***Title*:** QSU1 FY2020	***Author*:** Thisdell/ADs	***Date*:** 2/6/2020
		***Version*:** Final

National Radio Astronomy Observatory

Quarterly Status Update (QSU) 1 FY2020

October - December 2019

PREPARED BY	ORGANIZATION	DATE
Thisdell/ADs	Director's Office	2/6/2020

APPROVALS (Name and Signature)		ORGANIZATION
Nicole Thisdell	Nicole Thisdell Digitally signed by Nicole Thisdell Date: 2020.02.06 12:38:05 -05'00'	NRAO
Tony Beasley	Digitally signed by Tony Beasley Date: 2020.02.06 13:38:13 -05'00'	NRAO
Dave Curren		AUI

NRAO Quarterly Status Update
October - December 2019
QSU1 FY2020

			Q1 Performance Assessment		
POP Milestone	**Milestone**	**Completion Date**	**Cost**	**Schedule**	**Scope**
2.5	**NA ALMA Operations**				
	Operations				
2	Review conference applications	12/31/2019			
	Chile Office				
9	Power options for Parque Astronómico Atacama and ALMA	12/31/2019			
10	Office lease alternatives for OCA	12/31/2019			
13	Plan to improve maintainability of AOS technical building	12/31/2019			
14	Management of FEHV warranty	12/31/2019			
15	Multicancha project – delivery and inauguration	12/31/2019			
16	Collective bargaining	12/31/2019			
17	STEM EPO and D&I	12/31/2019			
3.3	**New Mexico Operations**				
	Very Large Array				
	Operations				
1	Define VLA GO and SRO capabilities to be offered for Semester 2020B	12/31/2019			
5	Determine baselines and pointing for antennas moving into their D configuration locations	12/31/2019			
8	Reconfigure from A to D configuration	12/31/2019			
	Maintenance and Renewal				
19	Perform preventive maintenance on each of two transporters prior to array reconfiguration to D	12/31/2019			
25	Perform preventive maintenance on the next configuration VLA antenna transformers prior to array reconfiguration to D	12/31/2019			
	Very Long Baseline Array				
	Operations				
43	Define VLBA GO and SRO capabilities to be offered for semester 2020B	12/31/2019			
	Maintenance and Renewal				
55	Major Maintenance Visit #1	6/30/2020			
57	Cold temperature operating report	12/31/2019			
4.3	**Central Development Laboratory**				
	Operations				
1	Build and test Band 1 cryogenic amplifiers	12/31/2019			
2	Build and test ALMA Band 1 local oscillators	12/31/2019			
	Development				
5	Design, fabrication, and testing of 310 MHz short-backfire antenna	12/31/2019			
	Maintenance Renewal, and Warranty Claims				
11	VLA/VLBA multichip module support	12/31/2019			
5.7	**Science Support and Research**				
	TAC				
5	TAC Meeting, Semester 2020A	12/31/2019			
7	Update SW requirements for TAC 2020A	12/31/2019			
	Science Ready Data Products				
14	Wave-1 SRDP operations	12/31/2019			
15	SRDP Wave-2 capabilities and requirements	12/31/2019			
16	TTA Tools Conceptual Design Review	12/31/2019			
	Scientific User Support				
21	NM Symposium	12/31/2019			
	Scientific Staff and Jansky Fellows				
27	SciStaff performance reviews	12/31/2019			
31	Jansky Fellows selection completed	12/31/2019			
	Student Programs				
34	Student Observing Support selection (VLA)	12/31/2019			
6.6	**Data Management and Software**				
	SIS				
4	Investigate HTCondor for local VLASS operations	12/31/2019			
	ALMA Systems Software				
10	ALMA Cycle 8 Release	12/31/2019			
	CASA Pipeline				
30	Pipeline C7/SRDP Release	12/31/2019			
32	Pipeline Python 3 Planning	12/31/2019			
	Science Support and Archives				
34	PST Updated for Semester 2020B	12/31/2019			
36	OPT Updated for Semester 2020A	12/31/2019			
40	SRDP-Wave-1	12/31/2019			

NRAO Quarterly Status Update
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QSU1 FY2020

			Q1 Performance Assessment		
POP Milestone	**Milestone**	**Completion Date**	**Cost**	**Schedule**	**Scope**
42	TTA Tools CoDR Support	12/31/2019			
7.5	**Program Management Department**				
	PMD Operations				
1	HQ PM/SE Project Leadership	12/31/2019			
2	NM PM/SE Project Leadership	12/31/2019			
3	CDL PM/SE Project Leadership	12/31/2019			
	Proposal Development				
4	HQ Proposal Development	12/31/2019			
5	NM Proposal Development	12/31/2019			
6	CDL Proposal Development	12/31/2019			
	PM Activities				
7	HQ Continuing Education	12/31/2019			
	PM/SE Activities				
10	Program Management Software Decision	12/31/2019			
12	Multicancha Construction Complete	12/31/2019			
14	SRDP TTA Tool Concept Design Review	12/31/2019			
15	VLBA Fiber Installation Complete	12/31/2019			
8.5	**Education and Public Outreach**				
	News and Public Information				
1	Identify potential image or story to feature	12/31/2019			
4	Define promotional materials for Astronomers	12/31/2019			
5	Establish calendar and contacts for deskside briefings	12/31/2019			
	Multimedia Team				
7	Define menu of press product image options	12/31/2019			
8	Determine specifications for Gallery	12/31/2019			
10	Identify topic for hosted video	12/31/2019			
11	Complete assignments for hosted video	12/31/2019			
12	Define format and develop procedure for populating style guide	12/31/2019			
	STEAM Ed				
15	San Pedro Cohort orientation	12/31/2019			
	VLA VC Operations				
20	Survey advertising options	12/31/2019			
9.4	**Computing and Information Services**				
	Observatory-Wide Support				
1	Upgrade of Mac platform to Mojave	12/31/2019			
3	Cyber Security risk assessment	12/31/2019			
6	Information Privacy Policy release	12/31/2019			
10.2	**Office of Diversity and Inclusion**				
	Local and National Programs				
1	Diversity Council quarterly meetings	12/31/2019			
6	Diversity and Cultural Awareness training offered	12/31/2019			
	International Partnerships				
7	Chile REU program recruitment completed	12/31/2019			
11.7	**Human Resources**				
	Workforce Management				
1	ngVLA Hiring	12/31/2019			
2	GBO Five-Year Proposal Workforce Management Plan	12/31/2019			
	Training and Development				
3	Observatory Leadership Cohort Pilot Assessment/Implementation plan	12/31/2019			
	Compensation				
6	Enhance Online Marketing Pricing Tool	12/31/2019			
7	Finalize Variable Pay Plan	12/31/2019			
	Benefits				
10	Electronic enrollment - Non open enrollment benefit entry	12/31/2019			
11	Third Party Benefits Vendor Upload Preparation	12/31/2019			
	HR				
17	FY2019 Climate Survey Results Initiatives	12/31/2019			
12.2	**Science Communications**				
1	Redesign NRAO exhibits	12/31/2019			
13.6	**Administration**				
	MIS				
7	Bi-Weekly ETK Entry Enhancements	12/31/2019			
14.1	**Budget**				

NRAO Quarterly Status Update
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			Q1 Performance Assessment		
POP Milestone	**Milestone**	**Completion Date**	**Cost**	**Schedule**	**Scope**
1	Hire Jr. Business Systems Analyst	12/31/2019			
2	Implement FY2020 Budget	12/31/2019			
5	2020 Insurance renewal	12/31/2019			
15.3	**Spectrum Management**				
1	WRC-19, Sharm El-Sheik	12/31/2019			
16.2	**Director's Office**				
	ALMA				
1	ALMA Board Meeting	12/31/2019			
	Corporate Meetings				
3	AUI Board of Trustee Meeting	12/31/2019			
4	AUI Executive Committee Meeting	12/31/2019			
	Science Community				
6	Appoint new Users Committee Members	12/31/2019			
	Management Reviews				
8	NSF Annual Program Review	12/31/2019			

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 budget

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

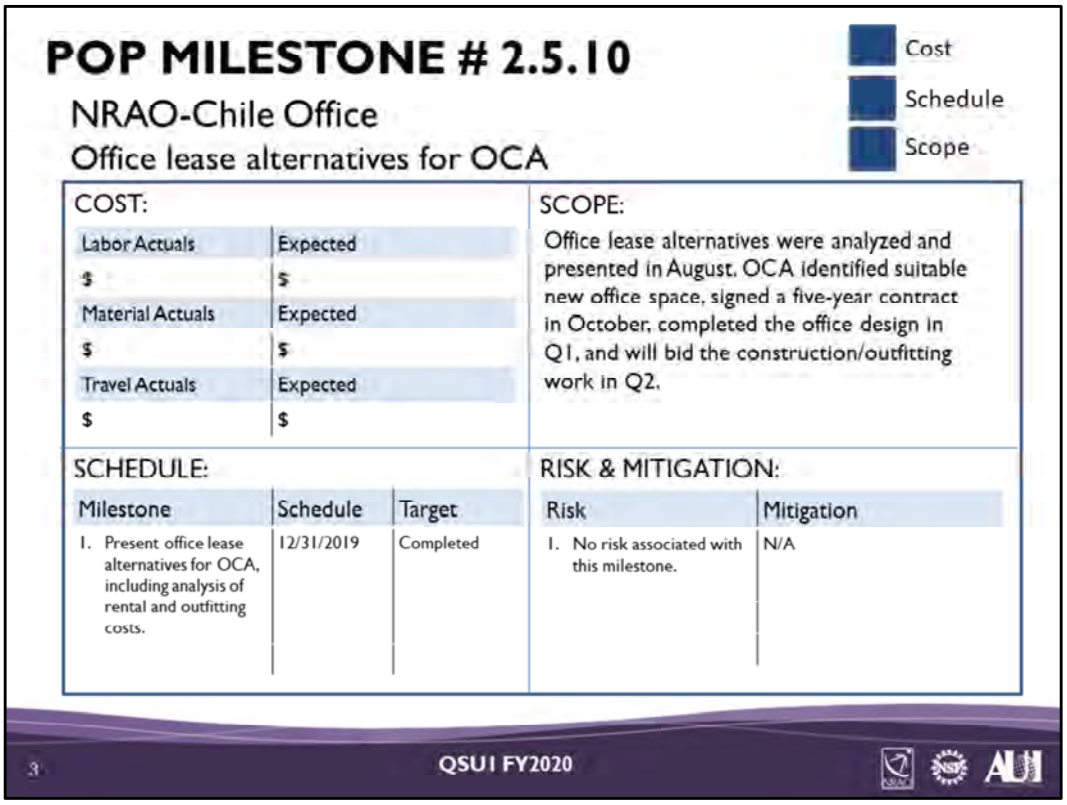
Grey - completed

QSU1 FY2020 Report

October – December 2019

QSU1 – Milestone progress

Total Q1 2020 milestone deadlines: 82
Total completed on time: 70
Percent completed on time: 85%
18 carryover milestones - 7 completed

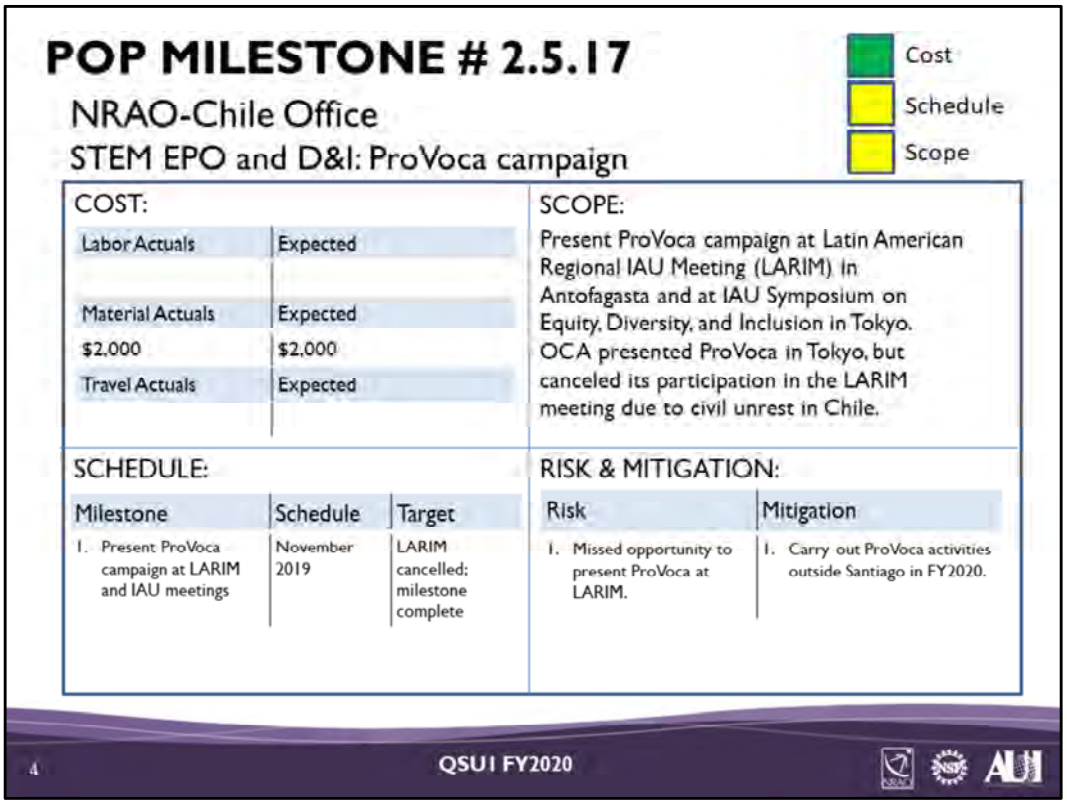


COST: No costs associated with early completion of the analysis leading to identification of new office space. Moving forward, office move has been organized as a project, with a set budget.

SCOPE: OCA analyzed several lease options in the vicinity of ALMA´s Santiago Central Office and chose the best in terms of location, characteristics, and price. The scope of the office move is being managed by a working group, which captured the requirements, oversaw the architectural design, prepared the documentation for the construction bid, and closely monitors progress.

SCHEDULE: This milestone was completed ahead of schedule, taking advantage of a very good lease opportunity.

RISK & MITIGATION: No risk directly associated with this milestone. Risk of office move project is overspending budget and/or taking longer than expected. The working group is mitigating these risks by closely monitoring the design and specifications, as well as hiring a technical inspector of works to oversee construction/outfitting.

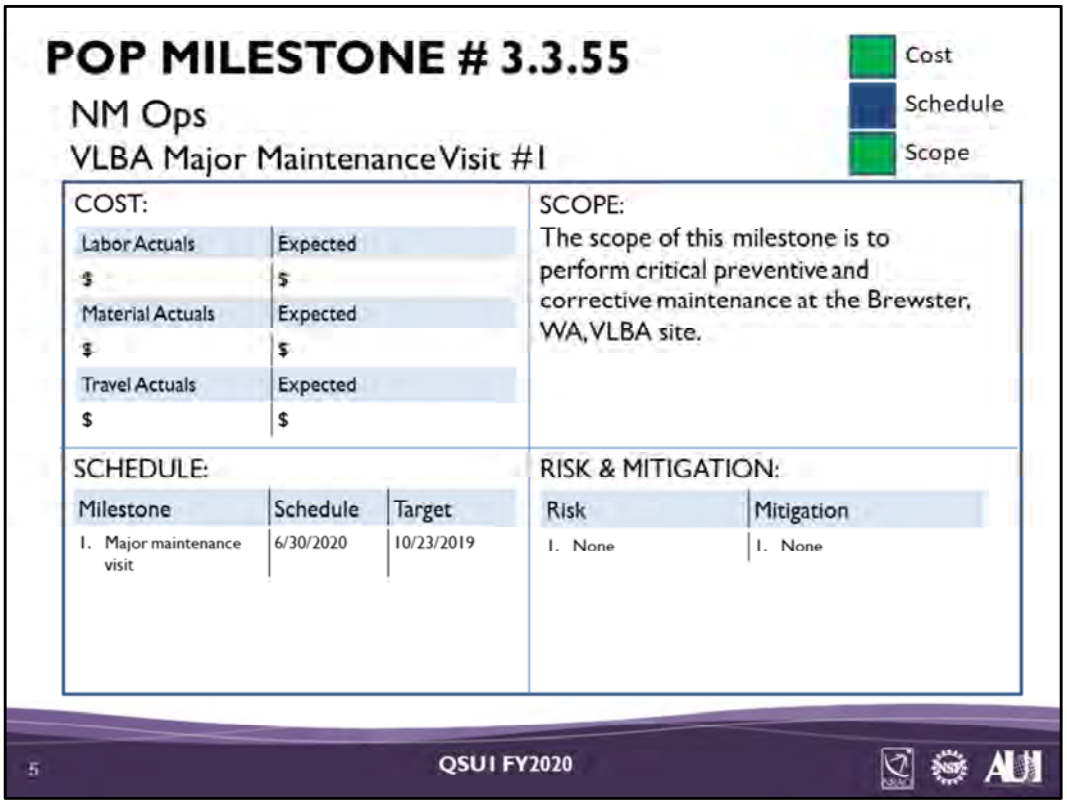


COST: Paid for, but could not use, AUI/NRAO stand at LARIM ($2,000).

SCOPE: Part of the scope was completed, i.e. PROVOCA was presented at the IAU symposium. OCA decided to cancel its participation in the LARIM meeting due to the civil unrest in Chile.

SCHEDULE: There is no new target for presenting at LARIM, since it takes place once every three years. Milestone will be marked as completed next quarter.

RISK & MITIGATION: Missed opportunity will be mitigated by carrying out ProVoca activities outside Santiago during FY2020.

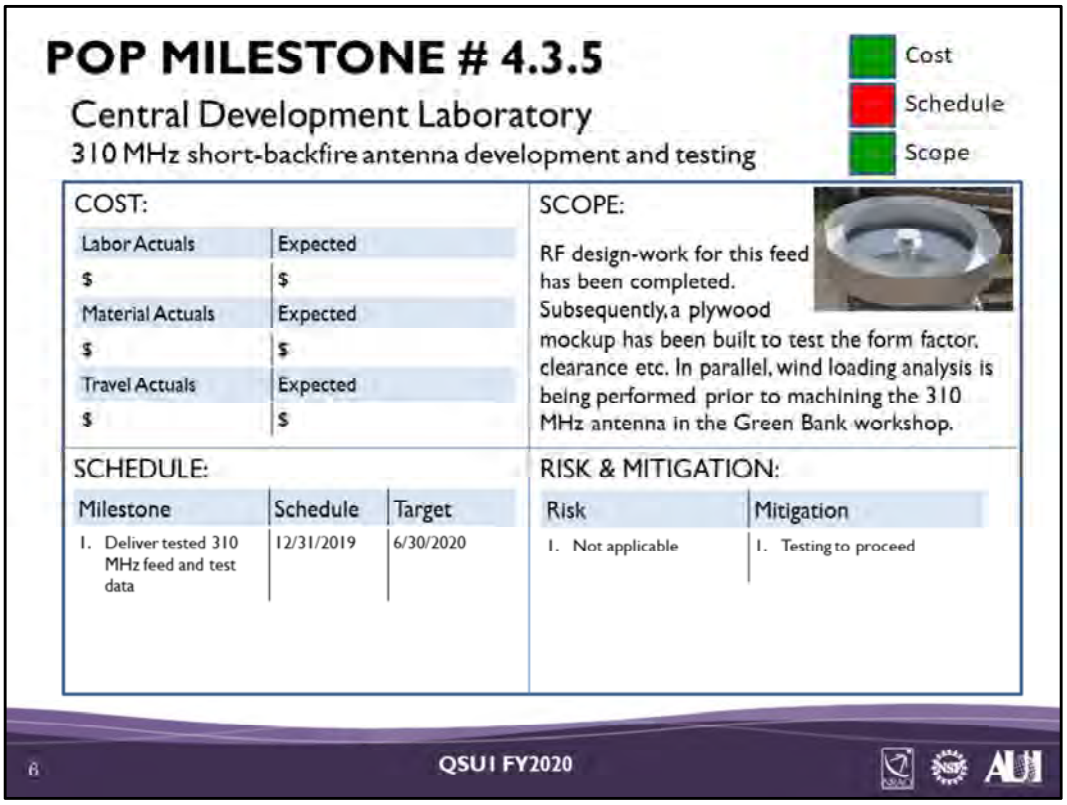


COST: No impact.

SCOPE: No impact.

SCHEDULE: Due to scheduling availability of critical personnel, this maintenance was performed in Q1 instead of Q3 as originally planned.

RISK & MITIGATION: No impact.

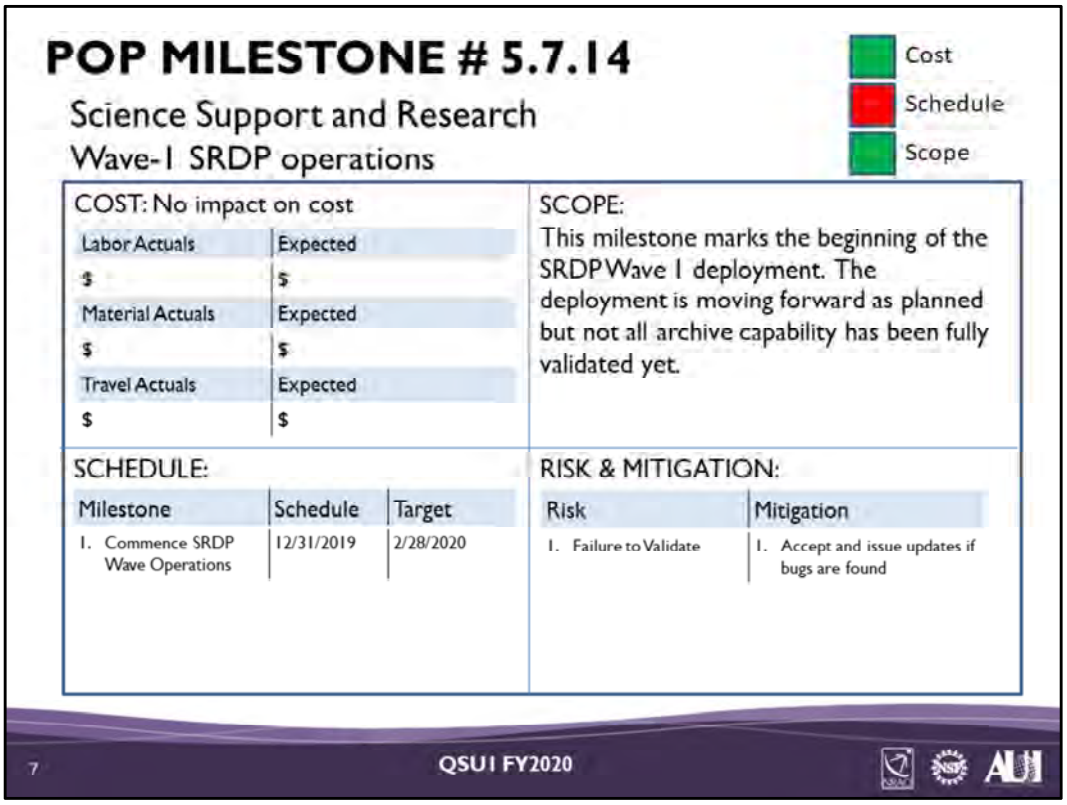


COST: No impact.

SCOPE: A plywood mock-up has been built to test form factor, clearance, etc. As for the actual antenna, we have performed electrical simulations and are currently doing wind loading. When that is complete (by February) we will show the electrical and wind loading results to GBO, and if they approve, full drawings will go to GBO for them to build.

SCHEDULE: Manufacture of this feed is scheduled for Q2 FY2020, and testing is nominally planned to be completed in Q3 FY2020.

RISK & MITIGATION: The overall 310 MHz project is a MSIP proposal (with University of Richmond) now and we have submitted a pre-proposal. In March, NSF will decide if we are worthy of a full proposal, which would be due in May. The GBO construction of the 310 MHz antenna, however, does not depend on the MSIP award, and GBO plans to build the antenna and do live testing on the GBT.

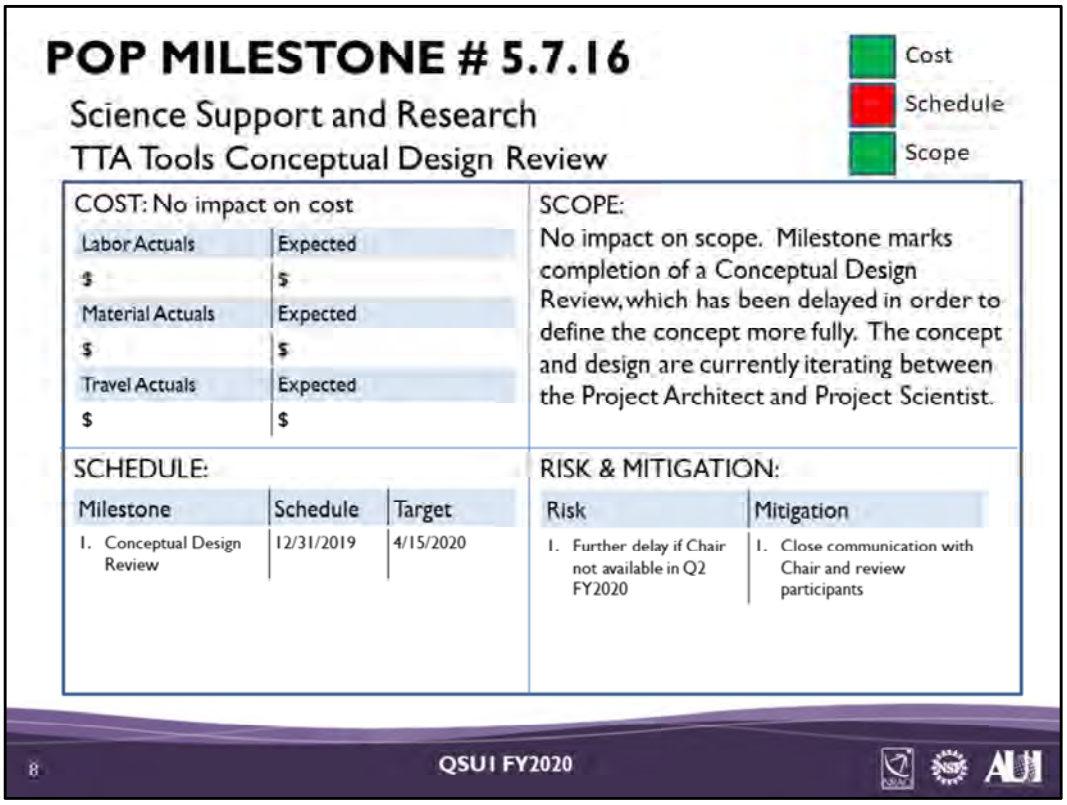


COST: No impact.

SCOPE: No impact.

SCHEDULE: Wave 1 Operations have commenced, production archive code has been deployed but some validation tasks remain on late breaking bug fixes.

RISK & MITIGATION: The code has been in production, with ongoing bug fixes. There is still a risk for a Failure to Validate or break working code. This is mitigated with further bug fixes and repeated validation.

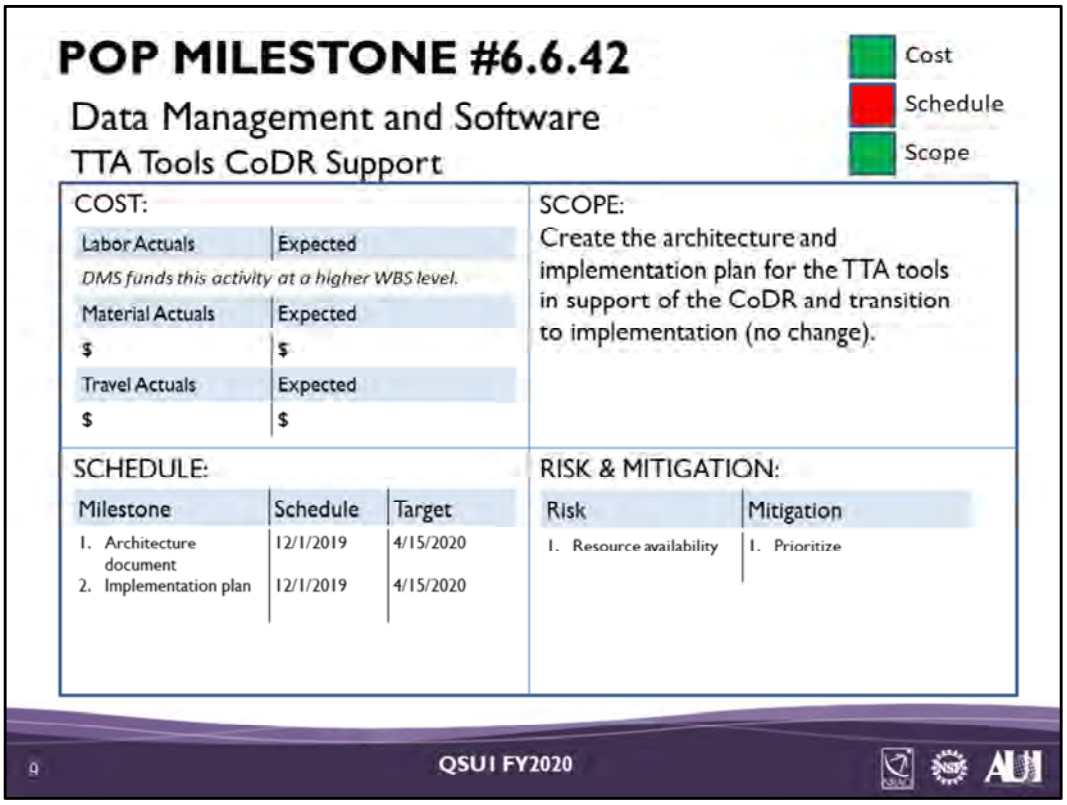


COST: No impact.

SCOPE: No impact.

SCHEDULE: This delay resulted from gaps discovered in the initial concept and requirements by the system architect, which need to be resolved prior to moving forward with the Conceptual Architecture. In addition, the Architect requested to include prototyping prior to the CoDR to validate the system architecture. A review chair has been appointed to conduct the external review, gaps have been addressed, and the design is progressing.

RISK & MITIGATION: Delay may interfere with the availability of the review committee, adding further delay to conduct review or reappoint a new Chair and committee members. This will be mitigated by close communication with chair to determine availability of key participants.

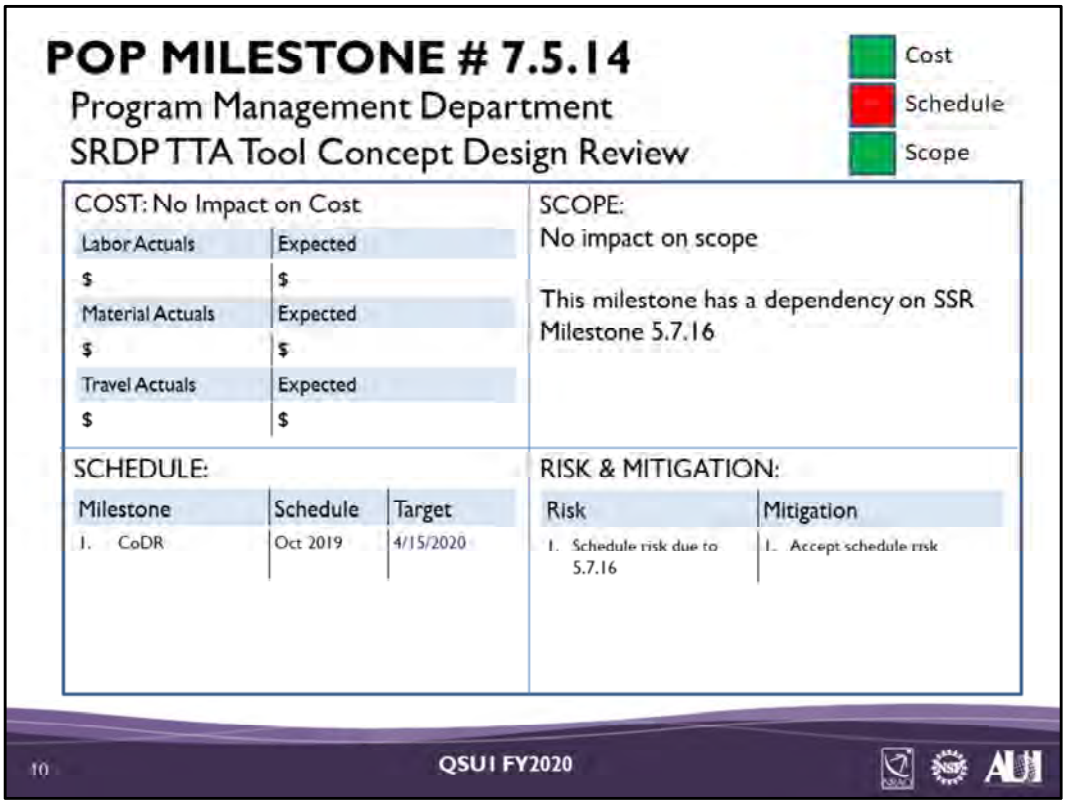


COST: DMS funds this activity at a higher WBS level. Costs are not tracked for this milestone.

SCOPE: The project to re-engineer the TTA tool suite is managed by SRDP. The project will transition from the initiation phase to the implementation phase in Q2 FY2020 with completion of a Conceptual Design Review (CoDR). DMS will create the architecture and implementation plan for review at the CoDR (no change).

SCHEDULE: This delay resulted from gaps discovered in the initial concept and requirements by the system architect, which need to be resolved prior to moving forward with the Conceptual Architecture. In addition, the Architect requested to include prototyping prior to the CoDR to validate the system architecture.

RISK & MITIGATION: Uncertainty about resource availability for completion of requirements in time for analysis and architecture completion. This will be prioritized to facilitate completion.

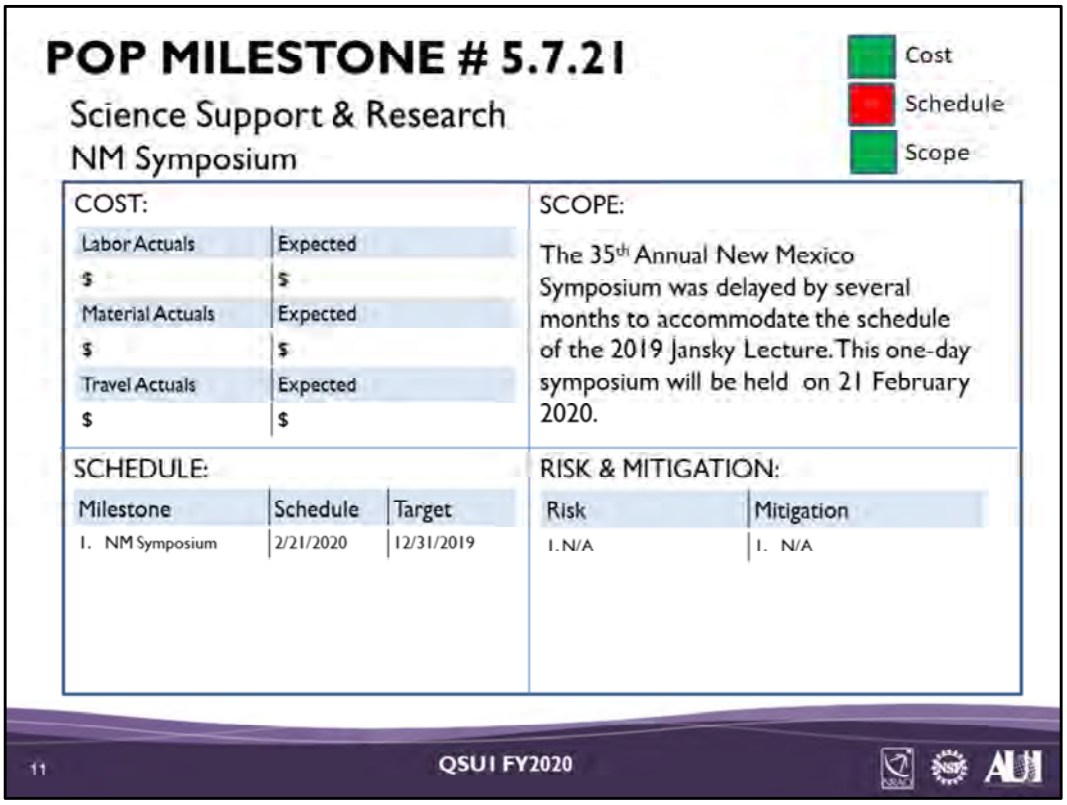


COST: No impact.

SCOPE: No impact.

SCHEDULE: This milestone is the Project Management component to oversee preparation of the document package, administration, and logistics for the review addressed in SSR Milestone 5.7.16. All critical documents in the package are in well developed drafts, the chairperson has been appointed and received the meeting plan mid/late January, the document package has a target completion date by the end of February.

RISK & MITIGATION: Schedule risk exists due to the dependency on 5.7.16, other risk is minimal since the review processes have been successfully executed on previous reviews.

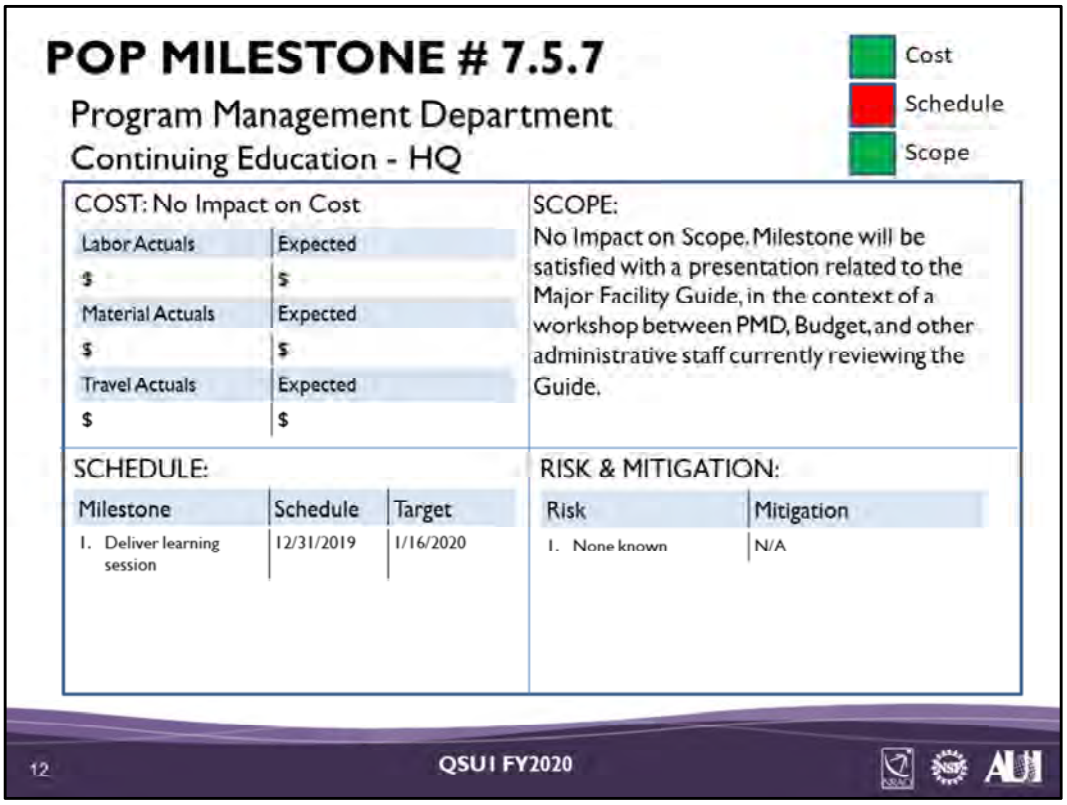


COST: No impact.

SCOPE: No impact.

SCHEDULE: The 35th Annual New Mexico Symposium will be held on 21 February 2020.

RISK & MITIGATION: No impact.

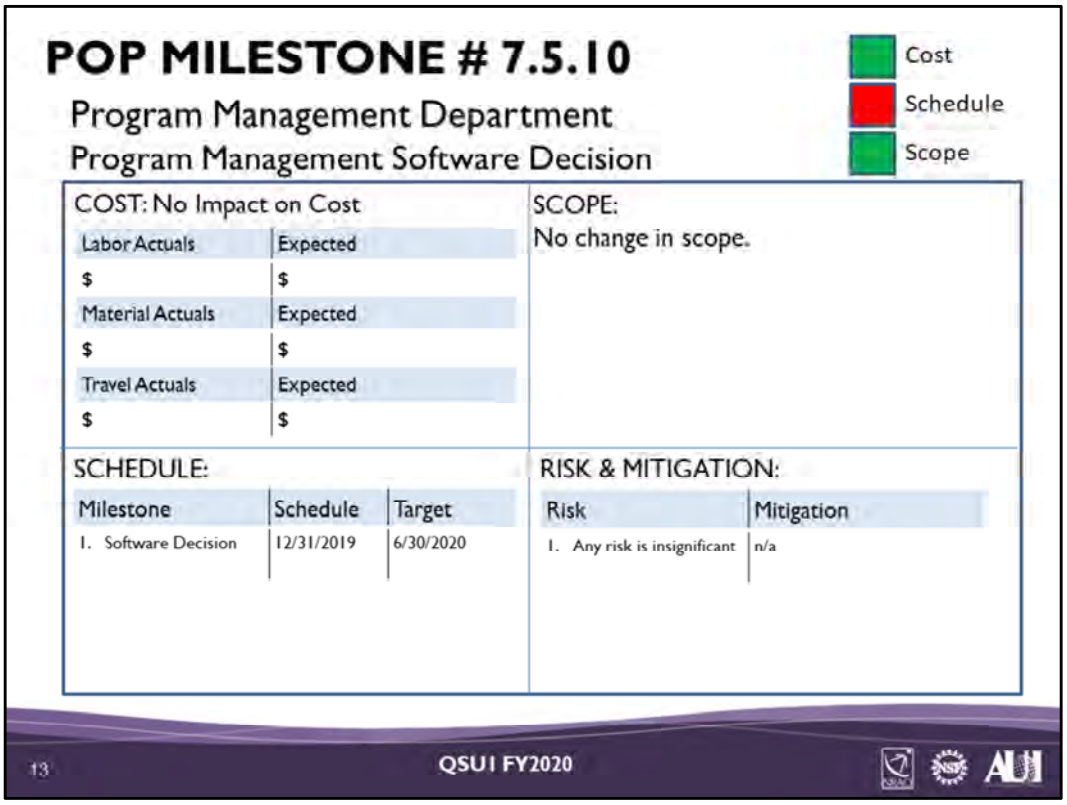


COST: No impact.

SCOPE: No impact.

SCHEDULE: Although the MFG workshop began in Q1 FY2019, the section assigned which is used to satisfy this milestone is scheduled for Jan 16, 2020.

RISK & MITIGATION: No known risks.

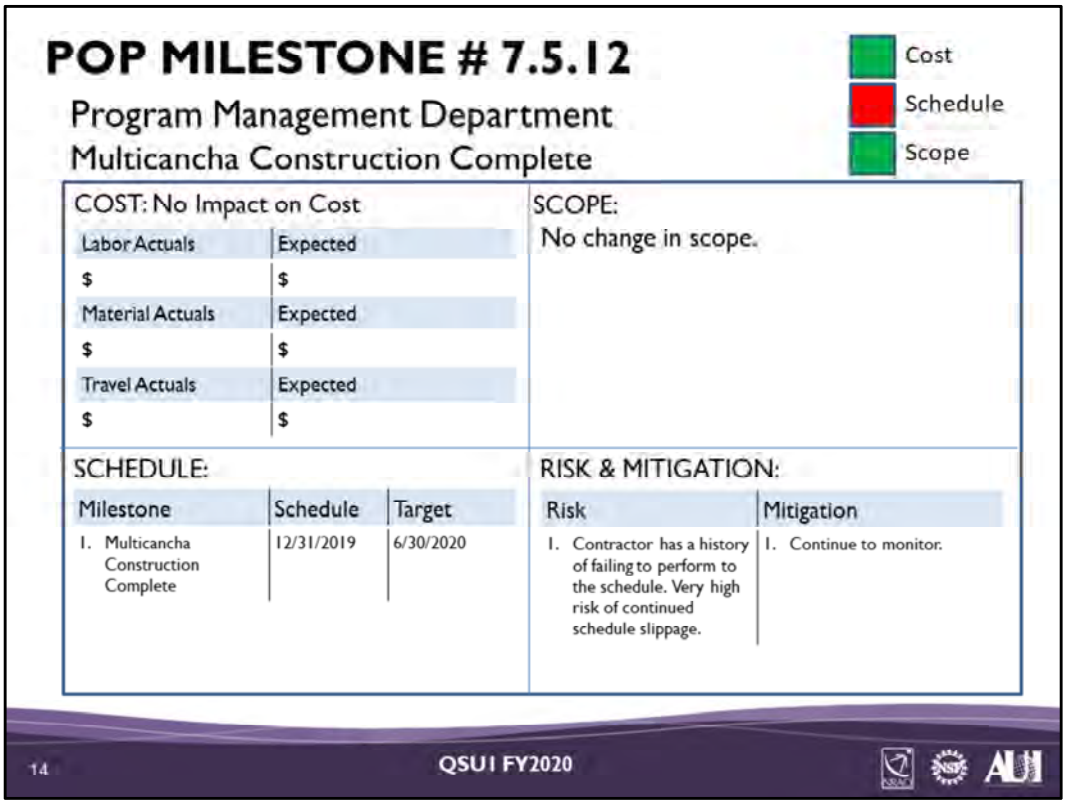


COST: No impact.

SCOPE: No impact.

SCHEDULE: We continue to evaluate the Oracle Prime Cloud software as it continues to develop. A decision will be made in June 2020.

RISK & MITIGATION: No known risks.

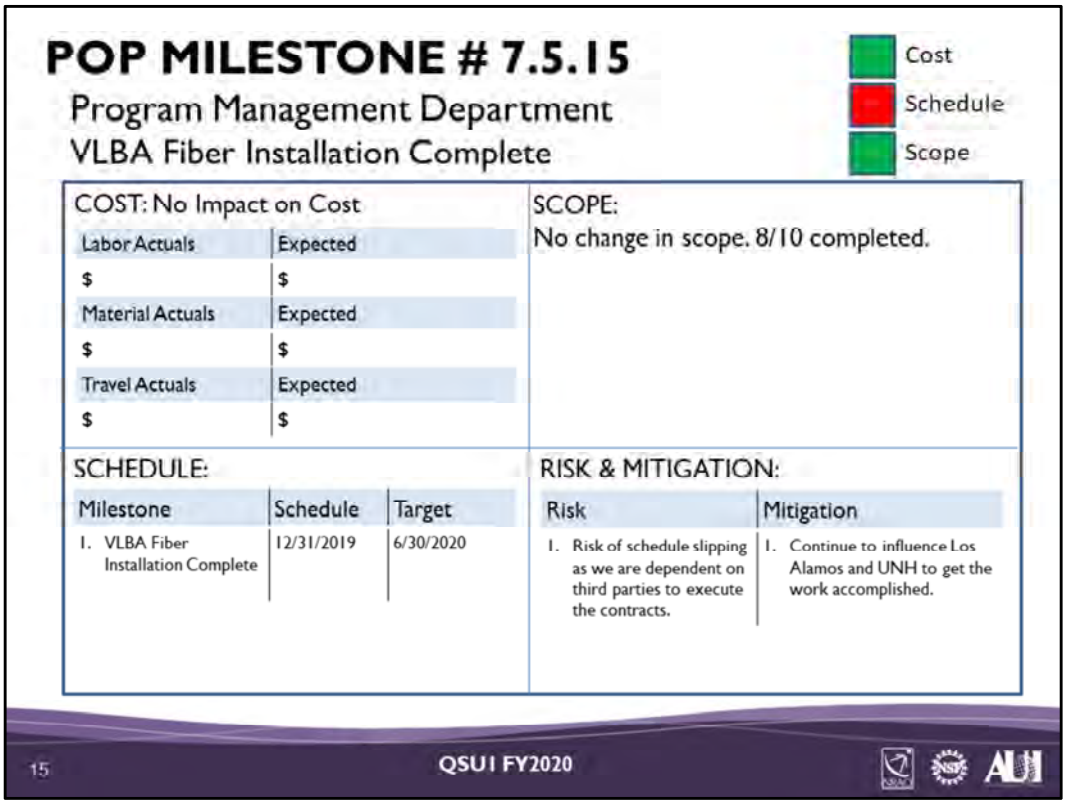


COST: No impact.

SCOPE: No impact.

SCHEDULE: Contractor continues to fall behind on schedule. Contractor is currently working on a schedule re-baseline.

RISK & MITIGATION: Contractor has a history of failing to perform to the schedule. Very high risk of continued schedule slippage.

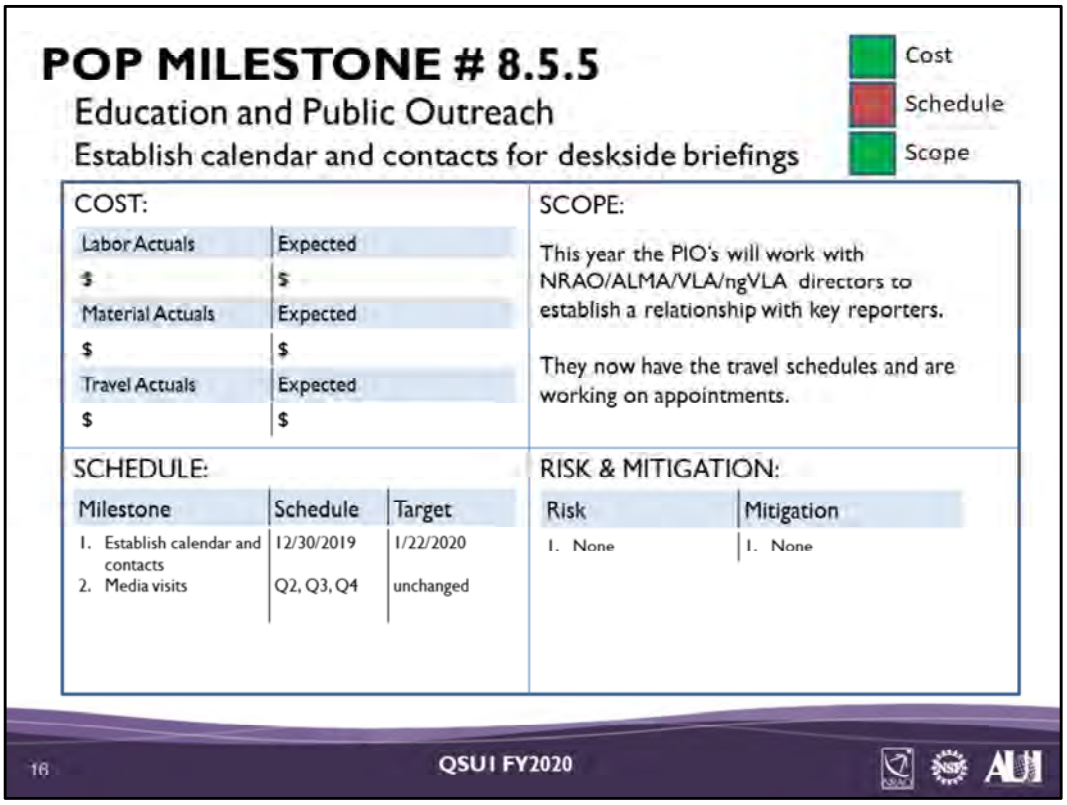


COST: No impact.

SCOPE: No impact.

SCHEDULE: No cost extension was approved by NSF. Los Alamos has not started and is reconsidering the contract as the contractor has increased cost. U of NH has an agreement with the town of Peterborough to bury the fiber over a one mile stretch. This will cause a schedule delay and an increase on cost. The amount of the increases are not yet determined.

RISK & MITIGATION: Risk of schedule slipping as we are dependent on third parties to execute the contracts. Continue to influence Los Alamos and UNH to get the work accomplished.

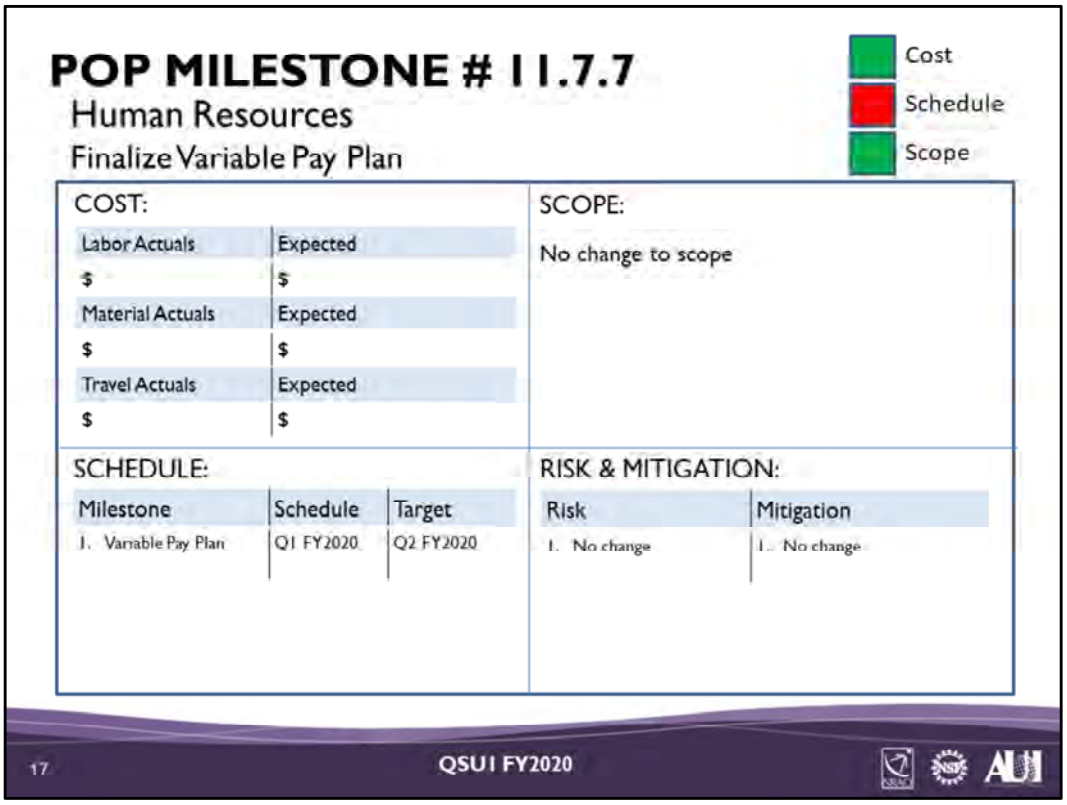


COST: No cost impact.

SCOPE: No change.

SCHEDULE: This will be done by the end of January. It was delayed by the transition in PIO positions, clarifying the activity for new staff, and then getting the schedules of the Directors.

RISK & MITIGATION: None.



COST: No impact.

SCOPE: No impact.

SCHEDULE: Schedule slip due to other competing priorities. Will finalize this policy by the end of Q2.

RISK & MITIGATION: No impact.


Carryover Milestones

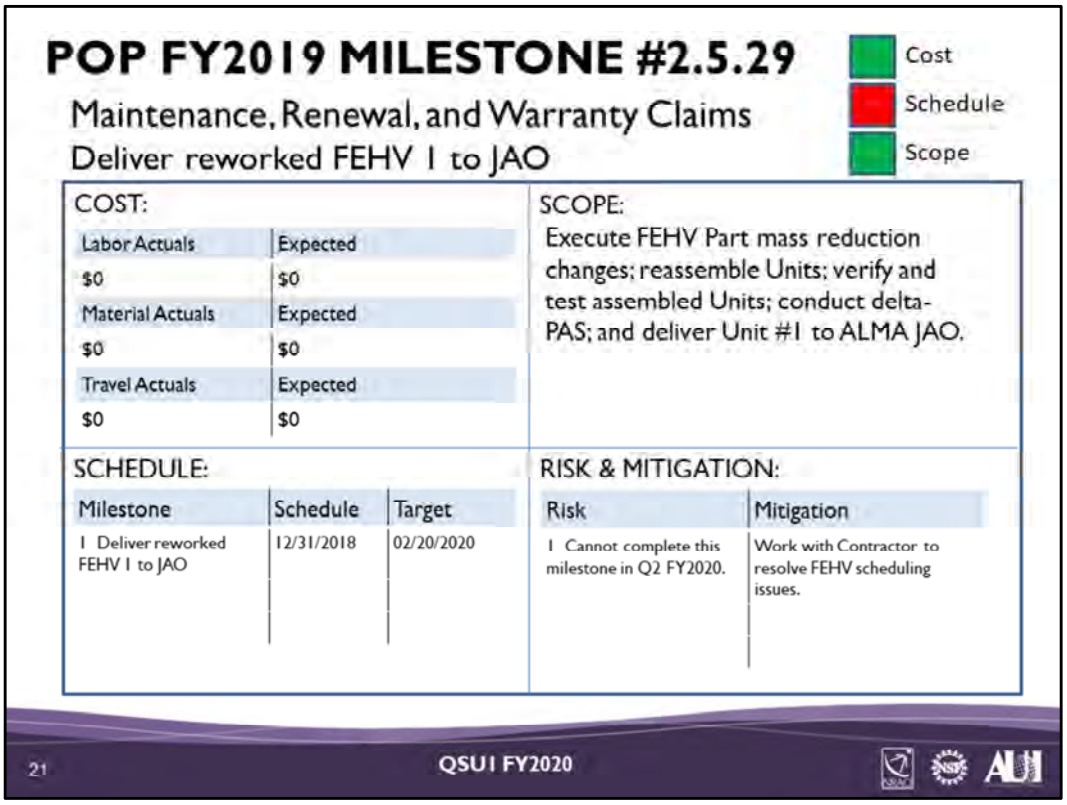
FY2019 Milestone Carryover Chart

FY2019				Q1 FY2020 Performance Assessment		
POP Milestone	Milestone	Completion Date	New Completion	Cost	Schedule	Scope
2.5	**NA ALMA Operations**					
	Maintenance, Renewal, and Warranty Claims					
29	Deliver [redacted] PDR 1 to JAO	12/31/2018	11/1/2019			
30	Deliver PDRs 2, 3, and 4 to JAO	9/30/2019	11/1/2019			
	NRAO -Chile Office					
34	[redacted]	9/30/2019	6/1/2020			
3.3	**New Mexico Operations**					
	Very Large Array					
	Development					
14	VLASS1.1 Single epoch continuum imaging complete	12/31/2018	11/1/2019	Cancelled		
	Technical Upgrades and Enhancements					
41	[redacted]	9/30/2019	12/31/2019			
42	Install upgraded servo SCR cards in three antennas	9/30/2019	12/31/2019			
	Very Long Baseline Array					
	Maintenance and Renewal					
60	Major VLBA Maintenance, Visit #1	6/30/2019	2/1/2020			
4.6	**Next Generation Very Large Array**					
	Conceptual Design and Development					
20	System Requirements and Architecture Review	9/30/2019	3/1/2020			
22	Antenna Optical Design	3/30/2019	6/1/2020			
29	Wide Band Feed Design	9/30/2019	11/1/2019			
31	Integrated Receiver Development Tests	9/30/2019	3/31/2020			
5.3	**Central Development Laboratory**					
	Research and Development					
12	Test 5 ADC prototype ASIC	6/30/2019	3/31/2020			
6.7	**Science Support and Research**					
	Science Ready Data Products					
17	Pilot SRDP Operations Complete	9/30/2019	12/1/2019			
7.5	**Data Management and Software**					
	CASA					
21	CASA 6.0 release	6/30/2019	12/1/2019			

FY2019 Milestone Carryover Chart

FY2019				Q1 FY2020 Performance Assessment		
POP Milestone	Milestone	Completion Date	New Completion	Cost	Schedule	Scope
8.5	**Program Management Department**					
	Headquarters					
6	Program Management Software Solution Implementation	6/30/2019	6/1/2020	Cancelled, in FY2020 POP		
7	Multicancha Mass Concrete Works Complete	12/31/2018	2/1/2020	Cancelled, in FY2020 POP		
8	Multicancha Beams Erection Complete	12/31/2018	2/1/2020	Cancelled, in FY2020 POP		
9	Multicancha Membrane Installation Complete	3/30/2019	2/1/2020	Cancelled, in FY2020 POP		
10	Multicancha Sport Flooring Installation Complete	3/30/2019	2/1/2020	Cancelled, in FY2020 POP		
11	Multicancha Construction Complete	9/30/2019	2/1/2020	Cancelled, in FY2020 POP		
13	SRDP Wave 1 Review	9/30/2019	11/1/2019			
	New Mexico Operations					
20	VLBA Fiber Final Service Analysis Report	9/30/2019	3/1/2020	Cancelled, in FY2020 POP		
	Central Development Lab					
28	CDL Continuing Education	9/30/2019	10/1/2019			

FY2018				Q1 FY2020 Performance Assessment		
POP Section	POP Milestone	Milestone	New Completion Date	Cost	Sched	Scope
4.3	**Central Development Laboratory**					
	Research and Development					
8	Explore DQMT calibration using hot-cold-noise	9/30/2018	12/13/2019			
	myVLA					
4	*Conceptual Design & Development*					
12	Algorithmic Study released	9/30/2018	3/31/2020			
15	RFI Mitigation study released	9/30/2018	12/13/2019			
3.11	**Long Baseline Observatory**					
	Operational Activities					
	VME replacement program will be complete	9/30/2018	Q1 FY2020			

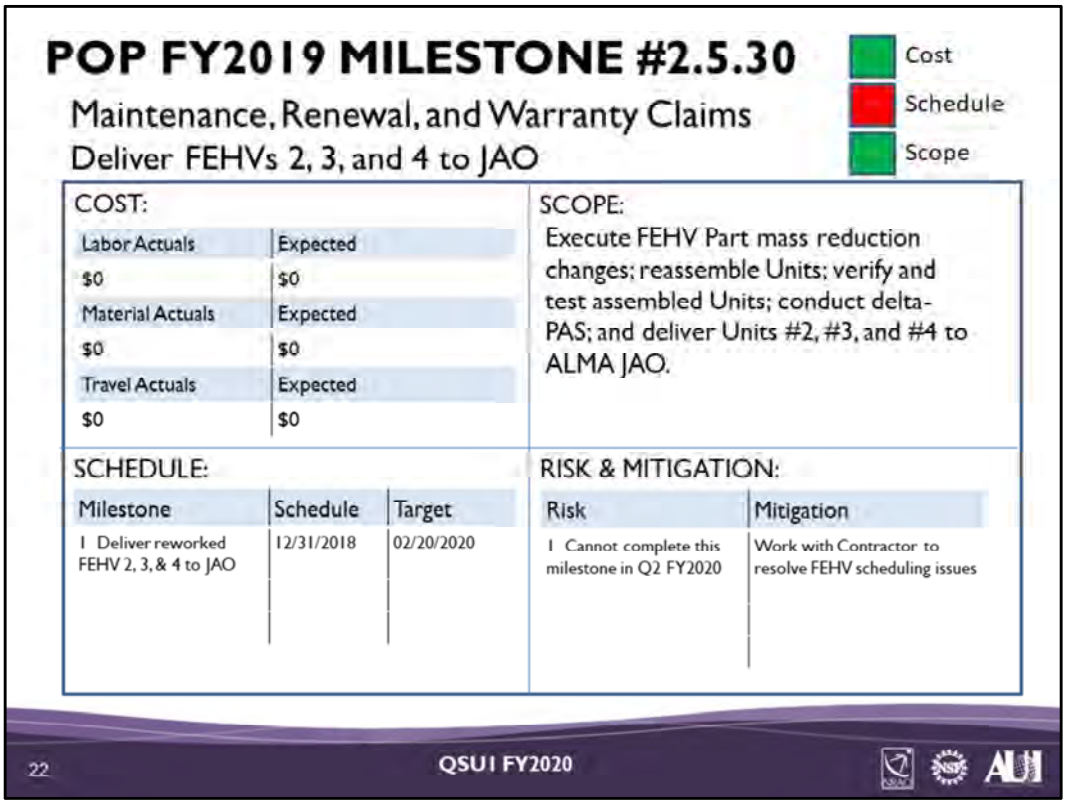


COST: No change in cost.

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

SCHEDULE: The Contractor was able to resolve issues with the lift jacks on Units #3 and #4 that were previously reported and the FEHV Units packed and shipped to the OSF arriving at the OSF on 21 October 2019. Unfortunately, the arrival of the FEHV units coincided with the dramatic increase in civil unrest in Chile, which lead to cancelling the vehicle PAS and Acceptance Review scheduled to begin on 24 October. The civil unrest was mitigated sufficiently by mid-November to allow rescheduling of the vehicle PAS Reviews which began on 21 November; the PAS Reviews were satisfactorily completed on 23 November. Unfortunately, because of scheduling issues with several key JAO personnel, the Final Acceptance Reviews (ACRVs) could not be scheduled for December and are therefore planned for 14 January 2020. Unfortunately, a site-wide power blackout in the early morning hours of 14 January forced the cancelation of the planned ACRV as all available personnel including Staff pertinent to the ACRV were assigned to Antenna Recovery. Because of previously scheduled vacations for ALMA and NRAO Key personnel, the ACRV has now been rescheduled for 20 February.

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.



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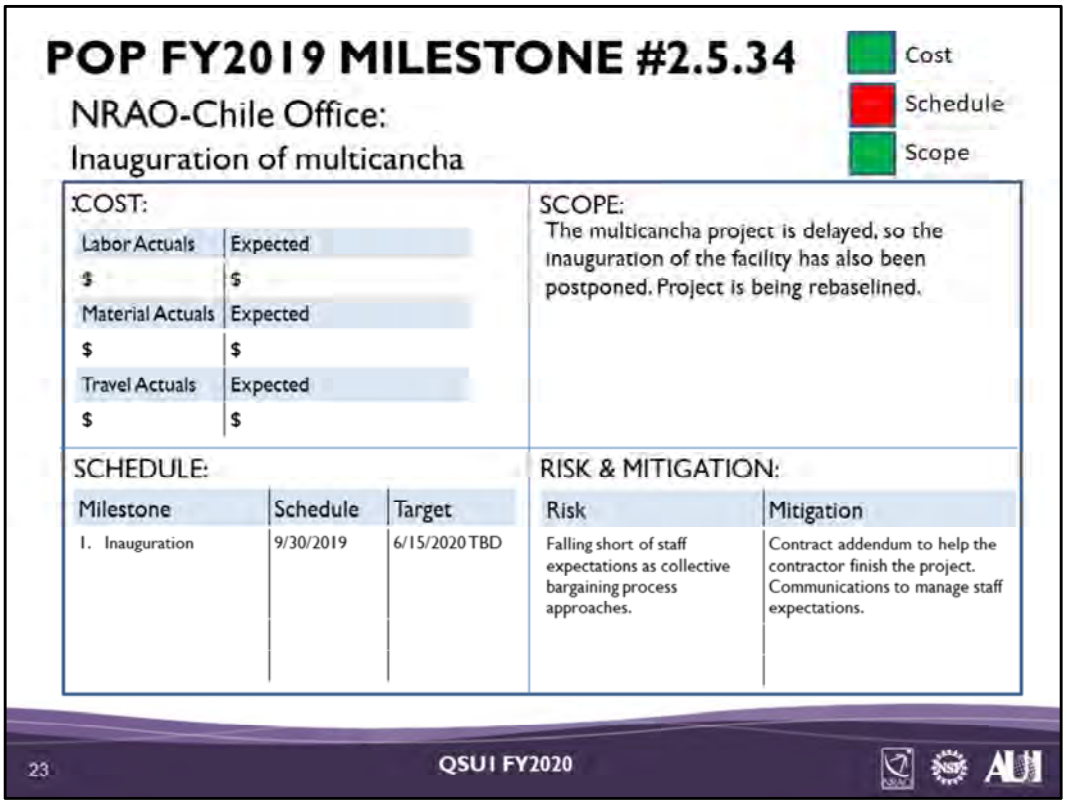
SCOPE: No change in scope; delivered FEHV to incorporate welding improvements and mass reductions.

SCHEDULE: The Contractor was able to resolve issues with the lift jacks on Units #3 and #4 that were previously reported and the FEHV Units packed and shipped to the OSF arriving at the OSF on 21 October 2019. Unfortunately, the arrival of the FEHV units coincided with the dramatic increase in civil unrest in Chile, which lead to cancelling the vehicle PAS and Acceptance Review scheduled to begin on 24 October. The civil unrest was mitigated sufficiently by mid-November to allow rescheduling of the vehicle PAS Reviews which began on 21 November; the PAS Reviews were satisfactorily completed on 23 November. Unfortunately, because of scheduling issues with several key JAO personnel, the Final Acceptance Reviews (ACRVs) could not be scheduled for December and are therefore planned for 14 January 2020. Unfortunately, a site-wide power blackout in the early morning hours of 14 January forced the cancelation of the planned ACRV as all available personnel including Staff pertinent to the ACRV were assigned to Antenna Recovery. Because of previously scheduled vacations for ALMA and NRAO Key personnel, the ACRV has now been rescheduled for 20 February.

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.

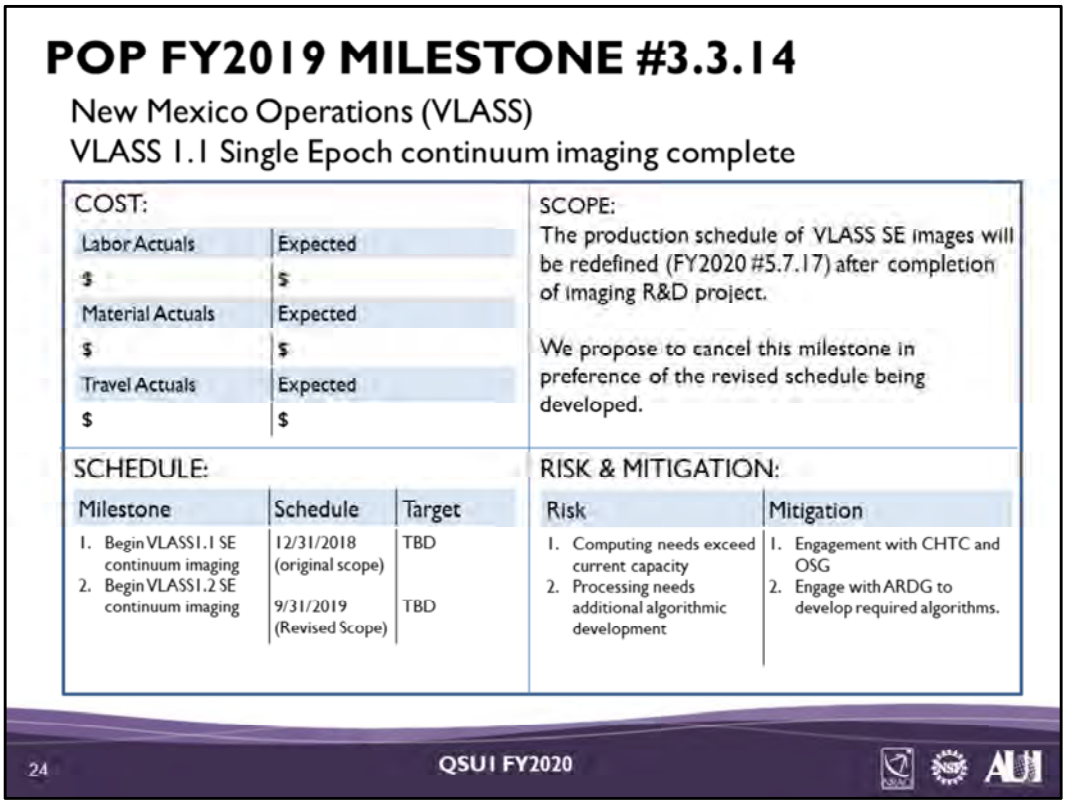


COST: Rescheduling the inauguration ceremony does not involve additional cost.

SCOPE: Scope is not affected by rescheduling.

SCHEDULE: A construction end of February 15th, plus 60 days for JAO acceptance, means that the facility will not be delivered before mid-April. Considering past contractor performance, a month's margin seems appropriate, bringing the new date for inauguration to mid-May. However, this timing may conflict with collective bargaining. As the project advances and we have a precise idea of the completion date, we will define the exact date (perhaps mid-June).

RISK & MITIGATION: The main risk of not completing this project on time, and inaugurating the facility with significant staff engagement, is falling short of expectations. The mitigation in place is a contract addendum that includes bonuses for performance. In addition, once we have clarity about completion dates we will communicate to staff in order to manage expectations.



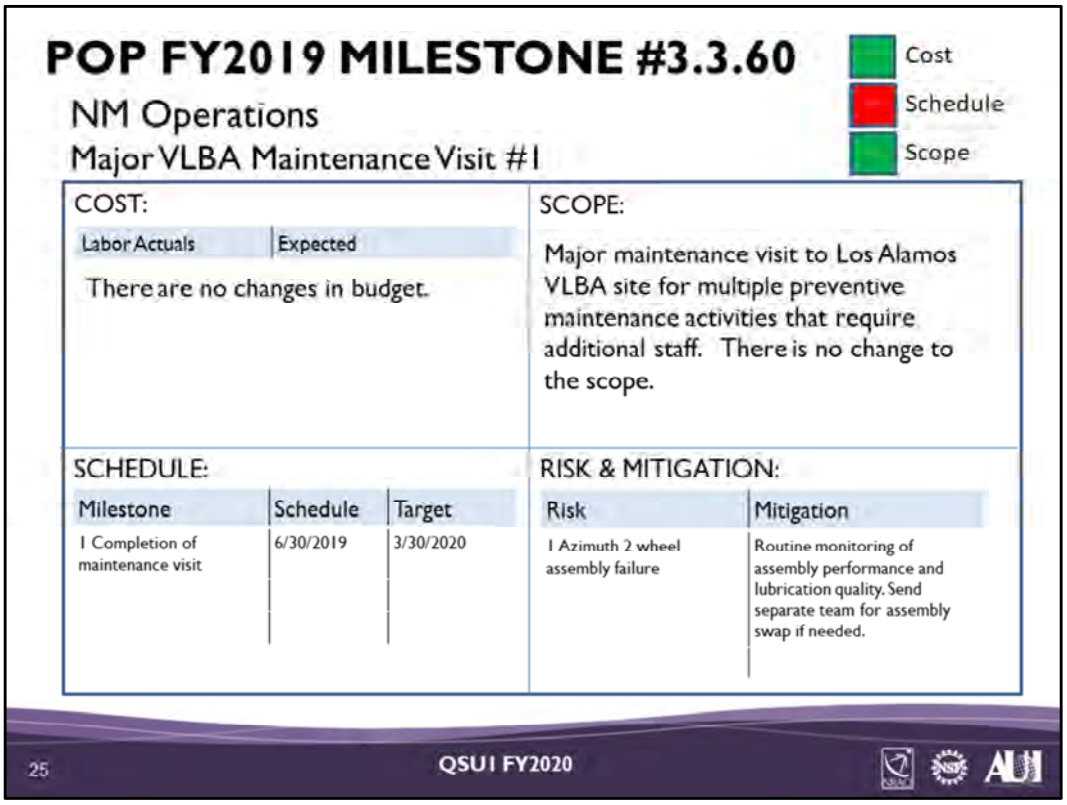
COST: Current tests of algorithms being developed indicate additional compute resources are needed to support VLASS SE imaging. Outsourced processing is under investigation by the DMS SCG group, with High Throughput Condor (HTCondor) at the Univ. of Wisc. as the most promising and cost effective way forward.

SCOPE: VLASS1.1 data contains pointing errors with 2/3 of the VLA antennas, discovered after the FY2019 Program Operating Plan was written. Scope was changed to begin the VLASS 1.2 Single Epoch continuum in Q1.

SCHEDULE: An candidate imaging algorithm suitable for processing VLASS1.2 is available in CASA and has been integrated with the VLASS Pipeline. Validation through the first quarter of FY2020 has been unsuccessful, thus production imaging has not commenced. Milestone #5.7.17 in Q2 FY2020 is to redefine the production schedule making this milestone obsolete. We propose to cancel this in preference of the (TBD) revised schedule.

RISK & MITIGATION:

- There continues to be a risk (most likely scenario) that the computing needs will exceed the inhouse capabilities. NRAO is engaged with the Center for High Throughput Computing at UW and the Open Science Grid to address this issue.
- Without a validated pipeline there continues to be a risk that additional algorithmic development will be required to produce the single epoch continuum images. We have initiated a high-priority R&D project specifically targeting the single epoch continuum imaging issues.

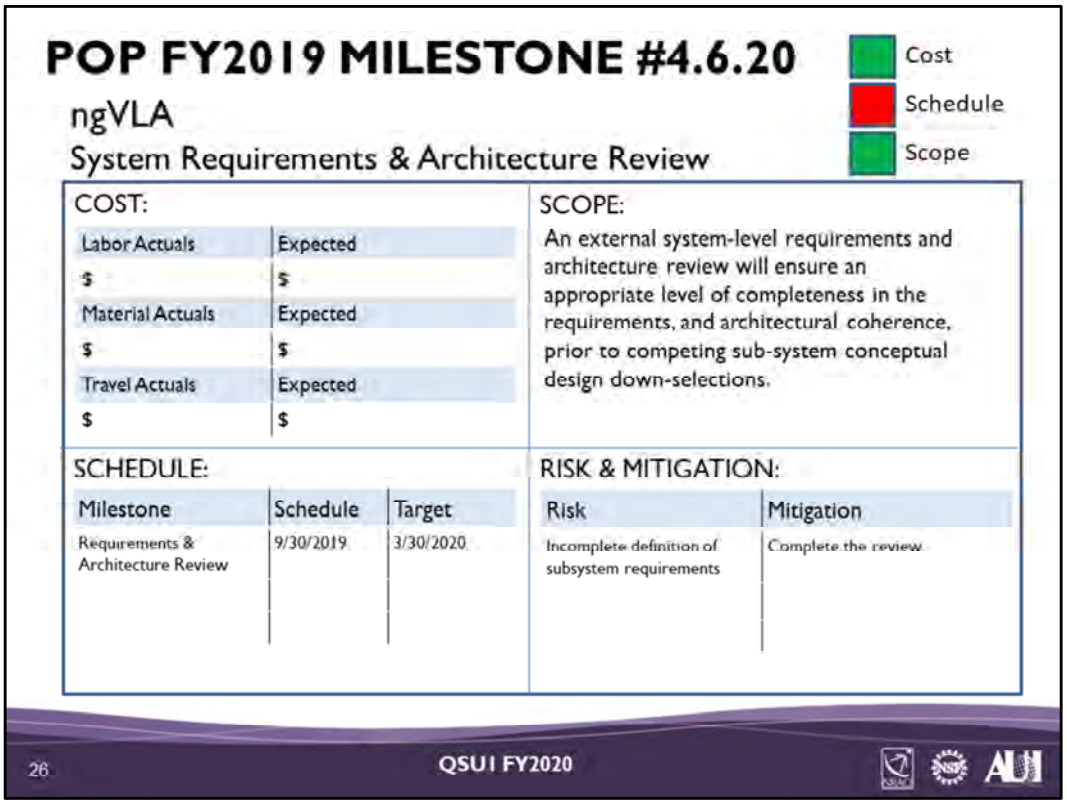


COST: No change.

SCOPE: No change. Visit includes a preventive replacement of the azimuth 2 wheel assembly.

SCHEDULE: Because of major resource conflicts due to the St. Croix repair project and the need to visit Mauna Kea twice during FY2019, staff and equipment were unavailable to support this trip. The Tiger Team visit is now scheduled for Q2 FY2020, at which point Los Alamos will receive a major preventive maintenance visit by staff from the Electronics and Engineering Services divisions.

RISK & MITIGATION: Due to the planned replacement of the wheel assembly being delayed, its performance and inspection of grease for signs of a failure are being watched closely. If signs of an impending failure are seen, antenna mechanics and engineers responsible for the assembly swap can be sent earlier than the main visit. There are currently no signs this is needed, despite this being the oldest remaining wheel assembly in the VLBA.

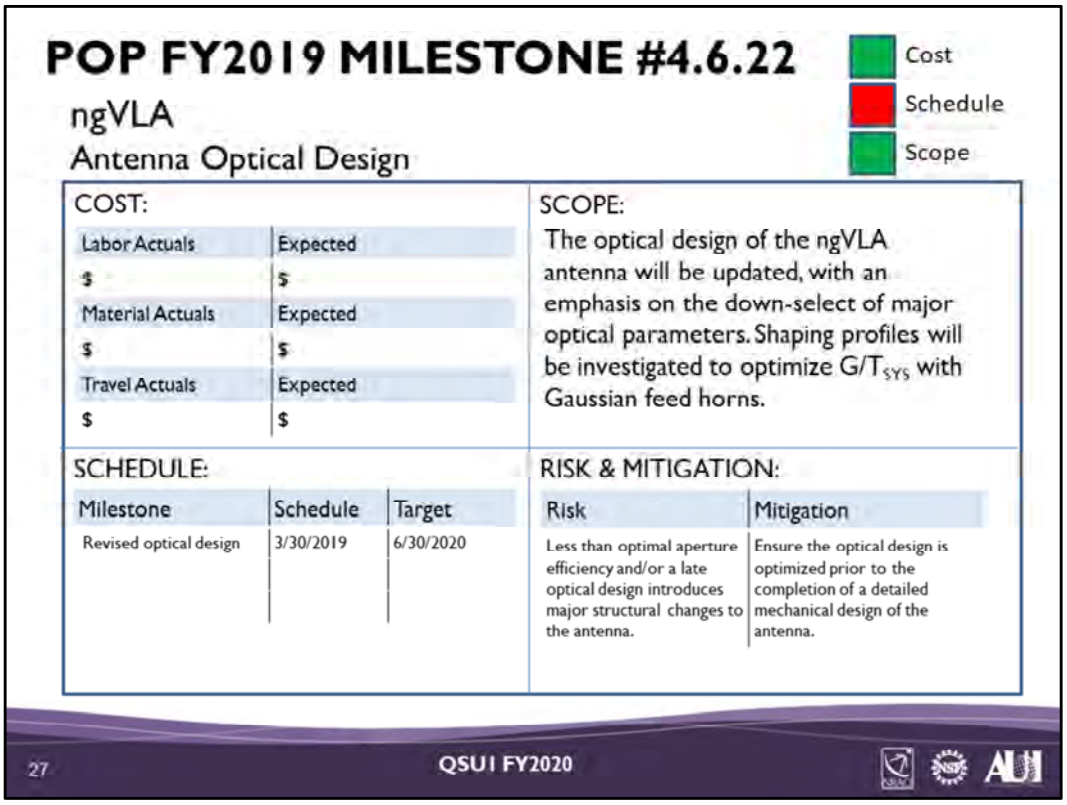


COST: No change

SCOPE: No change

SCHEDULE: A Stakeholders Requirements Review was held in Socorro on September 26, partially fulfilling the original intent of this milestone. The review was chaired by Michael Rupen (NRC) and Melissa Soriano (JPL). The committee noted the high quality of the documents they reviewed, and provided useful feedback on the documents in the form of Review Item Discrepancies (RIDs). The RIDs are being addressed, and the review was successfully concluded. Other system requirements and the ngVLA architecture need to be reviewed in a separate undertaking in Q2 FY2020. The design and development effort has slowed in comparison to what was originally scheduled, because the funding for it is lower than anticipated.

RISK & MITIGATION: The high level requirements and architecture need to be reviewed for completeness and overall coherence so that the requirements for subsystems are in turn complete. By not conducting this review, the requirements definition for a subsystem could be incomplete, leading to an incorrect decision in a design downselect or to a subsystem that does not deliver its requisite functionality. The risk can be mitigated by completing the review.

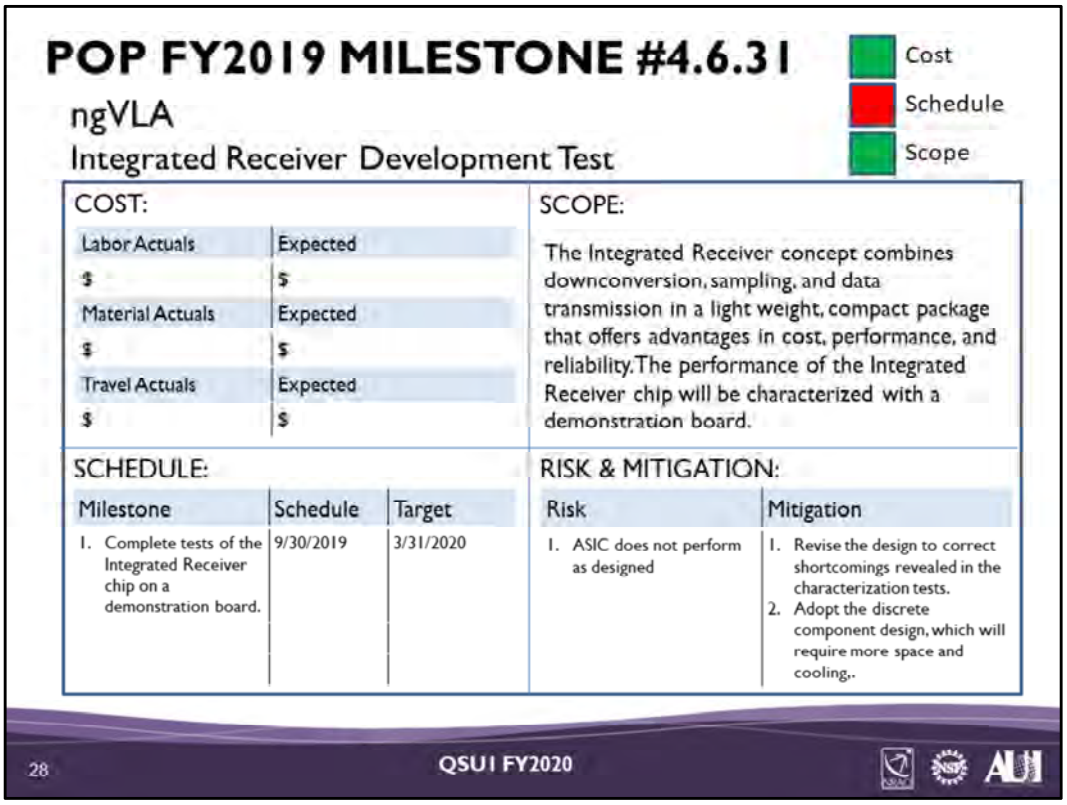


COST: No change

SCOPE: No change

SCHEDULE: The current optical design for the ngVLA antenna continues to look very good, and we aren't expecting major changes to it. The risk of using the existing model, and then having to make major changes to the structural design, has decreased. However, additional trade studies and engineering analyses need to be completed before the new optical design is done. The urgency of completing this milestone has greatly diminished. Considering other priorities and project needs, the new optical design does not need to be completed until Q3 FY2020. The delay should not affect the overall mechanical design as that process appears more lengthy than originally anticipated.

RISK & MITIGATION: The ultimate intent of the optical design is to optimize the aperture efficiency of the antennas. The higher the efficiency, the fewer number of antennas need to be built (at some level). Additionally, there was some concern that the optimized optical design would have major impacts on the structural design of the antenna, but this seems not to be a major design driver. The optical design needs to be finalized prior to the completion of the antenna's mechanical design.

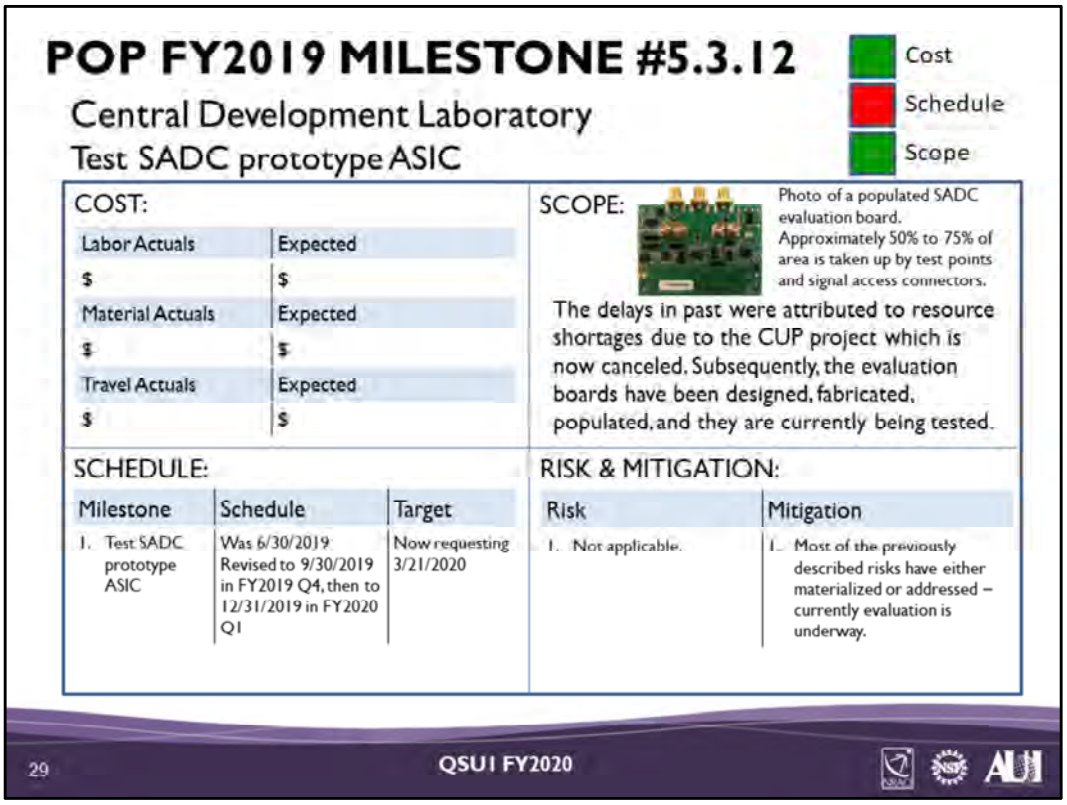


COST: No impact.

SCOPE: No change. The Integrated Receiver concept has been demonstrated with discrete components, but this has yet to be demonstrated with the ASIC chip that includes all of the stated functionality. The purpose of this milestone is one of risk reduction in showing that the ASIC performs in accordance with its design.

SCHEDULE: The ASIC chips have been delivered, but have yet to be characterized in the demonstration board. This board has been fabricated, and tests are underway. Tests are expected to be complete by March 31, 2020. Note: this task tracks to CDL milestone 5.3.12.

RISK & MITIGATION: If the ASIC does not perform as intended, its design could be revised to address the shortcomings identified in the characterization tests. However, this could be at considerable cost since it might require another (expensive) wafer run for the ASIC. Alternatively, the ASIC development effort could be abandoned in favor of the discrete component design, which has been demonstrated to work. However, the discrete component design will require more space and cooling, and is likely to be less reliable than the ASIC design.



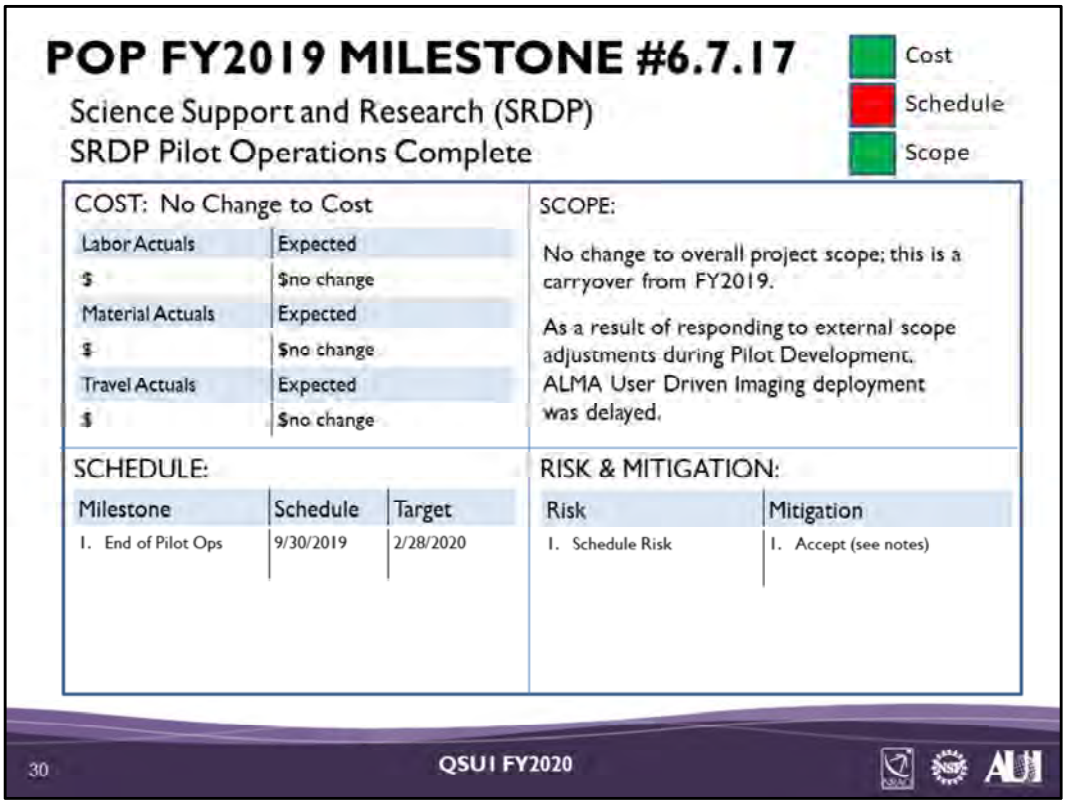
COST: No impact.

SCOPE: No impact/change.

Next steps:
1. Ensure all circuits come up and are functioning (at CDL),
2. Ensure SADC output is nominally working and decoding algorithm is working (at CDL),
3. Ship a couple of boards to ASIC vendor (City Semiconductor, SF) for full evaluation of ASIC functionality.

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

RISK & MITIGATION: Most of the risks described previously have been mitigated, and evaluation is in progress.

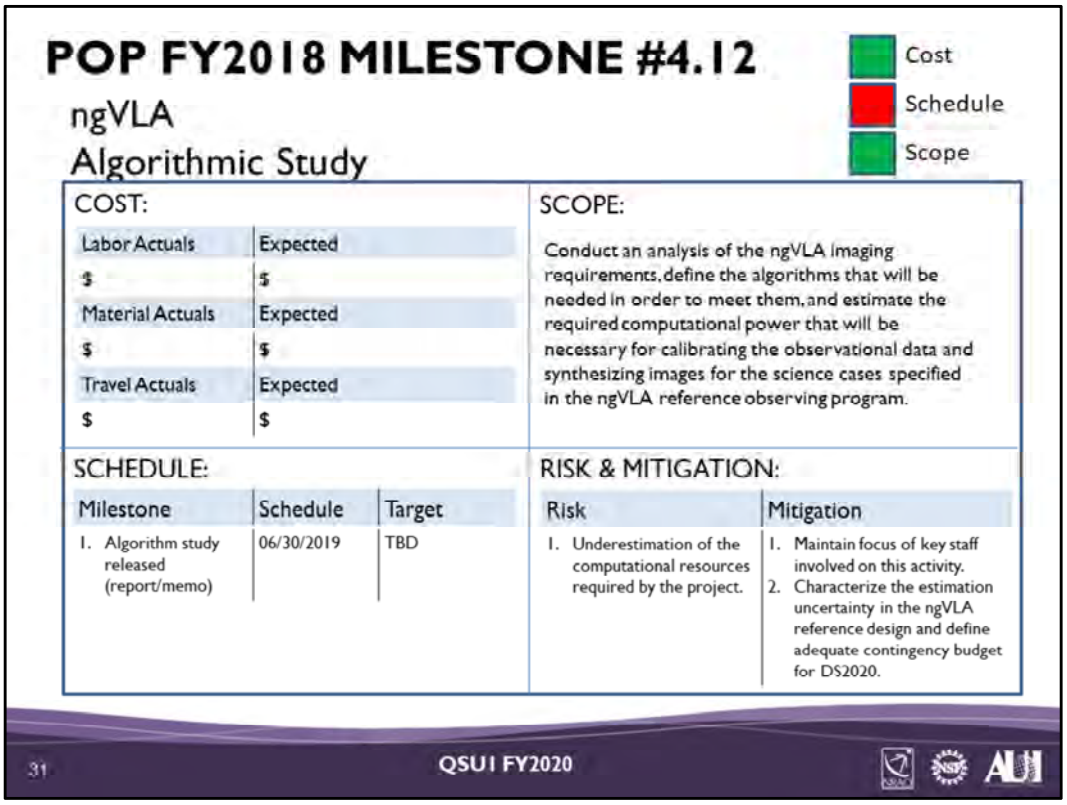


COST: No impact.

SCOPE: No Change to overall project scope, priorities were adjusted to exchange some scope items between Pilot development and Wave 1 development, primarily to support large projects. These scope adjustments resulted in deferred deployment of the ALMA User Driven Imaging (AUDI) until near the planned end of Pilot Operations. The final capability, ALMA User Driven Imaging (AUDI), was deployed but insufficient operational experience was gained by the scheduled target of FY2019 Q4. Pilot AUDI operations are currently ongoing.

SCHEDULE: The original target for completion of Pilot Operations was FY2019 Q4, most of which has been met with the exception of AUDI. We are extending the Pilot Operations period to allow for development of operational experience.

RISK & MITIGATION: Risk of further schedule delay is low, preliminary results from validation indicate most known issues have been adequately addressed.

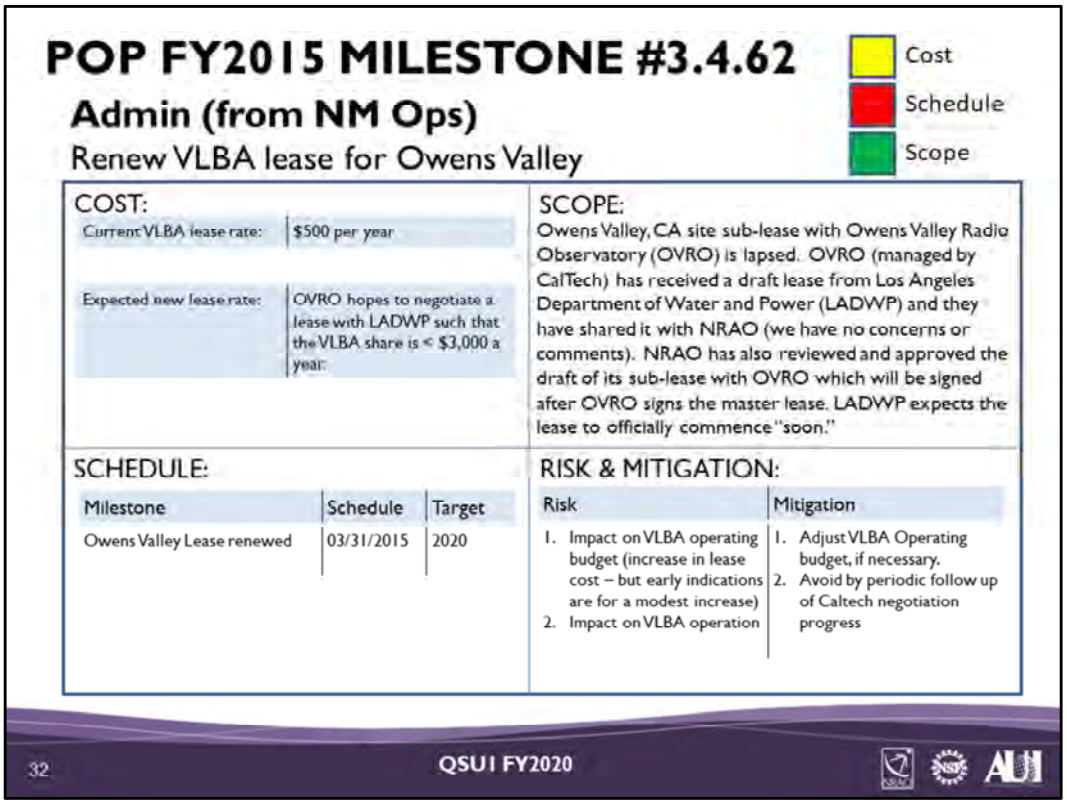


COST: No impact.

SCOPE: No impact.

SCHEDULE: Competing priorities within NRAO have delayed the completion of this milestone. It also required input from the ngVLA reference observing program, which has been completed. The task is currently predicted to be complete by March 31, 2020.

RISK & MITIGATION: The risk of not completing the algorithmic study is under-estimating the computational resources that will be required by ngVLA to produce its expected science products. In addition, a weak estimation in this area could suggest to DS2020 that the technical concept for the array is incomplete. This risk will be mitigated by maintaining the focus of the key personnel involved in writing the report. It would also be adequate to conduct a review of this report in anticipation of requests for additional information from DS2020.



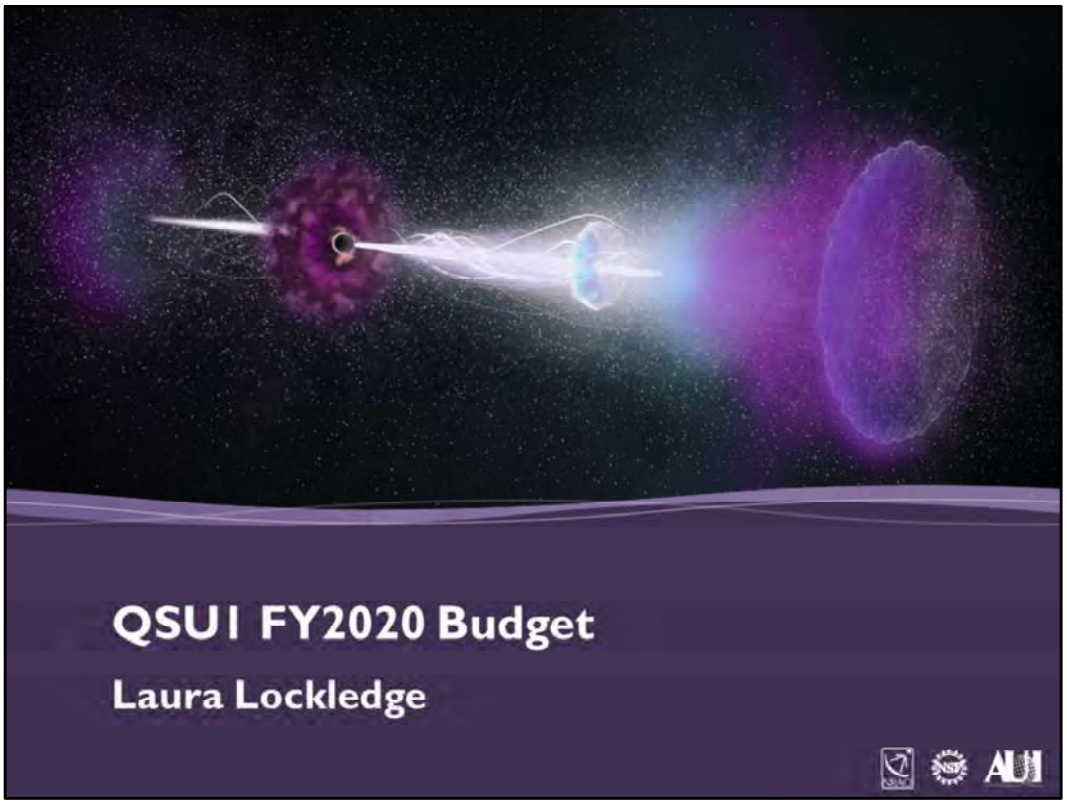
COST: Future lease costs are subject to the status of Caltech's re-negotiation of the lease with Los Angeles Water and Power.

SCOPE: No changes.

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 for 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.

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.



QSUI FY2020 Budget

Laura Lockledge

FY2020 Q1 Notes

- New fringe approach in place, includes employees welfare benefits + PTO. Budget @ 61.75% Q1 Actual @ 59.9%
- General underspends, Q1 usually slow.
- ICC underrecovered $530K. Reflects:
  - Programmatic underspends vs. indirect linear.
  - NSF delayed indirect rate approval (~50%).

CSA-V Q1 Results

	FY20 POP Budget	FY20 Rev. Budget	FY20 YTD Expenses	YTD % Rev Budget
NSF	34,970	34,970	12,302	35.2%
Carryforward/Other	0	8,082	8,082	0.0%
Total Revenues	**34,970**	**43,052**	**20,384**	47.3%
Telescope Ops	10,841	11,797	2,330	19.8%
Development	3,606	2,894	461	15.9%
Science Ops	7,400	9,088	1,489	16.4%
Admin Services	9,863	12,164	1,710	14.1%
Director's Office	2,469	2,469	469	19.0%
Ed. & Public Outreach	791	802	146	18.2%
ngVLA	0	3,838	537	14.0%
FY20, Total	**34,970**	**43,052**	**7,142**	**16.6%**
FY20 CSA-V Net	**0**	**0**	**13,242**	

- Budget changes related to carryforward allocations, esp. ngVLA.

CSA-A Q1 Results

	FY20 POP Budget	FY20 Rev. Budget	FY20 YTD Expenses	YTD% Rev Budget
NSF	47,260	47,260	16,930	35.8%
Carryforward	6,158	6,758	6,758	100.0%
Canadian Contribution	1,787	1,697	252	0.0%
Other	844	1,677	1,282	100.0%
Total Revenues	**56,049**	**57,392**	**25,222**	43.9%
Telescope Ops	28,310	24,767	3,564	14.4%
Development	3,181	10,082	334	3.3%
Science Ops	7,158	7,241	1,241	17.1%
Admin Services	8,744	10,930	1,766	16.2%
Director's Office	3,446	3,589	682	19.0%
Education & Public Outreach	761	783	140	17.9%
FY20, Total	**51,600**	**57,392**	**7,727**	**13.5%**
FY20 CSA-A Net	**4,449**	**0**	**17,495**	

- Telescope Ops budget reduction reflects reclass of reserves budget to Development.

CSA-L Q1 Results

	FY20 POP Budget	FY20 Rev. Budget	FY20 YTD Expenses	YTD % Rev Budget
NSF	3,430	3,760	2,686	71.4%
Telescope Time Sales	4,614	4,613		0.0%
Carryforward	71	128	128	
Other	333	624	291	46.6%
Total CSA-L Revenues	**8,448**	**9,125**	**3,105**	34.0%
Telescope Ops	5,311	5,932	1,177	19.8%
Development				
Science Ops				
Admin Services	2,673	2,672	478	17.9%
Director's Office	464	464	101	21.8%
Education & Public Outreach				
FY20	**8,448**	**9,068**	**1,756**	**19.4%**
FY20 CSA-L Net	**0**	**57**	**1,349**	

- Budget changes related to carryforward and reobligation of CSA-1 $.

CSA-H, F, N

	CSA H Budget	ITD Expenses	% Budget	CSA-F Budget	ITD Expenses	% Budget	CSA-N Budget	ITD Expenses	% Budget
NSF	2,000	1,936	96.8%	2,500	879	35.2%	4,000	463	11.6%

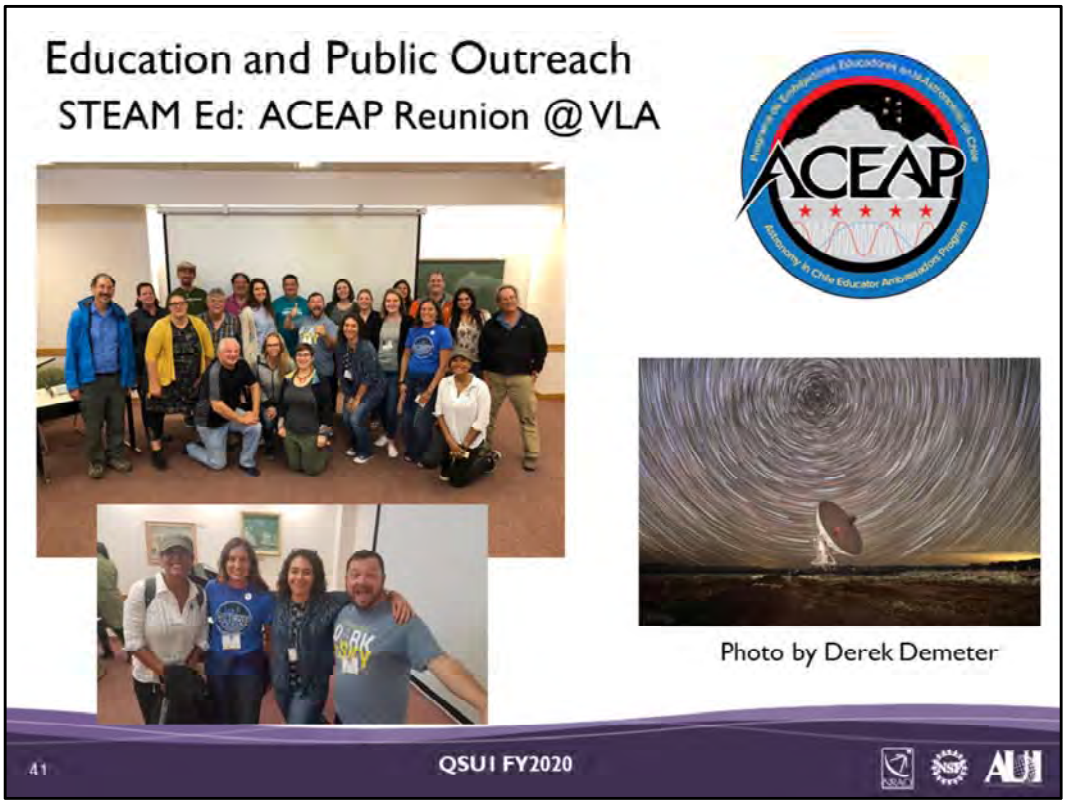
ICC Q1 Results

	FY20 POP Budget	FY20 Rev. Budget	FY20 YTD Expenses	YTD % Rev Budget
NRAO Recoveries	17,271	17,220	2,779	16.1%
External Recoveries	1,445	1,447	260	18.0%
Total ICC Revenu	**18,716**	**18,667**	**3,039**	16.3%
Telescope Ops	109	109	40	36.7%
Development	484	484	90	18.6%
Science Ops	2,841	2,826	564	20.0%
Admin Services	13,158	13,124	2,495	19.0%
Director's Office	2,124	2,124	380	17.9%
FY20, Total	**18,716**	**18,667**	**3,569**	**19.1%**
FY20 ICC Net	**0**	**0**	**-530**	

- Reduction in ICC budget reflects staffing changes.
- Underrecovery seasonal + rate approval delays.

QSUI FY2020 Exception Report

Suzanne Gurton, AD EPO

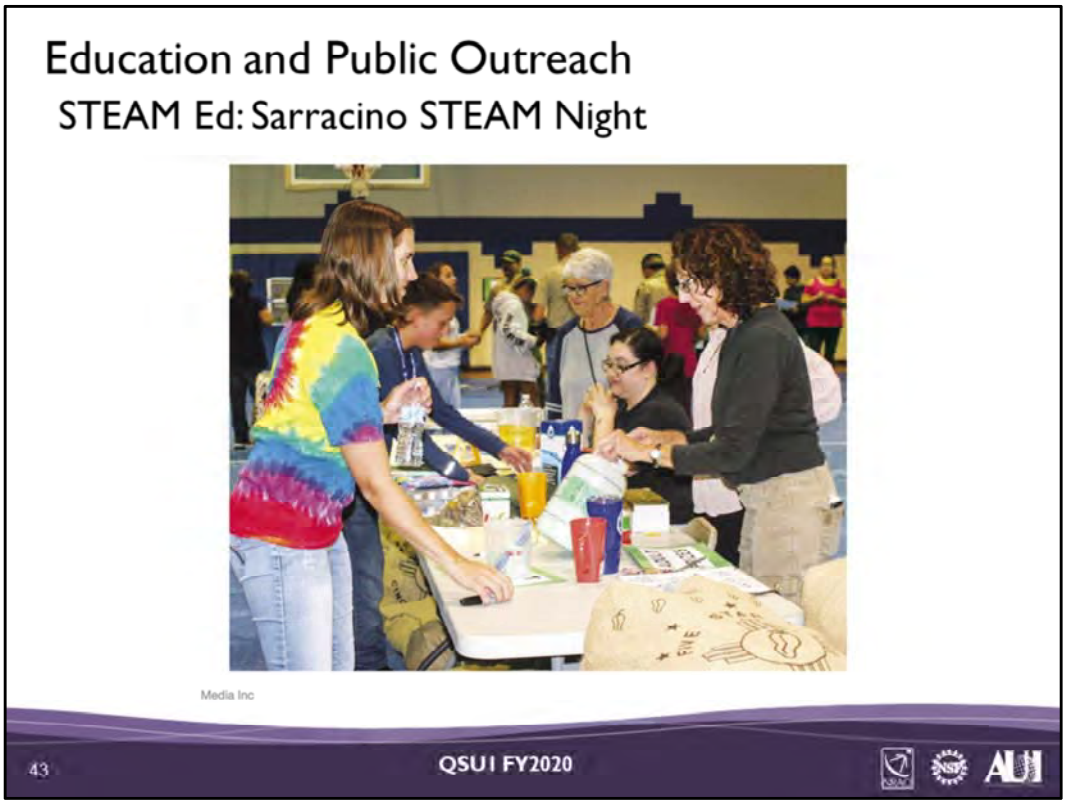


Astronomy in Chile Education Ambassadors Program: First week of October on NM Tech campus and tour the VLA and DSOC with VLA and ngVLA talks. 24 Attended (seen in group photo), smaller group photo features Sian Proctor, Amy Jackson, Angela Osterman Meyer, and Derek Demeter.
Outcomes: Earth and Sky blog by Rob Pettingill https://earthsky.org/space/nightscape-photos-very-large-array-vla-observatory
Our goal was to have them fall in love with other NRAO facilities beyond our partnership with ALMA. Parts of the meeting were also focused on plans for the future of the program informed by a survey that set some priorities.
Total # of Survey Participants = 42. ACEAP provides unique access to facilities and people, and the astronomy ecosystem; 37/42 ranked this very important. ACEAP brings together a group of people with diverse backgrounds and skill sets from both informal and formal education communities; 36/42 ranked this very important. ACEAP invests in people, we don't quit at the end of the expedition or year of involvement; 29/42 ranked this very important.

Education and Public Outreach

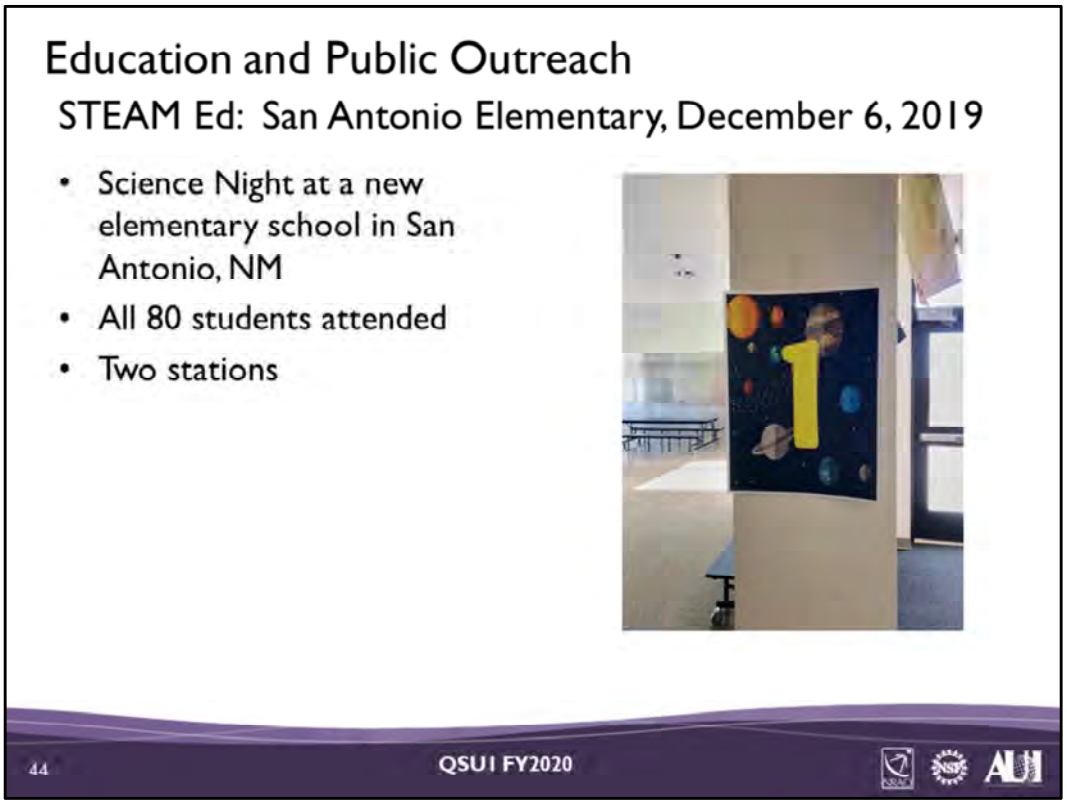
STEAM Ed: PVCC 10th Grade Career Day

- October 30-31st
- Suzy Gurton, Akeem Wells, Jason Castro, and Chris Jacques
- 2000 students



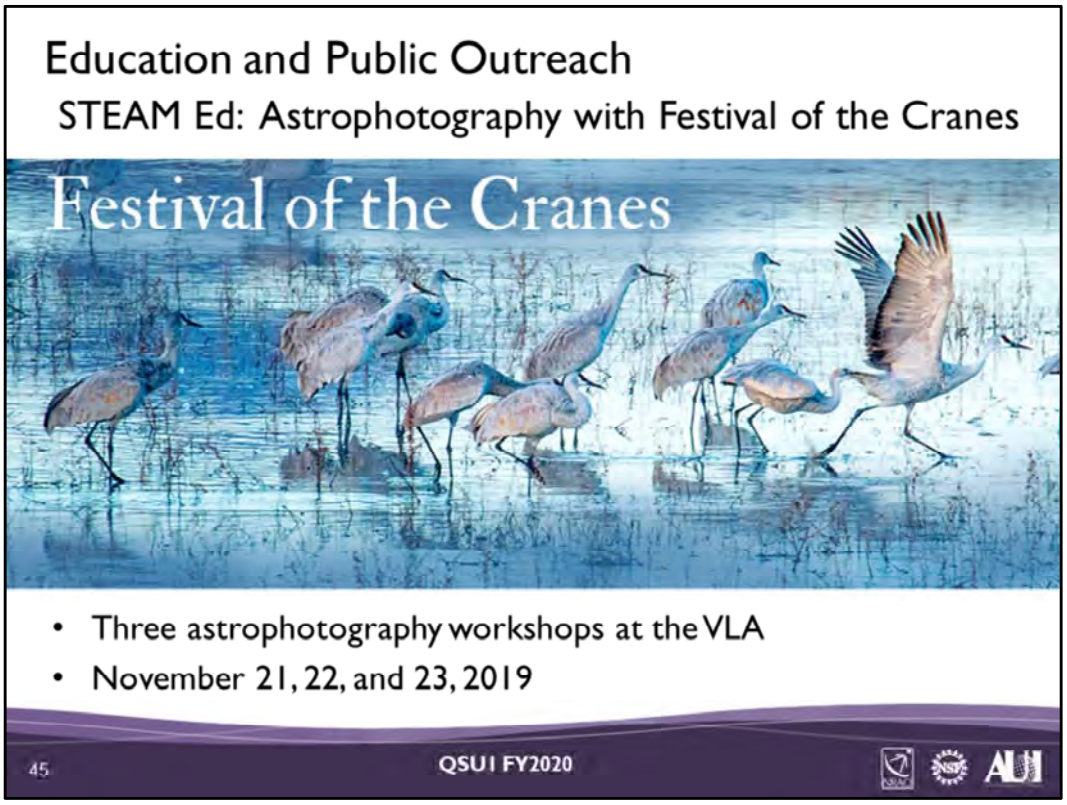
Sarracino STEAM Night - October 3rd

Education Specialist Faith Vowler participated in Sarracino Middle School's annual STEAM Night on Thursday, October 3rd, from 5-7 PM. She gave demonstrations for the visiting parents and students using the Cosmic Coloring red and blue glasses activity. She also handed out "Want More VLA" cards and "Cosmic Coloring" postcards to interested parents and students and directed them to the NRAO website, and told them about the upcoming Fall Open House at the VLA (which took place on Saturday, October 5th) while encouraging them to attend. At a rough estimate, 100 students and parents came to the Sarracino STEAM Night.
http://www.dchieftain.com/news/education/science-and-math-night-picture-gallery/collection_7c99c102-eadc-11e9-ab2c-af95f698ef49.html#5



San Antonio Elementary School Star-Party - December 6, 2019

On Friday, December 6th, Summer Ash and Faith Vowler visited San Antonio Elementary School in San Antonio, NM to participated in an afternoon of astronomy activities in advance of the school star-party that evening. Four groups of 15-20 students rotated between four stations, spending approximately 20 minutes at each. The groups were mixed grade levels ranging from Kindergarten to 5th grade. The NRAO station had two activities that focused on invisible light; Faith led the red/blue glasses activity and Summer ran the emission spectra with diffraction glasses activity. Each group was split into two so they spent 10 minutes doing one activity and then switched. The entire student body (~80 students) participated. [We didn't get any photos of the activity, but I snapped this one of the sign for our station.]



Festival of the Cranes Photo Shoot - November 21st, 22nd, and 23rd

The annual Festival of the Cranes nighttime photo shoots took place at the VLA in the Activity Center on the evenings of Thursday, November 21st; Friday, November 22nd; and Saturday, November 23rd. On Thursday and Friday, both Faith Vowler (the Education Specialist) and Summer Ash (the Senior Education Specialist) were in charge of this event; on Saturday, Summer was the sole point of contact. On each evening, Summer and Faith were present in the Activity Center throughout the event to provide coffee and hot tea, help Roman set up his presentation, inform the visitors of the places on site where they were allowed to go, and talk with and answer questions from the visiting photographers. Roughly 25 people each came to the Thursday and Friday shoots, and around 20 people came to the Saturday event, for an approximate total of 70 people throughout the three evenings.

Education and Public Outreach

VLA Visitor Center

- Total attendance: 5870
  - Fall Open House: 670
  - Festival of the Cranes Astrophotography: 70

Education and Public Outreach

News: NRAO Announcements

NRAO's Brett McGuire Part of Science News 10: Scientists to Watch

October 2, 2019 at 9:00 am | Announcement

Dr. Brett McGuire of the National Radio Astronomy Observatory (NRAO) has been named to Science News' list of 10 early-and mid-career scientists on their way to greater widespread acclaim.

New NSF Support Agreement for Next Generation Very Large Array

October 9, 2019 at 8:30 am | Announcement

The National Science Foundation (NSF) has awarded an additional $4M to the National Radio Astronomy Observatory (NRAO) and Associated...

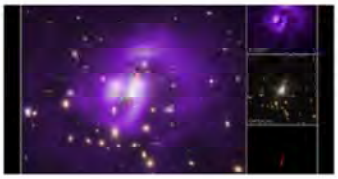
Antenna Design for the Next Generation Very Large Array

December 12, 2019 at 9:00 am | Announcement

The NRAO has awarded three contracts for the conceptual design of the 18m antenna for the next-generation Very Large Array (ngVLA).

Education and Public Outreach

News: Two VLA stories



A Weakened Black Hole Allows its Galaxy to Awaken

November 18, 2019 at 1:00 pm | News Release

Astronomers have found the first example of a galaxy cluster where large numbers of stars are being born at its core. The discovery revealed new details of how supermassive black holes affect their host galaxies.

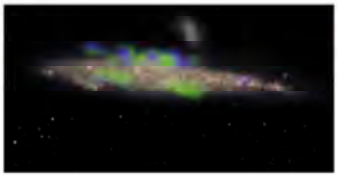


IMAGE RELEASE: Giant Magnetic Ropes in a Galaxy's Halo

November 26, 2019 at 8:00 am | News Release

VLA image reveals a large-scale magnetic field extending far into a galaxy's extended halo.

Education and Public Outreach

News: Six ALMA stories

Going Against the Flow Around a Supermassive Black Hole

October 15, 2019 at 1:00 pm | News Release

At the center of a galaxy called NGC 1068, a supermassive black hole hides within a thick doughnut-shaped cloud of dust and gas. When astronomers used ALMA to study this cloud in more detail, they made an unexpected discovery that could explain why supermassive black holes grew so rapidly in the early Universe.

Gas 'Waterfalls' Reveal Infant Planets around Young Star

October 16, 2019 at 5:00 pm | News Release

For the first time, astronomers using ALMA have witnessed 3D motions of gas in a planet-forming disk. At three locations in the disk around a young star called HD 163296, gas is flowing like a waterfall into gaps that are most likely caused by planets in formation.

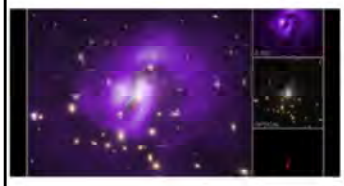
ALMA Resumes Regular Operations

October 28, 2019 at 6:04 pm | News Release

The management team of the Joint ALMA Observatory have decided to return to regular operations.

Education and Public Outreach

News: ALMA (cont'd)



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ALMA Spots Most Distant Dusty Galaxy Hidden in Plain Sight

December 11, 2019 at 12:00 pm | News Release

Astronomers using ALMA have spotted the light of a massive galaxy seen only 970 million years after the Big Bang!

Radio Jupiter: Seeing the Giant Planet in a New Light

December 13, 2019 at 8:46 pm | News Feature

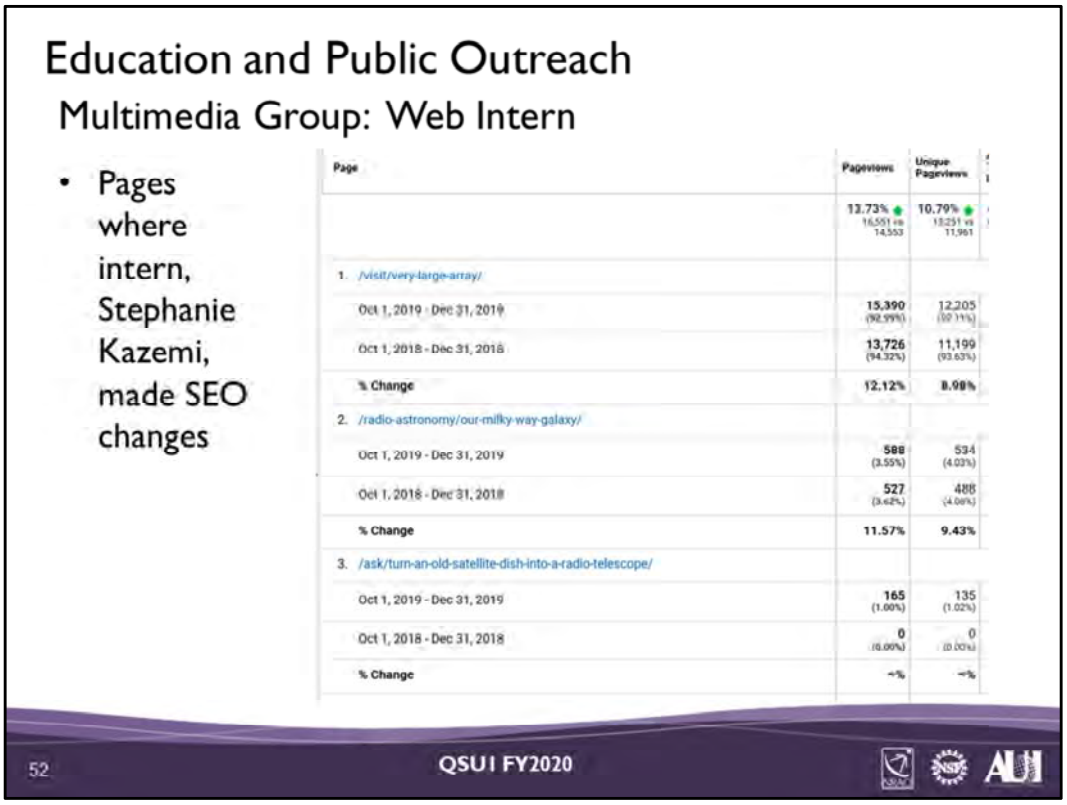
By looking at Jupiter in radio light, ALMA and the VLA reveal a world hidden by its layers of clouds.

In addition to these results, our PIO teams were preparing for press conferences that they would have at the winter AAS in Q2.

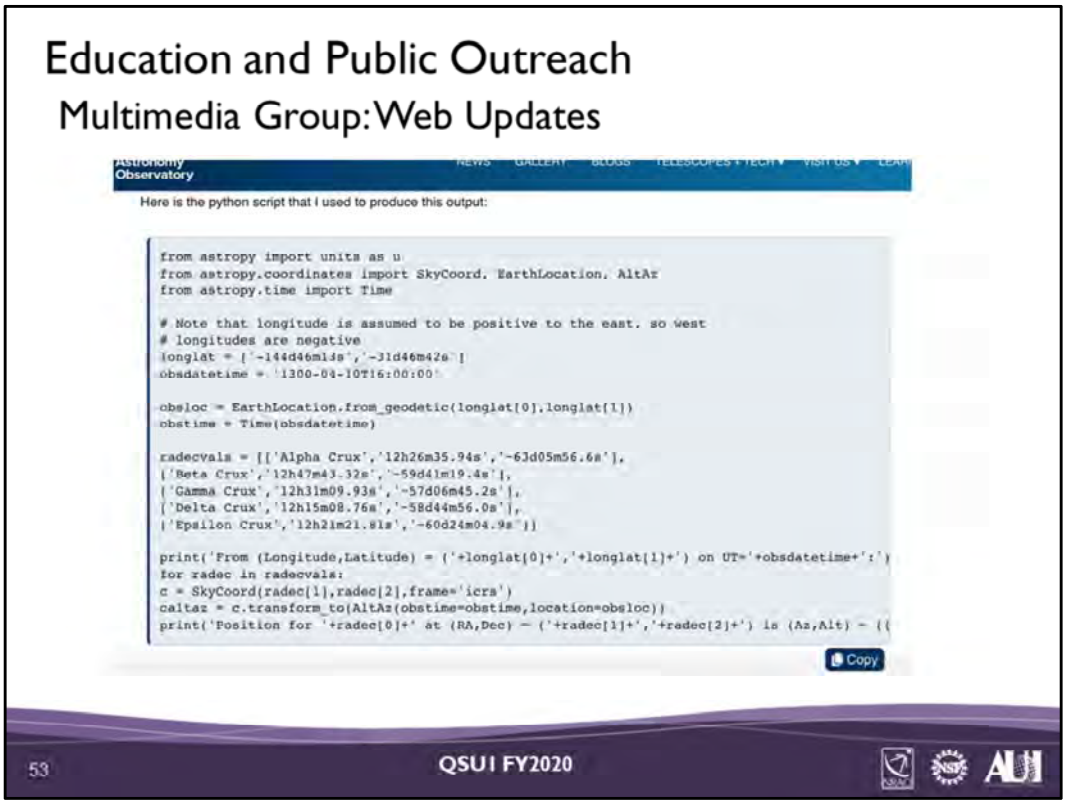
Education and Public Outreach

Multimedia Group

We had two blogs last quarter, one about the top 10 countdown, and this one from Lisa Locke, our Jansky Fellow at CDL who just left for a great job at JPL. We're not quite keeping the pace of one per month, but it's a goal.

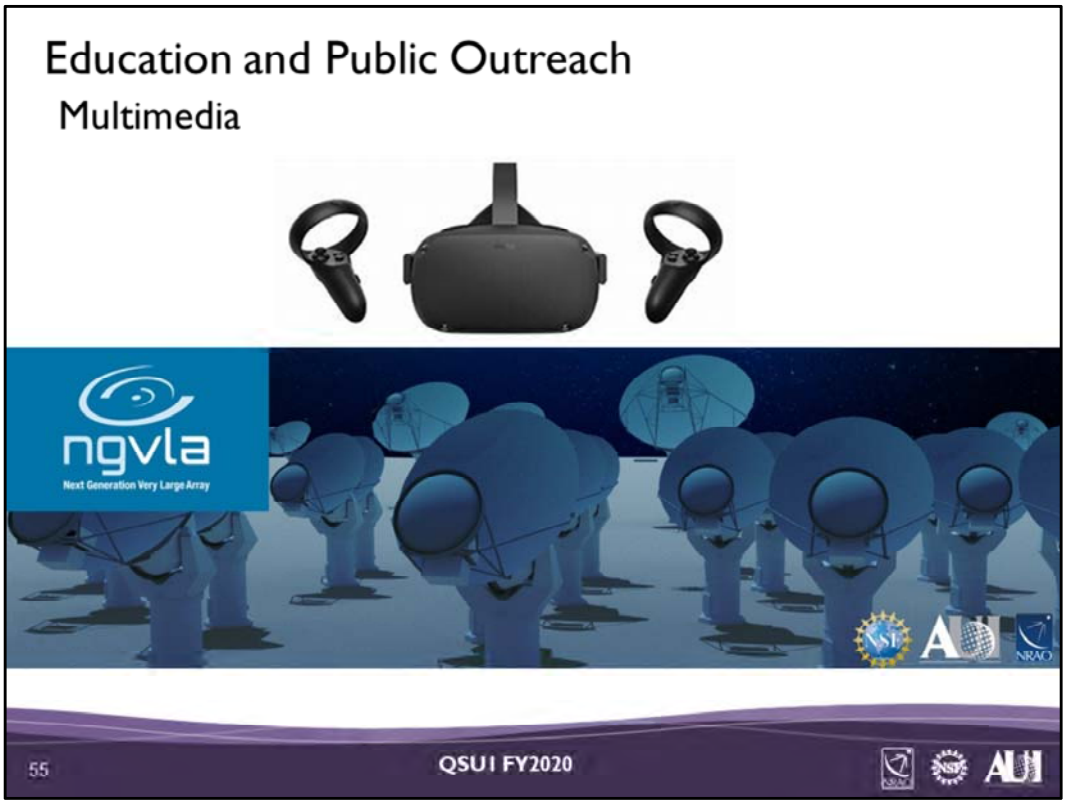


We also had our first web intern, Stephanie Kazemi. She was assisting mostly with behind the scenes clean up within Wordpress-- eliminating duplication in our image files and improving our search engine optimization. This was the first time our webmaster supervised an intern, so he did an exceptional job of tutoring her to make sure that she learned new skills as well as getting work done for us.

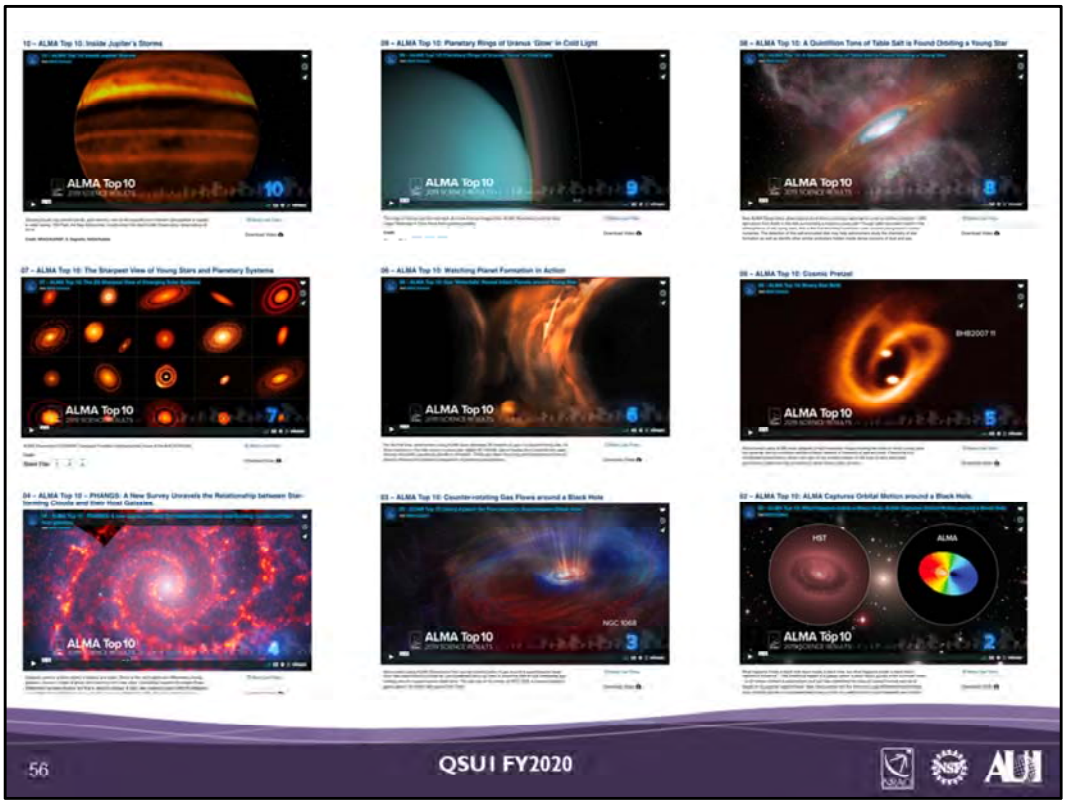


We didn't have any major new pages launched or old pages redesigned, but one little feature that made available on pages where we might want to share code is something called "Code Box" where on pages like the Ask An Astronomer page, actual lines of code can easily be copied, preserving all the critical formatting.

The team put in extra hours over the holidays to complete a pebbles-to-planets video that celebrates how radio, optical, and IR observatories are working together to unravel the mystery of how planets and distant solar systems form and how a new generation of observatories will be needed to answer some of the remaining questions.



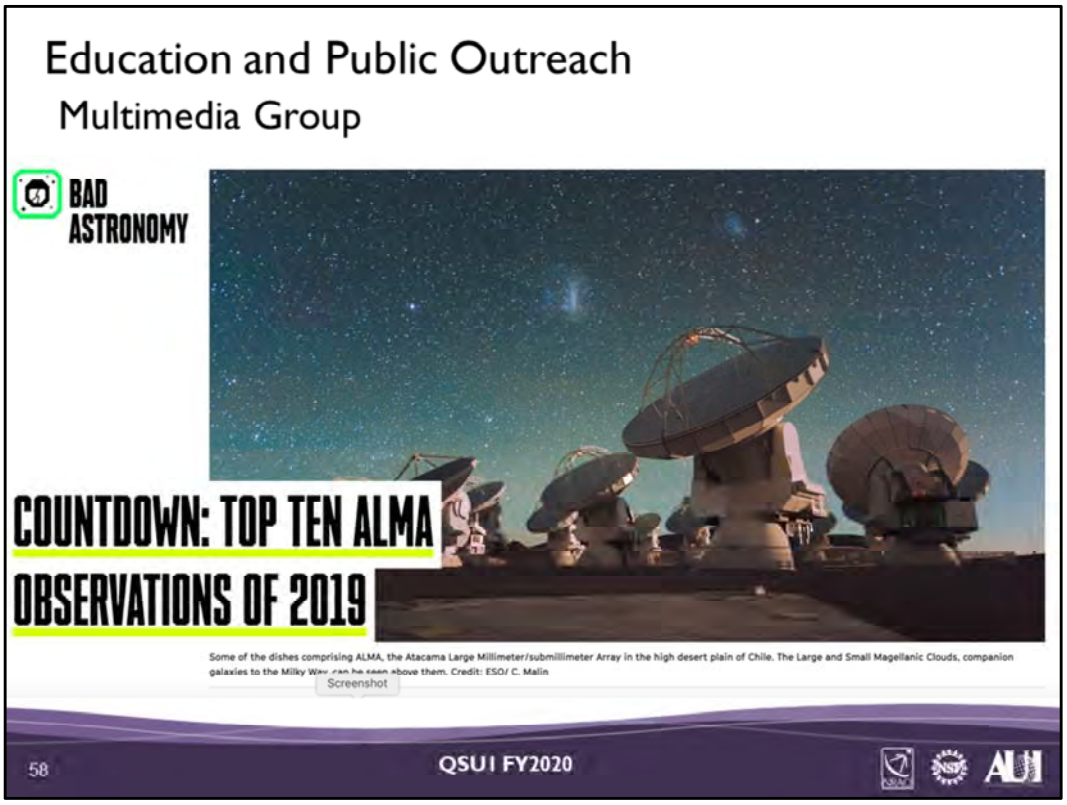
The big new project that we completed early is a VR exploration of ngVLA.



This Quarter we reached out to the Bad Astronomer, Phil Plait, to write one-minute summaries of the top 10 discoveries of the year for ALMA. He has featured many of our press releases in his blog for SciFi. He enjoyed the challenge of being so brief, recorded the audio, and our amazing Jeff Hellerman used the visuals and B roll to create the 10 videos that we released at the end of 2019.

During the Program Plan Review, several of us were asked if we were content with the credit that ALMA got for its contribution to making this image possible. There were many fighting for a piece of that spotlight, so we simply tried to put out good information, but in our countdown, we made it clear that were proud of that contribution.

The full set can be found here: https://public.nrao.edu/gallery-search/?search_text=ALMA+Top+10&search_type=release



Phil also wrote about it on his blog and while I try not to succumb to flattery, it was fun to read this in his blog about working on the project.

"It was an honor to work with the folks at NRAO on this, and I'm very pleased they asked me to do this. When I was in graduate school at the University of Virginia, NRAO HQ was right up the street from us, and I was over there pretty often to attend speaker colloquia and talk to the scientists there about one topic or another. To be able to actually work with them now and create this countdown was a true honor. It was also personally and deeply satisfying, connecting my present with my past when I was just getting started with my astronomy career. So thank you, NRAO and ALMA, for letting me be a part of this, but also for your dedication to observing the Universe … and making sure folks down here on Earth can get a glimpse of it, too."

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