predicated on an anticipated Astro2020 Decadal Survey submission in the first quarter of FY2019. The Astro2020 DS timeline has slipped and it is now anticipated that the submission of the ngVLA's reference design will be mid-to-late FY2019 (Q4). An internal review of the existing cost estimate has been conducted and the cost model/cost estimate will continue to be refined. At such time as we receive the Astro2020 DS Call for Submissions, the proper cost documentation will be finalized and prepared.

RISK & MITIGATION: An important element of the ngVLA's Astro2020 DS submission package is a rationally costed design. An internal review of the current cost estimate has been completed and the cost model/cost estimate will continue to be refined. The reference design cost documentation will be completed prior to the Astro2020 Decadal Survey Call for Submission.

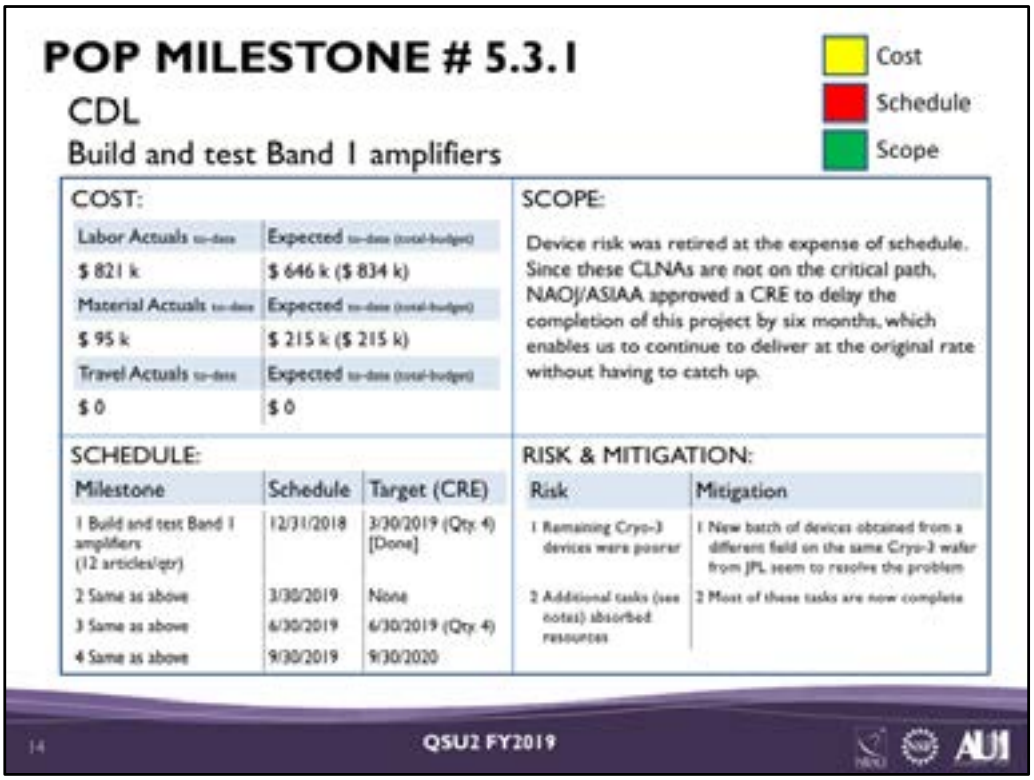


COST: No impact.

SCOPE: Several Systems Engineering (SE) planning documents and related processes were established in FY2018, based on NRAO Standard Operating Procedures (SOPs) which incorporate INCOSE processes and best practices. Some document preparation assigned to FY2018 milestones fell behind due to a six-month delay in recruiting a full time Systems Engineer. Previous SE-related milestones have been addressed early in 2019 as work continues to develop processes and documentation in configuration control, reliability, quality, safety, integration, verification, and other areas needed to support the ngVLA life cycle. Systems engineering will continue to provide document management, development of project-wide standards, and planning for reviews. An SE consultant has on-boarded and will support the decadal submission in FY2019 with oversight of SE processes, document management, and document preparation. The consultant has developed a schedule for the completion of required SE-related documents by the end of May 2019 with formal review/P.O. sign-off on-going through the Astro2020 Decadal Survey submission anticipated in FY2019 Q4.

SCHEDULE: Q3 FY2019

RISK & MITIGATION: Prioritize the backfill of the SE position, so that the hiring delay does not result in a delay of definition of requirements.



COST: Although we still expect to complete the project within the originally allocated budget, labor costs have been running over original estimates due to escalation of machining and chemical plating, effort to improve technical performance at NAOJ/ASIAA request, and time allocation of senior personnel on project. Costs will be carefully monitored each month to ensure assigned budget is not exceeded.

SCOPE: Remaining (first stage) devices on hand from the Cryo-3 wafer produced compliant but poorer noise temperatures. Consequently, significant rework was necessary to continue delivering amplifiers with performance similar to earlier delivered units. Investigations were undertaken to evaluate devices from another field on the same Cryo-3 wafer as well as devices from another commercial source. The former approach yielded good results and is being pursued. Also:

- The amplifier group was engaged in repairing NRAO amplifiers and producing a small number of amplifiers for other projects and that absorbed some resources. Those tasks are now almost complete.
- Some amplifier group time/resources were absorbed in supporting the JPL/DSN team visits to the CDL (part of the NRAO/JPL MoU under which Cryo-3 devices were obtained)

SCHEDULE: NAOJ and ASIAA approved a change request for a no-cost six month schedule extension to revise the project completion date from October 2019 to April 2020. This allows for us to continue production at the originally agreed rate of four CLNAs/month and meet the delivery requirements without having to catch up.

RISK & MITIGATION: A new batch of devices obtained from a different Cryo-3 wafer from JPL seemed to resolve the problem. Repair and production of amplifiers for another project (which absorbed amplifier group resources are completed/almost complete). We expect to be able to produce Band 1 CLNAs at the prior established rate (which was sufficient). We do not plan to catch up to the original SoW schedule, since a schedule CRE to modify the formal delivery schedule was approved.

POP MILESTONE # 5.3.1

CDL

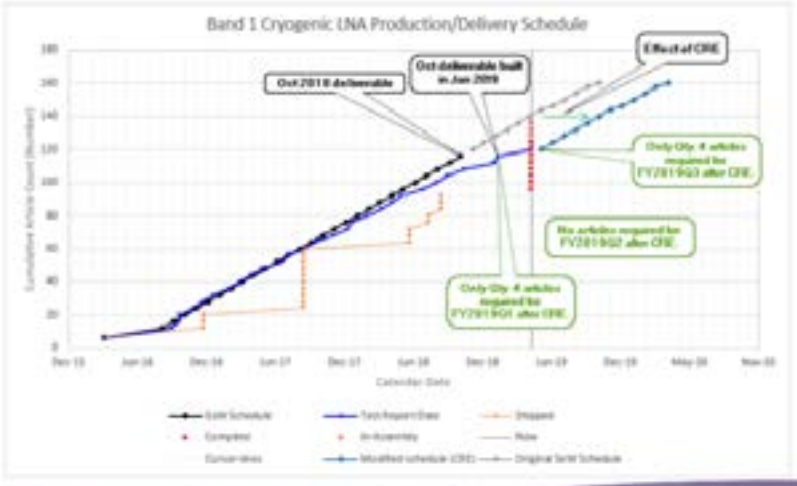
Build and test Band 1 amplifiers

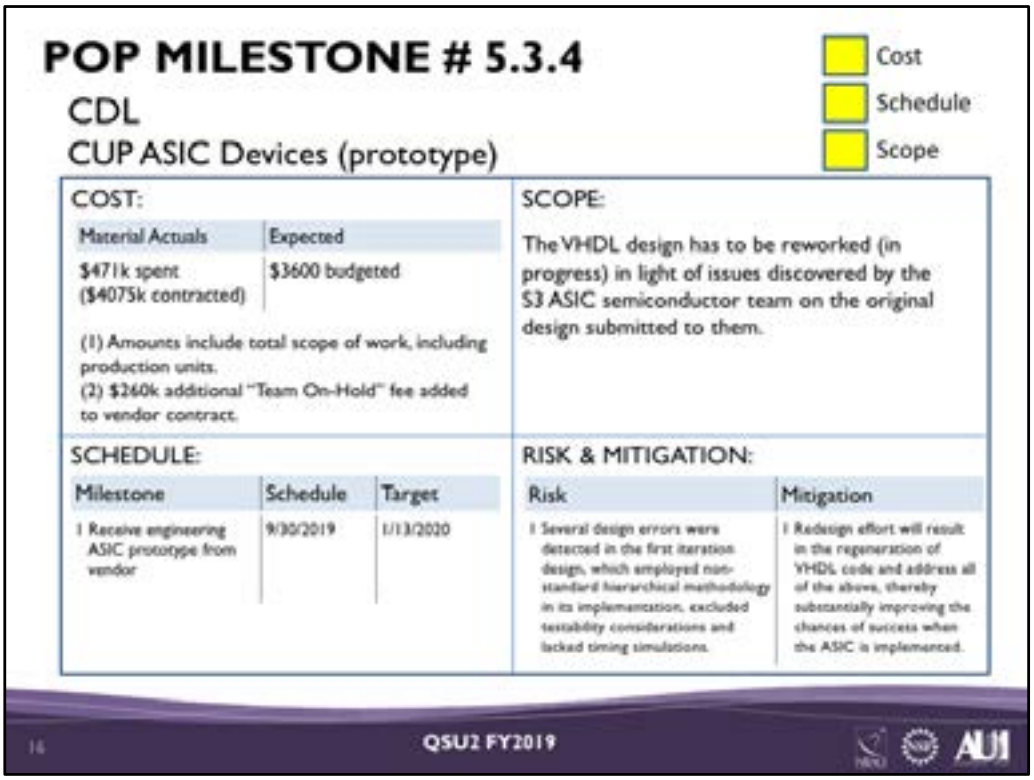
Supplementary information showing the schedule impact of CRE

Cost

Schedule

Scope





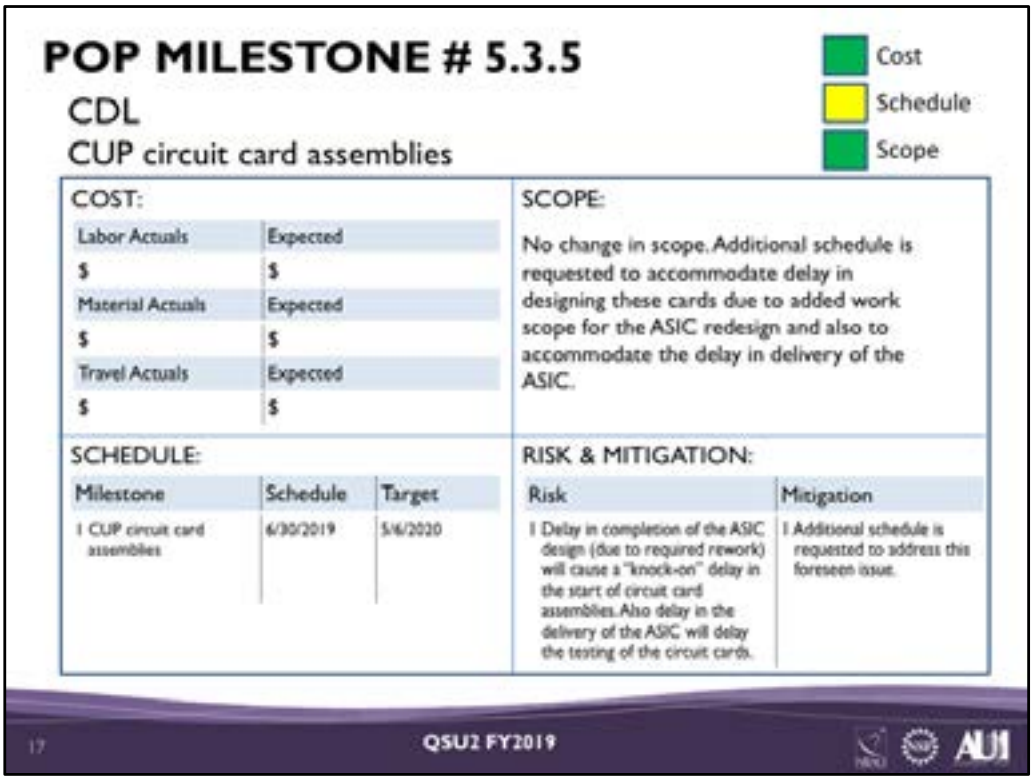
COST:
- The S3 ASIC vendor assessed a one time, "team on-hold fee" of $260k to agree to NRAO's request for schedule change to allow time to correct the VHDL design.
- Budgeted amount was set at the PDR, but the actual ASIC RFPs were sent out afterwards. Four out of five bids came out above what was budgeted and the one under didn't meet the technical requirements and got a low score.
- Difference between the contracted and budgeted values will be paid by using contingency funds (sufficient contingency funds were budgeted and are available).

SCOPE:
- During initial phase of front-end and back-end activities based on RTL drop #1 received from NRAO on 20-Jan-2019 the S3 ASIC Semiconductors team identified a list of unspecified, undefined and/or unclear technical requirements.
- A number of RTL design issues were also reported by S3 ASIC Semiconductors to NRAO.
- NRAO subsequently analyzed the feedback and comments from S3 ASIC Semiconductors and acknowledged that they must undertake substantial work in order to finalize their requirements, the RTL code and the documentation.
- NRAO has requested that the overall project schedule be substantially modified in order to allow us to complete our deliverable for RTL drop #2.
- NRAO is in the process of reworking the VHDL design for the scheduled RTL drop #2 on 6 May 2019.

SCHEDULE: To execute the redesign effort, additional schedule is required to complete this task. CUP ASIC Prototype Devices are now scheduled for 13 January 2020.

RISK & MITIGATION: The ASIC development is at very high risk due to:
- Several design errors in the first iteration design.
- Non-standard hierarchical design methodology that was adopted.
- Use of non-standard implementation practices.
- Exclusion of considerations for testability.
- No timing data simulations were performed on the first iteration VHDL design.
- Amount of rework to correct all of the above deficiencies add a lot of risk.

The redesign effort will result in the regeneration of VHDL code and address all of the above, thereby substantially improving the chances of success when the ASIC is implemented.

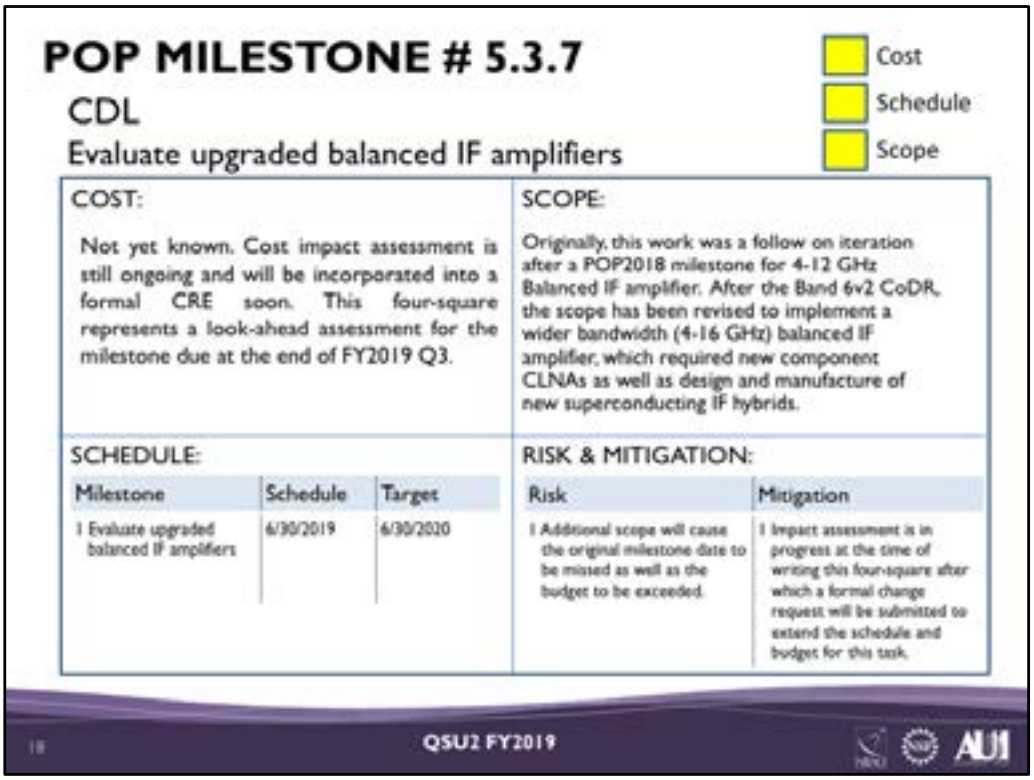


COST: No impact.

SCOPE: No impact.

SCHEDULE: Additional schedule is requested to accommodate delay in designing these cards due to added work scope for the ASIC redesign (milestone #5.3.4) and also to accommodate the delay in delivery of the ASIC.

RISK & MITIGATION: Delay in completion of the ASIC design (due to required rework) will cause a "knock-on" delay in the start of circuit card assemblies. Also delay in the delivery of the ASIC will delay the testing of the circuit cards. Additional schedule is requested to address this foreseen issue.

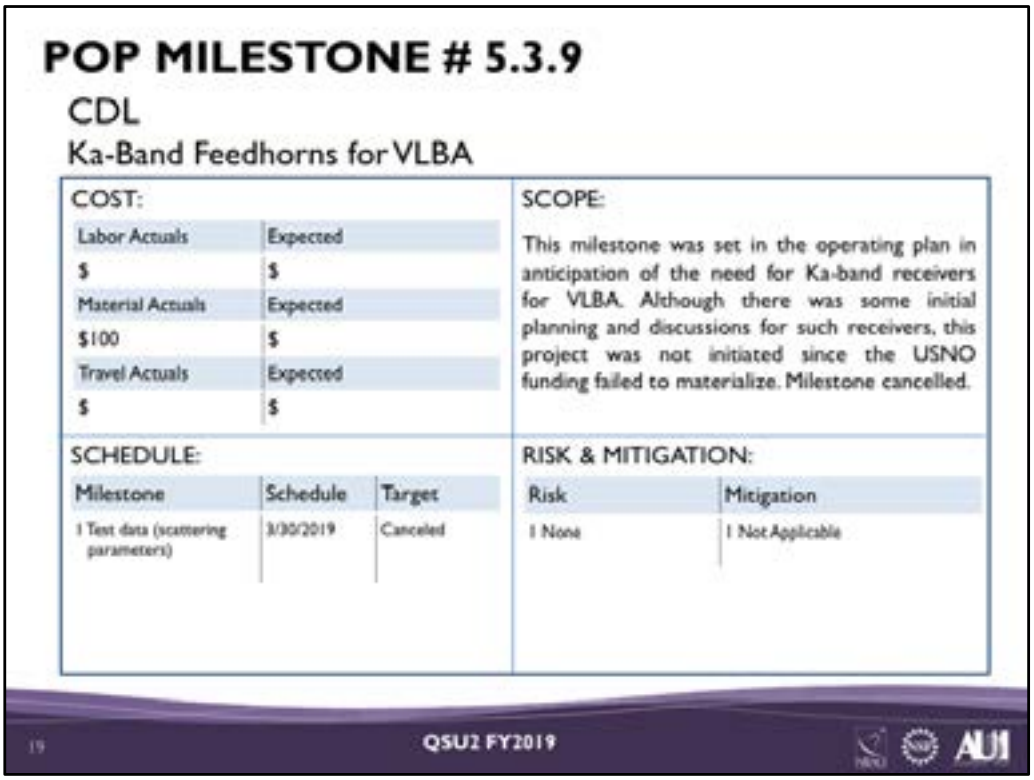


COST: Cost impact assessment is still ongoing and will be incorporated into a formal CRE. This four-square represents a look-ahead assessment for the milestone due at the end of Q3.

SCOPE: Originally, this work was a follow on iteration after a POP2018 milestone for 4-12 GHz Balanced IF amplifier. After the Band 6v2 CoDR, the scope has been revised to implement a wider bandwidth (4-16 GHz) balanced IF amplifier, which required new component CLNAs as well as design and manufacture of new superconducting IF hybrids.

SCHEDULE: Additional schedule is requested to accommodate delay in designing and implementing new superconducting IF hybrids, as well as procuring and testing new cryogenic low noise amplifiers.

RISK & MITIGATION: Additional scope will cause the original milestone date to be missed as well as the budget to be exceeded. Impact assessment is in progress at the time of writing this four-square after which a formal change request will be submitted to extend the schedule and budget for this task.

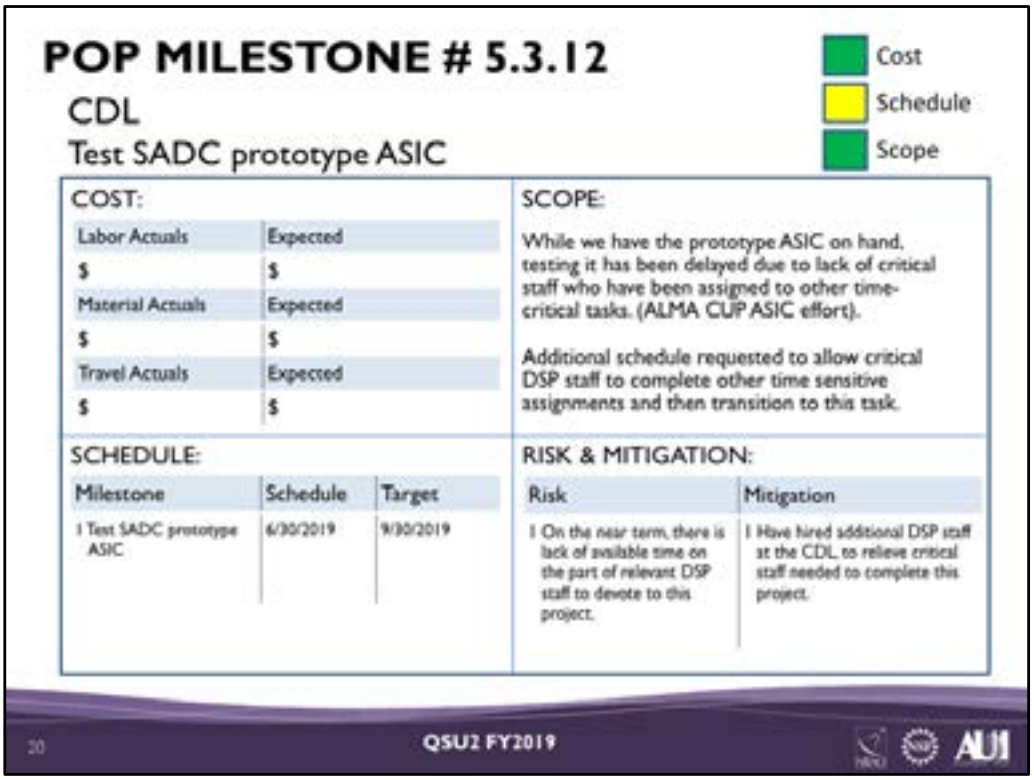


COST: No impact.

SCOPE: This milestone was set in the operating plan in anticipation of the need for Ka-band receivers for VLBA. Although there was some initial planning and discussions for building such receivers, this project was not initiated since the USNO funding failed to materialize. Milestone cancelled. Subsequent milestone 5.3.10 with deliverables in Q3 and Q4 will be cancelled as well.

SCHEDULE: No impact.

RISK & MITIGATION: No impact.

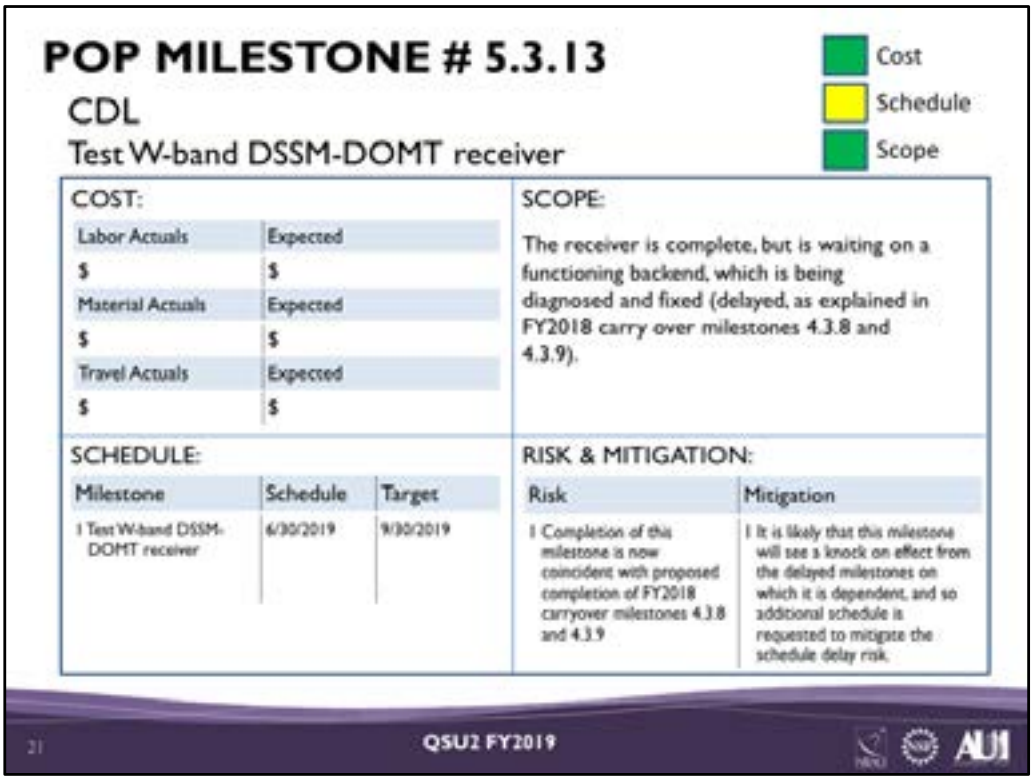


COST: No impact.

SCOPE: No impact.

SCHEDULE: As explained above, it is foreseen that additional schedule is required to complete this task.

RISK & MITIGATION: On a near term, there is lack of available time on the part of relevant DSP staff to devote to this project. While additional schedule should help, CDL has also hired additional DSP staff at the CDL, to relieve critical staff needed to complete this project.



COST: No impact.

SCOPE: No impact.

SCHEDULE: As explained above, it is foreseen that additional schedule is required to complete this task.

RISK & MITIGATION: Completion of this milestone is now coincident with proposed completion of FY2018 carryover milestones 4.3.8 and 4.3.9. It is likely that this milestone will see a knock on effect from the delayed milestones on which it is dependent, and so additional schedule is requested to mitigate the schedule delay risk.

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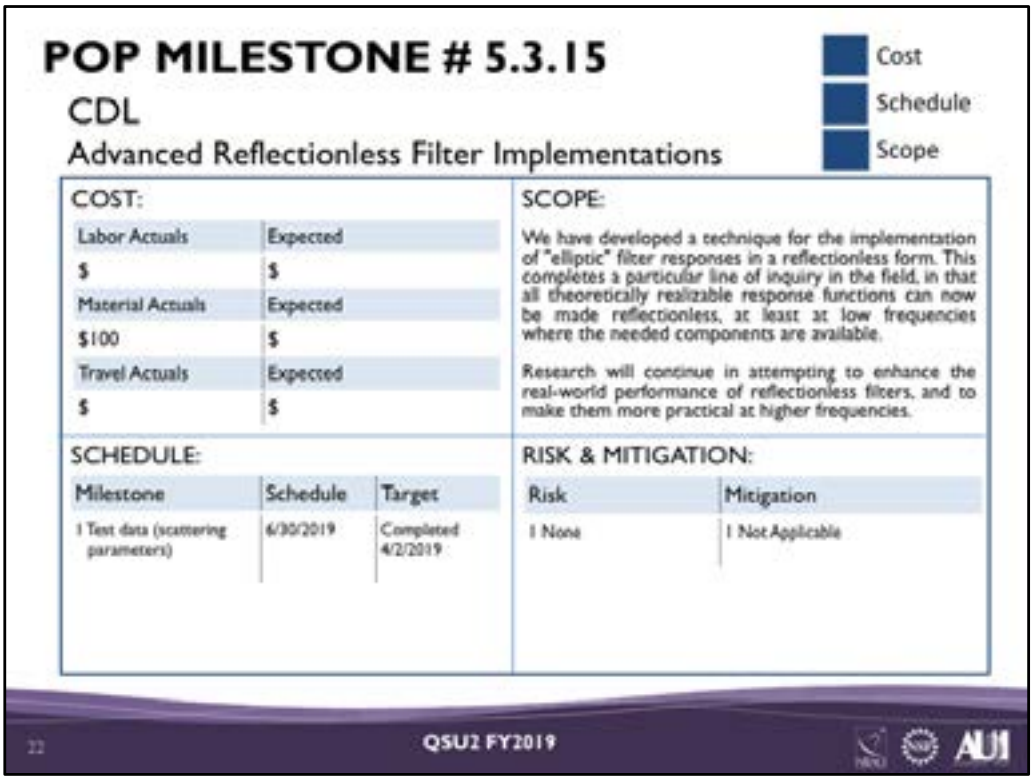


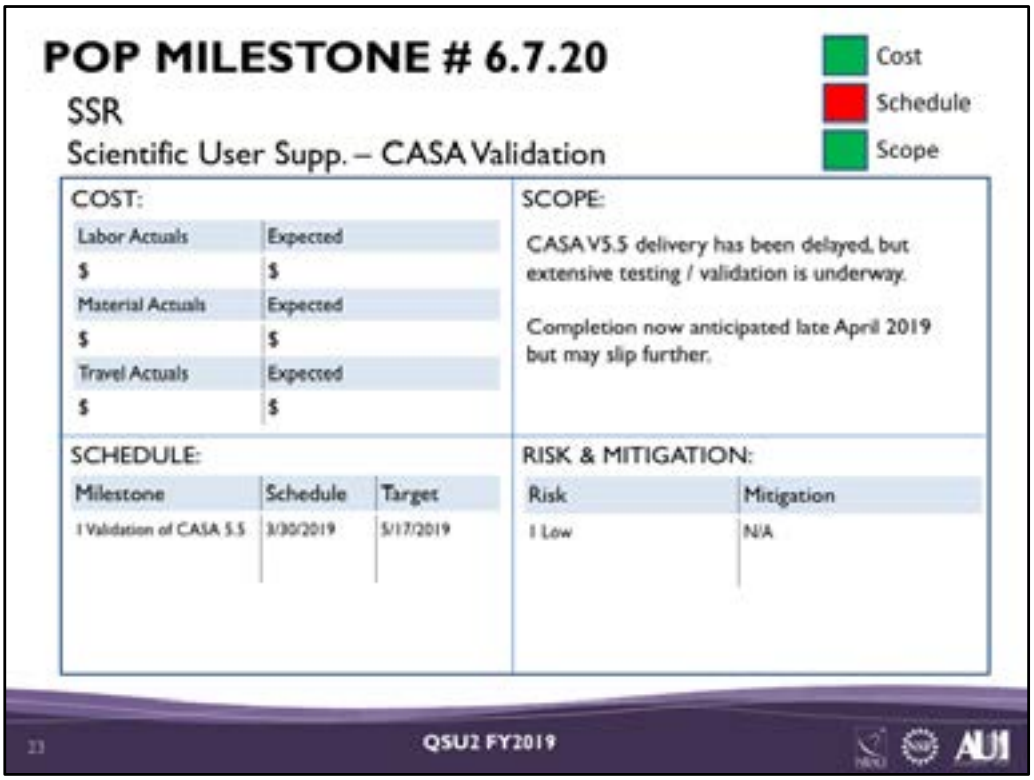
COST: Low. This was primarily a mental exercise, for which the labor (much of it off-hours) was not closely tracked. However, the M&S required to test and prove the new concept was remarkably inexpensive for an engineering project: less than $100 total (circuit board and parts for a 10 MHz filter).

SCOPE: Building upon a thread of inquiry started at the CDL about 10 years ago, we continue to explore and make improvements to the reflectionless filter technology which has become not only a new design capability for NRAO instrumentation, but also a source of academic publications, patents, and licensed income. It has also triggered a revival of interest from the academic community in absorptive filtering techniques, as numerous research groups are now attempting to follow where we have led. In this particular instance, we engaged in a collaboration with a retired engineer from Spain who, inspired by our most recent publications, felt that together we could solve one of the longstanding issues with these topologies--the realization of "elliptic" filter responses, proven decades ago to have the maximum selectivity for any causal filter using a finite number of elements.

Although with any discovery comes new questions, this achievement does in some ways "complete" reflectionless filter theory in that there are no realizable filter responses left which cannot be made reflectionless, from both ports and at all frequencies. Future explorations will no longer be about whether a particular desired response can be realized in principle, but whether it can be realized practically and conveniently (e.g. without transformers, at high frequency, using transmission lines, or using cavities).

SCHEDULE: The basic theoretical understanding and simulations were actually obtained in Q1 of this year, but construction of a practical test circuit was delayed as the team had to focus on other, higher-priority items. Nonetheless, successful tests were completed at the beginning of April, with outstanding agreement between measurement and simulation. A joint publication with our collaborator has been drafted and is now under review at an IEEE Journal, hopefully to be published by the start of the next fiscal year.

RISK & MITIGATION: No impact.

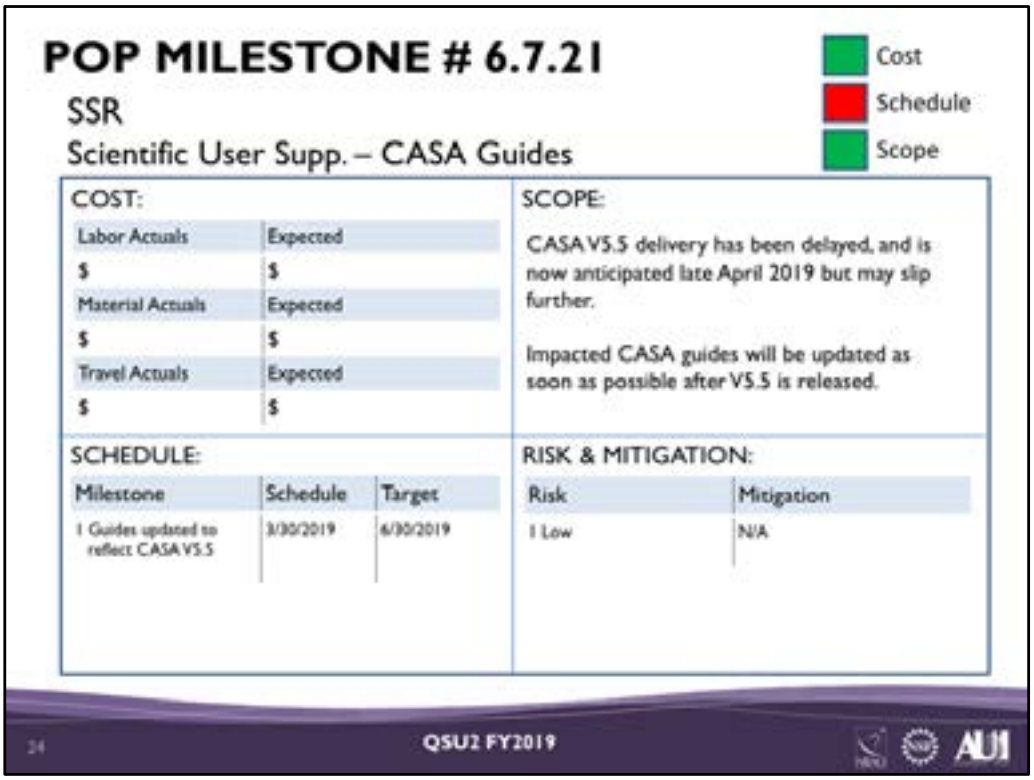


COST: No impact.

SCOPE: No impact.

SCHEDULE: Now expect validation complete by May 17, 2019.

RISK & MITIGATION: Risk is low. No specific mitigation required at present.

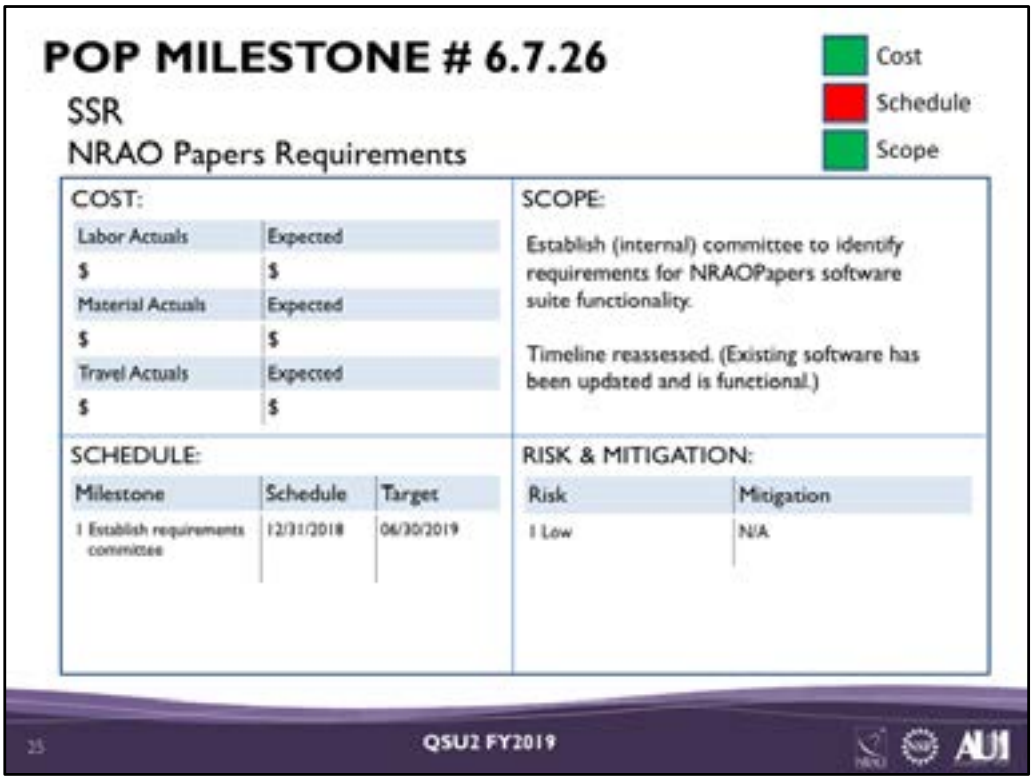


COST: No impact.

SCOPE: No impact.

SCHEDULE: If V5.5 is released by May 17, 2019, impacted Guides are expected to be updated by June 30.

RISK & MITIGATION: Risk is low. No specific mitigation required at present.

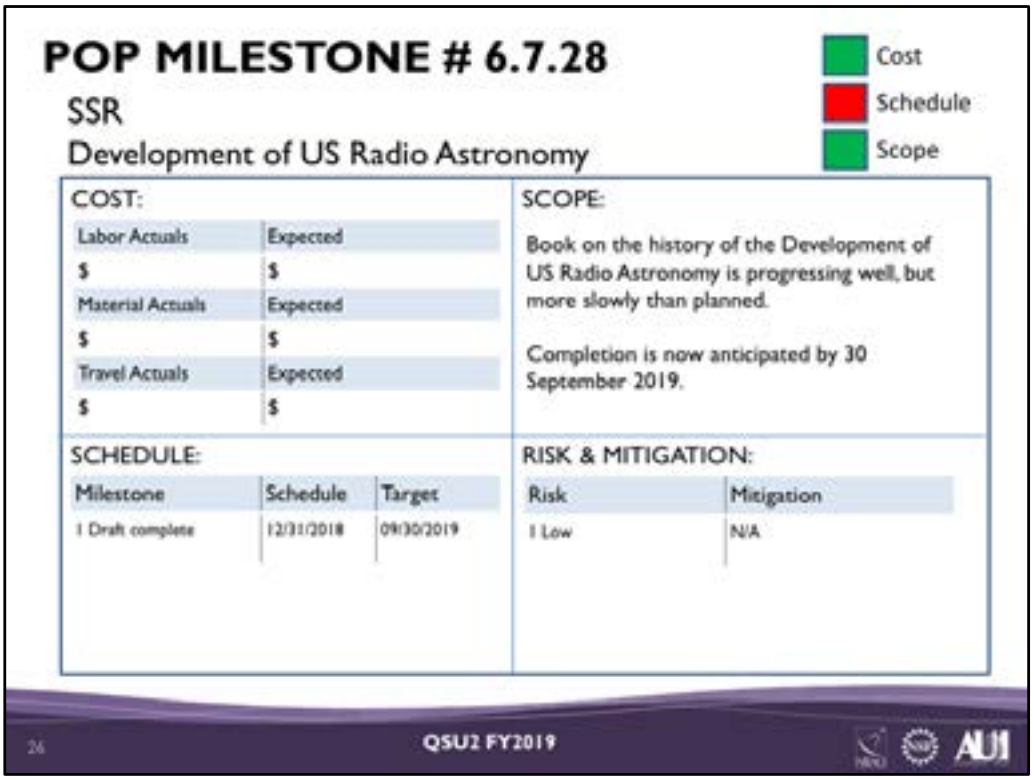


COST: No impact.

SCOPE: No impact.

SCHEDULE: Still targeting 30 June 2019 for establishment of requirements committee (as reported in QSU1).

RISK & MITIGATION: Risk is low. No specific mitigation required at present.

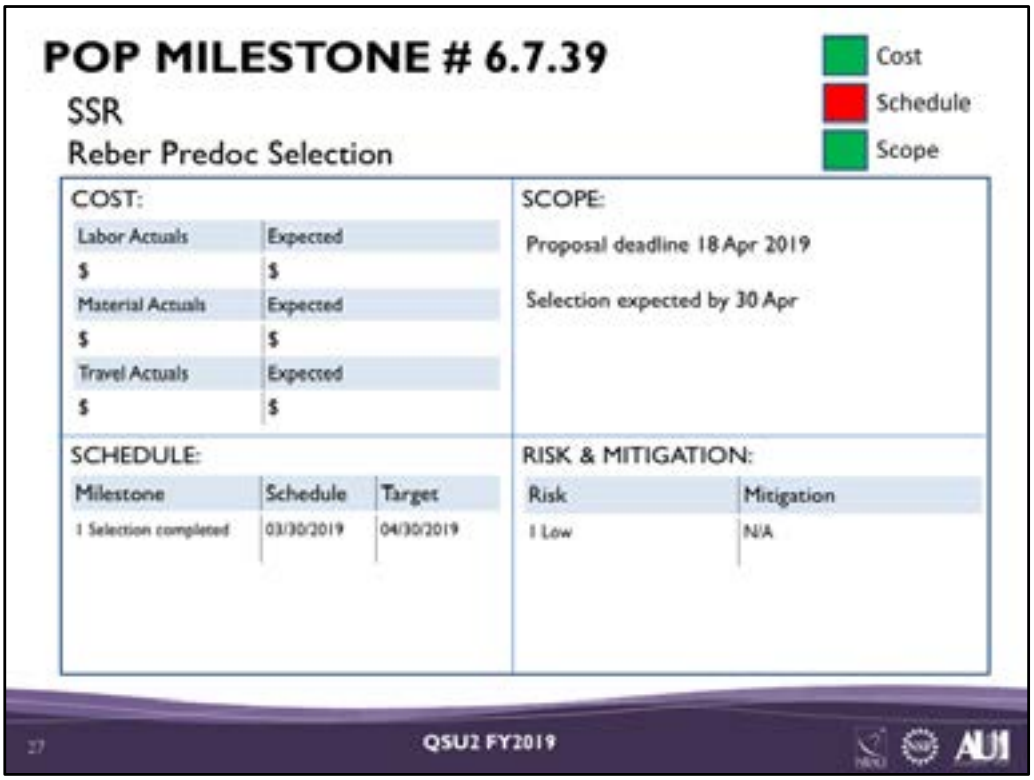


COST: No impact.

SCOPE: No impact.

SCHEDULE: Good progress is being made but the expected date of completion has slipped further and completion is now anticipated by end Q4 (previously reported as end Q3)

RISK & MITIGATION: Risk is low. No mitigation required.

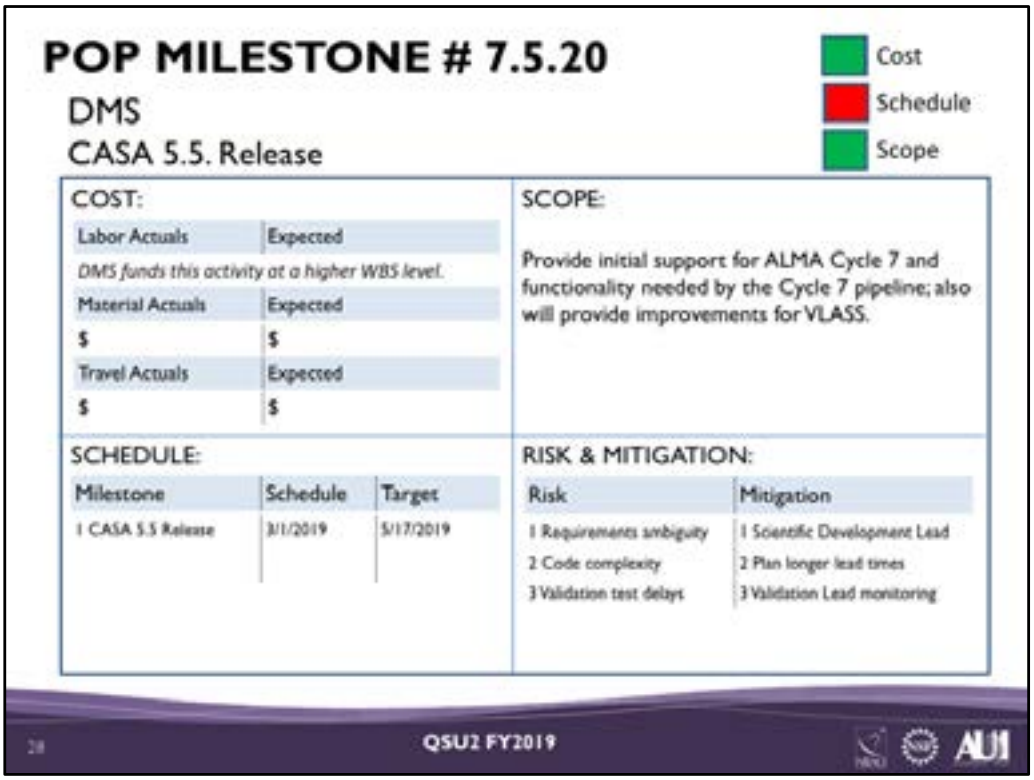


COST: No impact.

SCOPE: No impact.

SCHEDULE: Minor schedule slip.

RISK & MITIGATION: No impact.

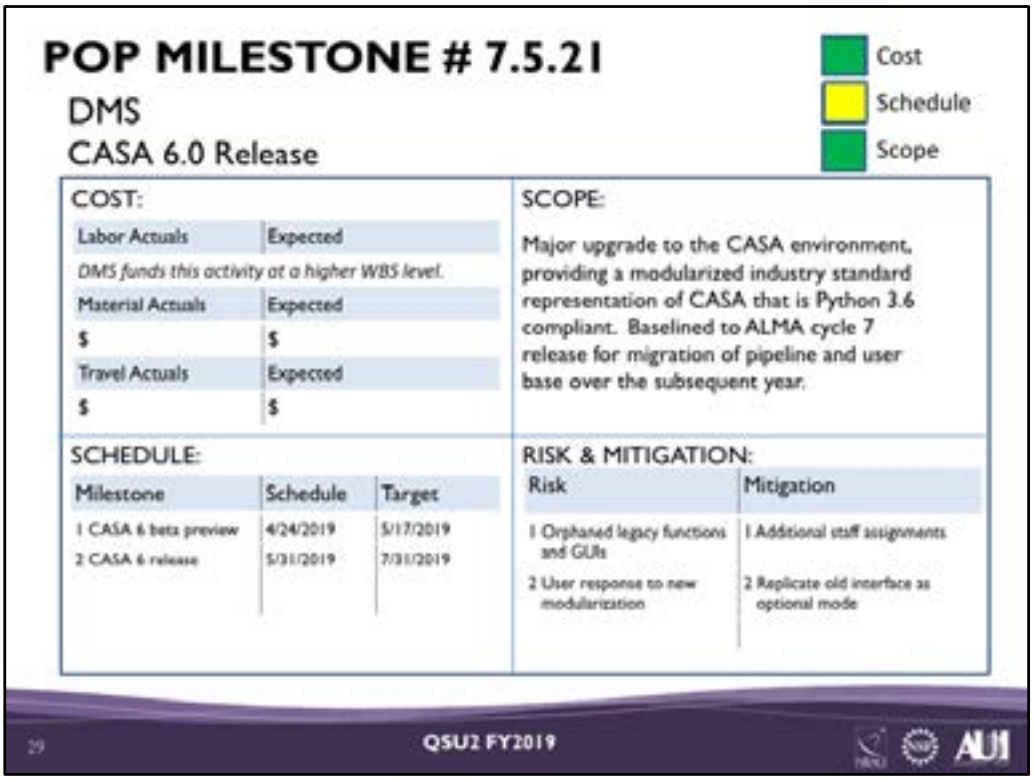


COST: DMS funds this activity at a higher WBS level. Costs are not tracked for this milestone.

SCOPE: Provide initial support for ALMA Cycle 7 and functionality needed by the Cycle 7 pipeline; also will provide improvements for VLASS.

SCHEDULE: Release was delayed by delayed requirements and code complexity in the particular area of a critical change to imaging code.

RISK & MITIGATION: 1) Ambiguous requirements have caused delays. A Scientific Development Lead has been appointed to address detailed requirement definition and solutions with the stakeholders in regular meetings. 2) The complexity of the code has caused delays, as changes in one place introduce errors in another. In the short term longer lead times for changes will be needed. Over the longer term, CASA plans to make structural changes as part of the next-generation CASA development. 3) Validation test delays can be introduced by the matrixed nature of the validation testing team. The Validation Lead is monitoring for delays in an effort to maximize test turnaround.

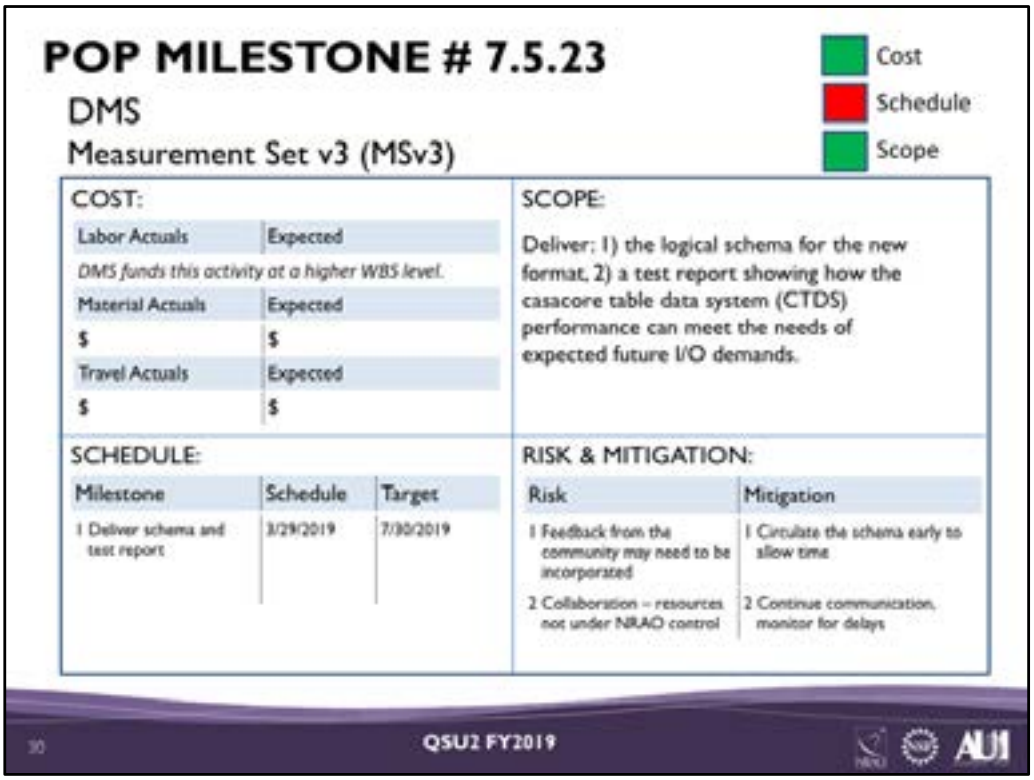


COST: DMS funds this activity at a higher WBS level. Costs are not tracked for this milestone.

SCOPE: Major upgrade to the CASA environment, providing a modularized industry standard representation of CASA that is Python 3.6 compliant. Baselined to ALMA Cycle 7 release for migration of pipeline and user base over the subsequent year.

SCHEDULE: CASA 6.x is being developed to provide a parallel testing path for the 5.x series of production releases. The original schedule was changed to align with ALMA Cycle 7 so that ALMA can migrate to CASA 6 for Cycle 8 using with the ALMA Cycle 7 as a comparison baseline.

RISK & MITIGATION: 1) CASA has functions and GUI's which the current development team does not have experience with. Staff will be reassigned from other CASA tasks to provide migration support. 2) Many current are used to a monolithic package containing a custom environment preconfigured for them. For users that prefer this, the old interface will be replicated as an optional mode. Note that our new industry standard approach will be more familiar to the Python community and provide more flexibility.

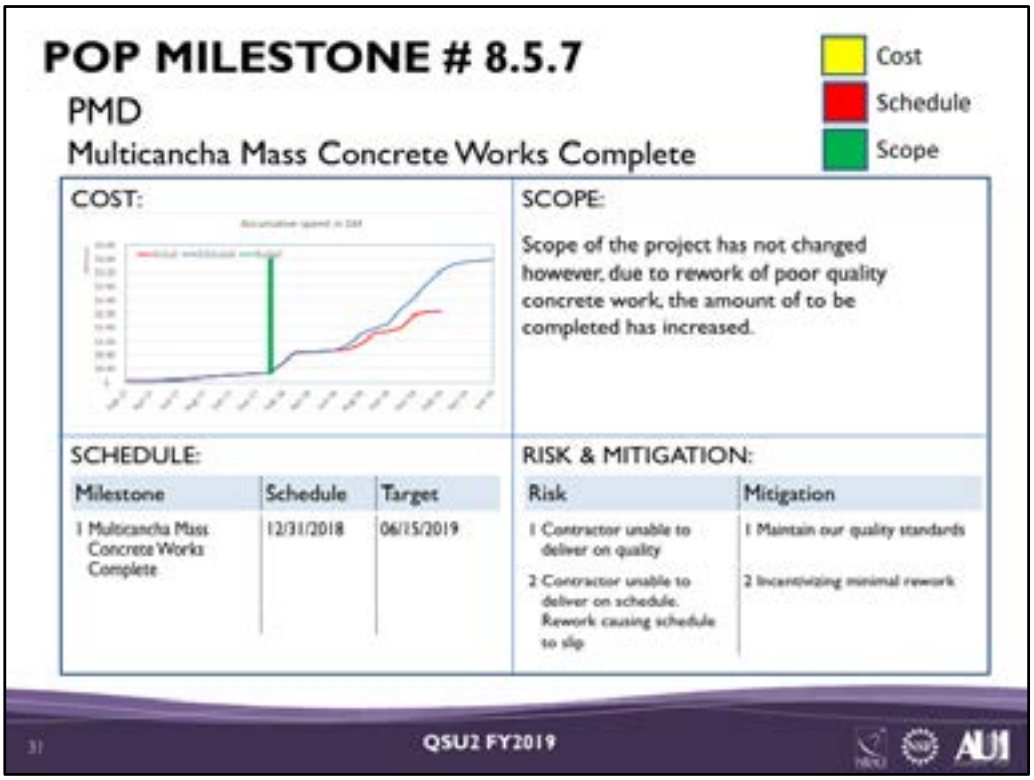


COST: DMS funds this activity at a higher WBS level. Costs are not tracked for this milestone.

SCOPE: Deliver: 1) the logical schema for the new format, 2) a test report showing how the casacore table data system (CTDS) performance can meet the needs of expected future I/O demands.

SCHEDULE: Work is done as a cooperative effort between NRAO, ASTRON, and SKA resources. All organizations have had critical projects which has pulled resources away from this and created the delay in the deliverables. Much of the work has been completed, and a schedule has been created to complete the final tasks, with resources assigned. Further delays are still possible which are outside of NRAO control. We will continue regular communication and monitor for delays.

RISK & MITIGATION: One of the tasks for completion is to circulate the revised schema to the community for feedback. While the changes are primarily extensions to the schema, there may be questions which need to be addressed. The schema will be circulated early in Q3 FY2019 to provide time for feedback.

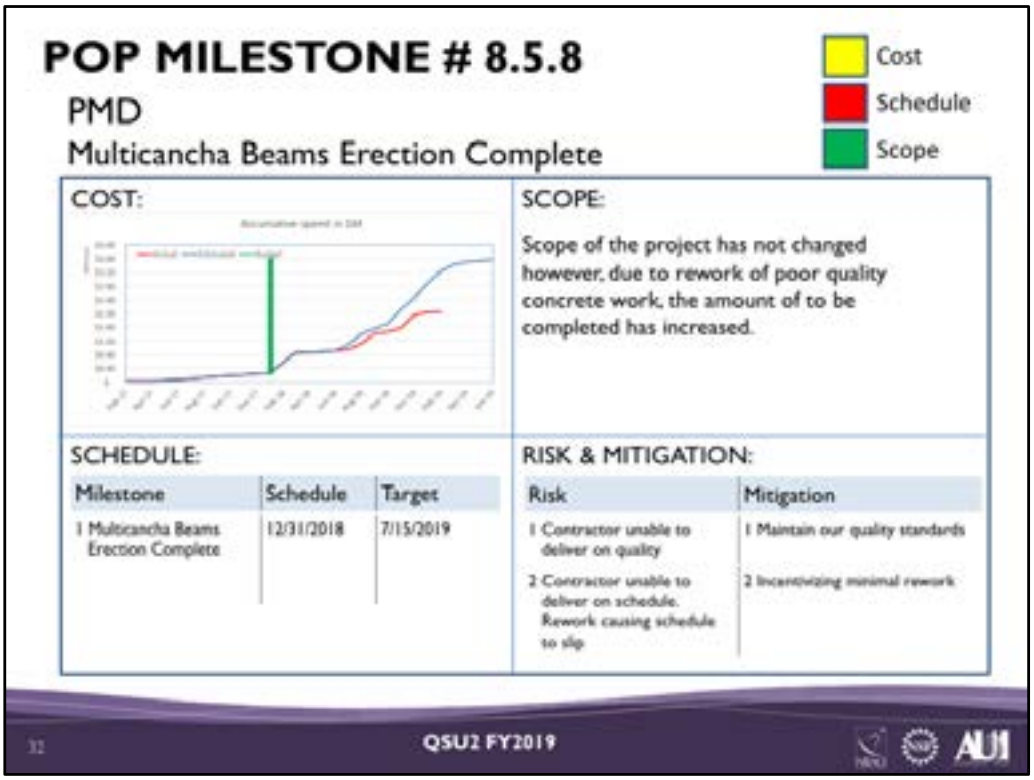


COST: This is a fixed price contract represented by the green bar in the chart, however the contractor is $650,000.00 over budget, behind on schedule and at risk of withdrawal from the contract. NRAO will negotiate monetary incentives for the contractor to finish the contract on a new more realistic schedule.

SCOPE: No impact.

SCHEDULE: Contractor has asked for 120 days beyond the current schedule. We do not feel this is realistic based on the rework necessary to repair current non-conformances combined with our understanding of the schedule of delivery of the membrane. We have requested a more realistic schedule to which we will negotiate the schedule of incentives.

RISK & MITIGATION: Quality remains an issue. We have closely monitored the quality of work and submitted non-conformance reports on each issue. We also have recommended a change of site management to the contractor as part of the contract renegotiation with incentives.



Notes are the same as 8.5.7

COST: This is a fixed price contract represented by the green bar in the chart, however the contractor is $650,000.00 over budget, behind on schedule, and at risk of withdrawal from the contract. NRAO will negotiate monetary incentives for the contractor to finish the contract on a new, more realistic schedule.

SCOPE: No impact.

SCHEDULE: Contractor has asked for 120 days beyond the current schedule. We do not feel this is realistic based on the rework necessary to repair current non-conformances combined with our understanding of the schedule of delivery of the membrane. We have requested a more realistic schedule to which we will negotiate the schedule of incentives.

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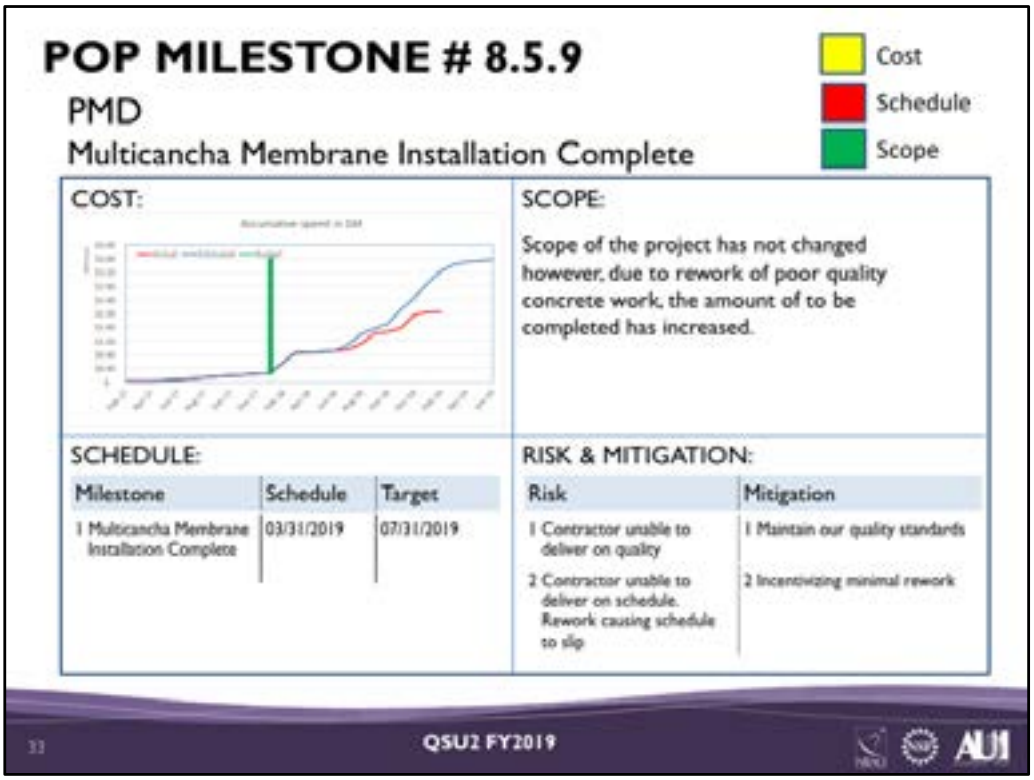

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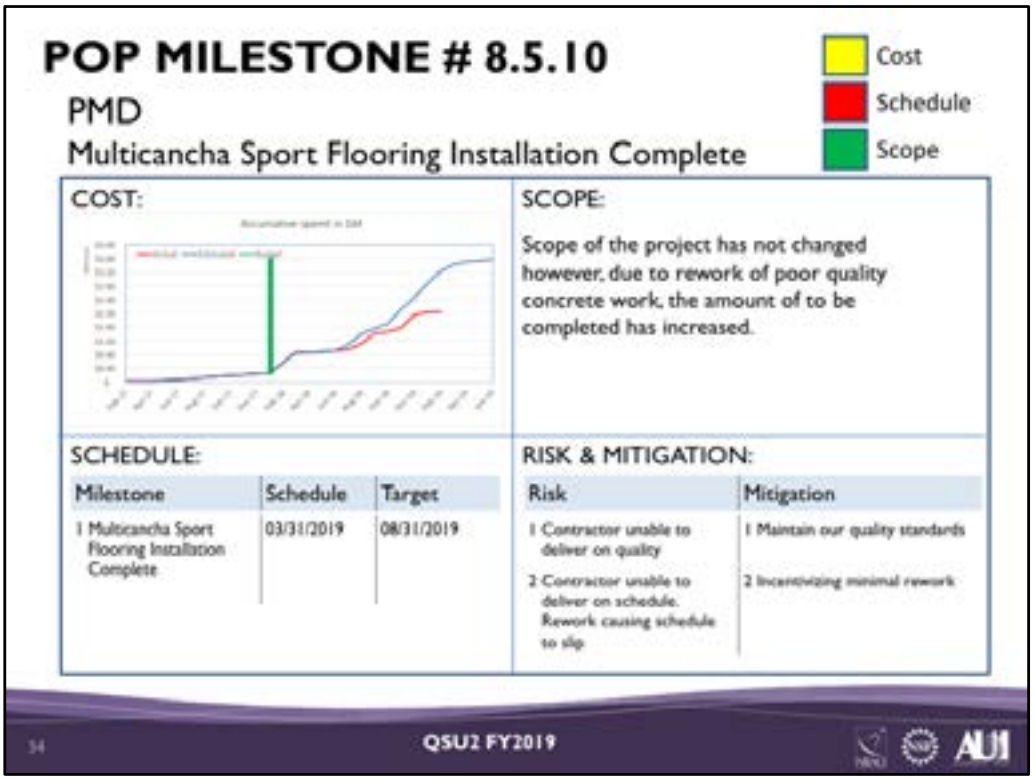
SCOPE: No change in scope.

SCHEDULE: Contractor has asked for 120 days beyond the current schedule. We do not feel this is realistic based on the rework necessary to repair current non-conformances combined with our understanding of the schedule of delivery of the membrane. We have requested a more realistic schedule to which we will negotiate the schedule of incentives.

RISK & MITIGATION: Quality remains an issue. We have closely monitored the quality of work and submitted non-conformance reports on each issue. We also have recommended a change of site management to the contractor as part of the contract renegotiation with incentives.



Notes are the same as 8.5.7

COST: This is a fixed price contract represented by the green bar in the chart, however the contractor is $650,000.00 over budget, behind on schedule, and at risk of withdrawal from the contract. NRAO will negotiate monetary incentives for the contractor to finish the contract on a new, more realistic schedule.

SCOPE: No change in scope.

SCHEDULE: Contractor has asked for 120 days beyond the current schedule. We do not feel this is realistic based on the rework necessary to repair current non-conformances combined with our understanding of the schedule of delivery of the membrane. We have requested a more realistic schedule to which we will negotiate the schedule of incentives.

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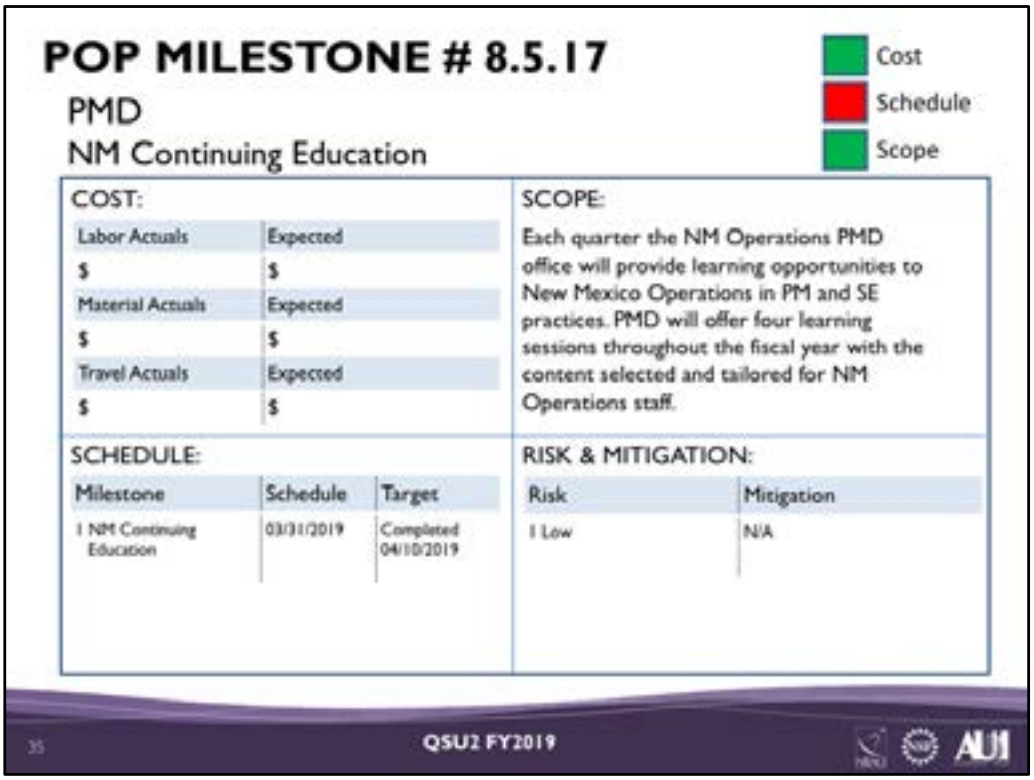
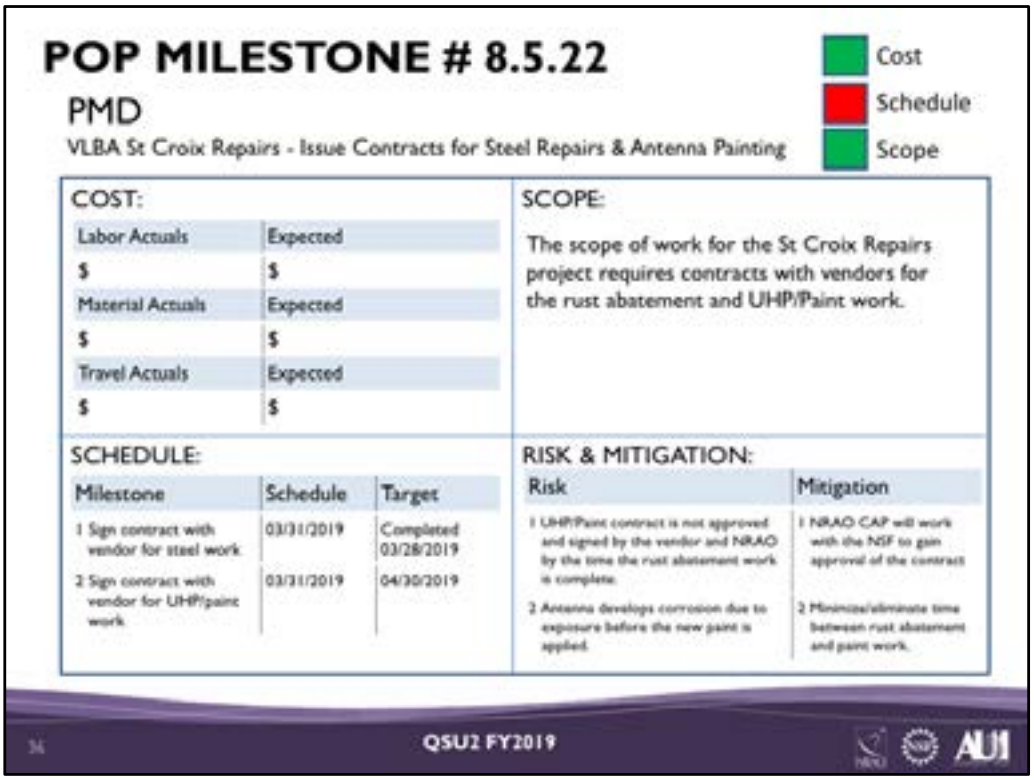


COST: No impact.

SCOPE: No impact.

SCHEDULE: Milestone completed when Lauren Zuckerberg presented "Project Management Basics & PMD @ NRAO" to the Leadership Cohort on 4/10/2019 in Socorro, NM.

RISK & MITIGATION: No impact.



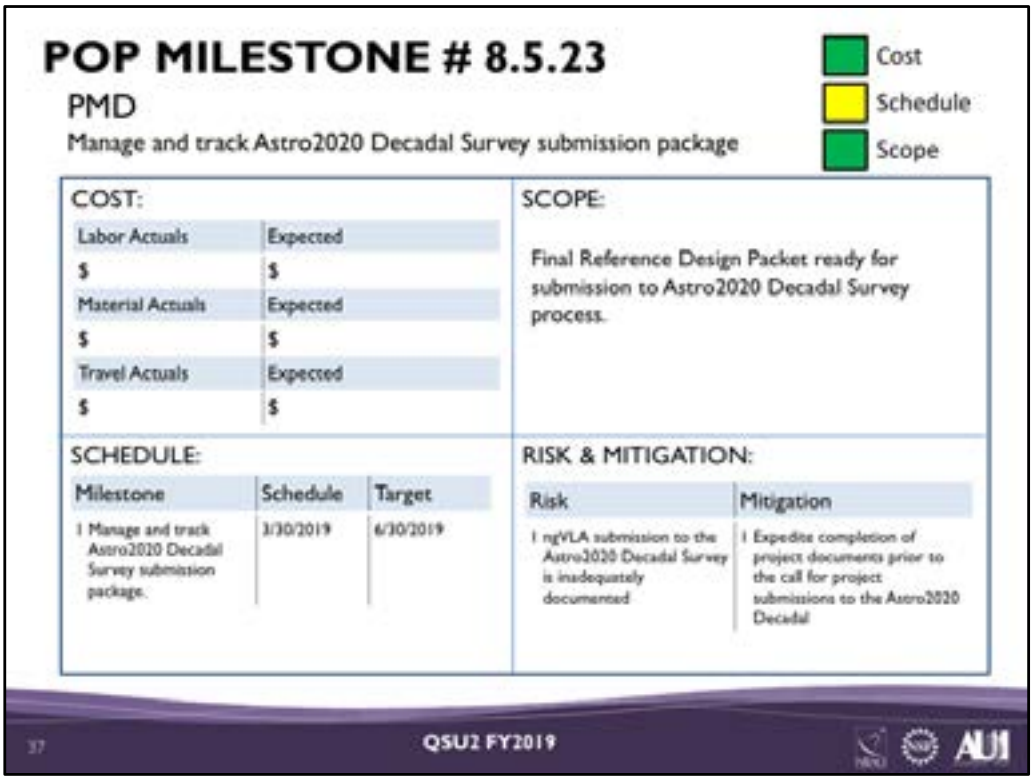
COST: No impact.

SCOPE: No impact.

SCHEDULE: The contract for the rust abatement work is in place, but the contract for the HP/paint work is with the NSF awaiting approval since the amount exceeds $250,000. No major impacts to scheduled work as long as the UHP/Paint contract is approved by the NSF before 4/30/2019. Overall for the project, we have abundant float in the schedule. However, if the UHP/Paint work is delayed it could resulted in a prolonged downtime of the antenna in which no work is being done, which would be unfortunate for our users.

RISK & MITIGATION:

1) Risk: The UHP/Paint contract is not approved and signed by the vendor and NRAO by the time the rust abatement work is complete. Mitigation: NRAO CAP will work with the NSF to gain approval of the contract before 4/30/2019.
2) Risk: Antenna develops corrosion due to exposure before the new paint is applied. Mitigation: Minimize/eliminate time between rust abatement and paint work.

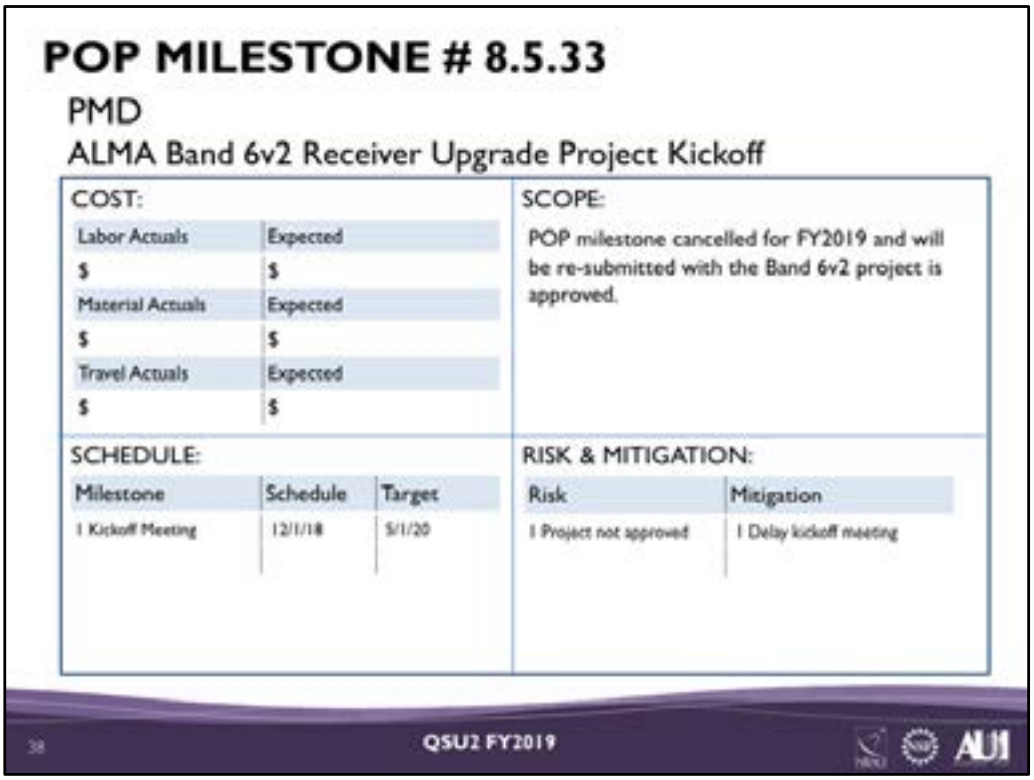


COST: No impact

SCOPE: No impact

SCHEDULE: To demonstrate that the NRAO understands the technical risk and cost of the proposed facility, the ngVLA Project Office is preparing a reference design for the array that describes the system architecture and a viable concept for each major element within the ngVLA system. The selected concepts have quantifiable technical risk and a sound cost basis, typically an engineer's estimate with component-level historical analogs or vendor quotations. This reference design was largely complete by the end of CY2018, with minor refinements at the sub-system level for architectural coherence expected in Q1 CY2019, incorporating feedback from the review conducted the prior fiscal year. The final reference design proposal documentation, including the supporting cost model documentation, will be on-going through the package submission to the Astro2020 Decadal Survey in Q4 FY2019.

RISK & MITIGATION: Expedite completion of project documents prior to the call for project submissions to DS2020.

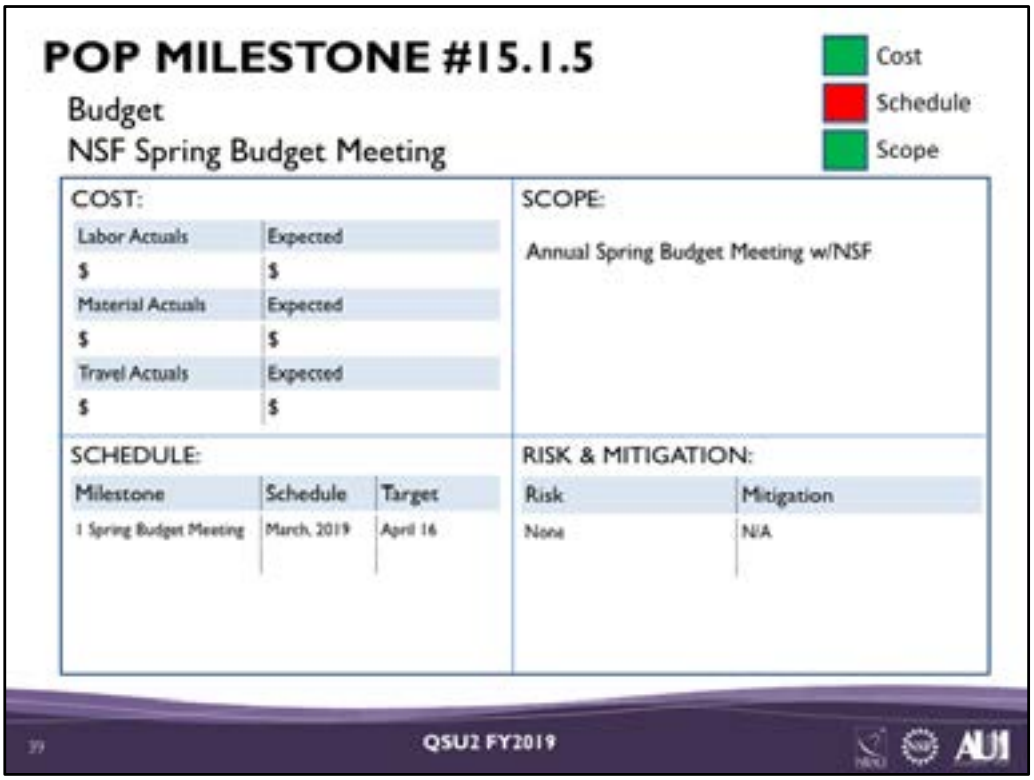


COST: N/A – still in proposal stage.

SCOPE: Project scope will be fully defined in the proposal.

SCHEDULE: A successful Conceptual Design Review (CoDR) was held on Sep 25th 2018. Although the original intention was to submit a preliminary design proposal for the Nov 2018 ALMA Board meeting, NRAO now intends to down-select design options through a series of development studies during FY2019, and submit a preliminary design study leading to a prototype cartridge in FY2020. This approach also will allow the development team to fill needed roles in the technical team before proceeding with an ALMA project commitment. We will, thus, cancel the preliminary design POP milestone for the remainder of this year, and reintroduce it in the next POP.

RISK & MITIGATION: If the ALMA Board does not approve the project, the team will implement any necessary recommendations and re-submit the proposal for the following Board meeting.

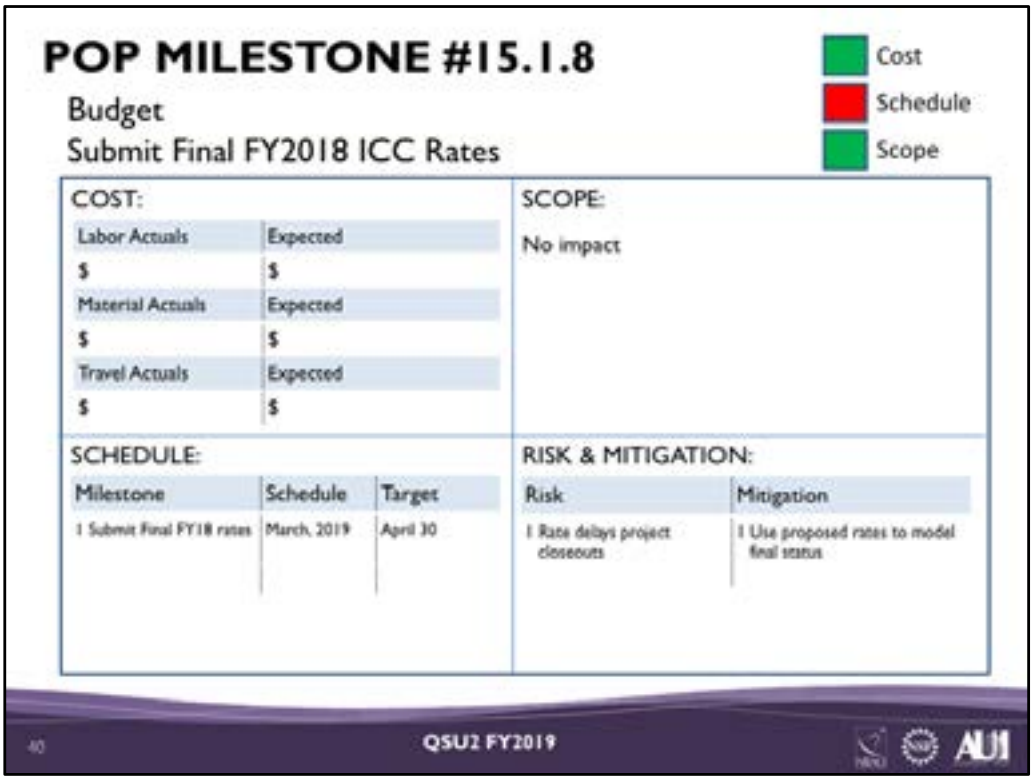


COST: No impact.

SCOPE: No impact.

SCHEDULE: Unable to schedule meeting until 4/16. Meeting has been completed.

RISK & MITIGATION: No impact.

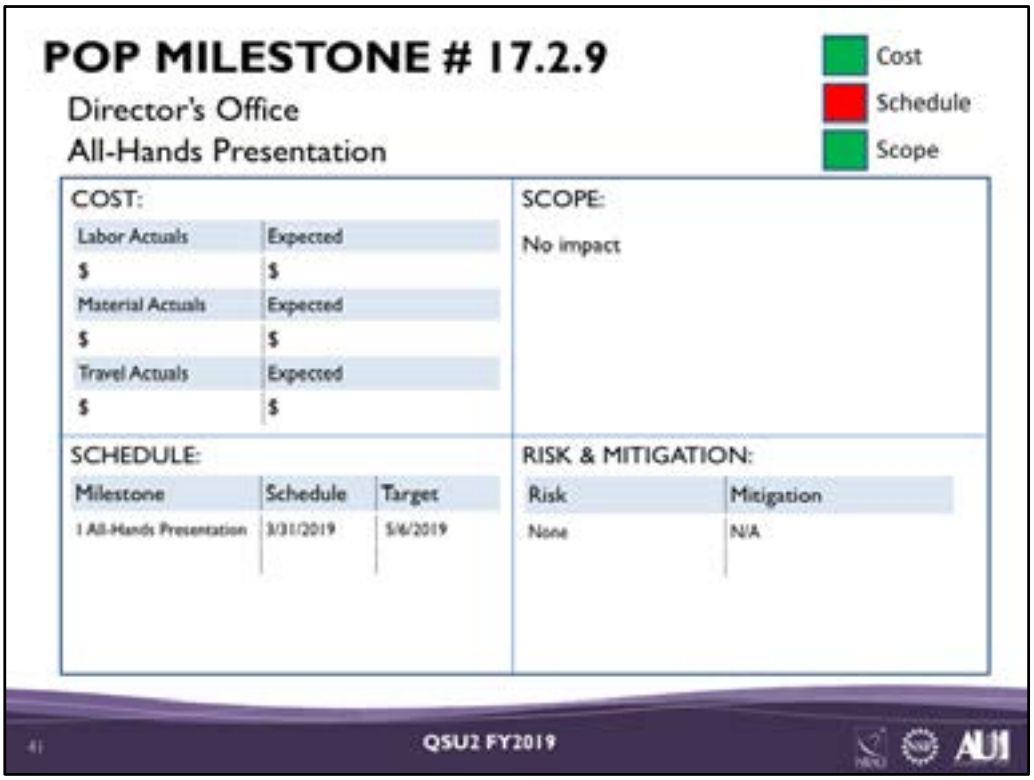


COST: No impact.

SCOPE: No impact.

SCHEDULE: NRAO portion of the rate submission complete. Awaiting AUI completion & submission.

RISK & MITIGATION: Delays in getting the final rates delays project closeouts and the ability to do accurate financial projections. The projects can be modelled with the proposed rates, but this is cumbersome.



COST: No impact.

SCOPE: No impact.

SCHEDULE: Government shutdown affected the all-hands meeting schedule

RISK & MITIGATION: No impact.

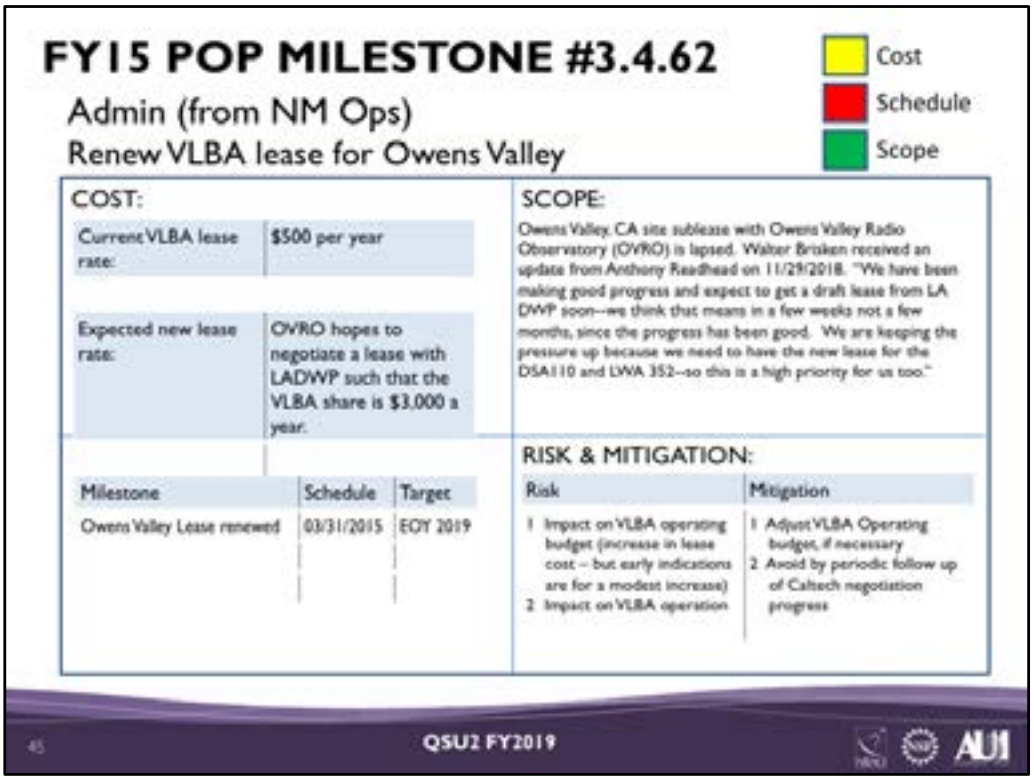

2018 Carryover Milestones
AUI

FY2018 Carryovers (1)

POP Section	POP Milestone	Milestone	POP Completion Date	New Completion Date		Cost	Sched	Scope
3.3		**Atacama Large Millimeter/submillimeter Array (ALMA)**						
		Maintenance, Renewal, and Warranty Claims						
	33	Deliver FEMTs 1 & 2 to JAO	3/31/2018	Q3			FY2019 POP	
3.4		**Very Large Array**						
		VLA Development						
	37	Realize operational for limited observing modes	9/30/2018	Q1 (new completion proposed Q3)	4-Square			
4.3		**Central Development Laboratory**						
		Research and Development						
	8	Explore DUPT calibration using hot-cold noise	9/30/2018	Q3 (new completion proposed Q4)	4-Square			
	7	Demonstrate high-bandwidth unformatted serial link with integrated FE	9/30/2018	Q2 (new completion proposed Q3)	4-Square			
5.4		**Science Support and Research**						
		Scientific User Support & Student Programs						
	28	CASA Guides	6/30/2018	Q1	Complete Q1			
	33	Student Observing Support Selection (ALMA)	9/30/2018	Q1	Complete Q1			
6.3		**Data Management & Software**						
		Scientific Information Services						
	6	NGAS storage replacement	9/30/2018	Q3	Complete Q3			
		ARCHE						
	33	Algorithm R&D Roadmap v.1	6/30/2018	Q1	Complete Q1			
7.2		**Program Management Department**						
		Headquarters						
	24	PMVII Training/Workshop	9/30/2018	Q1	Complete Q1			
		VLA Electrical Infrastructure Upgrade						
	33	VLA Electrical Infrastructure Upgrade Closeout	6/30/2018	Q1 (new completion proposed Q3)	4-Square			

FY2018 Carryovers (2)

POP Section	POP Milestone	Milestone	POP Completion Date	New Completion Date		Cost	Sched	Scope
10.3		**Office of Diversity & Inclusion**						
		Local and National Programs						
	3	NAIC Annual Workshop	9/30/2018	Q3	Complete Q3			
12.7		**Administrative**						
		Budget						
	3	Develop and test tool for use in budget planning	6/30/2018	Q3	Complete Q3			
		ngVLA						
2		**Antenna Reference Design**						
	3	Conduct formal documentation and design reviews of ngVLA Reference Design	9/30/2018	Q4	FY2019	FY2019 POP		
4		**Conceptual Design & Development**						
	3	Release first issue of Array Calibration document	9/30/2018	Q1 (new completion proposed Q3)	Complete Q3			
	13	WP Mitigation study released	9/30/2018	Q3 (new completion Q3)	4 Quarter			
	19	WVR Testing begins	9/30/2018	Q3	Complete Q3			
5		**Administration and Management**						
5.4		**Requirements Management**						
	6	Conduct gap analysis of stakeholder and system requirements	6/30/2018	Q3	Complete Q3			
	8	Release concept documents, system requirements and updated WVTM	9/30/2018	Q3 (new completion proposed Q1 CM)	Complete Q3			
3.11		**Long Baseline Observatory**						
		Operational Activities						
	4	VME replacement program will be complete	9/30/2018	Q1 (new completion proposed Q3)	4 Quarter			
	10	Complete VLBA upgrade roadmap	9/30/2018	Q1	Complete Q1			



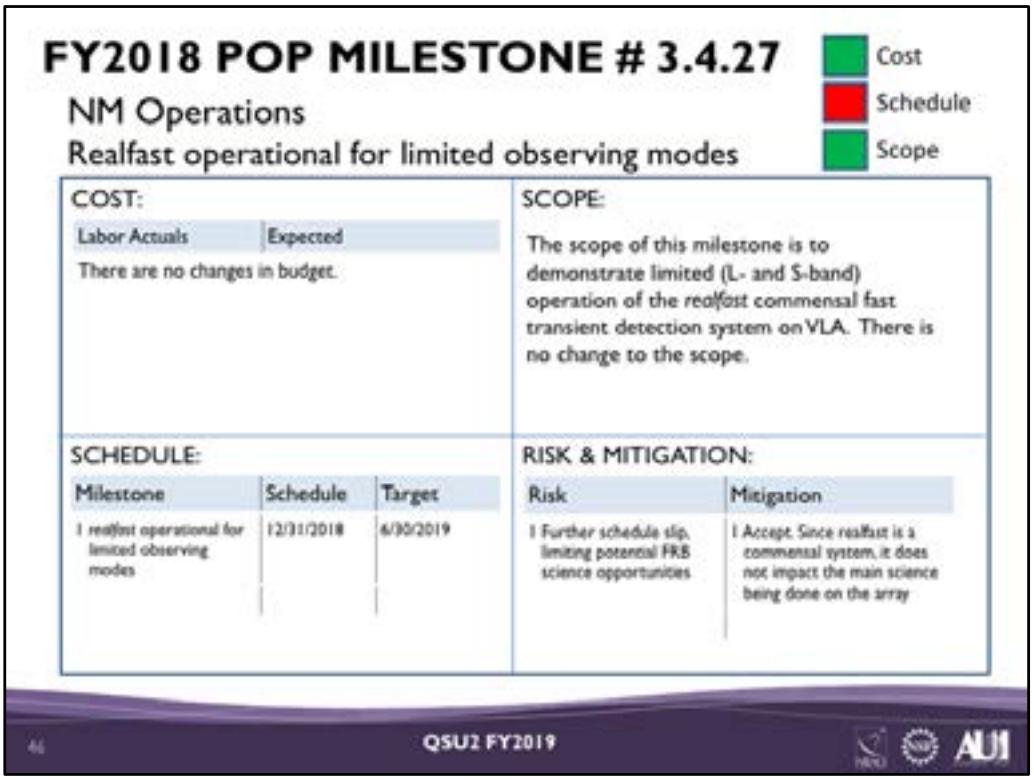
Updated 01/10/2019
COST: Future lease costs are subject to the status of Caltech's re-negotiation of the lease with Los Angeles Water and Power.

SCOPE: No impact.

SCHEDULE: Owens Valley Lease: The master lease for the Owens Valley Radio Observatory is an agreement between Caltech and Los Angeles Water and Power (the lease holder). The master lease has been expired since March 31, 2015, and renegotiating it does not appear to be a priority for LA W&P. NRAO has a sublease agreement for VLBA-OV with Caltech. We will continue to monitor the situation with the master lease, and propose a new milestone for the sublease at the appropriate time.

RISK & MITIGATION:

1. Caltech has leased Owens Valley, CA for a low yearly fee. The probability of a cost increase is low, but a budget adjustment would be needed if a cost increase occurs.
2. Impacts on other aspects of VLBA Operations are not likely to occur.
3. An interim agreement between Caltech and NRAO regarding the sublease during this interim period has been discussed and our continued occupancy is not an issue.

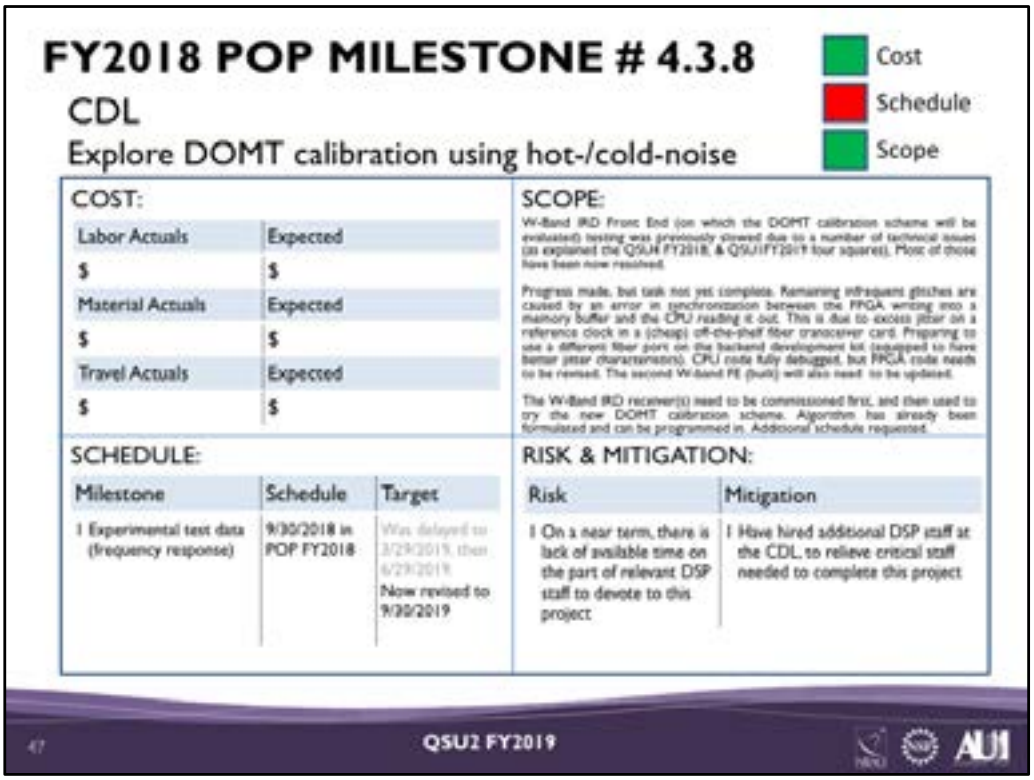


COST: No impact.

SCOPE: No impact.

SCHEDULE: Detailed testing of the *realfast* exposed a flaw in the underlying software, which impacts the main observing program (notably, it affects VLASS observing). It is not perceived to be a fundamental flaw in the architecture of the system, but rather a limitation in the current implementation in the Correlator Back-End (CBE) software, combined with the way in which it is being used. Because of this we could not make it part of the main observing system in this quarter. The rest of the software system is nearing readiness, but until this fundamental problem is solved we cannot begin the commensal observing.

RISK & MITIGATION: The risk is in further schedule slip, which limits the ability to capitalize on the potential science opportunity for detected FRBs. Since *realfast* is a commensal system and does not impact the main PI science being done with the VLA, we accept this ongoing risk. We note that there is an observing mode that allows observers to look for FRBs at targeted locations, which has been used successfully in the past, and that option still remains.



COST: No consequential change in cost performance.

SCOPE: No change in scope, originally proposed experimental test data (streaming spectra) is still proposed to be collected and delivered.

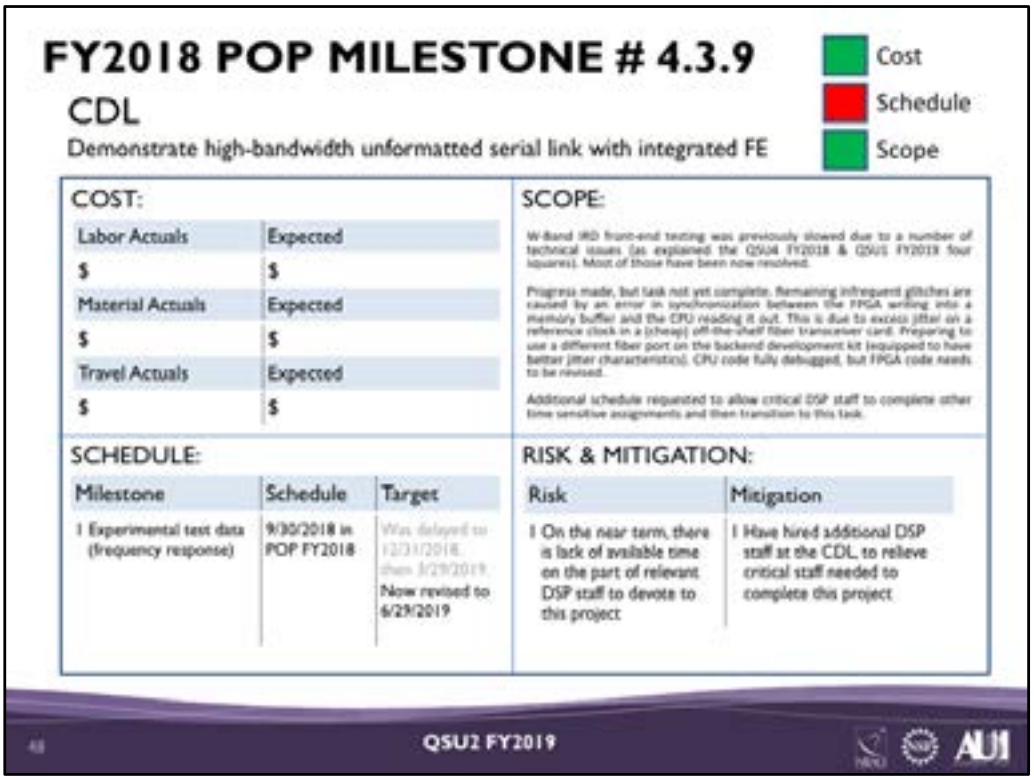
SCHEDULE: The DOMT tests utilize the W-band front-end and FPGA processor above as infrastructure, so we can't do this until that works. The test bed for the proposed work (W-Band IRD Front End) suffered damage, and needed to be first repaired and evaluated. The remaining infrequent glitches are caused by an error in synchronization between the FPGA writing into a memory buffer and the CPU reading it out. This is due to excess jitter on a reference clock in a (cheap) off-the-shelf fiber transceiver card. Preparing to use a different fiber port on the backend development kit (equipped to have better jitter characteristics). CPU code fully debugged, but FPGA code needs to be revised. This milestone will require a second W-band front-end, which has been built and is being simultaneously undergoing troubleshooting and fixing as necessary. Consequently, we are requesting another quarter to complete this milestone.

RISK & MITIGATION: The W-Band IRD Front End previously suffered several technical issues:

- A damaged Back End board (which was out of warranty)
- An unexpected oscillation in the IF module
- And a damaged doubler in our test set (which has been discontinued by the vendor).

During the past quarter, each of the above have been resolved as follows:
- Back End board was repaired
- We did solve the oscillation, but it cost us some gain to do it.
- A suitable replacement for the broken doubler was identified, procured, and integrated into the system.
- This milestone will require a second W-band front-end, which has been built and is being simultaneously undergoing troubleshooting and fixing as necessary.

At this point, we can read data out of the FPGA successfully, but with some occasional glitches which remain to be resolved by using a new fiber port and revised FPGA code. The W-Band IRD receiver needs to be commissioned first, and then used to try the new DOMT calibration scheme. Algorithm has already been formulated and can be programmed in.



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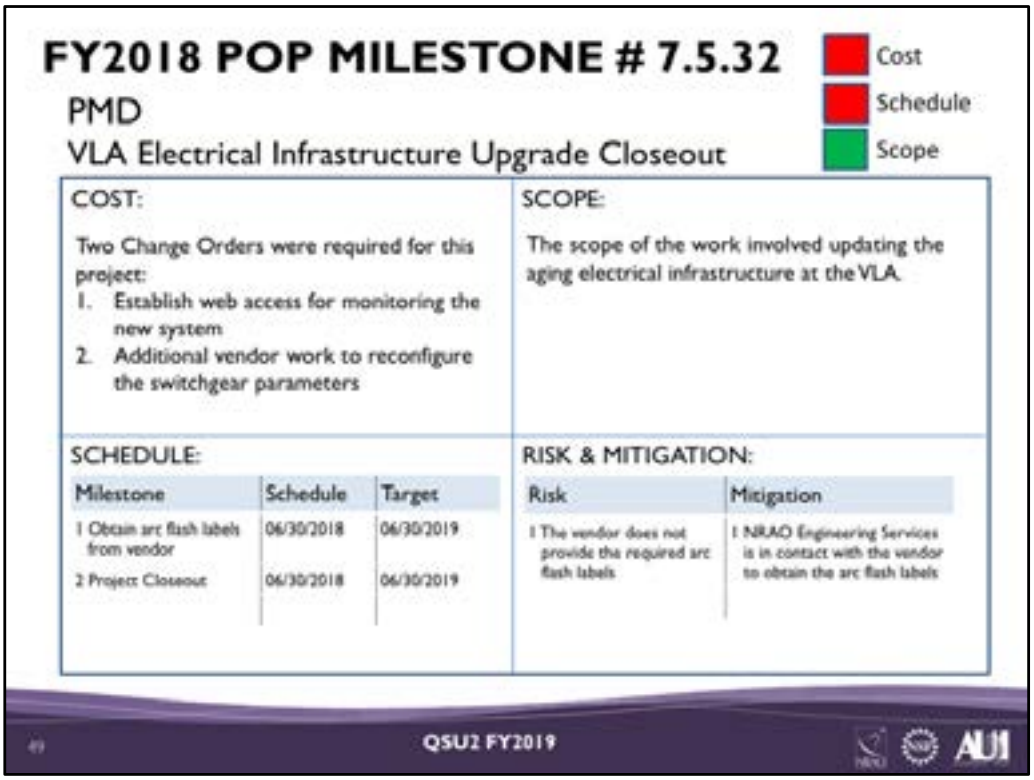
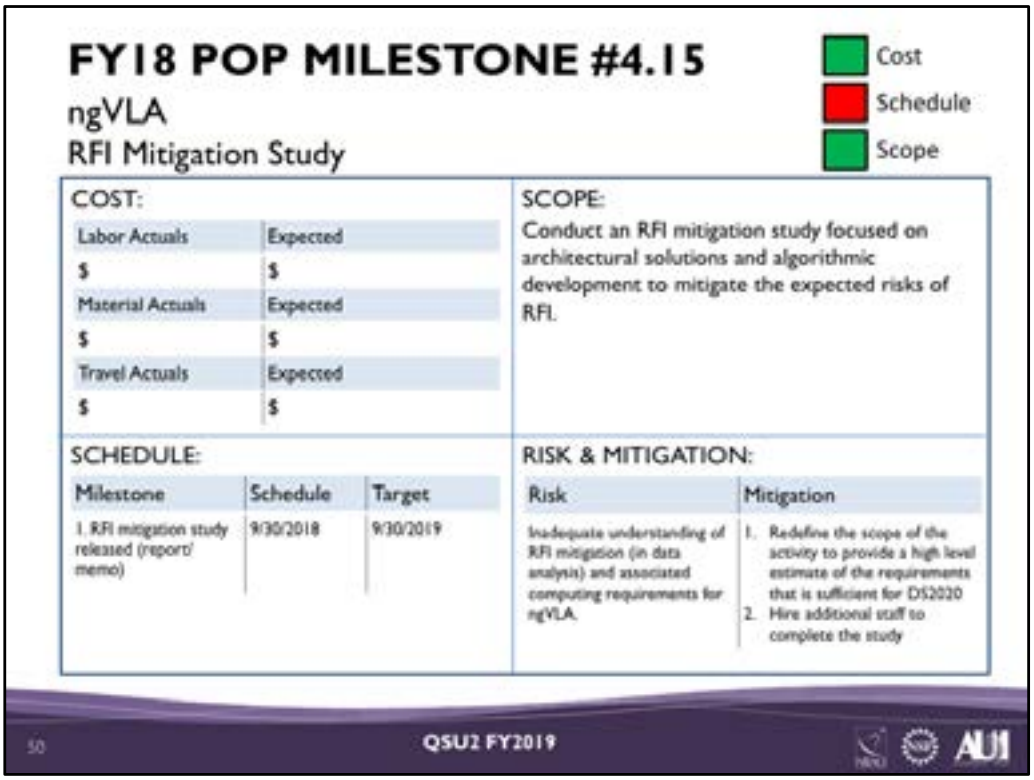


COST:
Two Change Orders were required for this project:
1. Establish web access for monitoring the new system
2. Additional vendor work to reconfigure the switchgear parameters

SCOPE: Overall scope is unchanged.

SCHEDULE: Project closeout is delayed due to the extended length of the power outage at the site. Additional delays are due to the need to reprogram the switchgear and troubleshoot errors seen in the monitoring system. NRAO CAP has closed out the procurement contract with GTI, but we are still awaiting arc flash labels to be provided by GTI. After those are obtained, PMD will finish the mostly-complete Closeout Report with the Project Director.

RISK & MITIGATION: The risk is that the vendor will not provide the arc flash labels. NRAO Engineering Services is in contact with the vendor to obtain the arc flash labels.



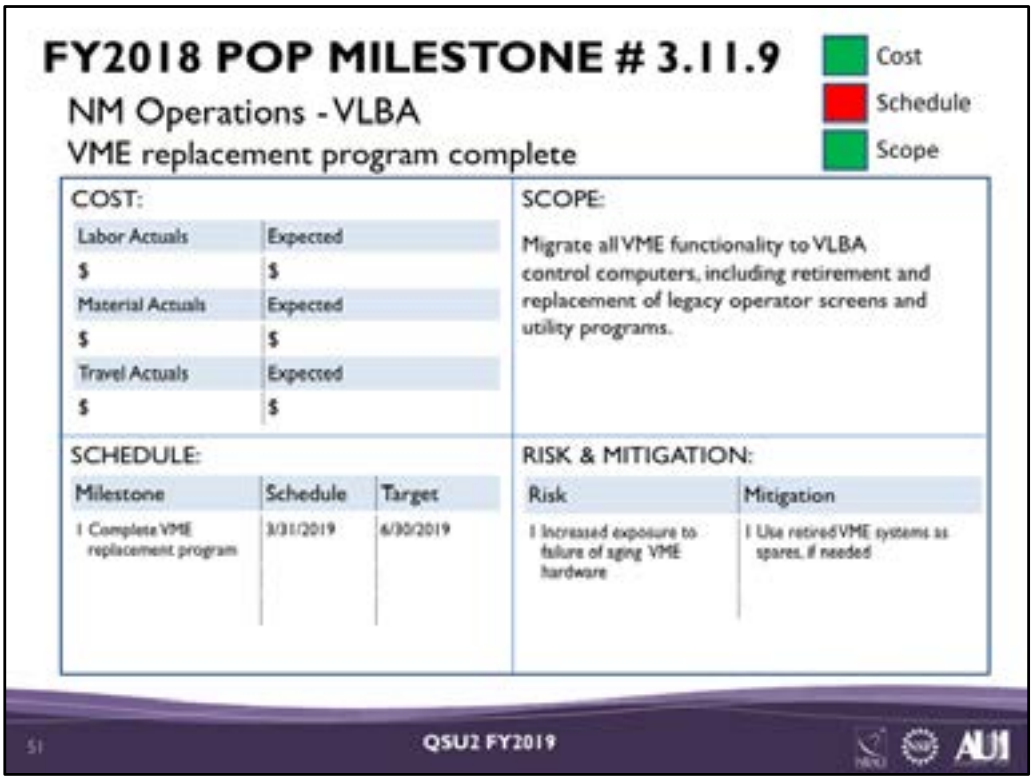
Owner: Rafael Hiriart

COST: No impact

SCOPE: An RFI mitigation report was issued in 2018. It focuses on estimating what the RFI environment might be on the timescale of 2030. No impact at this time.

SCHEDULE: Competing initiatives within the NRAO (e.g. VLASS) have slowed progress on this milestone, and there are currently insufficient resources within NRAO to complete the RFI mitigation study on the timescale of DS2020. Depending upon the details of the risk mitigation strategy, the new target date for this milestone is August 2019 (FY19 Q4).

RISK & MITIGATION: The risk of not completing the RFI mitigation study is an inadequate understanding of the data analysis requirements needed to minimize or remove the effects of RFI from ngVLA data. This could lead to a lack of RFI mitigation techniques in data analysis for ngVLA and an underestimate of its computing requirements. It would also suggest to DS2020 that the technical concept for the array is incomplete. The risk will be mitigated by redefining the scope of the activity to provide an estimate sufficient for the purposes of DS2020 and/or hiring additional staff to complete the study.

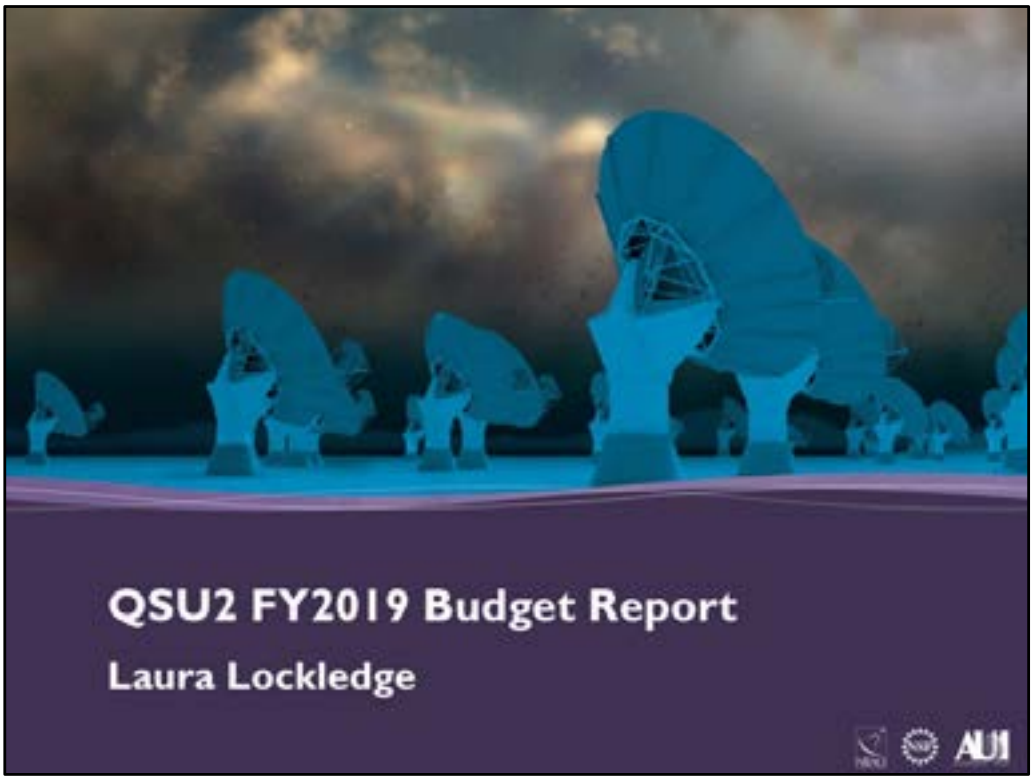


COST: No impact.

SCOPE: No impact.

SCHEDULE: The migration of all VME functionality to VLBA control computers was delayed by pointing testing at sites FD and SC, and by technical issues with new VME hardware at sites PT, MK and OV. More pointing testing and analysis of the hardware technical issues are in progress. Operational software has reached a usable level of completion with improvements continuing to be developed. At present 5 stations have been moved to the VLBA control computers, with the remaining scheduled to be completed by the end of Q3.

RISK & MITIGATION: The risk of further delay is increased exposure to failure of aging VME hardware between now and the end of full deployment of the new system. Now that some of the stations have been moved we have spares available, if needed.


QSU2 FY2019 Budget Report
Laura Lockledge
AUI

Budget Overview: FY2019 Q2

- ICC/IDC reflect FY2018 provisional rates
- Generally underspent
  - Q1 slow
  - Shutdown
- Benefits @ 31.9 vs. 36% budget
  - Insurance billing
  - Vacation contribution
  - Medical vendor change
  - Net credited to fund sources – in Director's Office WBS

CSA-V Q2 Results

	FY19 POP Budget	FY19 Rev. Budget	FY19 YTD Expenses	YTD % Rev Budget
NSF	38,850	38,850	38,850	100.0%
Carryforward/Other	1,165	5,215	5,215	0.0%
Total CSA-V Revens	**40,015**	**44,065**	**44,065**	100.0%
Telescope Ops	11,003	12,220	4,633	37.9%
Development	3,575	3,289	1,257	38.2%
Science Ops	6,829	8,439	2,966	35.1%
Admin Services	10,249	10,088	3,932	39.0%
Director's Office	2,659	2,289	1,000	43.7%
Education & Public Out	782	793	355	44.8%
ngVLA	4,918	6,947	2,432	35.0%
FY19, Total	**40,015**	**44,065**	**16,575**	**37.6%**
FY19 CSA-V Net	**0**	**0**	**27,490**	

- Carryover includes open commitments
- Large commitment made to two-year DMS surge (see Sci Ops)

CSA-A Q2 Results

	FY19 POP Budget	FY19 Rev. Budget	FY19 YTD Expenses	YTD % Rev Budget
NSF	40,280	40,280	40,280	100.0%
Carryforward	9,363	10,790	10,790	100.0%
Canadian Contribution	2,809	2,809	0	0.0%
Other	848	848	634	100.0%
Total CSA-A Revenues	**53,300**	**54,727**	**51,704**	**94.5%**
Telescope Ops	24,149	25,435	10,843	42.6%
Development	6,249	7,800	1,561	20.0%
Science Ops	6,783	7,157	2,806	39.2%
Admin Services	9,994	9,670	4,075	42.1%
Director's Office	3,617	3,231	1,359	42.1%
Education & Public Outreach	698	694	265	38.2%
FY19, Total	**51,490**	**53,987**	**20,909**	**38.7%**
FY19 CSA-A Net	**1,810**	**740**	**30,795**	

- Development budget inclusive of planned carryover
- EPO down due to open position

CSA-L Q2 Results

	FY19 POP Budget	FY19 Rev. Budget	FY19 YTD Expenses	YTD % Rev Budget
NSF	3,430	3,430	3,430	100.0%
Telescope Time Sales	4,439	4,439	4,223	95.1%
Other	285	285	0	0.0%
Total CSA-L Revenues	**8,154**	**8,154**	**7,653**	**93.9%**
Telescope Ops	6,157	6,062	2,112	34.8%
Development	0	0	0	
Science Ops	1	1	0	0.0%
Admin Services	1,470	1,565	1,053	67.3%
Director's Office	526	526	6	1.1%
Education & Public Outreach	0	0	0	
FY19, Total	**8,154**	**8,154**	**3,171**	**38.9%**
FY19 CSA-L Net	**0**	**0**	**4,482**	

- Watching external revenue
- Some previously budgeted telescope ops expenses (e.g. site leases, utilities) being charged to Admin

CSA-H, F Q2 Results

	CSA-H Budget	ITD Expenses	% Budget	CSA-F Budget	ITD Expenses	% Budget
NSF	2,000	527	26.4%	2,500	93	3.7%

- CSA-H major expenditures about to begin
- CSA-F expenses coming with spring work season
- Both CSA's were on hold during the shutdown

ICC Q2 Results

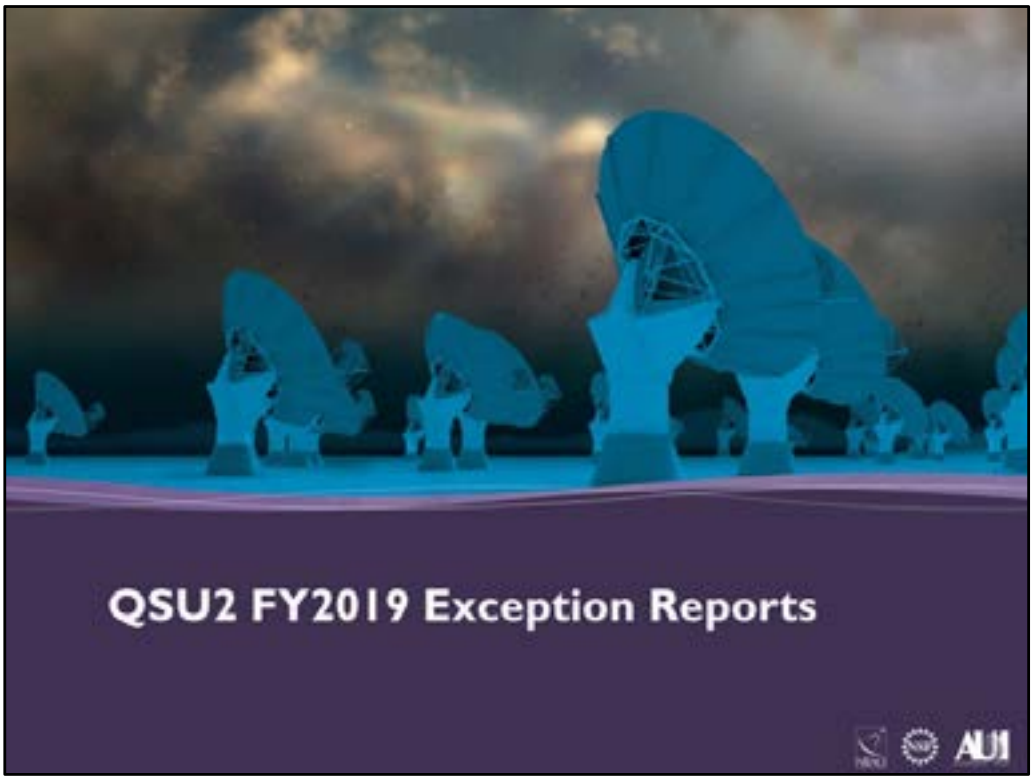
	FY19 POP Budget	FY19 Rev. Budget	FY19 YTD Expenses	YTD % Rev Budget
NRAO Recoveries	15,176	15,176	6,492	42.8%
External Recoveries	1,412	1,412	704	49.9%
Total ICC Revenues	**16,588**	**16,588**	**7,196**	43.4%
Telescope Ops	108	109	74	67.9%
Development	462	464	218	47.0%
Science Ops	2,567	2,594	1,260	48.6%
Admin Services	11,450	11,385	4,888	42.9%
Director's Office	2,001	2,029	692	34.1%
FY19, Total	**16,588**	**16,581**	**7,132**	**43.0%**
FY19 ICC Net	**0**	**7**	**64**	

- Modest over-recovery at prior year rates
- Telescope ops is spectrum management
- Director's Office low due to inclusion of fringe surplus

ICC FY2018 Final Rates

- Ready to be submitted by AUI
- First year with four pools
- GBO pool not shown

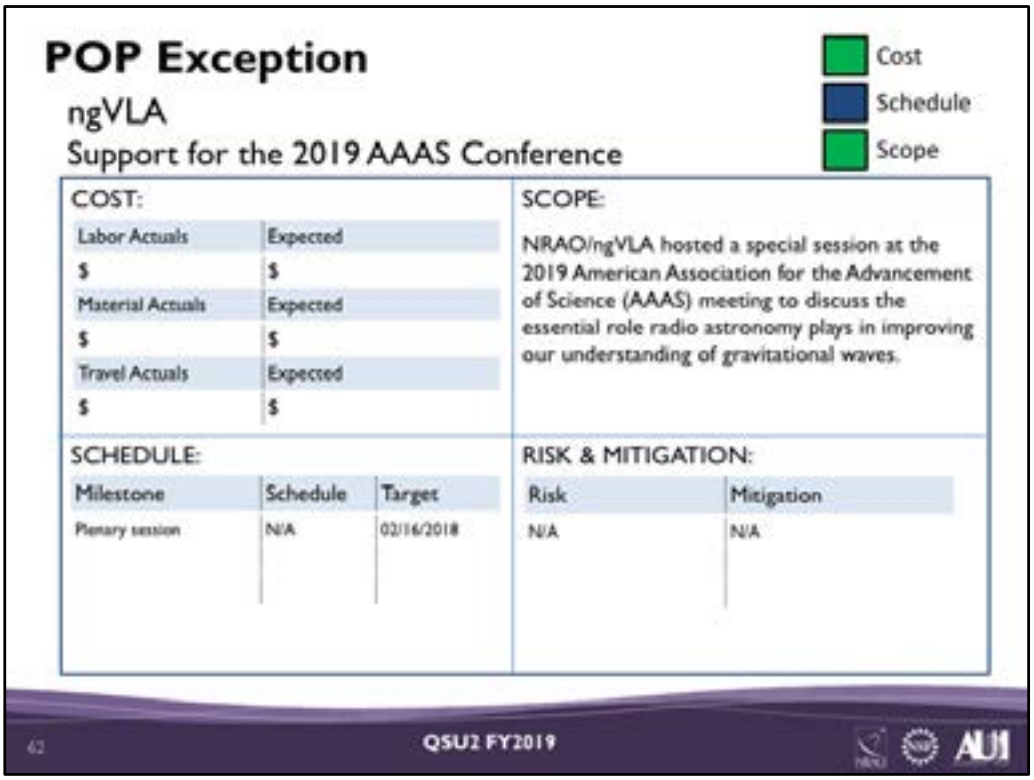
Pool	Proposed Rate	Final Rate
Admin 1	6.08	5.50
Admin 2	5.76	5.47
Facilities 1	4.34	3.98
Facilities 2	9.44	10.68
Total	**25.62**	**25.63**


QSU2 FY2019 Exception Reports
AUI

Mauna Kea VLBA Site Major Maintenance Visit

Additional Tiger Team Maintenance

- NRAO specialists traveled to Hawaii to join VLBA site staff to perform critical preventive and corrective maintenance.
  - Visit addressed recently seen structural and receiver/cryogenic problems that required these additional staff to resolve.
- Maintenance activities performed included:
  - Antenna mechanical structure inspection & lubrication
  - Receiver feed housing (leak) repair
  - Cryogenic system repair and decontamination
  - Measurement of antenna rail level, confirming status to specification
  - Site inspection
  - Monitor & control system troubleshooting & repair
  - HVAC system troubleshooting & repair



Owner: Eric Murphy/Mark Adams

COST: No impact.

SCOPE: Science Outreach: The NRAO/ngVLA hosted a special session at the 2019 American Association for the Advancement of Science (AAAS) meeting to discuss the essential role radio astronomy plays in improving our understanding of the physics of gravitational wave events now being detected in the Universe. This special session had three invited speakers from the community who spoke on recent developments in radio astronomy and how observations of astronomical phenomena via both gravitational and electromagnetic "messengers" are enabling major new physical insights into the cosmos.

SCHEDULE: Over and above what was identified in the POP.

RISK & MITIGATION: No impact.

Office of Diversity & Inclusion

ODI Chile – REU Chile

Exciting Outcome

ODI's REU Chile mission is to provide research opportunities to underrepresented students. In particular, the goal is to strengthen students' abilities to enter graduate school at one of Chile's premier universities in Santiago.

Both ODI Chile students from 2016/17 were accepted into Masters programs at the Instituto de Astrofisica at Pontificia Universidad Catolica in Santiago. The students had finished their undergrads in Universidad Catolica del Norte at Antofagasta.

- Valentina Zagal (Mentor: Loreto Barcos)
- Michel Maluenda (Mentor: Antonio Hales)

Antonio Hales, Program Lead

Michel Maluenda, Valentina Zagal and **Dr. Loreto Barcos (Mentor)** during summer 2017.

Office of Diversity & Inclusion

ODI Chile – REU Chile

Antonio Hales, Program Lead

2018/19 Cohort

- Camila Castro (Unab)
- Andrea Guerrero (U de Conce)
- Tomas Molina (Unab)

Awareness of the program, thanks to recruiting efforts led by Antonio Hales and Loreto Barcos, has resulted in a 10-fold increase in applicants – from 4 last year to 40 this year!

Added funding for a 3rd student in 2019.

Office of Diversity & Inclusion

ODI at the AAS

ngVLA Broader Impacts Poster

NAC Program on NRAO "Wall"

NINE Program i-Poster

Office of Diversity & Inclusion

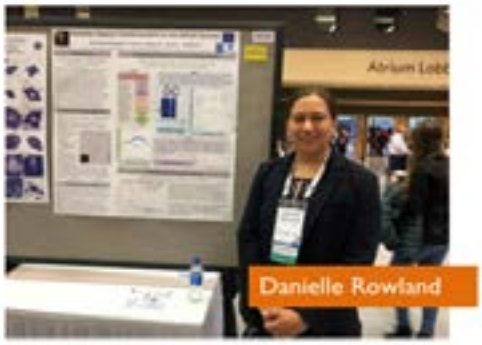
The NAC at AAS

22 NAC Alums at 233rd AAS meeting

Office of Diversity & Inclusion

The NAC at AAS

233rd AAS Chambliss Awards



Top: Danielle Rowland, Columbia '19 Undergraduate Chambliss Award for her presentation "Satellite Galaxy Characteristics in the SAGA Survey"

Left: Alia Wofford, Research Scientist and NASA Goddard Post-Baccalaureate Scholar, Chambliss Graduate Honorable Mention for her presentation, "Revisiting the Early Earth's Methanogen Biosphere"

Office of Diversity & Inclusion

NAC Annual Meeting & Special Session

The National Astronomy Consortium (NAC): A Model for a Robust Student Pipeline

NAC VI Annual Meeting

Presentations by 2018 summer cohort

Office of Diversity & Inclusion

Council of Representatives for Engagement (CORE)

Antonio Porras
Council of Representatives for Engagement (CORE)

Tierra Candelaria
CORE representative
EPO - RAP-NM mentor
NAC lead in Socorro

Diana Powell
Council of Representatives for Engagement (CORE)

Maryam Hami
Council of Representatives for Engagement (CORE)

Daniel Rowland
Council of Representatives for Engagement (CORE)

Kelsey Lund
Council of Representatives for Engagement (CORE)

Alia Wofford
EPO Internship (Spring 2019) - RAP-NM plans

Office of Diversity & Inclusion

NAC Alums beginning Grad School in AY2018/19

Congratulations to Myles McKay who is headed to the University of Washington's Astronomy PhD program!

Office of Diversity & Inclusion
2019 NAC Cohort VII

NRAO-CV	NRAO-SO	Princeton	STScI	Wisconsin-Madison
Samantha Garza (REU) (Alum)	Tiffany Christian (NAC grad)	Sarra Hayoune	Sophie Lebowitz (Alum)	Leonardo Clarke
Mihika Rao	Jacquie Hernandez	Theodore Pena	Cecilia Molina (Alum)	Allison Erena (Alum)
	Kelly Sanderson (NAC grad)	Fatima Zaidouni	Jafr-Tayar Shabazz	Sara Kostmayer
	Tierra Candelaria (NAC grad)			

Office of Diversity & Inclusion

2019 NAC Cohort VII

Leonardo Clark
Univ. of Minnesota
Wisconsin-Madison
Benjamin Hernandez

Allison Erena
Smith College
Wisconsin-Madison
Eric Wilcots

Sarra Hayoune
Hudson County CC
Princeton

Jacquie Hernandez
Texas Christian Univ.
NRAO-Socorro
Anne Kapuska

Sara Kostmayer
Mississippi State
Wisconsin-Madison
Katulla

Sophie Lebowitz
Ohio State Univ.
STScI

Cecilia Molina
S.F. State University
STScI
Mamchewa

Theodore Pena
Tufts
Princeton

Mihika Rao
Agnes Scott
NRAO-CV
Dana Baber

Jafr-Tayar Shabazz
Florida Intl Univ.
STScI
Kastler

Fatima Zaidouni
Univ. of Rochester
Princeton

Office of Diversity & Inclusion

NINE Program - UWI

Raspberry Pi Workshops
January 19-26, 2019

UWI Grads and Undergrads

Brian Kent, Program co-Lead

UWI

Office of Diversity & Inclusion

NINE Program - UVI

Alex Fortenberry

Completed:

- Three-day R-Pi and data science workshop for UVI students
  - R-Pi info and uses
  - R-Pi set-up
  - Data analysis
  - R-Pi project
- Three-day Python workshop for UVI students
  - Basic
  - Advanced
  - Practical uses
  - Data Science Exploratory Group (DataUp Workshop)

Immediate Future plans:

- Hosting Caribbean Astronomers Conference
  - Students from workshop will give tutorials

Office of Diversity & Inclusion

NINE 2019 Summer Program

TEXAS TECH UNIVERSITY SYSTEM

Hub lead: Alessandra Corsi
NINE participant: Heather Harbin

UNAH
UNIVERSIDAD NACIONAL AUTÓNOMA DE HONDURAS

Hub lead: Yvelice Castillo Rosales
NINE participant: Alejandro Saravia

The NINE Professional Training in Radio Astronomy

Local community development

Virtual/distance learning

Share NINE training

Return to home institution to establish hub

9-week training at NRAO
Project management &
Raspberry Pi/VLASS

Commitment from home institution

Competitive NINE selection process

Anja Fourie, Program Manager
Brian Kent, Technical/Science Manager

Go.nrao.edu/NINE

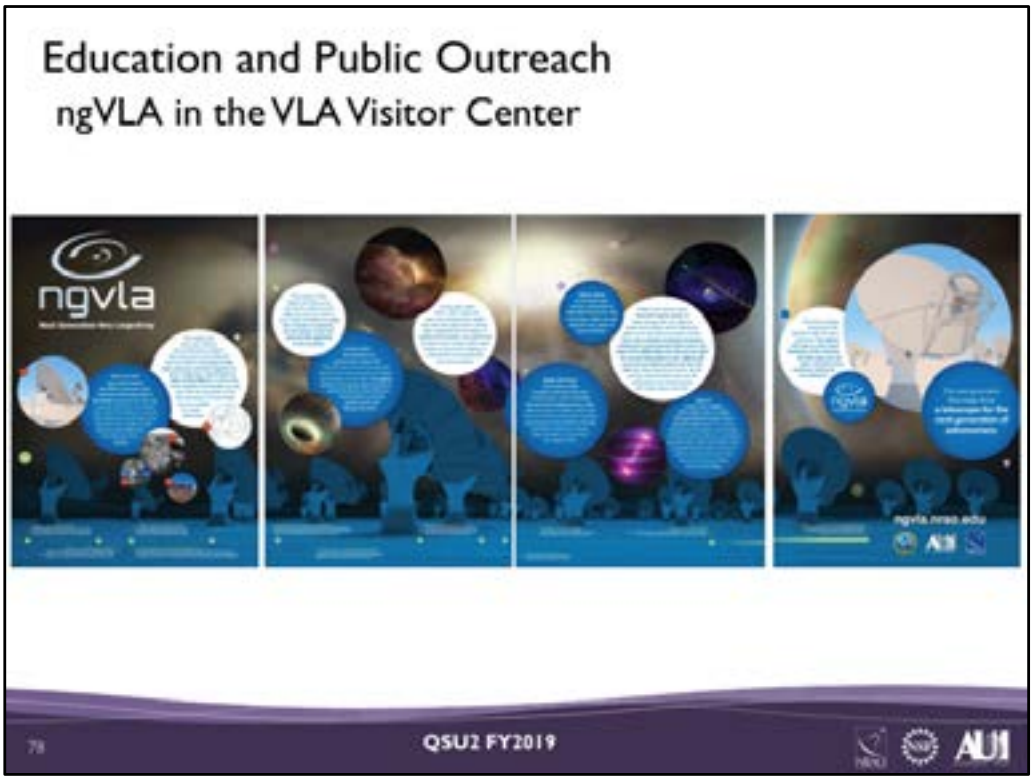
Office of Diversity & Inclusion

NRAO Employee Diversity Group

Intensive, four-part training, based upon UCAR's UNIEON training program (adapted to NRAO):

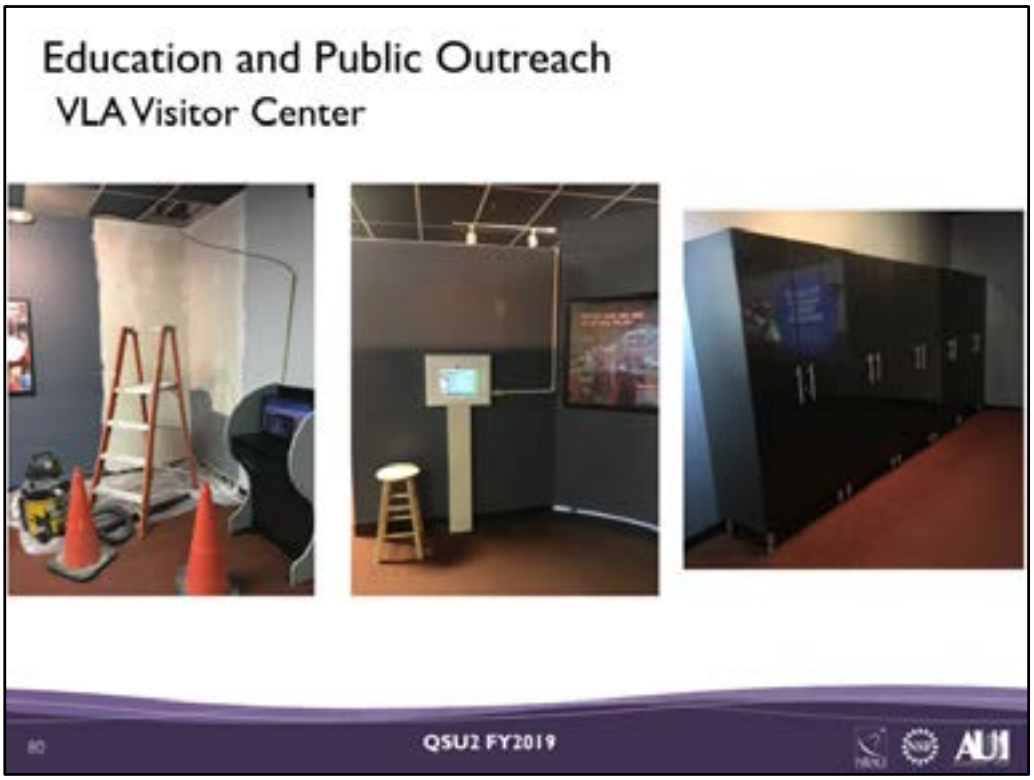
- ✓ Our place in society (different identities)
- ✓ Gender
- ✓ Race
- Putting into practice (bystander intervention and practical tools for addressing problematic behavior) - Workshop


Office of Diversity & Inclusion
Diversity Speakers and Online Training
Implicit Bias, Micro-aggressions, and My Experiences Being Queer, Black, and Trans in STEM
Science is fun, but sometimes it can be lonely if you're the only one who looks like you in your laboratory. Come to this talk to hear about the stories and experiences of a current queer, black trans graduate student, and how they found their place in their field. Topics include diversity, inclusion, equity, and intersectionality, and how to make the STEM fields a place where everyone feels comfortable, seen, and respected. This session is open to all.
Grey Batie is currently pursuing a Ph.D. at the University of California Berkeley. Their current research focuses on developing unique methods to design and operate reprocessing facilities and other nuclear material bulk handling facilities, to enable the detection of inadvertent or deliberate hold up of fissionable material.
Grey earned a Bachelor's degree in both Nuclear Engineering and in Physics from the Massachusetts Institute of Technology, and a Masters degree in Medical Physics from the University of Wisconsin-Madison. Grey's interests include recruitment, retention, and advocacy for minority students in the sciences.
Wednesday
March 13, 2019
CV-239
1200 -1:00pm ET
SO-288
1000-1100am MT
OGA-Conf
Zoom
Office of Diversity & Inclusion
Ongoing Speaker Series
NEW Training Platform
77
QSU2 FY2019



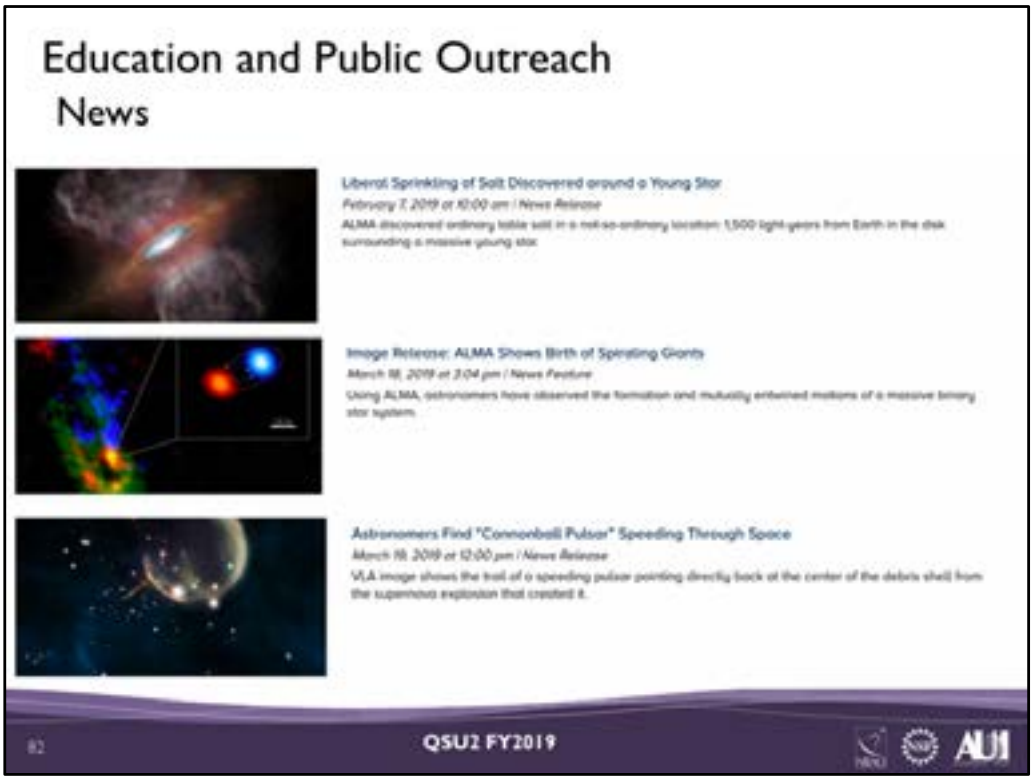
Continued to upgrade the interior of the VC with new graphics for the VLBA, improved storage with the installation of cabinets for gift shop stock and the decommissioning of older exhibits that were no longer functional. Installation of ngVLA posters; Removal of video projector and screen that were no longer in use; Removal of kiosks that are no longer in use; Installation of storage lockers for merchandise.

This the behind the scenes. This area was cleaned out. Merchandise used to be stored there. And new Electronics were installed with proper RFI shielding to control the new videos that I previewed last quarter.



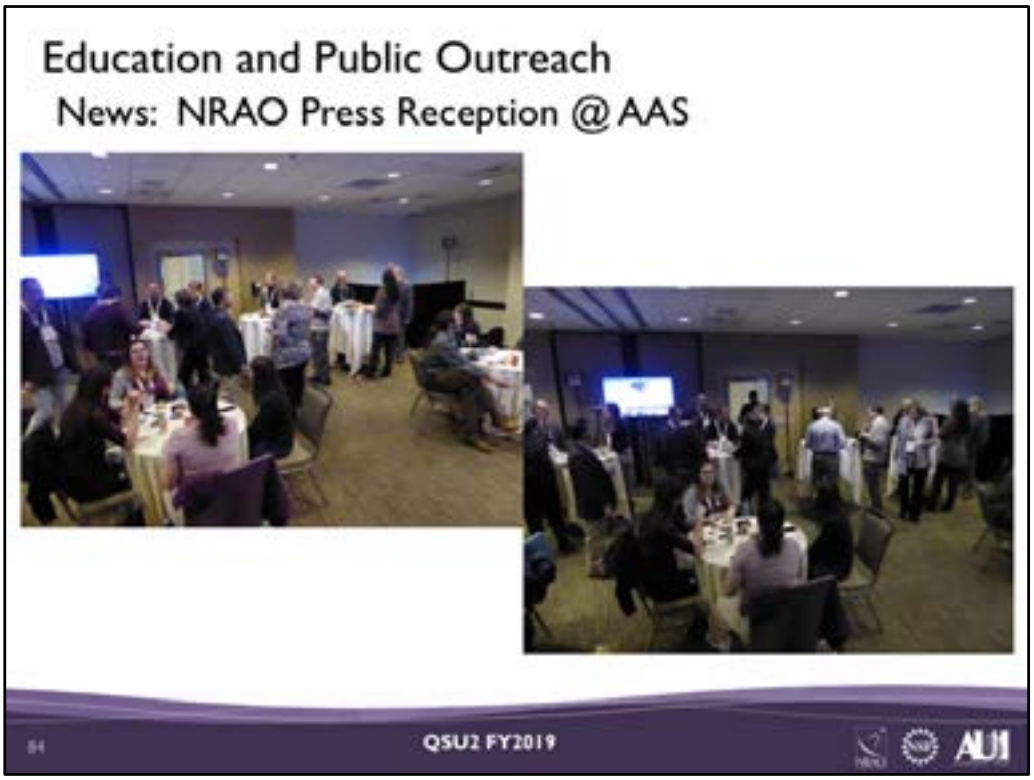
This renovation included the decommissioning of unused equipment, the installation of the new control box, and the installation of new storage cabinets. I'm most excited by control box and the new content, but our gift shop clerks are most thrilled with the cabinets. I also want to give a big than you to the new Mexico operations staff for all the work they did to install this.

Press releases were few in number this quarter, with three ALMA releases, one VLA release, one release with observations from both ALMA and VLA, and one image release. The few that we did have, however were significant firsts. The first time bubbles of hot plasma produced by an active quasar were studied by analyzing their effect on the light from the cosmic microwave background. The first release from from the PHANGS survey, looking at 74 galaxies with over 100,000 star forming regions to reveal new insights into the relationship between these star forming regions and their host galaxies. Both the VLA and ALMA were used to give us the first glimpse of an unusually powerful explosion that is still unexplained. It could be a supernova, but is unlike any other, it could be a tidal disruption event, but again unlike any other that's been observed.



Pass the popcorn, ALMA observed salt in the nebula surrounding a massive young star. That's a first, we've documented it in dying stars but not in young stars.
Another look at some new baby stars revealed a pair of spiraling giants. And finally, a pulsar being ejected from the supernova that created it.

In addition to these press releases, we had a significant press presence at the winter AAS meeting, starting Sunday afternoon 2-5 PM NRAO PIO Workshop to discuss best practices and new trends in media relations in astronomy.

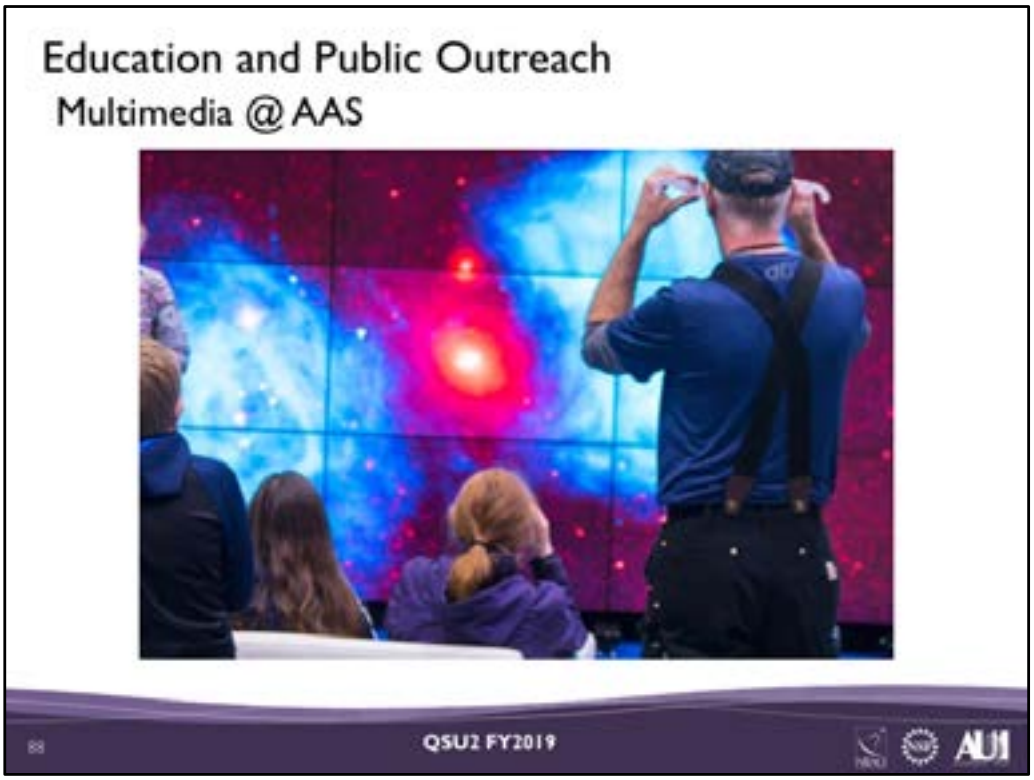


Wednesday, 5:30 p.m. NRAO Press Reception: (This resulted in connection with Dana Berry for the ngVLA video and the Stardate episode about VLASS). https://stardate.org/radio/program/2019-03-15

Wed. 2:15 PST Press Conference: "Black Holes and Galaxies Near and Far." Erik Rosolowsky will present PHANGES-ALMA.

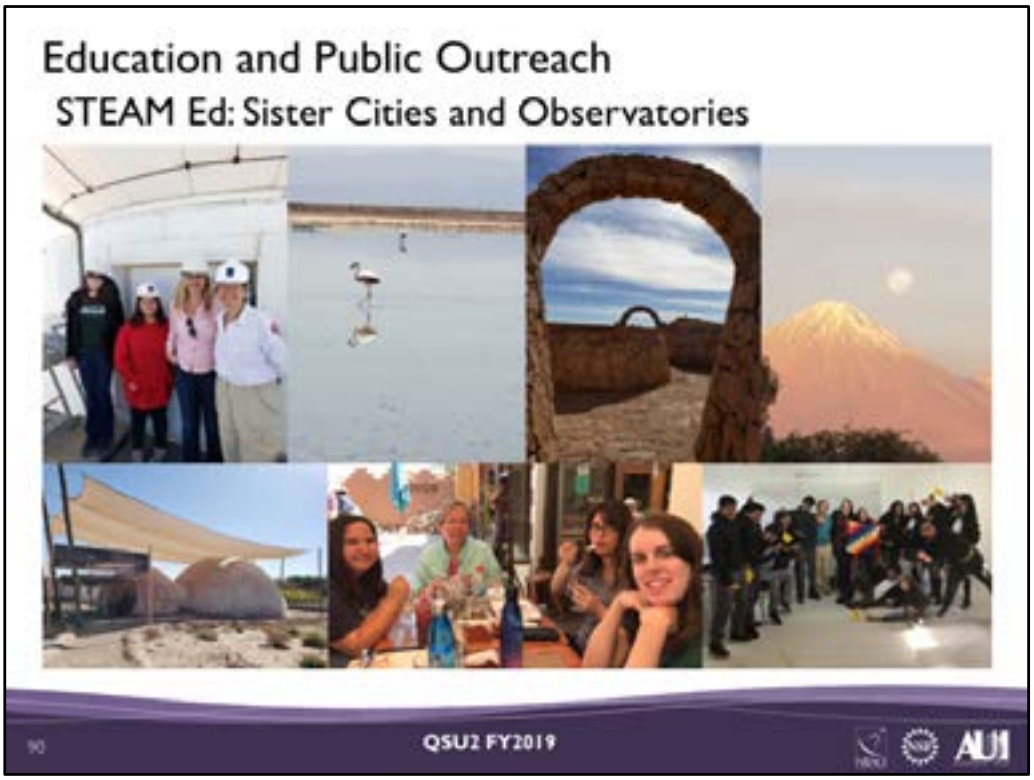
Thurs: 2:15 PST Press Conference: "Astronomers have a COW" Anna Ho will present ALMA and VLA observation of the radio transit known as The COW.

Abstract for event: Radio astronomy detects light that we can't see with our eyes or even extraordinary optical telescopes. Our telescopes, the Karl G. Jansky Very Large Array (VLA) and the Atacama Large Millimeter/submillimeter Array (ALMA), have mapped energetic jets from supermassive black holes and wispy remnants from stars that exploded long ago. The activity we will be doing with the students is a hands-on activity to explore the invisible universe. Suzy Gurton and Jessica Harris presented to 6-8 groups of about 10 students each at this event on Wednesday, January 9, 2019.



After breaking in a new render farm, our multimedia team completed a series of videos for the 3x3 video wall that was the centerpiece of the NRAO booth at AAS. These videos have been featured in both our website and social media posts.

In the week leading up to the January 20th lunar eclipse, Education Specialist Faith Vowler visited the public libraries of Magdalena and Socorro to promote and spread interest in the event. In these library visits, Faith used the "Big Sun, Small Moon" and "Solar Eclipse" demos, as well as her own "Eclipse Flash Cards," to teach the attendees about why and how often eclipses occur; the different types of eclipses, and what causes them; and upcoming local eclipse events, and the best ways to view them. She also promoted the Etscorn Observatory in Socorro and Kids' Science Café in Magdalena as locations where the public could view the lunar eclipse with telescopes, encouraging the library visitors to attend if possible. In the aftermath of these library visits, Faith has kept the lines of communication open with both libraries in the hopes of working with them again in the future.



On Thursday, March 14, our Sister Cities and Observatories (SCO) New Mexico cohort—consisting of student Mona Ingersoll-Qureshi, teacher Holly Hagy, and NRAO EPO Education Specialist Faith Vowler—departed for their exchange to Chile. They arrived in San Pedro de Atacama on Friday, March 15, and stayed in a hostel there until Thursday, March 21. They were accompanied throughout their time in San Pedro by AUI employee Alina Prus, who served as the cohort's Chilean chaperone, driver, and translator, and for two days by Mabel Muñoz, who created the program agenda for the cohort.

During their time in San Pedro, the cohort had the chance to visit local schools in Toconao and San Pedro and meet students from both schools—including the Chilean cohorts of this year's and last year's programs—to share their own experiences and learn more about the Chilean school system. They also got to visit ALMA's OSF twice, the experiences of which included joining one of the public ALMA tours; getting to climb one of the American ALMA antennas; seeing the two antenna transporters up close and sitting in the cockpit of one of them; talking with and interviewing an NRAO researcher and an ALMA engineer; and receiving a tour of other ALMA facilities such as the hotel and the transporter barn. Additionally, the cohort had the chance to experience the Atacama desert by visiting local attractions such as the Valley of the Moon, flamenco lakes, Laguna Cejar salt lake, Meteorite Museum, Puritama hot springs, and the Pukará de Quitor ruins.

On Thursday, March 21, the cohort left San Pedro and returned to Santiago, where they stayed until Sunday, March 24. During this time, they had the chance to visit the ALMA and AUI offices, and participate in events for Chile's "week of astronomy" at ALMA and San Cristóbal Hill. As in San Pedro, they also got to experience several local Santiago attractions; such as hiking to the statue of Virgin Mary on San Cristóbal Hill; receiving a tour of historic parts of the city from Alina; shop at the Los Dominicos market; and ascend to the top of the Sky Costanera observing deck of the Costanera Center.

On Sunday, March 24, the cohort departed from Santiago, and arrived back in Albuquerque on March

25.

Education and Public Outreach

Social Media

- **Twitter**
- 18.8 Followers

Instagram
1,861 Followers

Facebook
64,601 Follow our page

Education and Public Outreach

Social Media

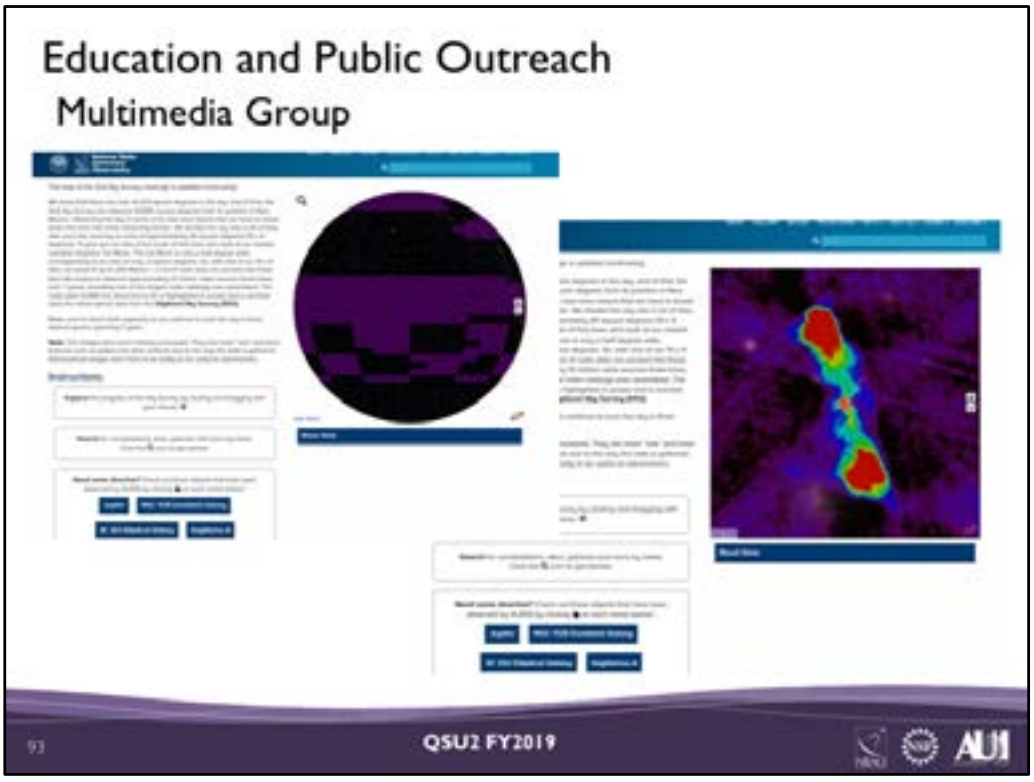
Where Will the Next-Generation Very Large Array Take Us? To Our Cosmic Origins

Developing a Quick Method to Review VLASS QuickLook Data

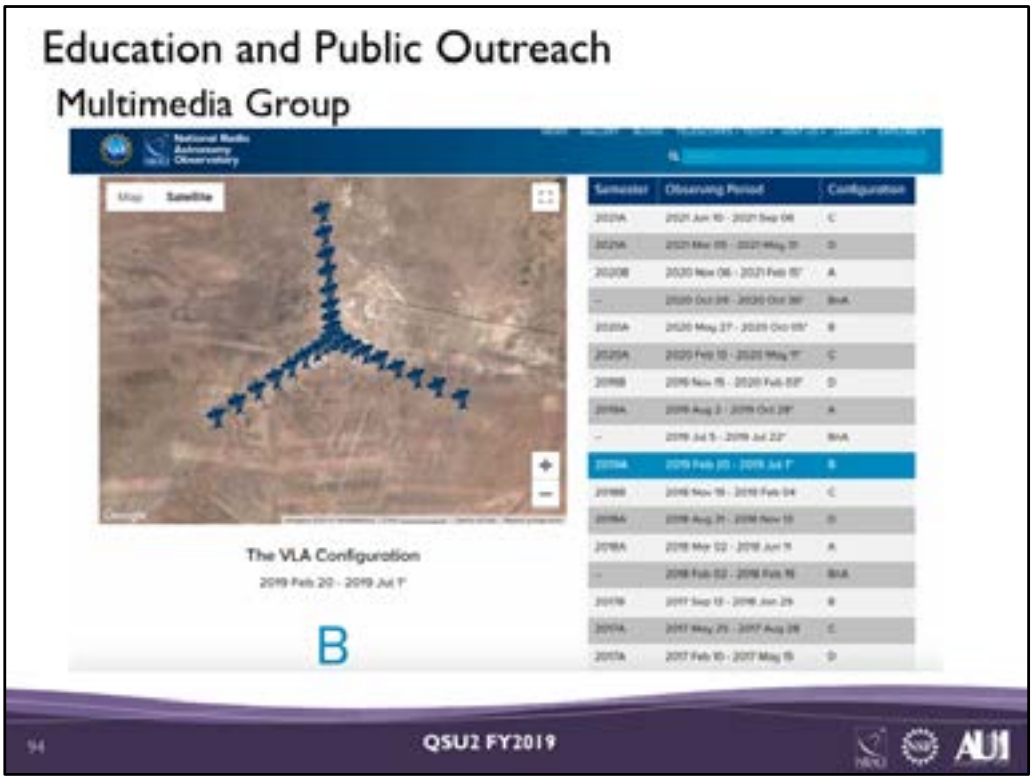
Bridging the gap between the programming required to access VLASS data and the coding abilities of undergraduate physics students.

On Young Love (of Radio Telescopes)

NRAO NINE Participants Explore Radio Astronomy in Trinidad



In addition to continual improvement of things like our press release templates and website glossary, we worked to expand on two specific web pages on our site.
First, we unlocked the zoom feature on the VLASS progress map so you can zoom in and out and explore the map, but to get folks started, we added a couple of buttons with suggested targets, so you are guaranteed to see some interesting data.



Second, our multimedia group updated the VLA Visit Us website to include a map for our visitors showing what the configurations of the VLA are.

Education and Public Outreach

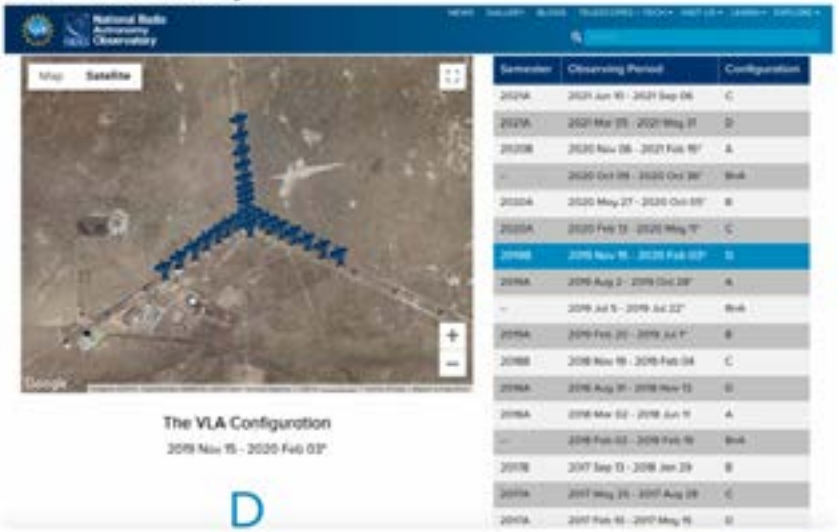
Multimedia Group

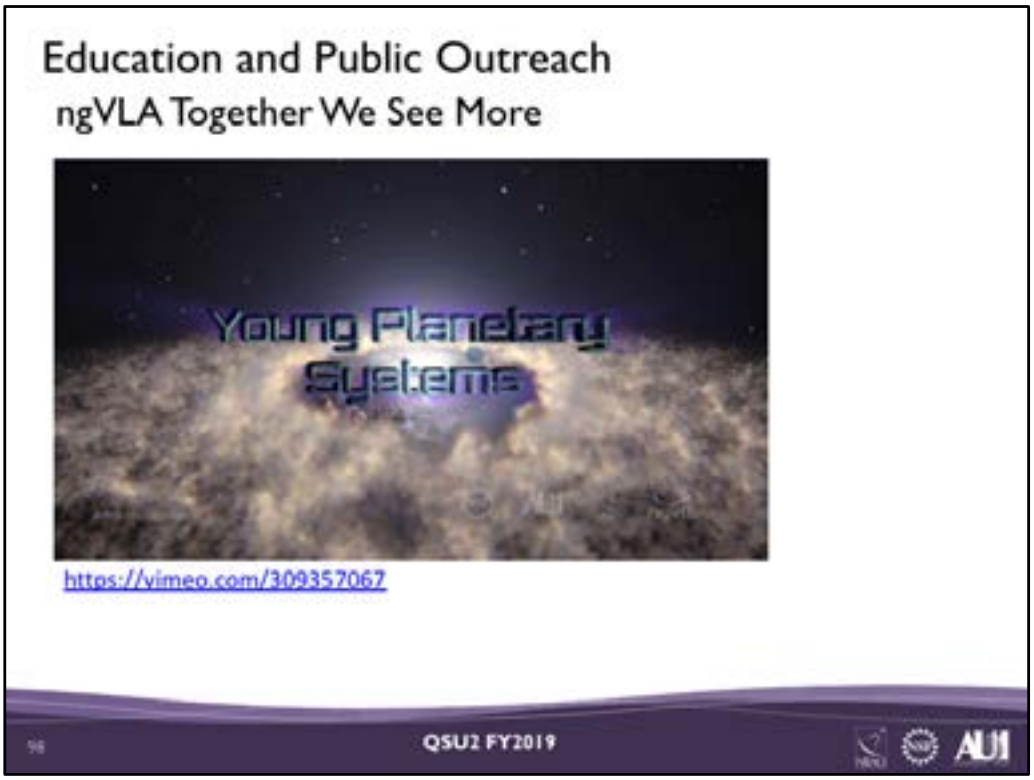
Education and Public Outreach

Multimedia Group

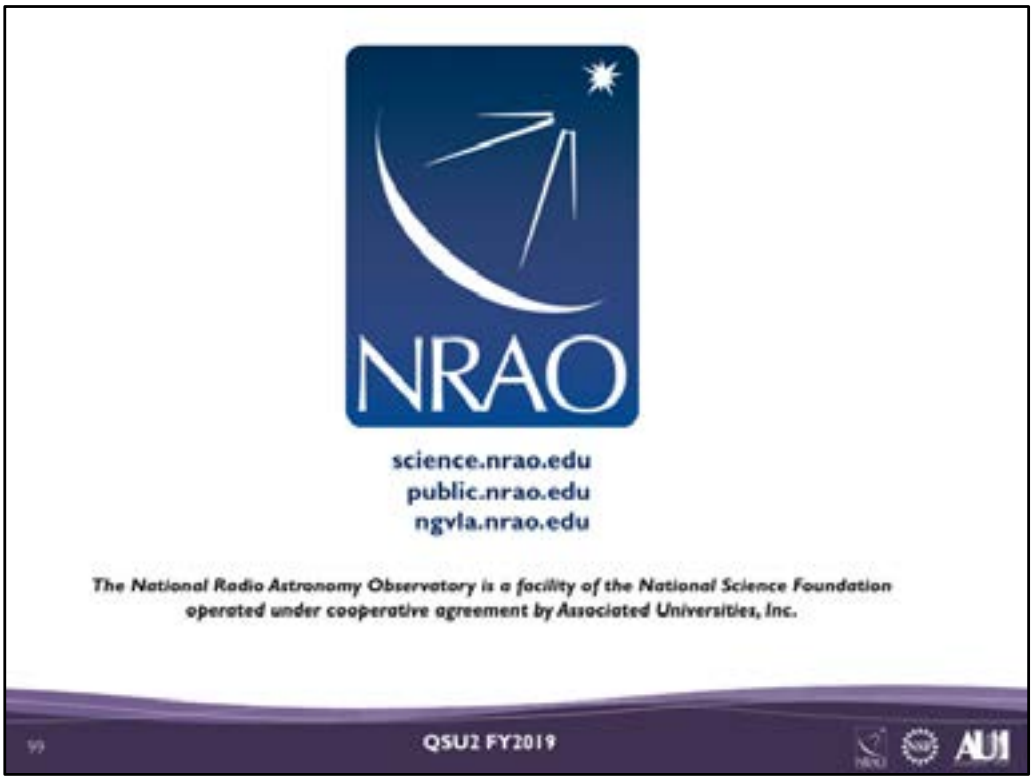
Education and Public Outreach

Multimedia Group





I'll end on the video with original animations that the group put together that debuted at the Winter AAS that will have a couple new science cases added to it for the June meeting.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