***Title*:** QSU4 FY2018	***Author*:** Thisdell/ADs	***Date*:** 11/09/2018
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National Radio Astronomy Observatory

Quarterly Status Update 4 FY2018

July - September 2018

PREPARED BY	ORGANIZATION	DATE
Thisdell/ADs	Director's Office	11/09/2018

APPROVALS (Name and Signature)	ORGANIZATION
Nicole Thisdell	NRAO
Tony Beasley	NRAO
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POP Section	POP Milestone	Milestone	Completion Date	Q1 Performance Assessment			Q2 Performance Assessment			Q3 Performance Assessment			Q4 Performance Assessment		
				Cost	Schedule	Scope	Cost	Schedule	Scope	Cost	Schedule	Scope	Cost	Schedule	Scope
2.5		**Atacama Large Millimeter/submillimeter Array (ALMA)**													
		Operations													
	1	AODs in support of telescope operations in Chile	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
	2	Diagnostic support for troubleshooting issues and problems found during array operations	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
	3	Technical secretary(s) will attend the ALMA Proposal Review and Time Allocation Committee meeting	6/30/2018												
	4	PhIm Cognizant lead will attend the ALMA Proposal Review and Time Allocation Committee meeting	6/30/2018							Cancelled					
	5	Review all the Phase 2 Scheduling Blocks submitted by PIs for ALMA Cycle 5	12/31/2017												
			3/31/2018												
	6	Participate in CPM7	3/31/2018												
	7	Participate in ObsMode 7	6/30/2018												
	8	Participate in the planning and coordination meetings in preparation for ALMA Cycle 6 scheduled for 2018 October	6/30/2018												
			9/30/2018												
	9	SWST supporting calibration and imaging heuristic development	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
	10	Assemble the Cycle 6 Release 1 (C6R1) requirements providing support for running the Cycle 5 Pipeline on PI data	12/31/2017												
			3/31/2018												
	11	Provide Support for Running Cycle 5 Pipeline	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
	12	Testing the Cycle 6 candidate pipeline	6/30/2018												
			9/30/2018												
	13	Lead role in testing the Cycle 6 ALMA Archive access	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
	14	Data services team will deliver on average between 20–25 datasets per week	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
	15	Phase 3 testing of the AAT/PPI	3/31/2018												
	16	Preparation of the Cycle 6 Call for Proposals and user documentation including all updates and edits to the ALMA science portal	12/31/2017												
			3/31/2018												
	17	Act as CSs and liaisons to the NA ALMA PI observing programs	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
	18	Initiate the ALMA Ambassadors program and train the scientific community to run outreach events	12/31/2017												
			3/31/2018												
	19	Host data reduction visitors over the FY with the goal of hosting a minimum of 12 visits	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
	20	Hold the 11th NAASC workshop, in coordination with Taiwanese colleagues	3/31/2018												
	21	Sponsor a topical meeting on star and planet formation with a focus on disks to be held at the Biosphere 2 Center, Oracle, AZ.	3/31/2018												
	22	Supporting role in the organization, presentation, and development of tutorials for the 16th Synthesis Imaging Summer School to be held in Socorro, NM	6/30/2018												
	23	Topical meeting on galaxies and AGN to be held at the JAO in Santiago, Chile	6/30/2018							Cancelled					
	24	Major corporate sponsor of the International Symposium on Molecular Spectroscopy, 18–22 June, 2018 in Champaign, IL, including the LGBTQIA reception.	6/30/2018												
		Development													
	25	FY2018 (Cycle 5) Study Proposal Awards	12/31/2017												
	26	FY2018 (Cycle 5) Project Proposal Awards	3/31/2018												
			6/30/2018												
	27	FY2017 (Cycle 4) Studies Complete	6/30/2018												
		Maintenance, Renewal, and Warranty Claims													
	28	NA Antenna Surface Accuracy Improvement Critical Design Review	12/31/2017												
	29	NA Antenna Surface Accuracy Installation (25 antennas)	3/31/2018												
	30	Completion of Antenna Nutators Root Cause Analysis Definition of Mirror Cracking	12/31/2017												
	31	Antenna Nutators – Reword Cost/Benefit Analysis	12/31/2017												
	32	Deliver FEHVs 1 & 2 to JAO	3/31/2018												
	33	Deliver FEHVs 3 & 4 to JAO	6/30/2018												
		NRAO –Chile Office													
			12/31/2017												

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				Q1 Performance Assessment			Q2 Performance Assessment			Q3 Performance Assessment			Q4 Performance Assessment		
POP Section	**POP Milestone**	**Milestone**	**Completion Date**	**Cost**	**Schedule**	**Scope**	**Cost**	**Schedule**	**Scope**	**Cost**	**Schedule**	**Scope**	**Cost**	**Schedule**	**Scope**
	34	Collective Bargaining Preparation and Negotiation	3/31/2018												
			6/30/2018												
	35	Application of New Collective Contract Provisions	9/30/2018												
	36	Multicancha Project	12/31/2017												
			3/31/2018												
			9/30/2018												
	37	Key Performance Indicators	12/31/2017												
	38	OCA Office Move to SCO or Other Location	12/31/2017												
	39	Risk Register	6/30/2018												
			9/30/2018												
	40	Environmental Work Plan	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
	41	Broadening participation of URM in STEM	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
3.4		**Very Large Array**													
		VLA Science Operations													
	1	Define VLA general and shared risk capabilities to be offered for semester 2018B	12/31/2017												
	2	Define VLA general and shared risk capabilities to be offered for semester 2019A	6/30/2018												
	3	Update VLA documentation to support 2018B Call for Proposals, perform proposal technical reviews	3/31/2018												
	4	Update VLA documentation to support 2019A Call for Proposals, perform proposal technical reviews	9/30/2018												
	5	Determine baselines and pointing for antennas moving into their BnA and A configuration locations	3/31/2018												
	6	Determine baselines and pointing for antennas moving into their D configuration locations	6/30/2018												
	7	Determine baselines and pointing for antennas moving into their C configuration locations	9/30/2018										Cancelled		
		VLA Antenna Maintenance													
	8	Perform five antenna overhauls during the course of the year	9/30/2018												
	9	Replace one antenna azimuth bearing during the course of the year	9/30/2018											Cancelled	
	10	Perform preventive maintenance on each of two transporters prior to array reconfiguration to A	3/31/2018												
	11	Perform preventive maintenance on each of two transporters prior to array reconfiguration to D	6/30/2018												
	12	Perform preventive maintenance on each of two transporters prior to array reconfiguration to C	9/30/2018												
		VLA Track Maintenance													
	13	Identify and replace 5000 aging or damaged cross-ties	9/30/2018												
	14	Identify and replace five antenna pad intersections	9/30/2018												
		VLA Site Infrastructure Maintenance													
	15	Perform preventive maintenance on the next configuration VLA antenna transformers prior to array reconfiguration to A	3/31/2018												
	16	Perform preventive maintenance on the next configuration VLA antenna transformers prior to array reconfiguration to D	6/30/2018												
	17	Perform preventive maintenance on the next configuration VLA antenna transformers prior to array reconfiguration to C	9/30/2018												
	18	Purchase/install new VLA site backup generator and power transfer gear	9/30/2018												
	19	Purchase/install new VLA site electrical hatch gear	9/30/2018												
		VLA Development													
	20	Deliver Quick Look images for VLASS 1.1	3/31/2018												
	21	Deliver wideband Stokes I continuum Single Epoch images for VLASS 1.1	9/30/2018											Cancelled	
	22	ngVLA special session at AAS	3/31/2018												
	23	ngVLA science meeting	9/30/2018												
	24	Internal review of ngVLA reference design	9/30/2018												
	25	Issue RfP for ngVLA antenna design study	3/31/2018												
	26	Deliver ngVLA design and development proposal	12/31/2017												
	27	Realfast operational for limited observing modes	9/30/2018												
		VLA Technical Upgrades and Enhancements													
	28	L-band solar upgrade, install 11 additional receivers (#15–#25) with full RF upgrade	3/31/2018												
	29	X-band solar upgrade, install seven additional receivers (#18–#24) with 20 dB switched attenuators on outputs only, no solar Tcals	9/30/2018												
	30	Ku-band solar upgrade, install five additional receivers (#14–#18) with 20 dB switched attenuators on outputs only, no solar Tcals. Two in Q2	3/31/2018												
	31	Ku-band solar upgrade, install five additional receivers (#14–#18) with 20 dB switched attenuators on outputs only, no solar Tcals. Three in Q4	9/30/2018												
	32	C-band thermal gap retrofits, install five additional (#21–#25)	6/30/2018												
	33	FE control card upgrades, 35 additional	9/30/2018												
	34	Install replacement ACUs in three antennas, #8, 9, and 10 by Q4	9/30/2018												
	35	Install four upgraded SCR cards in three antennas	6/30/2018												
	36	Build eight Servo hardware Bearing Change Kits	6/30/2018												
		VLA Array Operations													
	37	Develop Array Operations Succession Plan	3/31/2018												

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		VLA Observing Capability Enhancements													
	38	Solar observing promoted from RSRO to SRO	12/31/2017												
	39	Solar observing promoted from SRO to GO	6/30/2018												
	40	Frequency averaging promoted from RSRO to SRO	3/31/2018												
	41	Frequency averaging promoted from SRO to GO	9/30/2018												
	42	Y1 software requirements written	3/31/2018												
	43	P-band spectroscopy from RSRO to SRO	3/31/2018												
	44	P-band spectroscopy from SRO to GO	9/30/2018												
	45	Pulsar observing promoted from RSRO to SRO	9/30/2018												
	46	OTF promoted from SRO to GO	9/30/2018												
4.3		**Central Development Laboratory**													
		Repair, Maintenance, Production, Support													
	1	Build and test Band 1 amplifiers	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
	2	Delivery of Band 1 Local Oscillators	3/31/2018												
		Research and Development													
	3	Band 2+ Project Closeout	12/31/2017												
	4	Band 2 components	12/31/2017												
	5	Build W-Band IRD front-end and test set	3/31/2018												
	6	Demonstrate reflectionless filter with active synthetic elements	3/31/2018												
	7	Revise W-band MMIC mixer and module	6/30/2018												
	8	Explore DOMT calibration using hot-cold-noise	9/30/2018												
	9	Demonstrate high-bandwidth unformatted serial link with integrated FE	9/30/2018												
	10	Balanced 4–12 GHz IF amplifier	9/30/2018												
	11	ngVLA feed-horn	9/30/2018												
5.6		**Science Support and Research**													
		Telescope Time Allocation													
	1	CfP for Semester 2018B	3/31/2018												
	2	SRP & Tech Review Process, Semester 2018B	3/31/2018												
	3	CfP for Semester 2019A	9/30/2018												
	4	SRP & Tech Review Process, Semester 2019A	9/30/2018												
	5	TAC Meeting, Semester 2018A	12/31/2017												
	6	TAC Meeting, Semester 2018B	6/30/2018												
	7	Update SW Tools Requirements for TAC Support 2018B	12/31/2017												
	8	Update SW Tools Requirements for PST 2019A	3/31/2018												
	9	Update SW Tools Requirements for TAC support 2019A	6/30/2018												
	10	Update SW Requirements Tools for PST 2019A	9/30/2018												
	11	Update Documentation for CfP and Tools 2018B	3/31/2018												
	12	Update Documentation for CfP and Tools 2019A	9/30/2018												
	13	SRP/TAC Process Change Decision	12/31/2017												
	14	TTA SW Tool Suite Requirements	3/31/2018												
		Science Ready Data Products													
	15	SRDP Project Scientist Identified	12/31/2017												
	16	End of Project Initiation Phase	3/31/2018												
	17	SRDP Project Office Fully Staffed	9/30/2018												
	18	SRDP Project Scope Established	12/31/2017												
	19	SRDP Implementation Cycle 1 Defined	3/31/2018												
		Scientific User Support & Student Programs													
	20	New DAs for VLASS Started	12/31/2017												
	21	Community Day Event Program Finalized	6/30/2018												
	22	NM Symposium	12/31/2017												
	23	VLA Data Reduction Workshop	12/31/2017												
	24	Synthesis Imaging Workshop	6/30/2018												
	25	CASA Validation	12/31/2017												
	26	CASA Guides	12/31/2017												
	27	CASA Validation	6/30/2018												
	28	CASA Guides	6/30/2018												
	29	Summer Student Selection and Offers	3/31/2018												
	30	Proposal for NSF funding for REU program	9/30/2018												
	31	Student Observing Support Selection (VLA)	12/31/2017												
	32	Student Observing Support Selection (VLA)	6/30/2018												
	33	Student Observing Support Selection (ALMA)	9/30/2018												
	34	Reber Predoc Selection	3/31/2018												
	35	Reber Predoc Selection	9/30/2018												
		Reference Services													
	36	BiblioMetrix Implementation Decision	12/31/2017												
	37	Metrics Analyst Handover Complete	12/31/2017												
	38	PEMP and Performance Report Reviewed and Revised	3/31/2018												
		Scientific Staff & Jansky Fellows													
	39	SciStaff Performance Reviews Completed	12/31/2017												
	40	SciStaff Promotions Reviews Completed	3/31/2018												
	41	Post Tenure Reviews Completed	3/31/2018												

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	42	Jansky Lectureship Awarded	6/30/2018												
	43	Jansky Fellows Selection Completed	12/31/2017												
	44	Jansky Fellows Appointments Completed	3/31/2018												
	45	Review take up of engagement in observatory activities and broader skills development	6/30/2018												
6.5		**Data Management & Software**													
		Scientific Information Services													
	1	Red Hat Enterprise Linux Migration testing on workstations	12/31/2017												
	2	Red Hat Enterprise Linux Migration testing on cluster nodes	6/30/2018												
	3	Installation of a CASA Parallel Test Cluster	12/31/2017												
	4	NAASC Luster replacement	3/31/2018												
	5	NGAS storage migration testing	3/31/2018												
	6	NGAS storage replacement	9/30/2018												
	7	NM Lustre software upgrade	6/30/2018												
	8	Lustre storage quotas	6/30/2018												
	9	VLASS and SRDP support	12/31/2017												
	10	External Computing Capacity Engagement	3/31/2018												
	11	Lustre Backup	3/31/2018												
	12	Moab Cluster Scheduler	3/31/2018												
	13	Moab Cluster Scheduler	9/30/2018												
		ALMA System Software													
	14	Cycle 6 Software Release	3/31/2018												
	15	Cycle 7 Software Pre-release	9/30/2018												
		VLA System Software													
	16	Support 2017B Observing	3/31/2018												
	17	Support 2018A Observing	9/30/2018												
	18	Support 2018A Commissioning	3/31/2018												
	19	Support 2018B Commissioning	9/30/2018												
		CASA													
	20	CASA v5.1 public release	12/31/2017												
	21	CASA v5.3 public release	6/30/2018												
		CASA Pipeline													
	22	CASA ALMA Cycle 5 pipeline release	12/31/2017												
	23	CASA ALMA Cycle 5 pipeline update	3/31/2018												
		SSA													
	24	Archive Access Tool release 3.0	12/31/2017												
	25	Archive Access Tool release 4.0	9/30/2018												
	26	2018B PST and 2018A OPT release	12/31/2017												
	27	2018B PHT release	3/31/2018												
	28	2019A PST and 2018B OPT release	6/30/2018												
	29	2019A PHT release	9/30/2018												
		Testing													
	30	AAT test coverage and test strategy	6/30/2018												
	31	Improved CASA test system	9/30/2018												
		ARDG													
	32	Algorithm R&D group implementation plan	12/31/2017												
	33	Algorithm R&D Roadmap v.1	6/30/2018												
7.5		**Program Management Department**													
		New Mexico Operations													
			12/31/2017												
			3/31/2018												
	1	NM Documentation Support	6/30/2018												
			9/30/2018												
			12/31/2017												
			3/31/2018												
	2	NM PM/SE Learning Opportunities	6/30/2018												
			9/30/2018												
			12/31/2017												
			3/31/2018												
	3	NM Proposal Development Leadership	6/30/2018												
			9/30/2018												
			12/31/2017												
			3/31/2018												
	4	NM PM/SE Project Leadership	6/30/2018												
			9/30/2018												
	5	ngVLA PM/SE Support for Design Proposal	12/31/2017												
	6	ngVLA PM/SE Support for ngVLA Design and Costing Antenna Concept Contract	6/30/2018												
	7	ngVLA PM/SE Support for final Science and Technology Meeting	9/30/2018												
		LBO													
			12/31/2017												
			3/31/2018												
	8	LBO Documentation Support	6/30/2018												
			9/30/2018												
	9	LBO PM/SE Learning Opportunities	9/30/2018												

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			12/31/2017												
	10	LBO PM/SE Project Leadership	3/31/2018												
			6/30/2018												
		CDL													
			12/31/2017												
			3/31/2018												
	11	CDL Documentation Support	6/30/2018												
			9/30/2018												
			12/31/2017												
			3/31/2018												
	12	CDL PM/SE Learning Opportunities	6/30/2018												
			9/30/2018												
			12/31/2017												
			3/31/2018												
	13	CDL Proposal Development Leadership	6/30/2018												
			9/30/2018												
			12/31/2017												
			3/31/2018												
	14	CDL PM/SE Project Leadership	6/30/2018												
			9/30/2018												
			12/31/2017												
			3/31/2018												
	15	CDL Band 1 CLNA Quarterly Reports	6/30/2018												
			9/30/2018												
	16	CDL Band 1 CLNA Annual Report	6/30/2018												
		ALMA Development													
	17	ALMA-D Cycle 5 Studies Commence	12/31/2017												
	18	ALMA-D Cycle 5 Awarded Project Notifications	3/31/2018												
	19	ALMA-D Cycle 4 Close Out Reports Published	3/31/2018												
		SRDP													
	20	SRDP Complete Project Planning Documents	12/31/2017												
	21	SRDP Complete Document Package for Conceptual Design Review	3/31/2018												
		Headquarters													
			12/31/2017												
			3/31/2018												
	22	PMHQ Observatory-wide Documentation Support	6/30/2018												
			9/30/2018												
	23	Incorporate Changes and Feedback into SOPs	9/30/2018												
			12/31/2017												
			3/31/2018												
	24	PM/SE Training/Workshop	6/30/2018												
			9/30/2018												
			12/31/2017												
			3/31/2018												
	25	PMHQ PM/SE Project Leadership	6/30/2018												
			9/30/2018												
		Sport Facility at ALMA OSF													
	26	Sport Facility at ALMA OSF Construction Contract Awarded	12/31/2017												
	27	Sport Facility at ALMA OSF JAO Design Review	3/31/2018												
	28	Sport facility at ALMA OSF Construction Complete	9/30/2018												
		VLA Mark 6 Development													
	29	VLBA Mark 6 Development Deliver First Two Units	6/30/2018												
		VLA Electrical Infrastructure Upgrade													
	30	VLA Electrical Infrastructure Upgrade Project Planning	12/31/2017												
	31	VLA Electrical Infrastructure Upgrade Execution and M&C	3/31/2018												
	32	VLA Electrical Infrastructure Upgrade Closeout	6/30/2018												
8.5		**Education and Public Outreach**													
		STEAM													
	1	Assessment of opportunities to grow the program beyond cultural exchange	12/31/2017												
	2	Individual learning plans for all participants	6/30/2018												
	3	NM participants travel to Chile	9/30/2018												
	4	San Pedro participants travel to NM	9/30/2018												
	5	Review evaluation of 2017 RAP/NM workshop	3/31/2018												
	6	Recruit participants for 2018 RAP/NM	6/30/2018												
	7	Develop and administer survey about current outreach	12/31/2017												
	8	Survey community (CV and SO) for outreach opportunities	3/31/2018												
	9	Survey stakeholders to set community outreach themes	3/31/2018												
	10	Collect published activities based on survey	3/31/2018												
	11	Develop and test community outreach activities	9/30/2018												
		News and Media Relations													
	12	Review of other science news websites to define types of content	12/31/2017												
	13	Develop new look and feel for home page	3/31/2018												
	14	Build out of new home page in WordPress	6/30/2018												
	15	New website is user tested	9/30/2018												

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	16	Establish social media calendar	12/31/2017												
	17	Review of available assets	6/30/2018												
	18	Create blog template for NRAO blogs	12/31/2017												
	19	Establish pool of contributors to NRAO blog	3/31/2018												
		Multimedia Engagement													
	20	Define framework for new webpage	3/31/2018												
	21	Create additional ngVLA content	6/30/2018												
	22	Define framework for CDL virtual tour	12/31/2017												
	23	Curate archived CDL content	3/31/2018												
	24	Create new CDL content	6/30/2018										Cancelled		
	25	Populate new CDL map	9/30/2018										Cancelled		
	26	Define the framework of "the Basics"	12/31/2017												
	27	New content and visual assets created	9/30/2018										Cancelled		
	28	Populate new pages	9/30/2018										Cancelled		
	29	Establishing priorities for cataloging process	12/31/2017												
		Visitor Center Operations													
	30	Audit current brochures and handouts	12/31/2017												
	31	Redesign and edit brochures for consistent look and feel	6/30/2018												
9.4		**Computing and Information Services**													
	1	Migration to Microsoft Windows 10	12/31/2017												
	2	Unix OS moved to RHEL 7	6/30/2018												
	3	Service availability reports	3/31/2018												
	4	Capacity management	9/30/2018												
	5	Employee onboarding	6/30/2018												
	6	Bi-annual network perimeter scan	12/31/2017												
	7	Automation of perimeter scan	6/30/2018												
	8	Securing the Human and cyber security training	6/30/2018												
	9	Integrated Web search evaluation	9/30/2018												
	10	Tape backup replaced in NM	3/31/2018												
	11	Replacement of BOS	9/30/2018												
	12	Implement "Enhanced Computing Support"	12/31/2017												
	13	Computer Hardware Standards review	6/30/2018												
	14	Video System end-of-support mitigation	9/30/2018												
10.3		**Office of Diversity & Inclusion**													
		Diversity Council													
	1	Diversity Council Meeting	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
		Local and National Programs													
	2	SEDLE, LSAMP, NAC	3/31/2018												
			6/30/2018												
	3	RAMP-UP	12/31/2017												
	4	Summer Programs Initiated	9/30/2018												
	5	NAC Annual Workshop	9/30/2018												
		International Programs													
	6	ODI Chile Undergraduate Recruiting	12/31/2017												
	7	ODI Chile Undergrad Research Experience Initiated	3/31/2018												
	8	NINE Program	6/30/2018												
			9/30/2018												
	9	Diversity and Cultural Awareness Program Plan Developed and Implemented	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
11.7		**Human Resources**													
		Workforce Management													
	1	Staff Renewal/Transition	3/31/2018												
		Training & Development													
	2	Observatory Leadership Cohort Training	6/30/2018												
	3	Observatory-wide Ethics Training	6/30/2018												
		Compensation													
	4	JDE Compensation Module Implementation Preparation	9/30/2018												
		Benefits													
	5	Voluntary Benefits Offering	3/31/2018												
	6	Electronic Enrollment (Non–Open Enrollment)	6/30/2018								Cancelled				
		Recruitment/Employment													
	7	Review, evaluate, and report recruitment/employment metrics	3/31/2018												
			9/30/2018												
	8	Development of on-line diversity resource matrix for Hiring Managers	3/31/2018												
	9	Hiring Manager Training	3/31/2018												
		Human Resources													
	10	JAO Collective Bargaining	12/31/2017												
		JAO Process Improvement/Employee Communications													
	11	Review and enhance ISM On-boarding & Off-boarding process	6/30/2018												

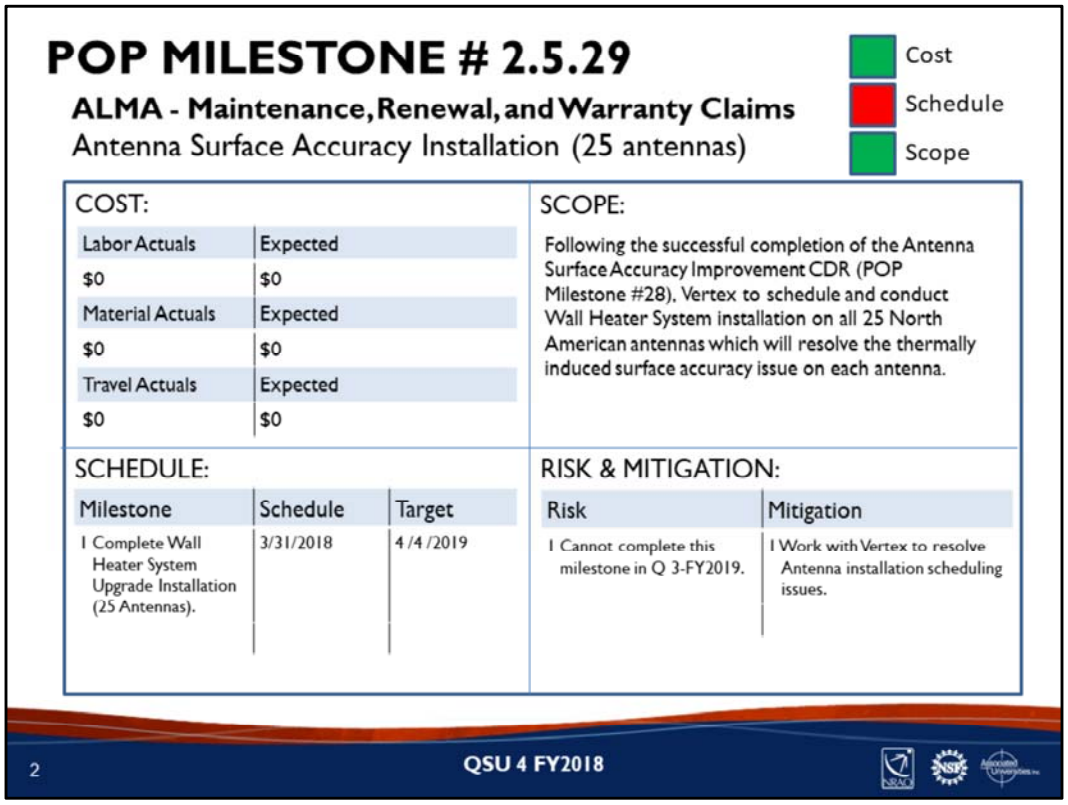
NRAO Quarterly Status Update
QSU4 FY2018

				Q1 Performance Assessment			Q2 Performance Assessment			Q3 Performance Assessment			Q4 Performance Assessment		
POP Section	**POP Milestone**	**Milestone**	**Completion Date**	**Cost**	**Schedule**	**Scope**	**Cost**	**Schedule**	**Scope**	**Cost**	**Schedule**	**Scope**	**Cost**	**Schedule**	**Scope**
	12	Update ISM webpage and review Expatriate Allowances	6/30/2018												
12.2		**Science Communications**													
	1	Update NRAO Research Facilities brochure	12/31/2017												
	2	Submit 2018 AAAS science symposium proposal	6/30/2018												
	3	IAU General Assembly exhibition	9/30/2018												
13.7		**Administration**													
		Budget													
	1	Define scope of project and desired outcomes of budget planning tool project	3/31/2018												
	2	Develop and test tool for use in budget planning	6/30/2018												
	3	Develop cost estimator position requirements, job description and advertise position. Form a search committee.	12/31/2017												
	4	Cost estimator Interviews, finalist identified, offer made.	3/31/2018												
		Environmental, Safety and Security													
	5	Training workers on fall and equipment hazards	12/31/2017												
	6	Inspection and certification of permanent building anchorages	3/31/2018												
	7	Review of fall protection on existing and new fixed ladders over 24 feet and installation or upgrade of equipment where necessary	9/30/2018												
	8	Modification of policies to prohibit discouraging workers from reporting an injury or illness. Supervising training on new policies	12/31/2017												
	9	Procurement of new OSHA Posters	3/31/2018												
		Management Information Services													
	10	Prepare Project Plan and Schedule for upgrade to 9.2 and order Upgrade Equipment	12/31/2017												
	11	Installation and preparation of new hardware and software upgrade loaded	3/31/2018												
	12	Testing plan prepared and used for testing and validation by users	3/31/2018												
	13	JDE upgrade Go-live	6/30/2018												
		Technology Transfer Office													
	14	Submit policies to Intellectual Property attorney for review and if required, updates	3/31/2018												
	15	If there are changes to the IP policies, submit them for approval to AUI Operations and Administration Committee	6/30/2018												
	16	Identify patented or licensed NRAO technologies and collaborate with EPO to create publicity announcements	9/30/2018										Cancelled		
14.3		**Spectrum Management**													
	1	WP 7D meeting	12/31/2017												
	2	WP 7D meeting	6/30/2018												
	3	WP 1A,1B,5A,5B,5C meetings	6/30/2018												
	4	CORF meeting	6/30/2018												
	5	SFCG meeting	9/30/2018										Cancelled		
	6	IAU General Assembly	9/30/2018												
15.2		**Director's Office**													
		ALMA													
	1	ALMA Board Meeting	12/31/2017												
			6/30/2018												
	2	ALMA Director's Council	12/31/2017												
			3/31/2018												
			6/30/2018												
			9/30/2018												
		Corporate Meetings													
	3	AUI Board of Trustees Meetings	12/31/2017												
			3/31/2018												
			6/30/2018												
	4	AUI Executive Committee Meetings	12/31/2017												
			6/30/2018												
			9/30/2018												
	5	AUI Visiting Committee Meeting	6/30/2018												
		Science Community													
	6	Appoint new Users Committee members	12/31/2017												
	7	Users Committee meeting	6/30/2018												
		Management Reviews													
	8	NSF Annual Program Review	12/31/2017												
	9	All-Hands Presentations	3/31/2017												
			9/30/2018												
		ngVLA													
2		***Antenna Reference Design***													
	1	Initiate contract for the ngVLA Costed Antenna Reference Design	12/31/2017												
	2	Receipt and review of preliminary results of Costed Antenna Reference Design	6/30/2018												
	3	Conduct formal documenttion and design reviews of ngVLA Reference Design	9/30/2018												
3		***Education and Public Outreach***													
	1	Launch second round of ngVLA community studies	12/31/2017												
	2	First draft of ngVLA Science Book complete	6/30/2018												
	3	Discuss ngVLA concept with local community stakeholders	3/31/2018												
	4	Conduct ngVLA science meeting	6/30/2018												
	5	Create new ngVLA website incorporating artwork	6/30/2018												

NRAO Quarterly Status Update
QSU4 FY2018

				Q1 Performance Assessment			Q2 Performance Assessment			Q3 Performance Assessment			Q4 Performance Assessment		
POP Section	**POP Milestone**	**Milestone**	**Completion Date**	**Cost**	**Schedule**	**Scope**	**Cost**	**Schedule**	**Scope**	**Cost**	**Schedule**	**Scope**	**Cost**	**Schedule**	**Scope**
4		***Conceptual Design & Development***													
	1	Release Science Requirements document	12/31/2017												
	2	Release Operations & Maintenance Concept document	12/31/2017												
	3	Release updated System Requirements document	6/30/2018												
	4	Release System Architecture	6/30/2018												
	5	Release first issue of Array Calibration document	9/30/2018												
	6	Release updated Array Configuration	9/30/2018												
	7	Preliminary Antenna Optical Design released	3/31/2018												
	8	Receiver Noise Model released	6/30/2018												
	9	Receiver & Cryo Thermal Model released	3/31/2018												
	10	Correlator Architectural Study released	6/30/2018												
	11	Software Architecture drawings released	9/30/2018												
	12	Algorithmic Study released	9/30/2018												
	13	Monitor & Control architecture released	9/30/2018												
	14	RFI Environment projections released	6/30/2018												
	15	RFI Mitigation study released	9/30/2018												
	16	Wide angle feed design released for manufacture	9/30/2018												
	17	Release RFP for cryogenic development	6/30/2018												
	18	ASIC contract released	6/30/2018												
	19	WVR Testing begins	9/30/2018												
	20	Release Time and Frequency Distribution report	9/30/2018												
5		***Administration and Management***													
5.1		**Project Office**													
	1	Complete recruitment and hiring process for open ngVLA positions	12/31/2017												
	2	Hand-over responsibilities from interim personnel to new hires	3/31/2018												
5.3		**Project Processes and Software Tools**													
	1	Conduct a review of software solution options and determine best-fit solutions	3/31/2018												
	2	Implement the selected software solutions	9/30/2018												
5.4		**Cost Estimation**													
	1	Recruit Cost Estimator	12/31/2017												
	2	Develop initial version of cost estimation plan and processes	3/31/2018												
5.5		**Systems Engineering**													
	1	Provide initial versions of systems engineering process planning and documentation	12/31/2017												
5.6		**Requirements Management**													
	1	Provide initial versions of Requirements Management process planning and documenation	12/31/2017												
	2	Conduct Stakeholder Requirements Review (StRR)	3/31/2018												
	3	Develop initial lifecycle and concept description	3/31/2018												
	4	Conduct Systems Requirements Review (SRR)	9/30/2018												
	5	Develop initial version of RVTM	6/30/2018												
	6	Conduct gap analysis of stakeholder and system requirements	6/30/2018												
	7	Draft quality processes for verification and validation plan	6/30/2018												
	8	Release concept documents, system requirements and updated RVTM	9/30/2018												
	9	Develop preliminary architectural and software definitions	9/30/2018												

QSU4 FY2018 Report

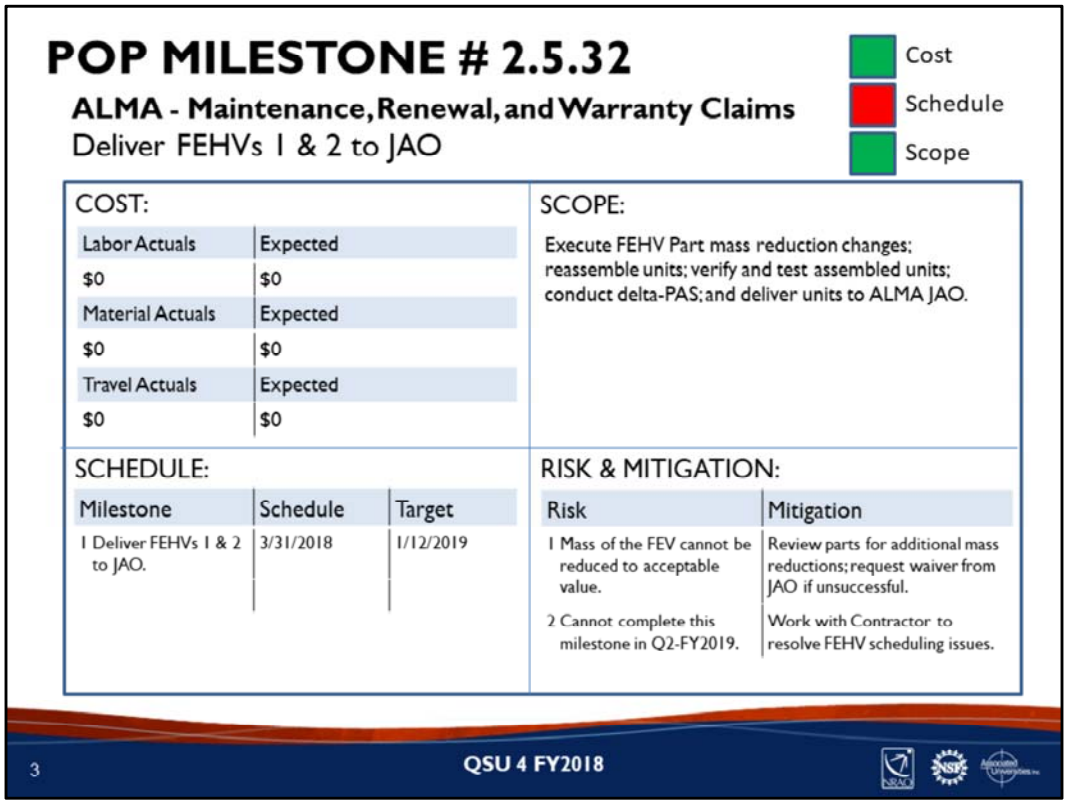


COST: The vendor is responsible for resolving this issue.

SCOPE: The root cause of the surface accuracy behavior has been traced to local temperature variations in the antenna receiver cabin wall that generate mechanical strain (due to thermal expansion/contraction) which is transferred through the antenna back-up structure (BUS) and "imprinted" on the reflecting surface of the dish. The antenna contractor, Vertex Antennentechnik, GmbH, has developed a mitigation system consisting of thermostatically controlled wall heaters that may be adjusted to maintain more uniform wall temperature and a corresponding stable surface rms versus ambient temperature. This concept was tested via astro-holography and thermocouple readings during FY2017 on four antennas (DV06, DV09, DV14, and DV25). The planned CDR is meant to confirm the heater system's ability to improve the overall antenna surface thermal performance, identify any impacts to other antenna systems, and identify any design and/or hardware changes prior to installation on the remaining N.A. antennas.

SCHEDULE: Wall heater system (Delta) CDR conducted on 28 September 2018; execution of Engineering Change Request/Notification currently underway for submittal to ALMA JAO which will formally identify planned upgrades to the accepted antenna configuration; Vertex is finalizing the system installation schedule for the remaining N.A. antennas. Vertex is developing a schedule to expedite the wall heater system installation, including hardware procurement, spares development, and antenna documentation (associated drawings and maintenance manuals) revisions, which should allow completion of the upgrades by the target date of 04 April 2019; noting that this schedule is contingent on ALMA JAO providing unlimited access to the antennas during this period.

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.

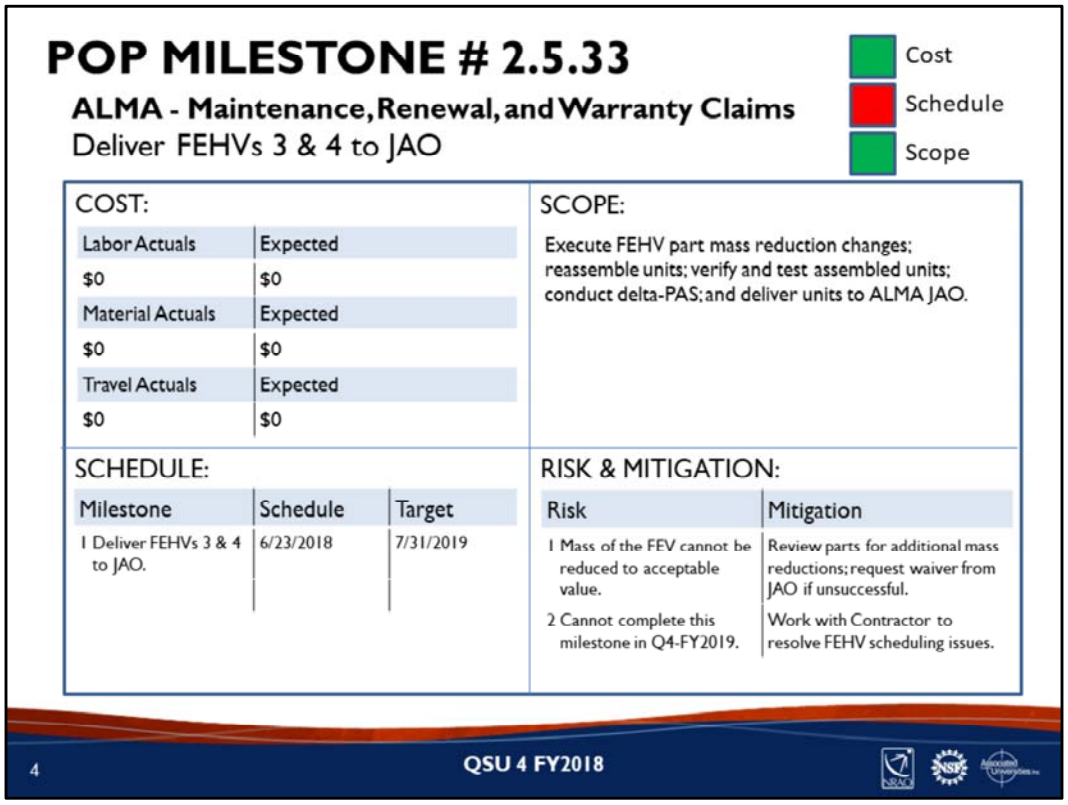


COST: No impact.

SCOPE: No impact.

SCHEDULE: Measurement of the total mass of unit #1 at PAS revealed that the upgraded unit was ~35kg over the mass limit of the FEHV Technical Specification (and would exceed weight limit of FESV Access Ramps). Implementation of proposed component mass reductions is now complete and unit #1 has been reassembled and operationally tested; total assembled mass is now ~5kg below mass limit. Expect to deliver unit #1 in early November with unit #2 expected by January target date.

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.

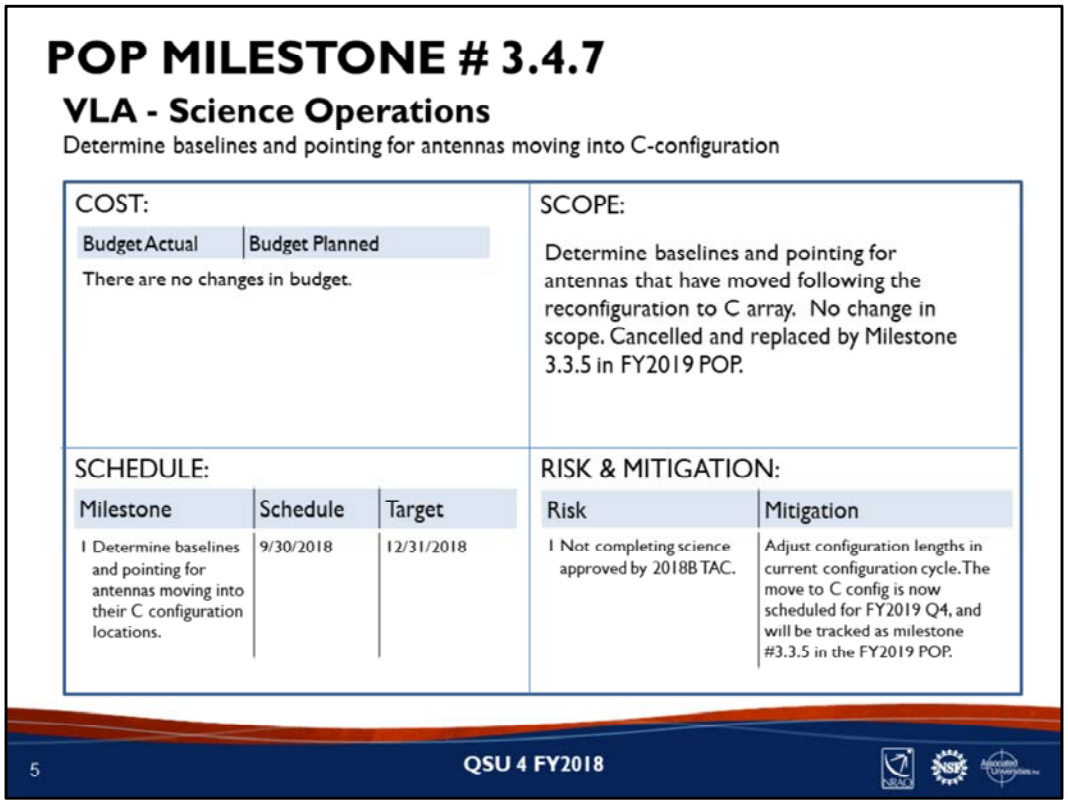


COST: No impact.

SCOPE: No impact.

SCHEDULE: Measurement of the total mass of unit #1 at PAS revealed that the upgraded unit was ~35kg over the mass limit of the FEHV Technical Specification (and would exceed weight limit of FESV Access Ramps). Implementation of proposed component mass reductions is now complete and unit #1 has been reassembled and operationally tested; total assembled mass is now ~5kg below mass limit. Expected that part changes and re-assembly to proceed in sequence (serially) for each FEHV with expected delivery of unit #1 in early November 2018, unit #2 in January, and units #3 and #4 delivered by the July target date.

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.



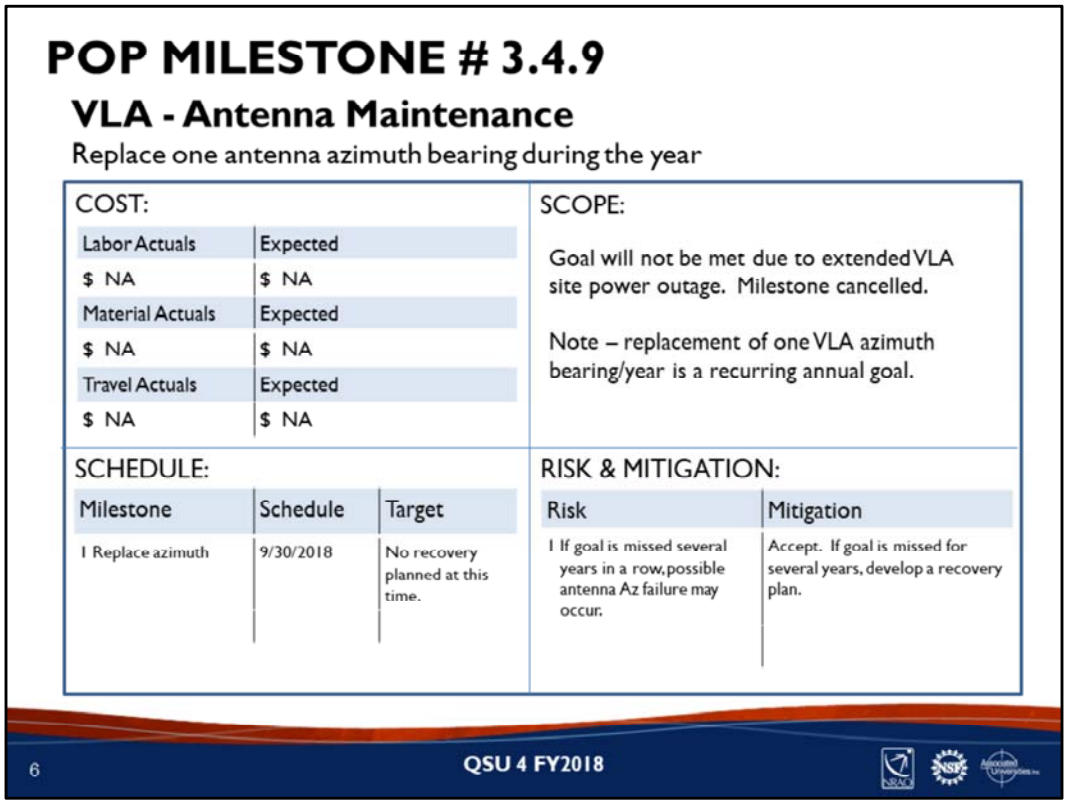
Owner: Bryan Butler

COST: No impact.

SCOPE: Cancelled.

SCHEDULE: The determination of baselines and pointing for moved antennas normally immediately follows an array reconfiguration. The move from the D-configuration to the C-configuration was delayed until Q1 FY2019 by the unexpected extension of the Electrical Infrastructure Upgrade (EIU) work, and the schedule for this milestone is tied to the delayed array reconfiguration. This milestone will be tracked as #3.3.5 in the FY2019 POP moving forward.

RISK & MITIGATION: The dates of the reconfigurations needed to be modified to address the risk of not completing the science program approved by the 2018B TAC. The change in the D to C reconfiguration dates imposes a moderate immediate impact on the overall schedule of the current D-C-B-A configuration cycle, but the original schedule is recovered by the next D-configuration (scheduled for November 2019) by adjusting move dates and lengths for the configurations between now and then.



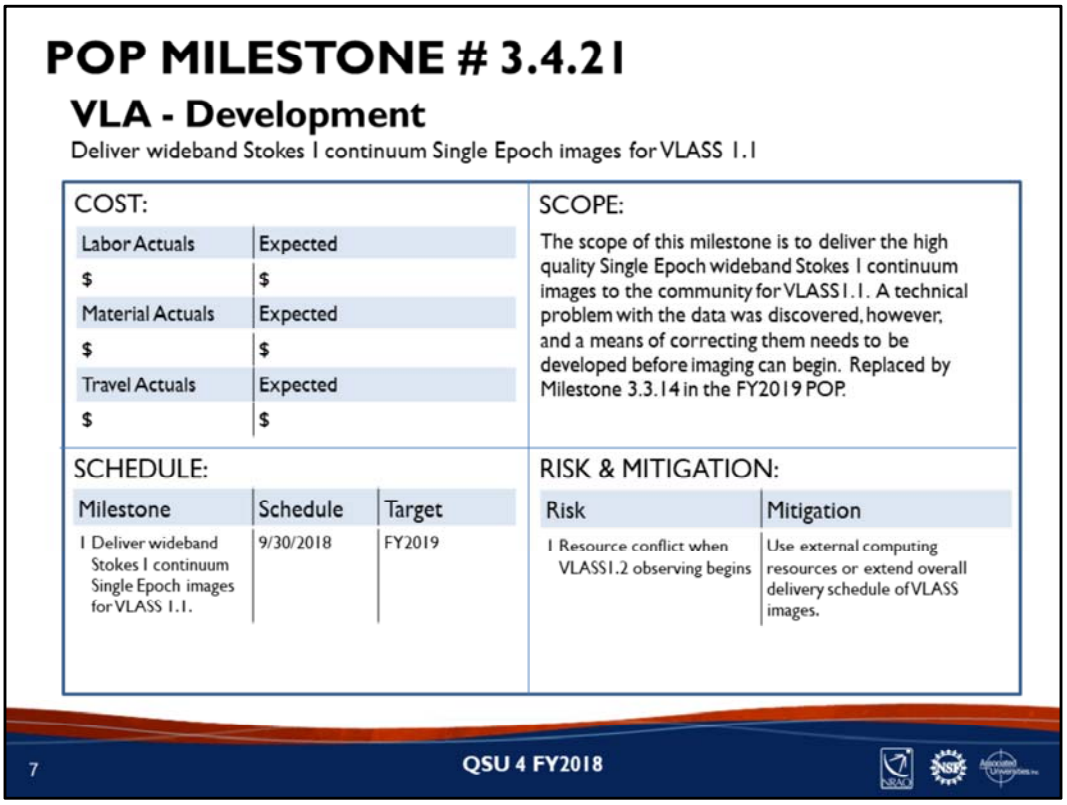
Owner: Chris Langley

COST: No cost. Labor was redirected towards other tasks.

SCOPE: The VLA power shutdown for the Electrical Infrastructure Upgrade (EIU) work lasted six weeks longer than anticipated, so there was no way to perform the azimuth bearing replacement during that time. Once power was restored, other tasks were assigned a higher priority.

SCHEDULE: No recovery is planned. Milestone cancelled.

RISK & MITIGATION: The risk of not keeping up with the goal of replacing one azimuth bearing per year is that an antenna azimuth failure may occur. We accept the risk on a year to year basis. If the goal goes unmet for several years in a row, we will develop a plan to recover some of the replacements.



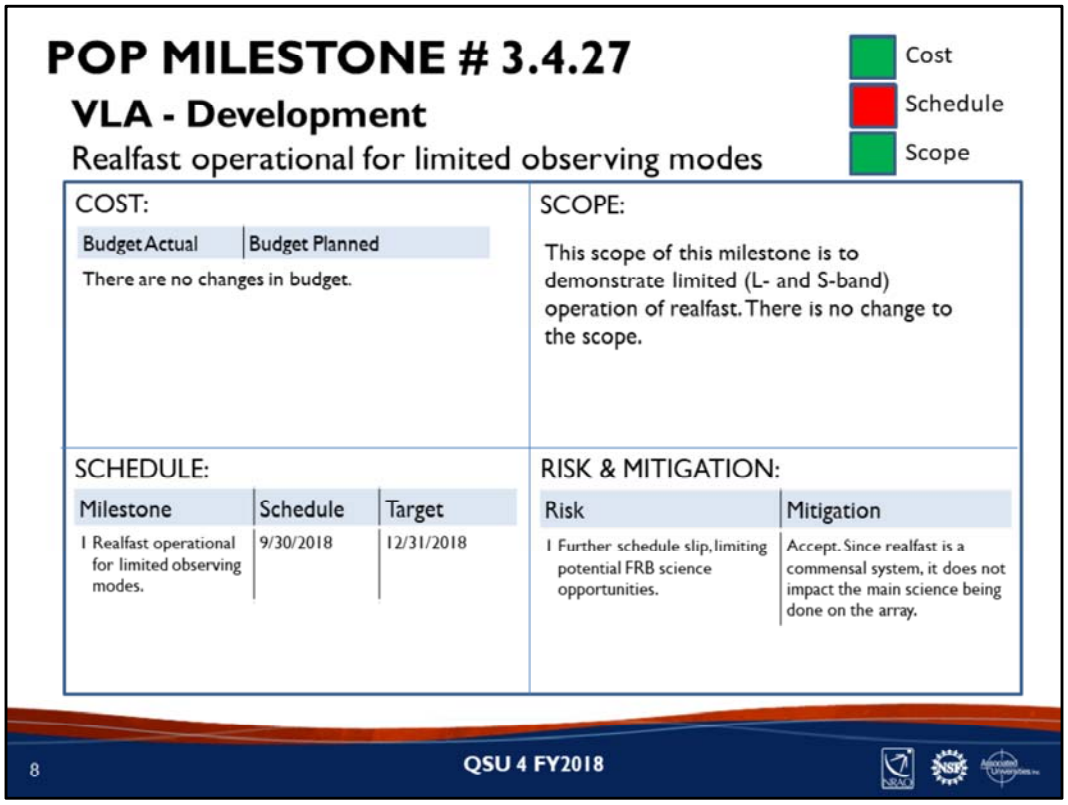
Owner: Claire Chandler

COST: Not tracked at this level.

SCOPE: A problem with the VLASS1.1 data associated with the pointing of VLA antennas with old ACUs (caused by a bug in the online system) was discovered, and a means of correcting those data needs to be developed before Single Epoch imaging can begin.

SCHEDULE: Two items have delayed the production of wideband Stokes I Single Epoch images for VLASS1.1: (1) the 5.4.0 CASA calibration pipeline containing the VLASS SE calibration heuristics was not released until October 2018, and (2) the pointing problem noted above was discovered, and will require additional development before imaging can begin. This milestone was therefore not met on the original schedule, and will be tracked by milestone #3.3.14 of the FY2019 POP going forward. DMS is evaluating AW projection now.

RISK & MITIGATION: The delay in starting the SE imaging for VLASS1.1 will cause a potential resource conflict when VLASS1.2 observing begins in Q2 FY2019. This will be mitigated either by using external computing resources, or extending the overall delivery schedule of VLASS images to the community.



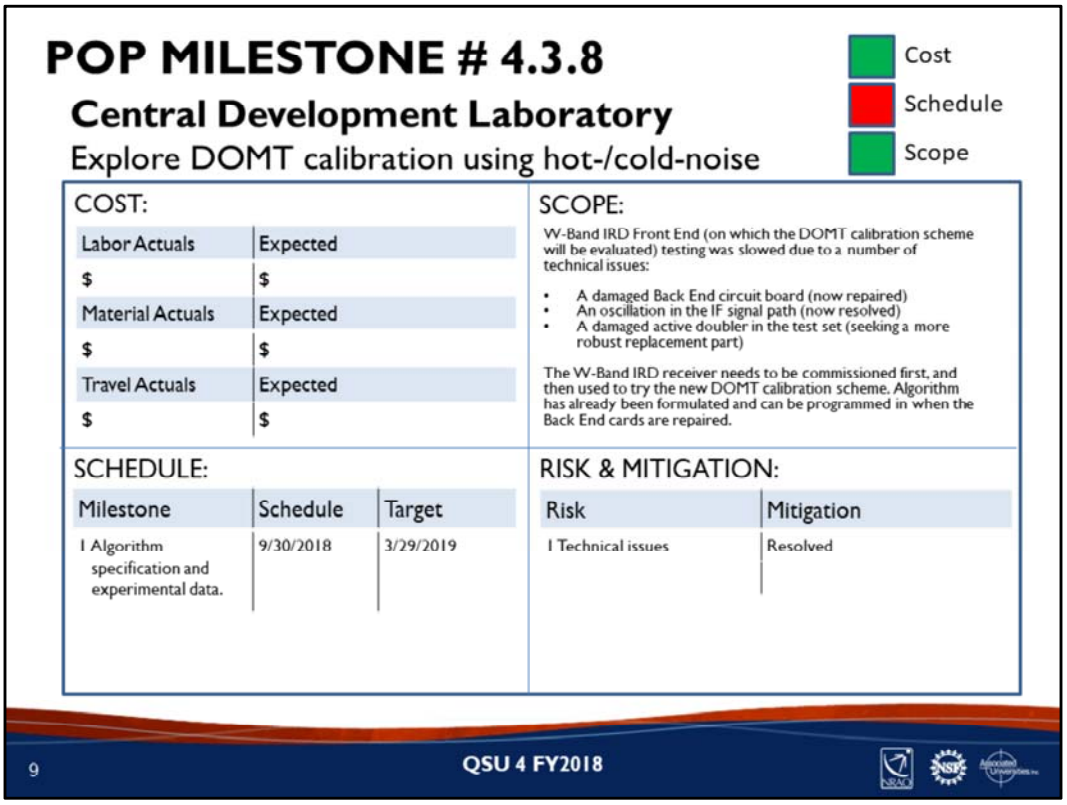
Owner: Bryan Butler

COST: No impact.

SCOPE: No impact.

SCHEDULE: The ability to implement and test the realfast system was delayed by the unexpected extension of the VLA Electrical Infrastructure Upgrade (EIU), which made it impossible to access the prototype cluster nodes at the site and prevented data from being taken. We now aim to achieve the stated level of limited operation by the end of Q1 FY2019, but note that in order to complete the TAC-approved science in D-configuration following the EIU delay we have given up one day of test time per week, which impacts the ability to test realfast.

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 risk.



COST: No impact.

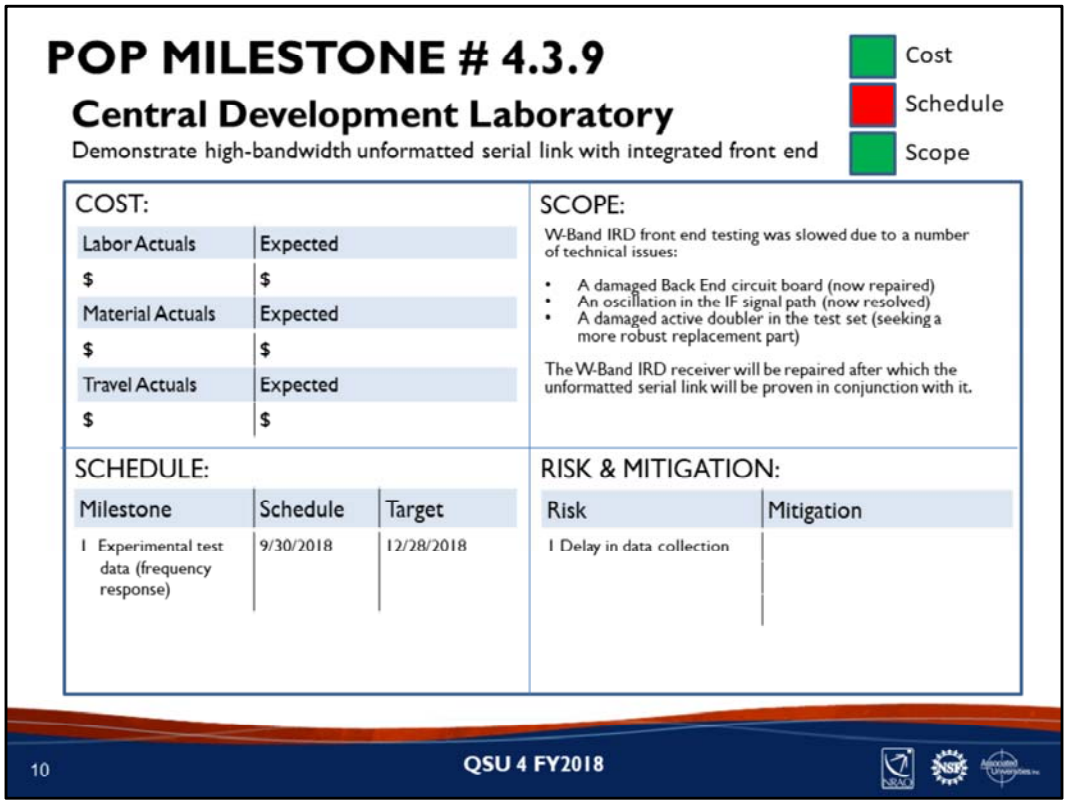
SCOPE: No change in scope, originally proposed experimental test data is still proposed to be collected and delivered. Algorithm has already been formulated and can be programmed in when the Back End cards are repaired.

SCHEDULE: The test bed for the proposed work (W-Band IRD Front End) suffered damage, and needs to be first repaired and evaluated. We expect that to take about one quarter. Consequently, it is proposed to move back this milestone by two quarters.

RISK & MITIGATION: The W-Band IRD Front End 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).

Each of the above have been resolved (or the path to resolution identified) as follows:
- We will get the backend board repaired
- We did solve the oscillation, but it cost us some gain to do it. We are pursuing another approach in hopes of getting the gain back.
- We have identified some suitable replacements for the blown doubler, and have requested quotes. Will order as soon as purchasing turns back on.



COST: No impact.

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

SCHEDULE: The test bed for the proposed work (W-Band IRD front end) suffered damage, and needs to be first repaired and evaluated. We expect that to take about one quarter. Consequently, it is proposed to move back this milestone by the same amount.

RISK & MITIGATION: The W-Band IRD Front End 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).

Each of the above have been resolved (or the path to resolution identified) as follows:
- We will get the back end board repaired
- We did solve the oscillation, but it cost us some gain to do it. We are pursuing another approach in hopes of getting the gain back.
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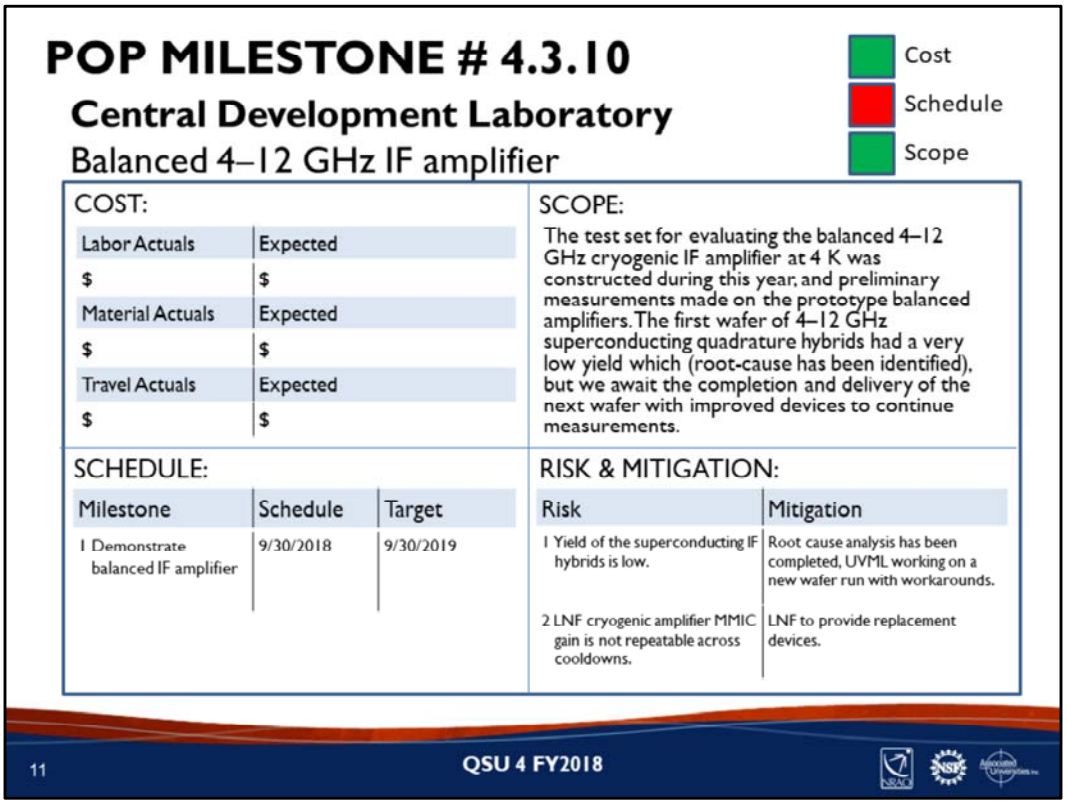
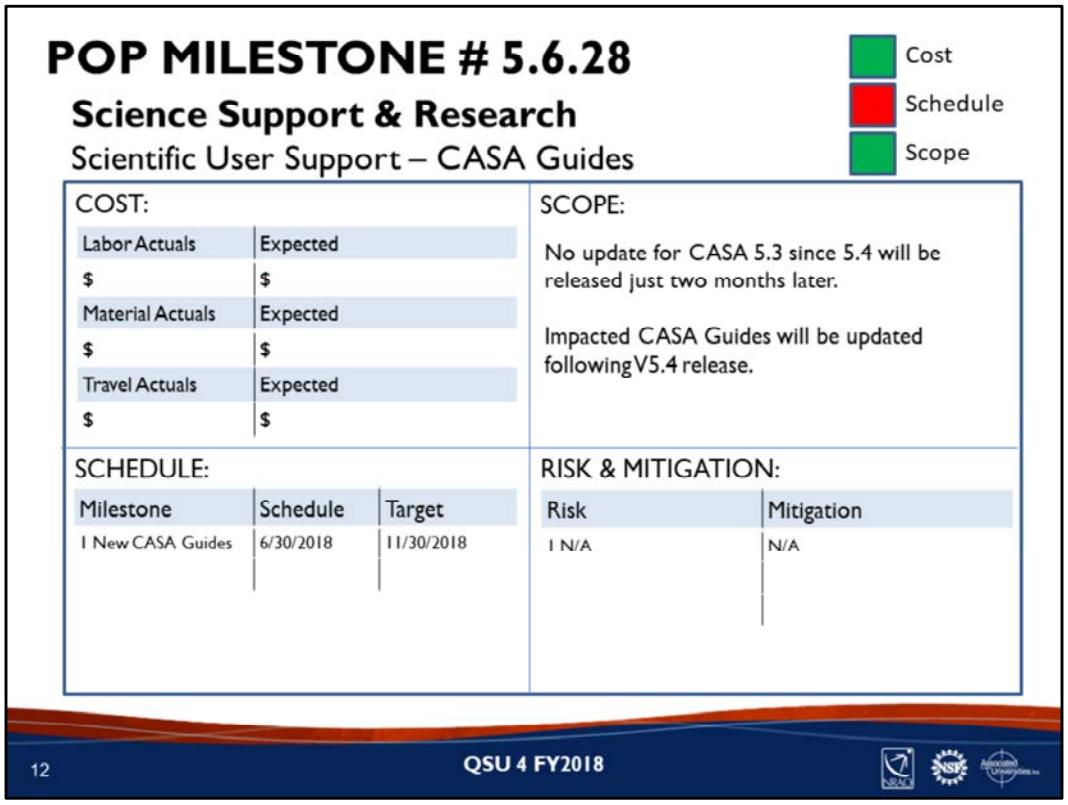


COST: No impact.

SCOPE: No change in scope, originally proposed demonstration of a balanced IF amplifier is still proposed to be carried out.

SCHEDULE: The test set for evaluating the balanced 4–12 GHz cryogenic IF amplifier at 4 K was constructed during this year, and preliminary measurements made on the prototype balanced amplifiers. Further work is expected to be done in the coming months and consequently this project will continue into FY2019.

RISK & MITIGATION: The first wafer of 4–12 GHz superconducting quadrature hybrids had a very low yield which (root-cause has been identified), but we await the completion and delivery of the next wafer with improved devices. Furthermore, following the delivery of the amplifiers, LNF found that the gain of MMIC chips used would change from one cool-down to the next. This is not acceptable for a balanced amplifier, and the manufacturer has proposed to replace the MMICs in these amplifiers with new ones.

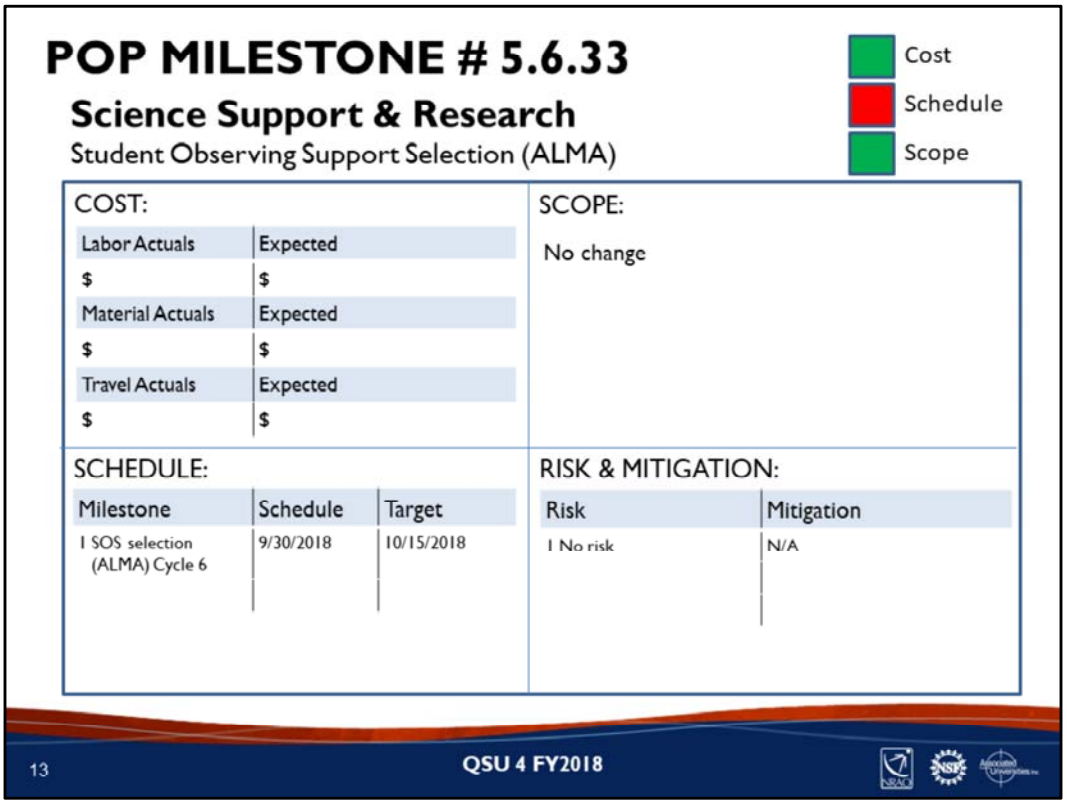


COST: No impact.

SCOPE: Original plan was to update CASA Guides following release of V5.3, but that release was delayed and CASA 5.4 was expected to be released just two months after 5.3. Decided to update guides just once for V5.4.

SCHEDULE: Now expect new guides to be delivered by November 30 (two weeks later than target reported in Q3 four-square), provided V5.4 is released by mid-November, as now anticipated. Total slip is five months, completely dependent on CASA delivery.

RISK & MITIGATION: No impact.

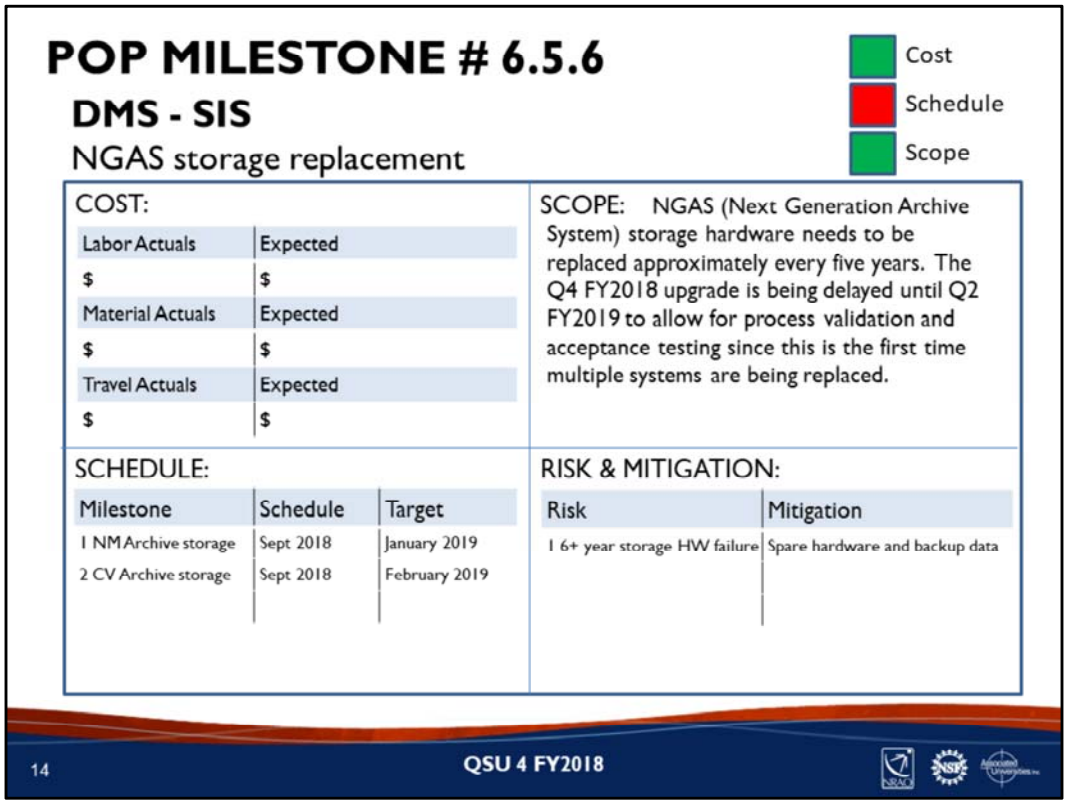


COST: No impact.

SCOPE: No impact.

SCHEDULE: Approximately two week delay. Selection meeting took place on October 2. Recommendations have been approved and awards are underway.

RISK & MITIGATION: No impact.

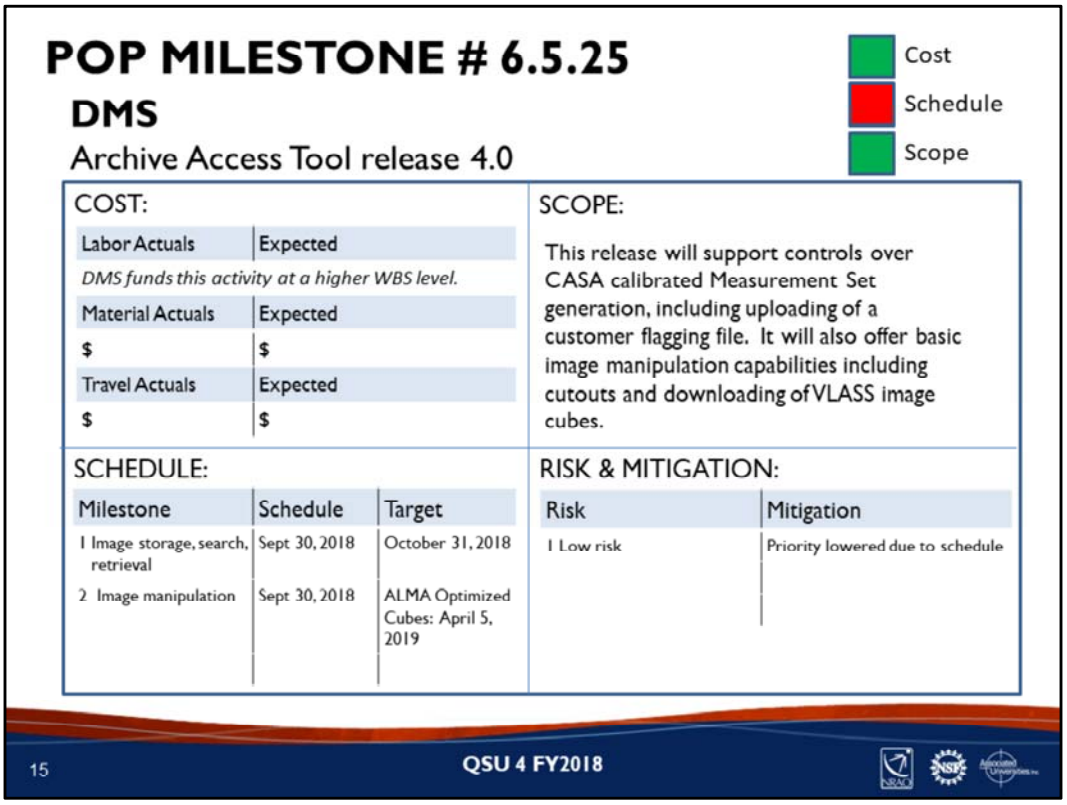


COST: No cost risk, hardware already purchased in FY2018.

SCOPE: The NM (VLA) and CV (ALMA) archive use NGAS (Next Generation Archive System) to store observed and reduced data products in perpetuity. The storage hardware needs to be replaced approximately every five years. The Q4 FY2018 upgrade is being delayed until Q2 FY2019 to allow for process validation and acceptance testing since this is the first time multiple systems are being replaced. Scope well defined to first generation archive storage systems for VLA/VLBA (NM) and ALMA (CV).

SCHEDULE: Slipped due to caution and additional testing and validation of archive data export/import scripts.

RISK & MITIGATION: Run current hardware.



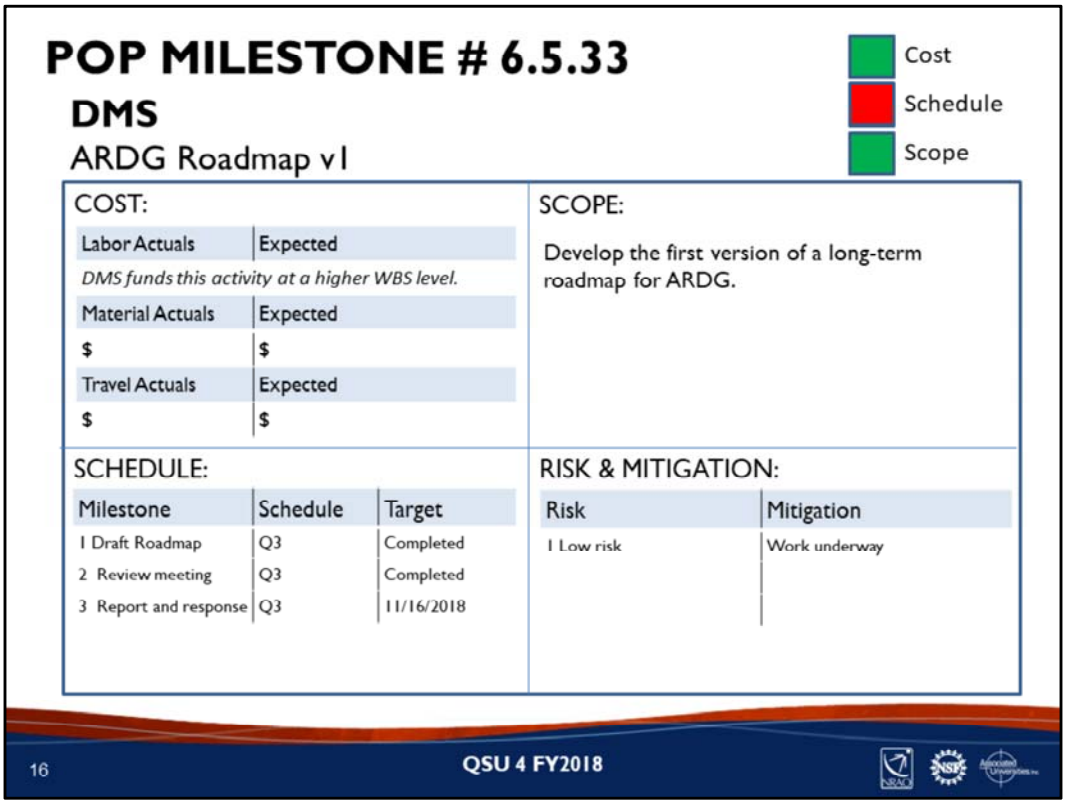
COST: DMS funds this activity at a higher WBS level. Costs are not tracked for this milestone.

SCOPE: This release will support controls over CASA calibrated Measurement Set generation, including uploading of a customer flagging file. It will also offer basic image manipulation capabilities, including cutouts and downloading of VLASS image cubes.

SCHEDULE: Milestone 6.5.25 was delayed by resource constraints on the team which supports the Archive. The work done in FY2018 to allow imaging storage, search, and retrieval will be deployed in release 3.5 early in Q1 FY2019. Other capabilities, such as manipulation of the Measurement Set (MS) and images have been included in the SRDP project and will be delivered according to the SRDP timeline.

As part of the SRDP Project, image and MS manipulation have been reprioritized. SSA will deliver ALMA optimized cubes in Wave 1, taking the place of the originally planned image manipulation. This is a more straightforward development effort which logically follows effort to include OUS structure in the archive, also included in SRDP Wave 1, and provides a related capability for ALMA. This will be made available for testing in Q3FY2019.

RISK & MITIGATION: Image manipulation was planned for FY2018 in anticipation of the need to work with VLASS SE images. The priority of this has decreased since SE images are not yet being produced. Risk is low.

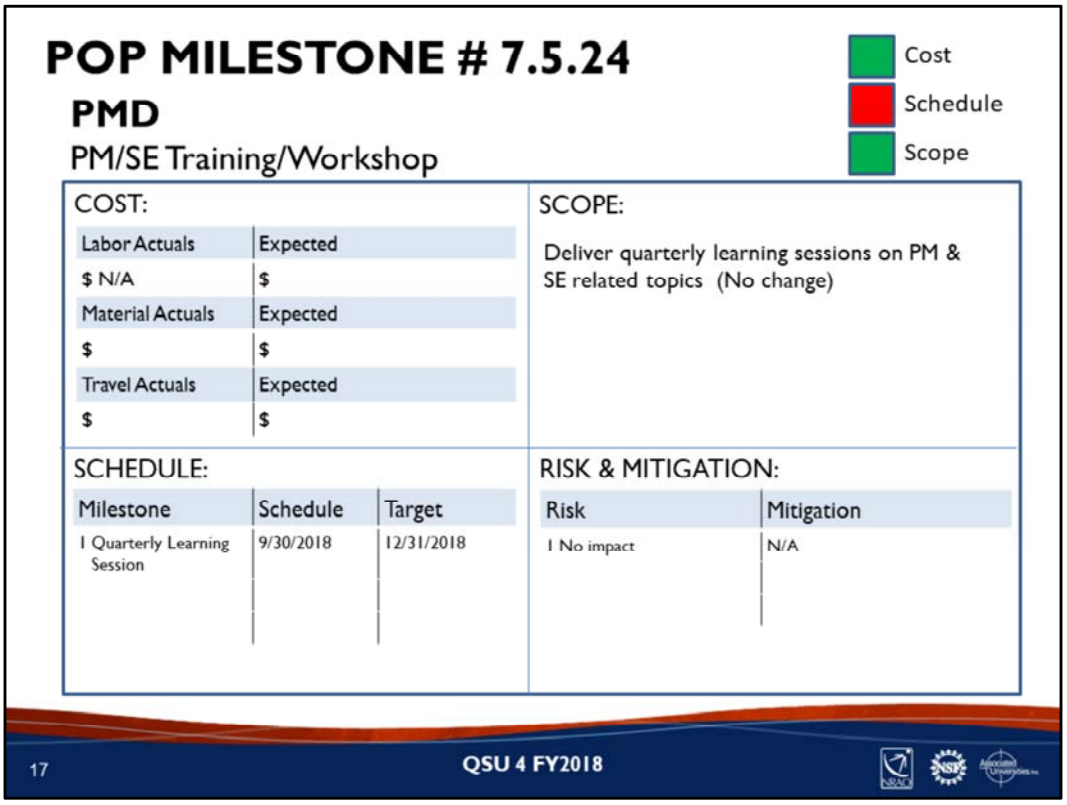


COST: DMS funds this activity at a higher WBS level. Costs are not tracked for this milestone.

SCOPE: Develop the first version of a long-term roadmap for ARDG.

SCHEDULE: The roadmap was created in Q3 and reviewed by the committee in Q4. The report from the committee is pending. We anticipate the major comments will involve the priority of RFI algorithm investigations and how the related CASA and ARDG work is organized. This will be completed in Q1 FY2019.

RISK & MITIGATION: Work is already underway on the roadmap deliverables and the anticipated impact of the review comments is manageable. Risk is low.

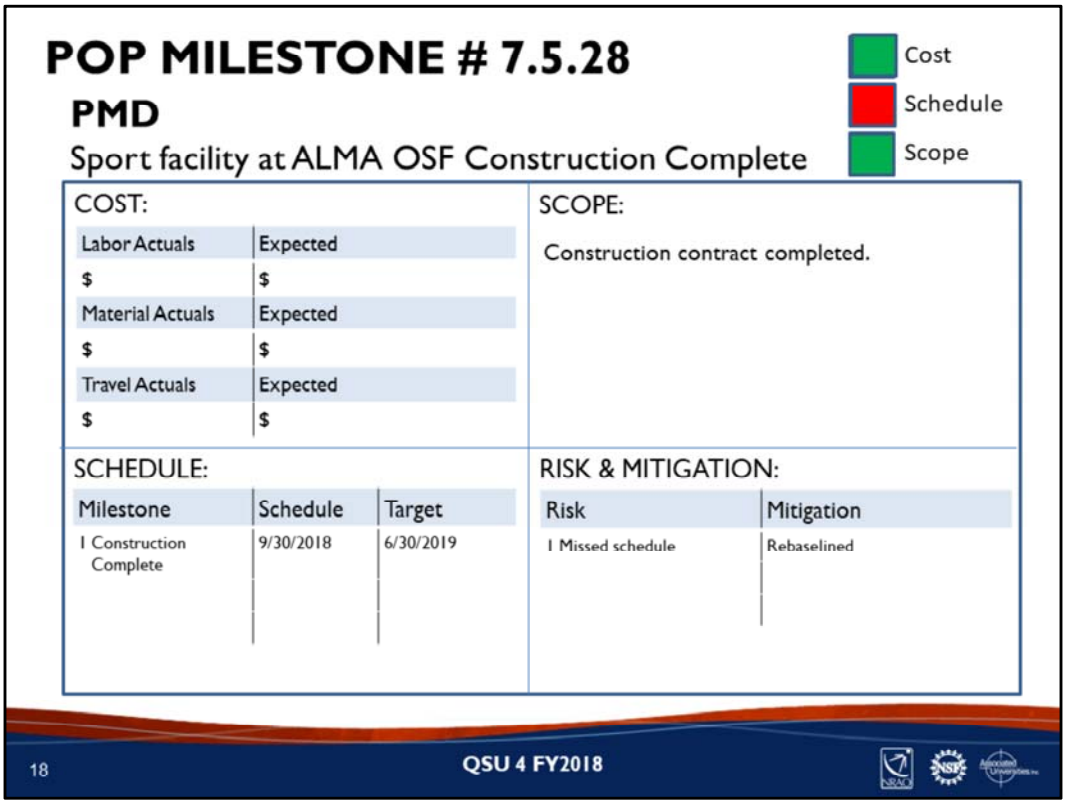


COST: No impact.

SCOPE: No impact.

SCHEDULE: Milestone slipped, is expected to complete in Q1 FY2019. Due to a delay in recruiting the ngVLA System Engineer, the interim position was extended by seven months. ngVLA priorities displaced completion of this milestone. The staffing shortfall has been addressed and this milestone will be made up in the next quarter.

RISK & MITIGATION: No impact.

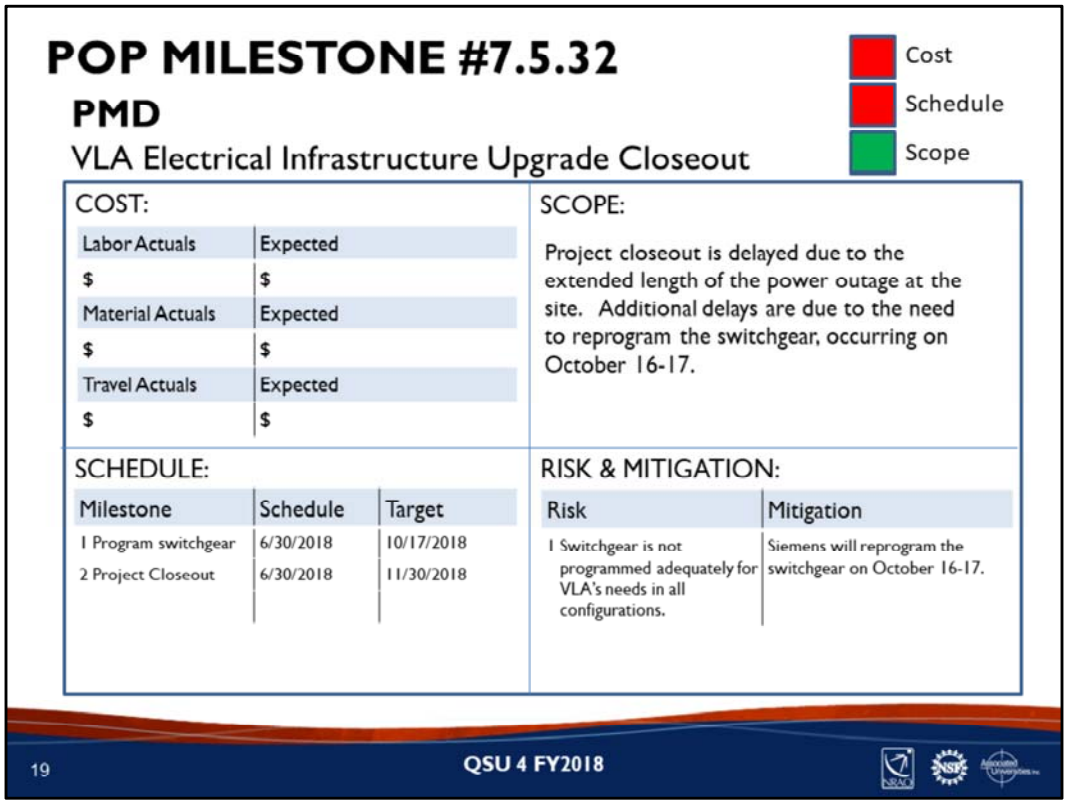


COST: No impact.

SCOPE: Construction contract complete.

SCHEDULE: The schedule for this project has been rebaselined. Construction completion is now scheduled for 30 June 2019.

RISK & MITIGATION: Project Risk has been reduced by the rebaselining of this project and the successful design review.

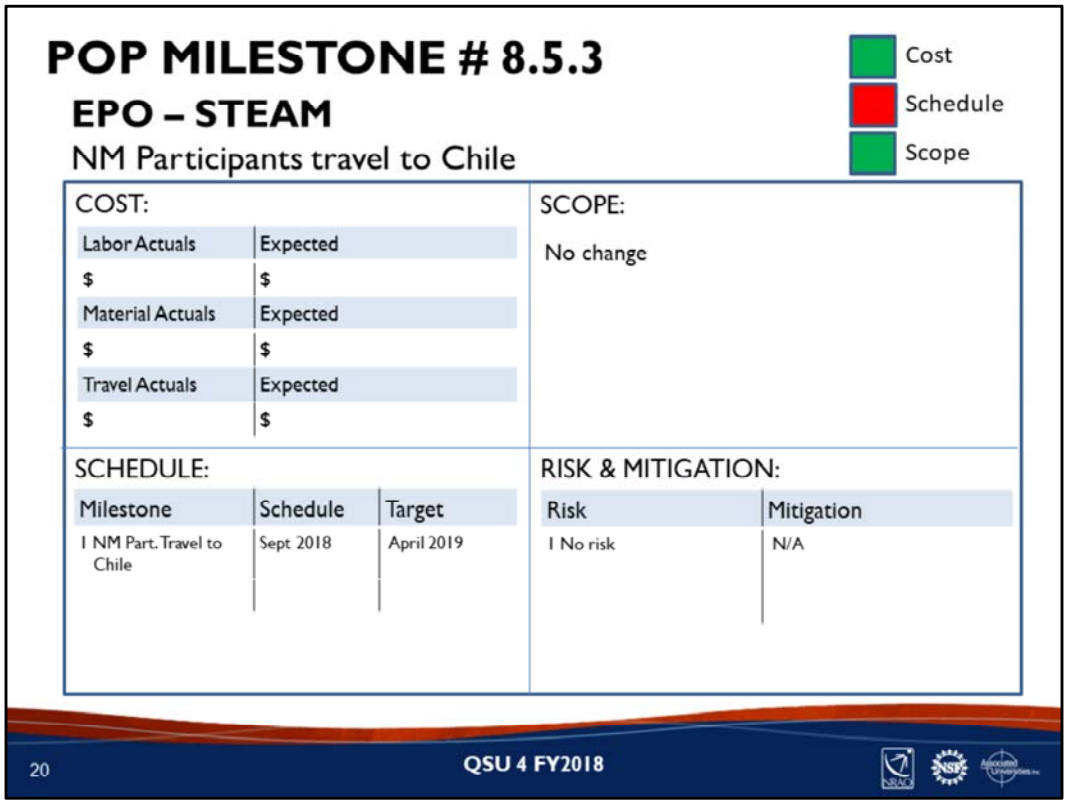


COST: An additional contract was established for Siemens to return to reprogram the switchgear.

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, occurring on October 16-17.

RISK & MITIGATION: When Siemens reprograms the switchgear, the risk of not having backup generator power in a utility outage will be mitigated for all configurations.

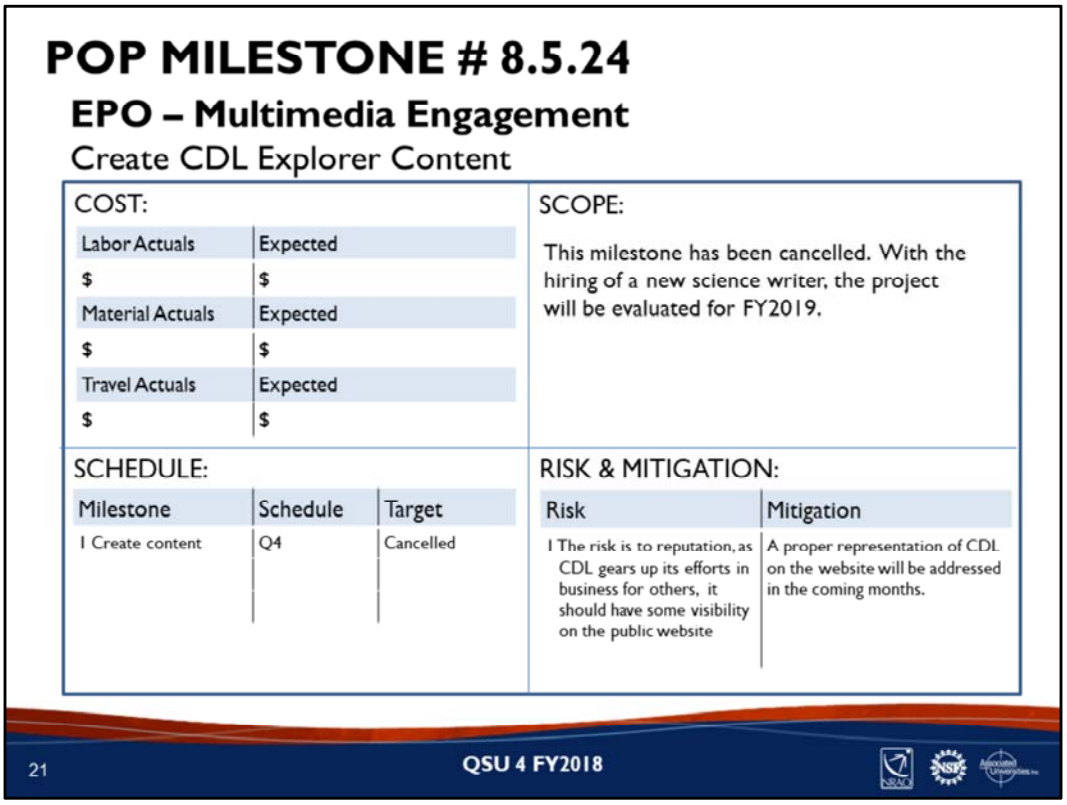


COST: No impact.

SCOPE: No impact.

SCHEDULE: When planning the POP, we had hoped that the two exchanges could happen back to back, but after further consultation with our partners, it turns out that spring break is a better time for the NM kids to be traveling, so their trip is simply delayed to later in their school year rather than at the beginning of their school year.

RISK & MITIGATION: No impact.

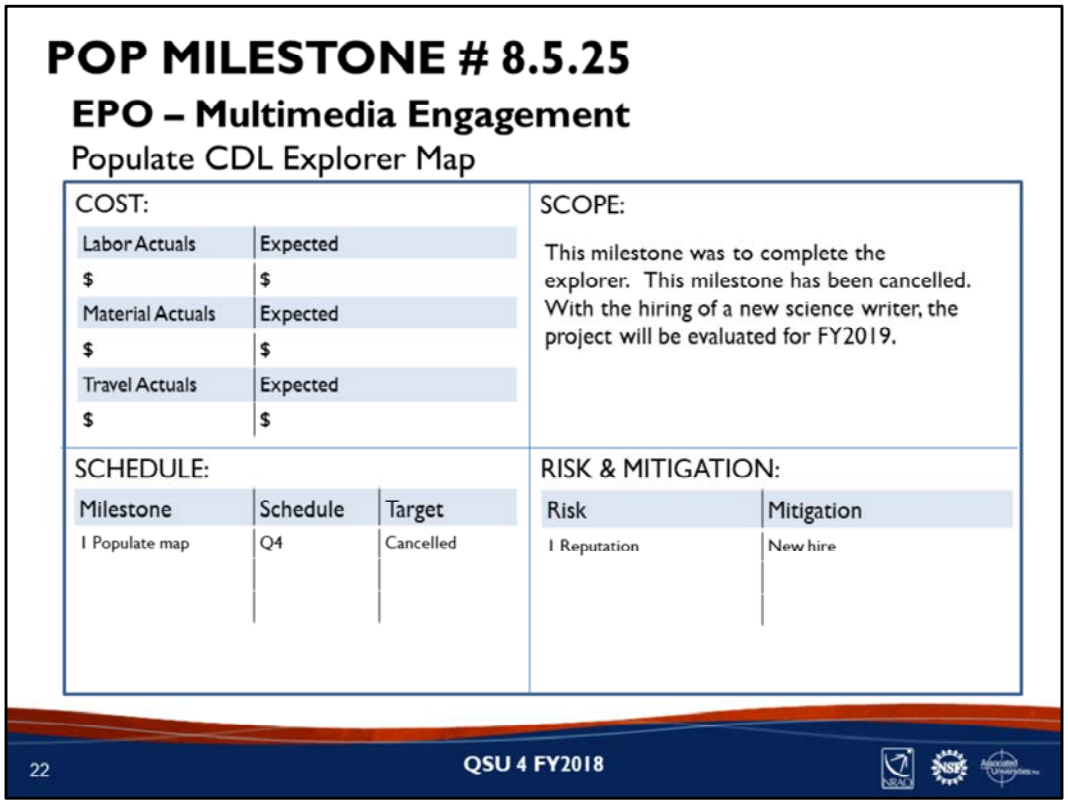


COST: No impact.

SCOPE: This milestone has been cancelled.

SCHEDULE: With the hiring of a new science writer, the project will be evaluated for FY2019.

RISK & MITIGATION: The risk is to reputation, as CDL gears up its efforts in business for others, it should have some visibility on the public website. Mitigation: The position was not filled when POP planning for FY2019 was underway, but a proper representation of CDL on the website will be addressed in the coming months. Resources are limited, however as we support ngVLA, so it may not be an explorer that we pursue.

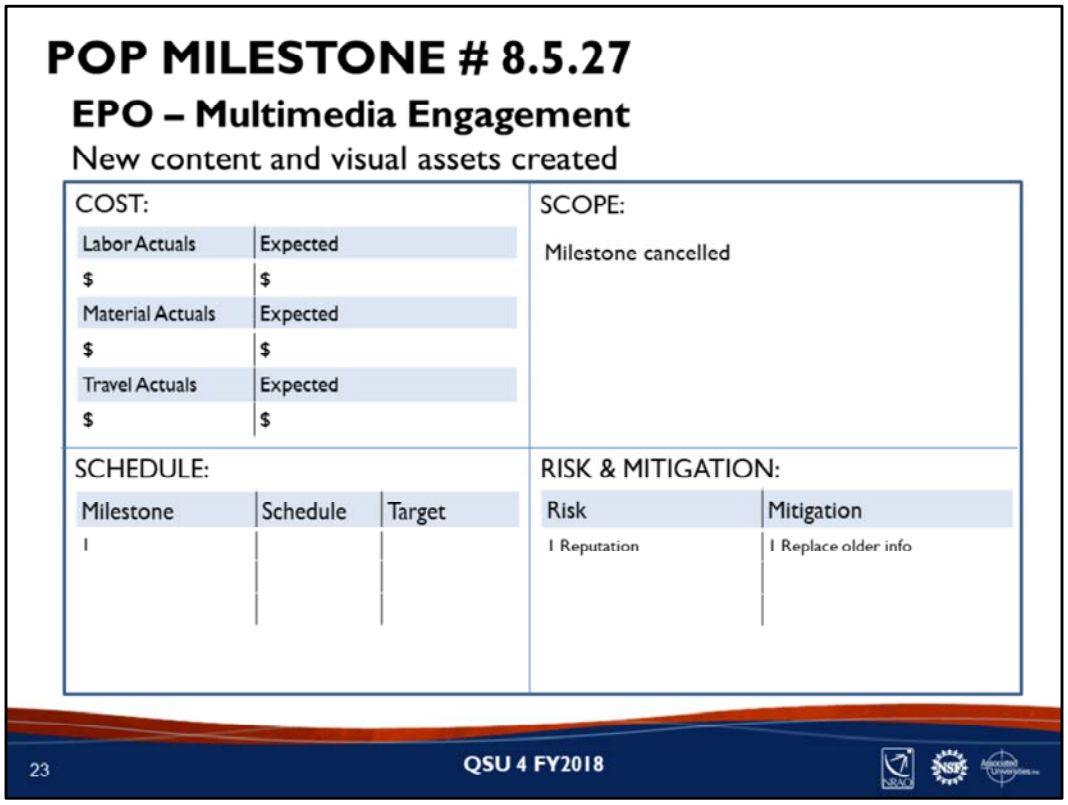


COST: No impact.

SCOPE: This milestone was to complete the explorer. This milestone has been canceled. With the hiring of a new science writer, the project will be evaluated for FY2019.

SCHEDULE: Milestone is cancelled.

RISK & MITIGATION: The risk is to reputation, as CDL gears up its efforts in business for others, it should have some visibility on the public website.

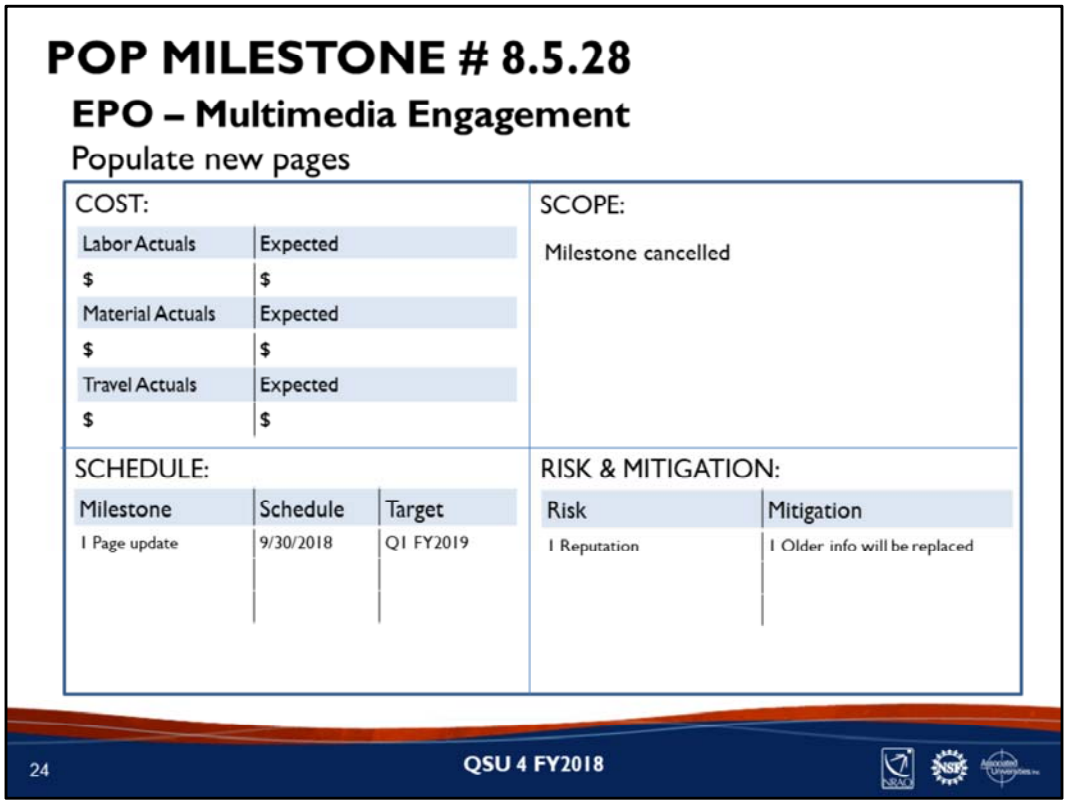


COST: No impact.

SCOPE: With the vacancy in the science writer position, this and Milestone 8.5.28 are cancelled.

SCHEDULE: Q1 FY2019.

RISK & MITIGATION: Older information is still on the website, but as mentioned above, these basics will be addressed in the development of the interferometry pages.

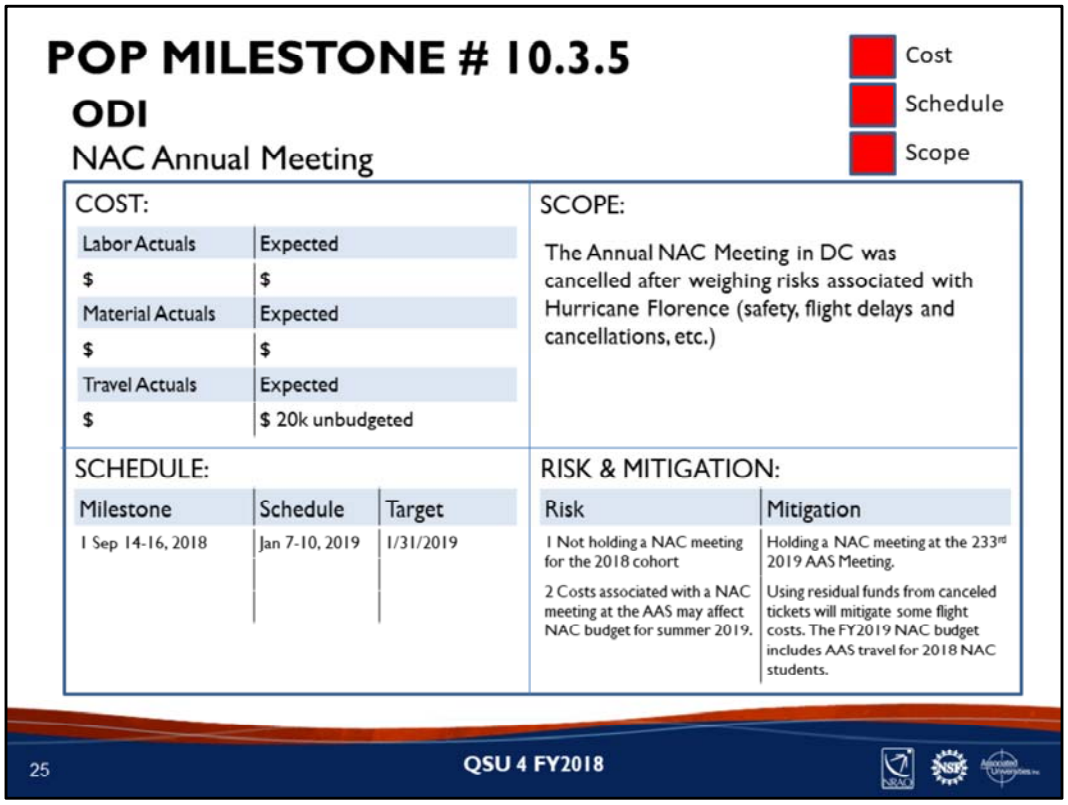


COST: No impact.

SCOPE: Q1 FY2019.

SCHEDULE: With the vacancy in the science writer position, this and Milestone 8.5.28 are cancelled. This content will be addressed in the FY2019 Interferometry milestones.

RISK & MITIGATION: Older information is still on the website, but as mentioned above, these basics will be addressed in the development of the interferometry pages.

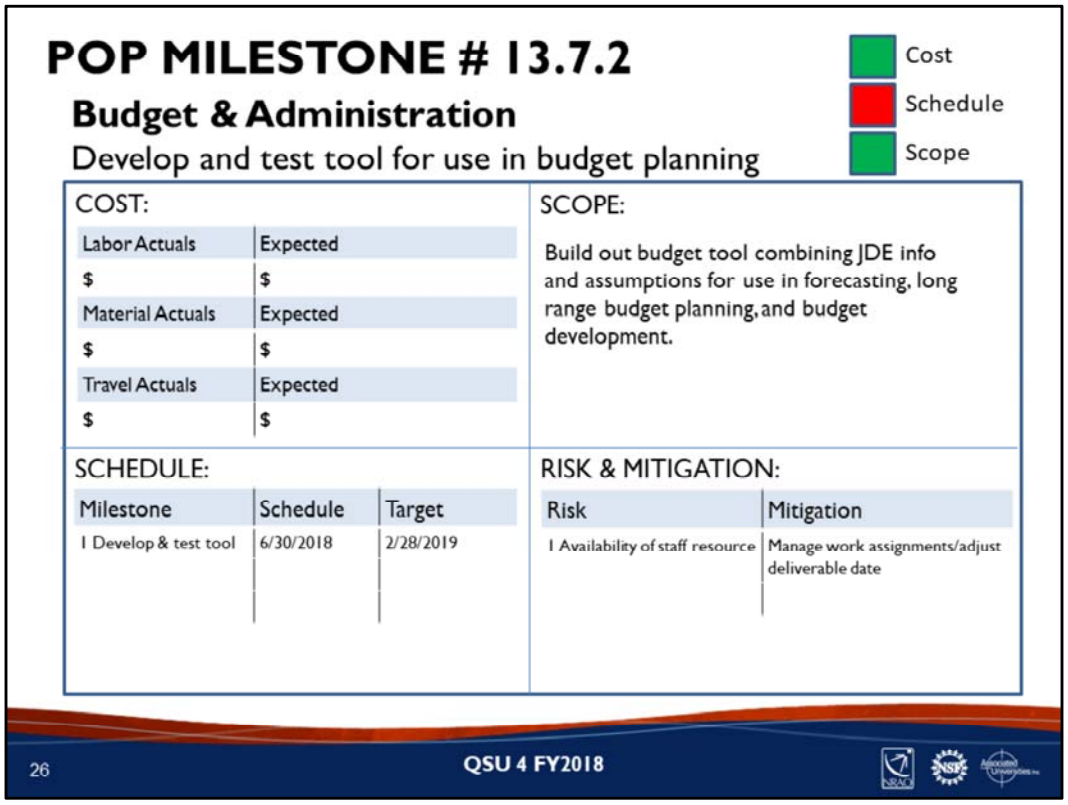


COST: The hotel waived the contracted costs associated with our booking (rooms and catering) and residual ticket value has been applied to new flights. The funds expended do not transfer to FY2019 but have been mitigated with carryover.

SCOPE: No impact.

SCHEDULE: The NAC meeting will take place during the AAS meeting (Jan 6-11, 2018).

RISK & MITIGATION: There is a reputational and programmatic risk to not holding a meeting highlighting the research of the 2018 summer NAC students. Holding the meeting at the AAS meets the intent of the NAC meeting, and may even have the benefit of offering a larger audience for the NAC student presentations. Associated costs are mitigated somewhat since the 2018 NAC students' travel to the AAS is already a part of the FY2019 budget; the non-budgeted costs relate to ~8 additional NAC students who will go to the AAS meeting.

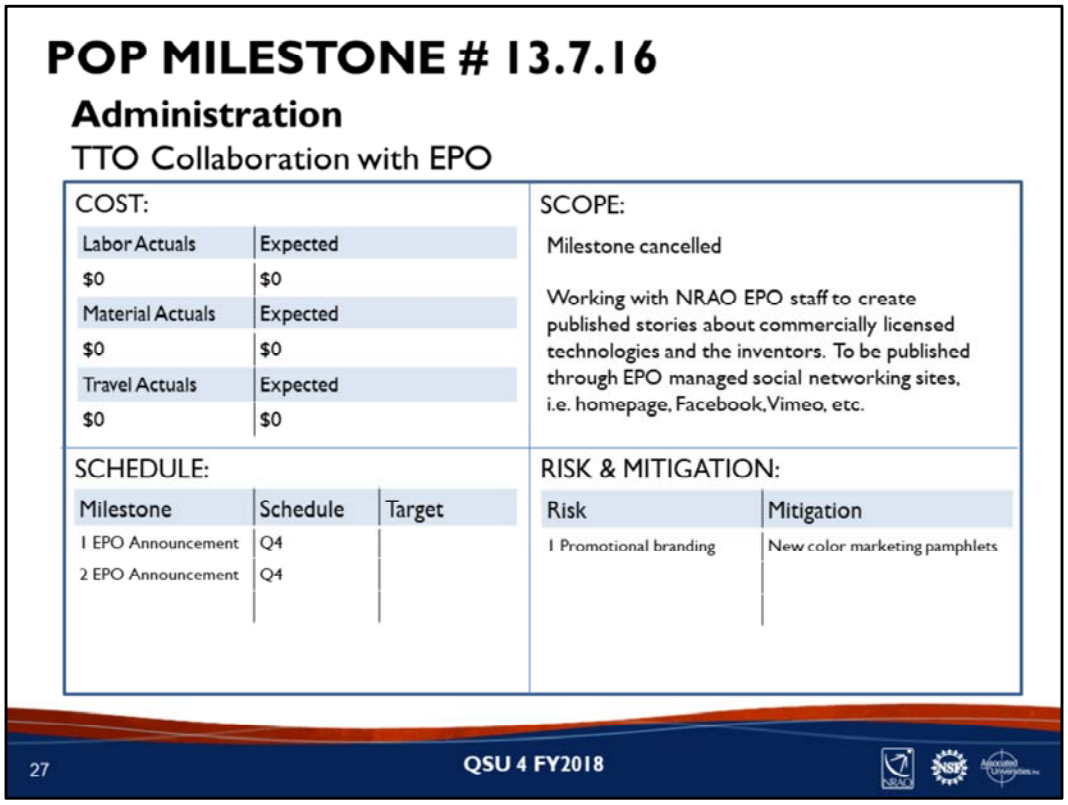


COST: No impact.

SCOPE: No impact.

SCHEDULE: This project is vulnerable to the availability of the Sr. Business Systems Analyst. During the key work period for this project, that resource was diverted into responding to various audit requests from USNO and NSF in addition to having some unforeseen other commitments.

RISK & MITIGATION: Continued risk of resource diversion. Need to be aggressive with making progress when time is available. Upcoming ALMA audit materials are well organized and should enable quick access if/when those requests materialize, limiting the potential disruption from that source.

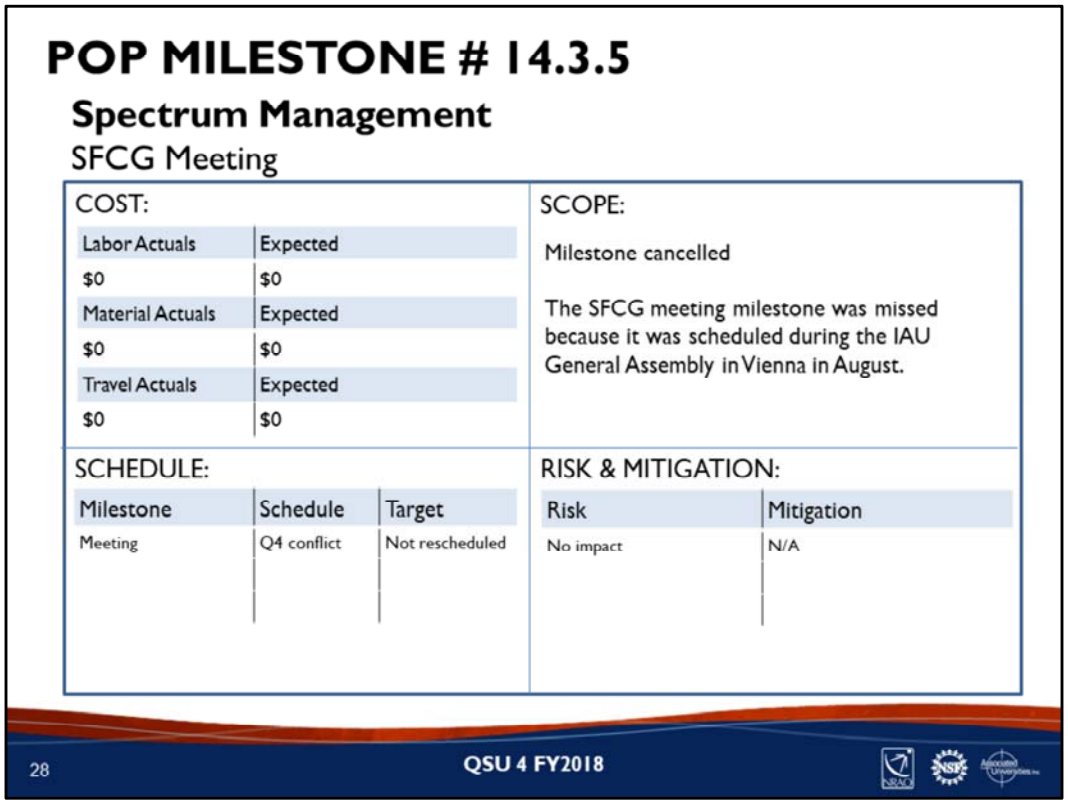


COST: No additional costs were or expected to be incurred.

SCOPE: The scope changed, when EPO decided to hire a different person to carry out the EPO writing campaign, which included this milestone.

SCHEDULE: This milestone has been cancelled because of EPO staffing changes. A new EPO writer is being hired sometime in FY2019.

RISK & MITIGATION: Risk: delay in promotional branding of the NRAO as a place of high tech development. Mitigation: efforts underway to create color marketing pamphlets for general circulation at conferences and workshops.

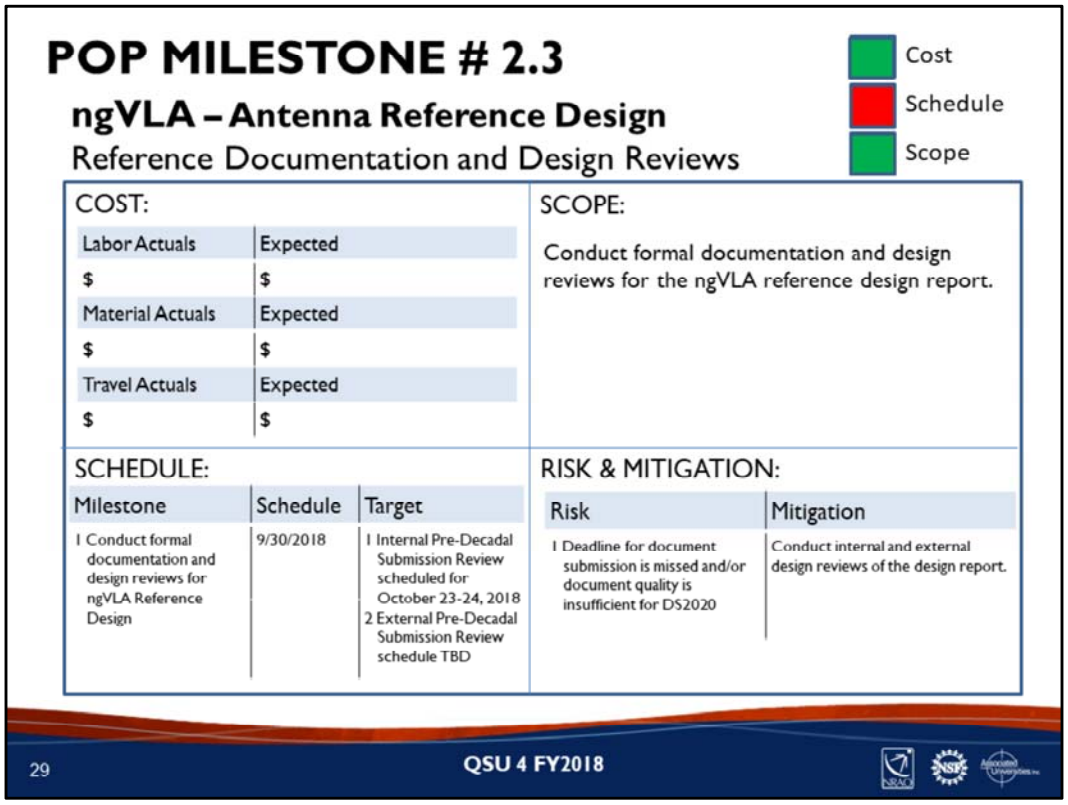


COST: No impact.

SCOPE: No impact.

SCHEDULE: The SFCG meeting milestone was missed because it was scheduled during the IAU General Assembly in Vienna in August. The scheduling of the SFCG meeting was unknown at the time the milestones were originally formulated.

RISK & MITIGATION: No impact.



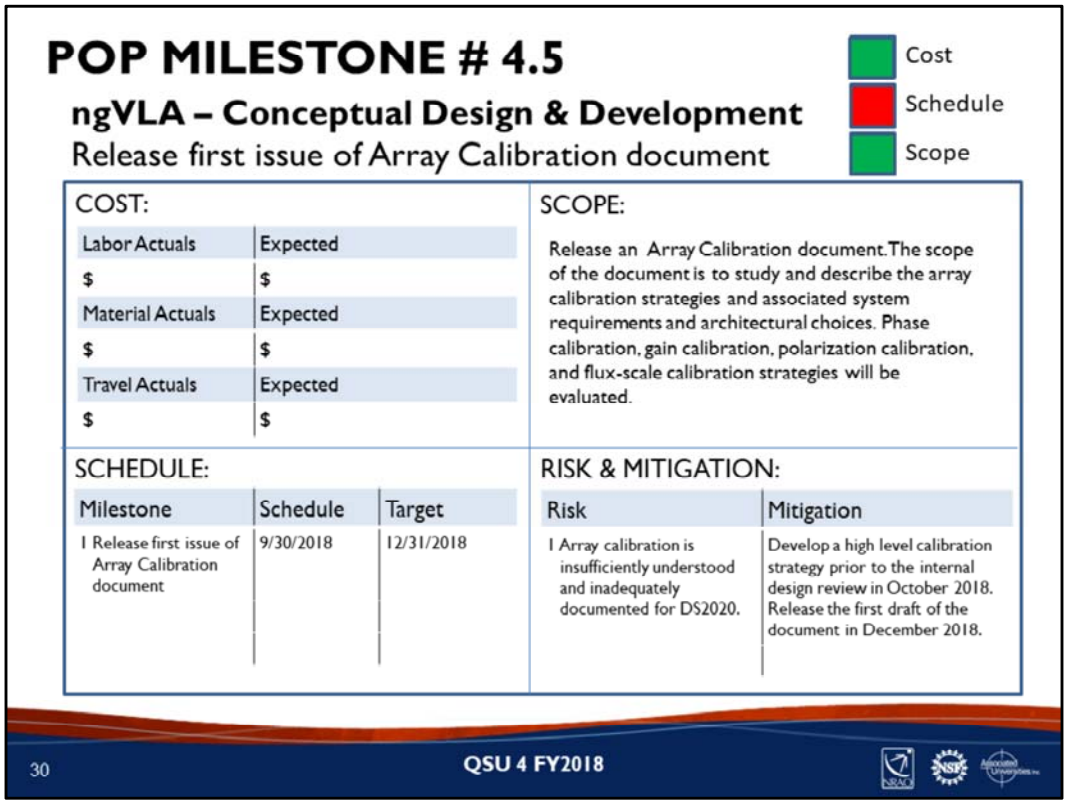
Owner: Cristina Simon/Rob Selina

COST: No impact.

SCOPE: The deliverable for this milestone is an approved ngVLA reference design and associated documents. No impact.

SCHEDULE: A delayed hire of the ngVLA system engineer delayed the conduct of the review. Additionally, the schedule for the Astro2020 Decadal Survey submission was slightly delayed to Q2 FY2019.

RISK & MITIGATION: The ngVLA will utilize the additional time prior to the Decadal Survey submission to conduct two reference documentation and design reviews. The internal review was conducted in October 2018. The external review will be coordinated to the Decadal Survey deadlines, date TBD.



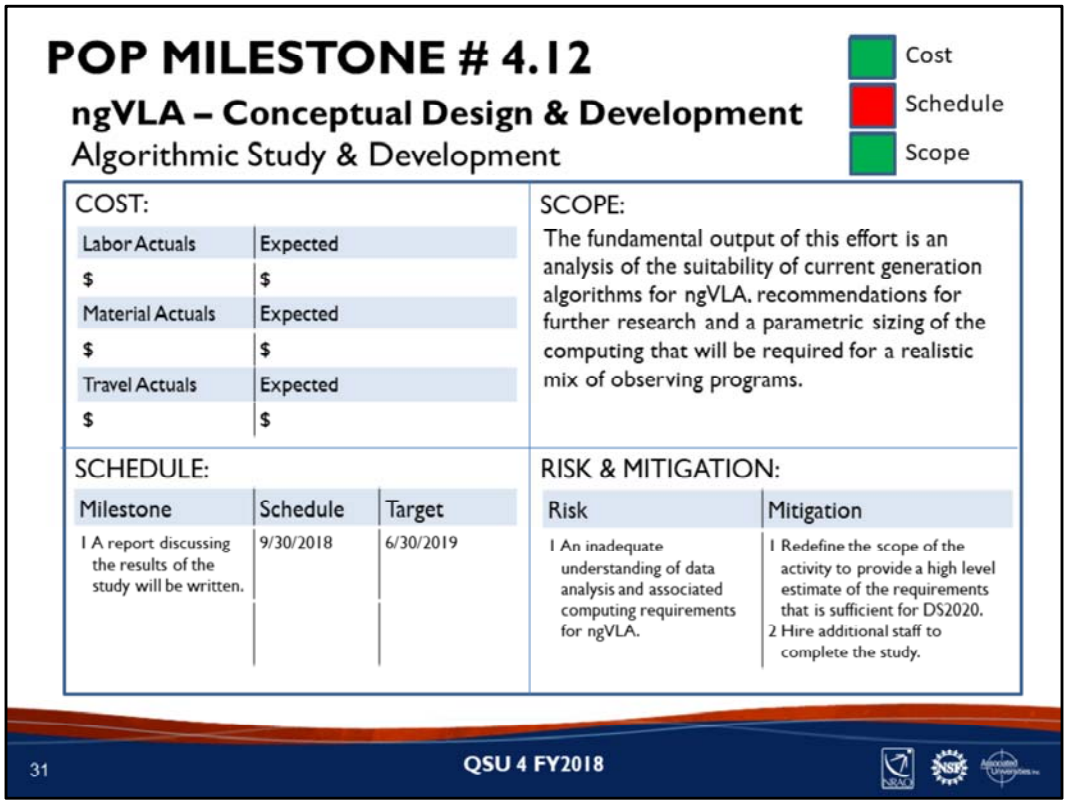
Owner: Bryan Butler

COST: No impact.

SCOPE: No impact.

SCHEDULE: The first issue of the Array Calibration document was delayed due to a delay in the hiring of the research associate (RA) meant to do the bulk of the work. The RA is now in place. The document is scheduled for release in late December 2018.

RISK & MITIGATION: A delayed or incomplete array calibration document may result in the calibration requirements of the ngVLA being underestimated or inadequately understood, and would suggest an incomplete technical concept in the DS2020 review process. This risk will be mitigated by expediting the completion of the document. The RA is now in-place and working on the document for release by the end of 2018. A preliminary array calibration strategy will be documented prior to the internal system-level requirements review in October 2018.

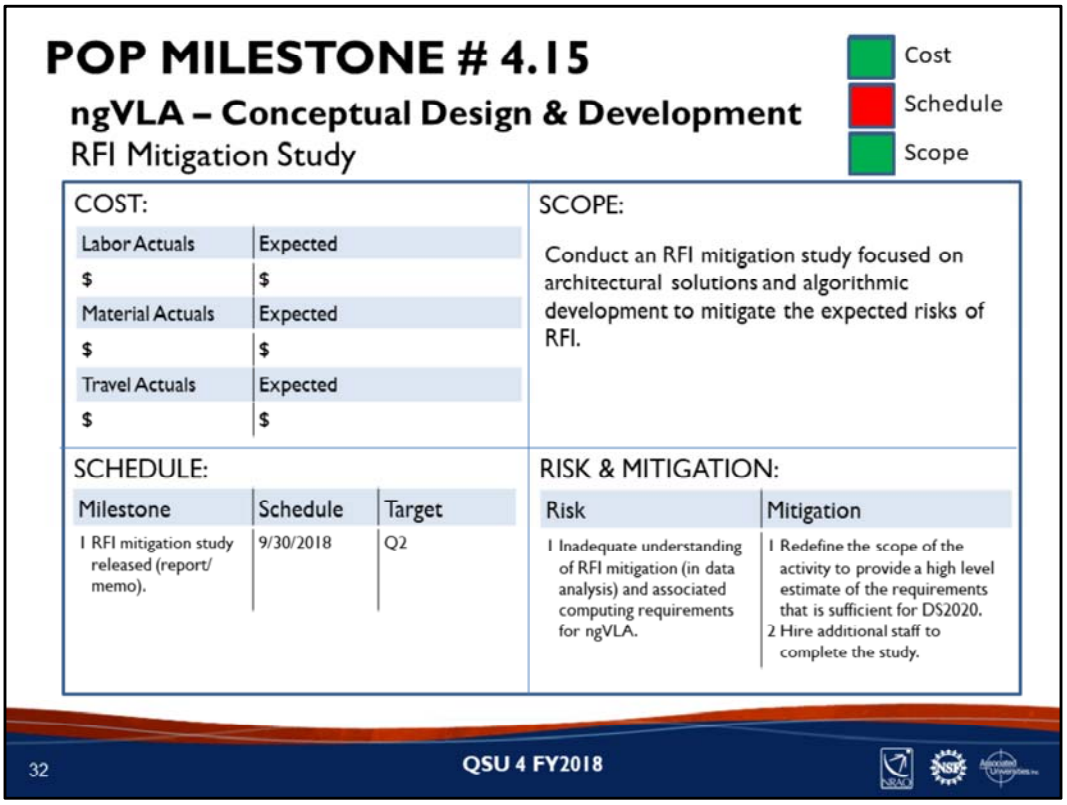


COST: No impact.

SCOPE: In support of the software architectural definition, algorithmic work and studies are required to understand the overall size of computing systems and the scaling relationships with key parameters. After a survey of existing algorithms, areas for improvement may be identified, such as gridding and deconvolution within the imaging pipeline. The fundamental output of this effort is an analysis of the suitability of current generation algorithms for ngVLA, recommendations for further research and a parametric sizing of the computing that will be required for a realistic mix of observing programs.

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 study on the timescale of DS2020. Depending upon the details of the risk mitigation strategy, the new target date for this milestone is June 30, 2019.

RISK & MITIGATION: The risk of not completing the algorithm study is an inadequate understanding of the data analysis and associated computing requirements for ngVLA. This could lead to inadequate estimate of ngVLA computing requirements and an incomplete technical concept for the array. The risk will be mitigated by redefining the scope of the activity to provide an estimate that is sufficient for the purposes of DS2020 and/or hiring additional staff to complete the study.



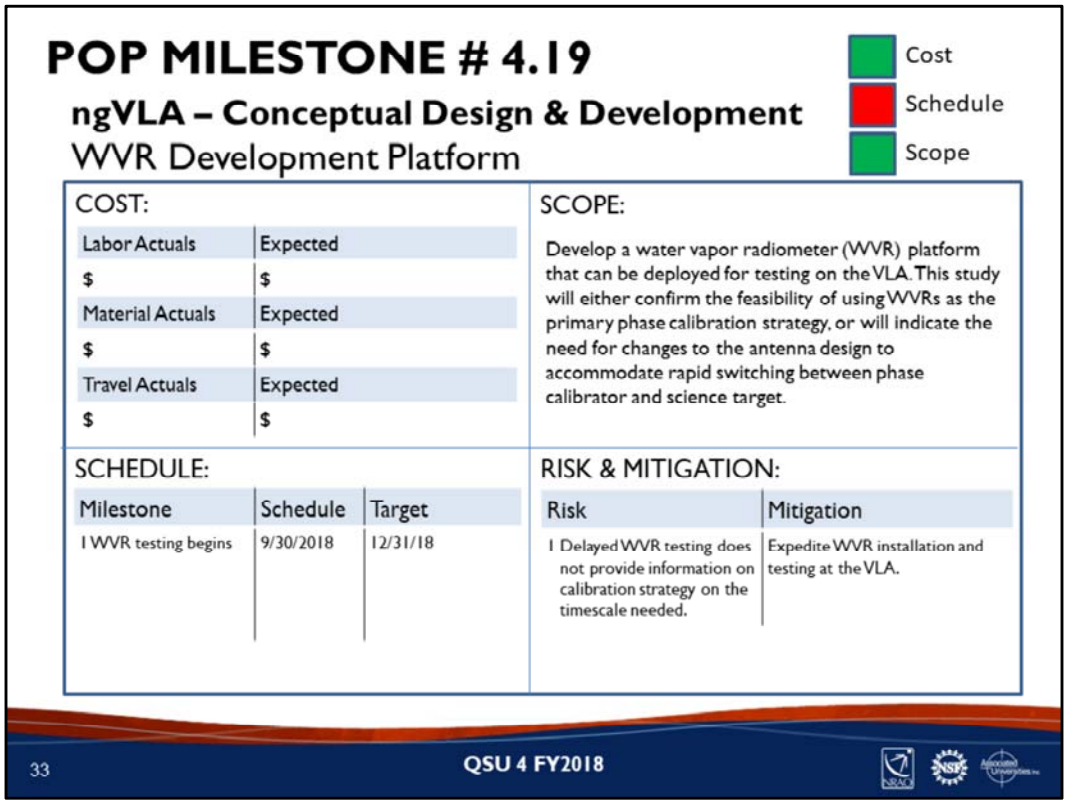
Owner: Rafael Hiriart

COST: No impact

SCOPE: An RFI mitigation report was issued earlier this year. 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 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 in Q2 FY2019.

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.

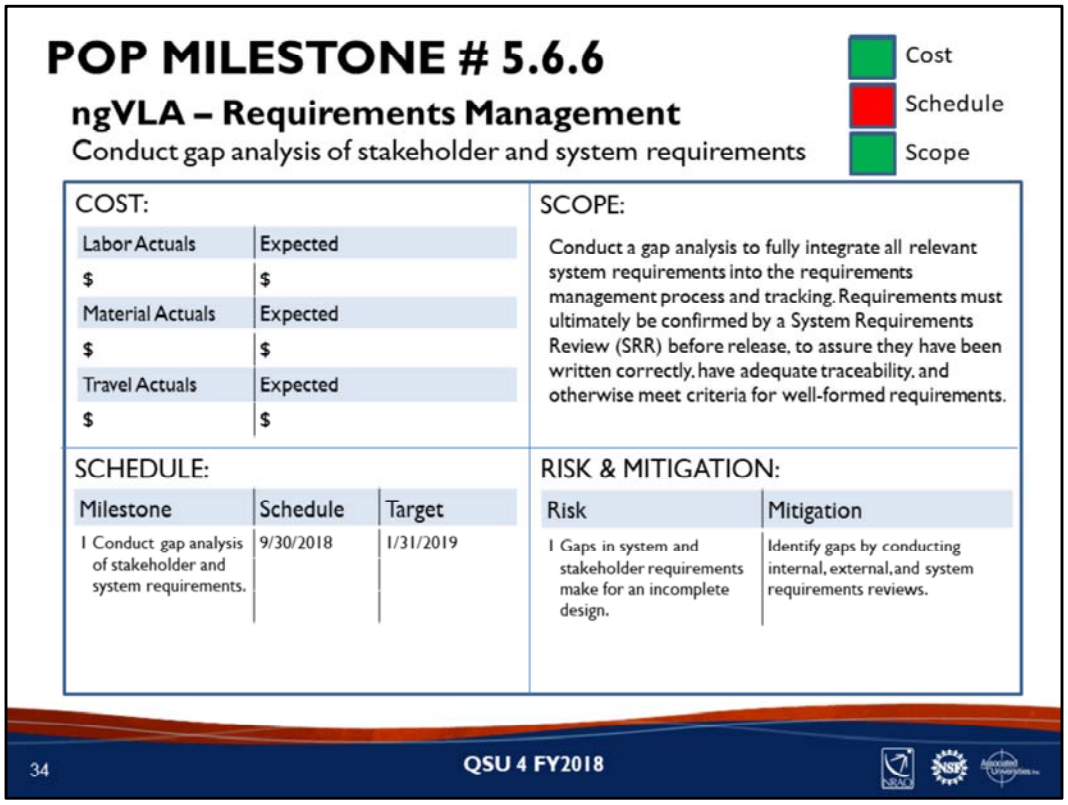


COST: No impact.

SCOPE: A number of phase calibration strategies have been investigated for the ngVLA. The conventional solution involves switching between the science target and a phase calibrator over short cycles in order to calibrate atmospheric and instrumental phase. Such an approach becomes both expensive and impractical for large antennas and reduces the time spent on the science target. This reduction in array efficiency directly impacts the achievable sensitivity limits for the system. ALMA has demonstrated the effectiveness of water vapor radiometry at 185 GHz. The ALMA WVR is routinely used in observations and allows the observatory to observe phase calibrators much less frequently, thereby improving observing efficiency. However, the lower elevation of the VLA site will not allow the operation of 185 GHz WVRs for the ngVLA, and the use of 22 GHz WVRs has not been adequately tested for the project to adopt this as the preferred phase calibration strategy. This study aims to improve both our understanding of 22 GHz WVR phase solutions and their limits by testing a functional prototype during VLA observations. No impact.

SCHEDULE: WVR testing has not begun yet, due to delays in delivery of hardware, and the inability to access the VLA during the extended Electrical Infrastructure Upgrade. The first WVR will be installed at the VLA, and testing will begin by the end of 2018.

RISK & MITIGATION: The risk posed by delayed testing of the WVR is that the information needed to inform calibration strategies does not occur on the timescale needed for DS2020. The risk can be mitigated by expediting the installation and testing of the WVR prototype at the VLA.

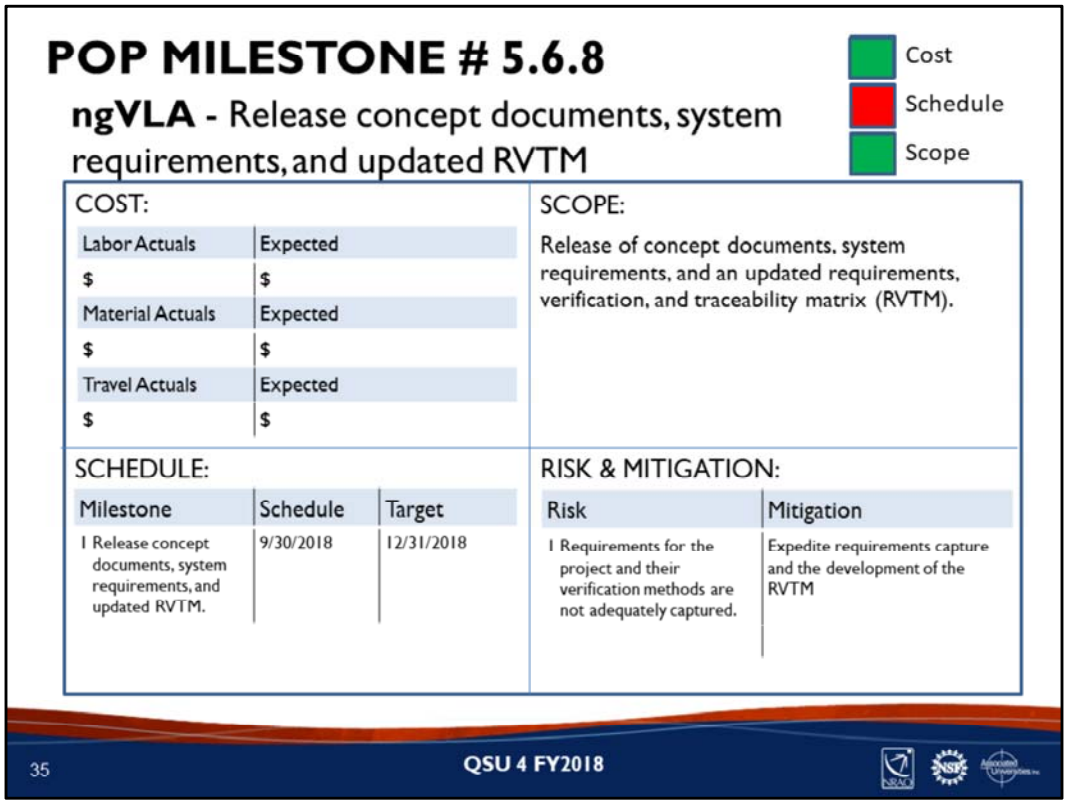


COST: No impact.

SCOPE: No impact.

SCHEDULE**:** The analysis was delayed by the delayed hiring of the ngVLA systems engineer (SE). The SE has now joined the project office staff. Gaps are being identified through the internal/external reviews that will occur in October 2018 and a date TBD, respectively.

RISK & MITIGATION: Gaps in stakeholder and systems requirements make for an incomplete design of the ngVLA. Mitigate the risk by identifying gaps over the course of upcoming design reviews.



Owner: Cristina Simon/Bob Treacy

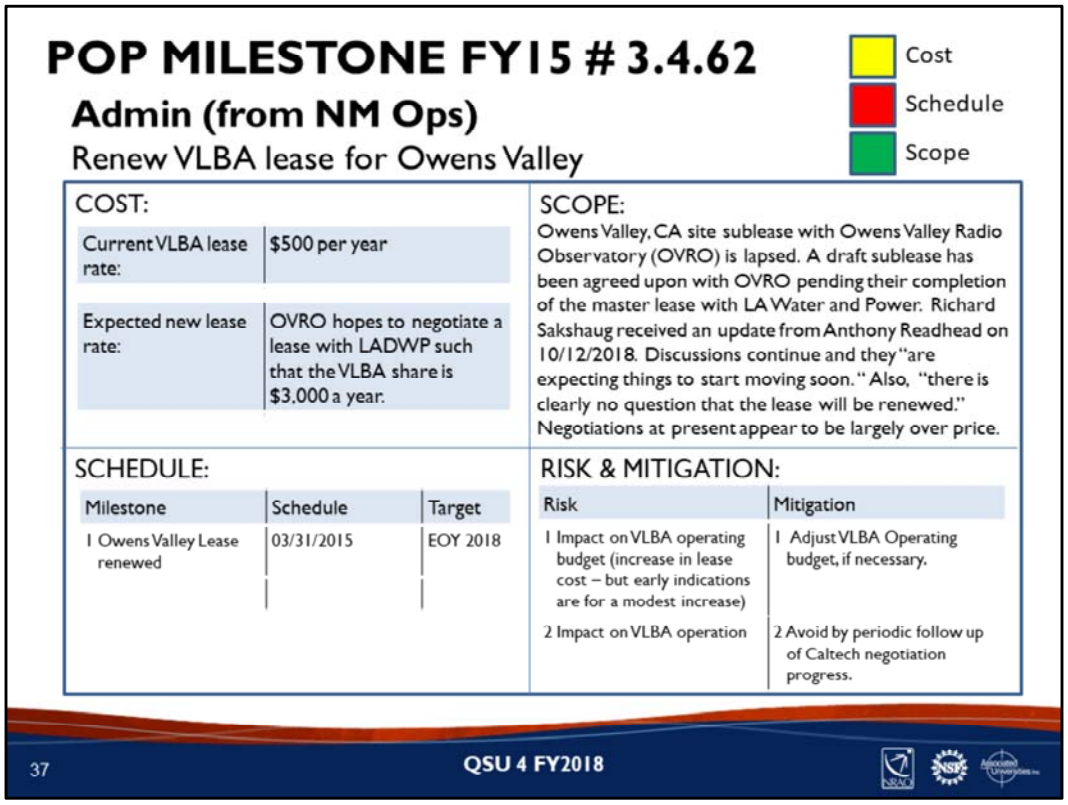
COST: No impact

SCOPE: No impact

SCHEDULE: The release of the concept documents, system requirements and Requirements Verification Traceability Matrix (RVTM) was delayed due to the delayed hiring of the ngVLA systems engineer (SE). The SE has now joined the project office staff. Work on all of these items is in progress. We anticipate they will be completed by the end of 2018.

RISK & MITIGATION: The risk to the project is its requirements and associated verification methods are not adequately captured. This can be mitigated by expediting requirements capture and the development of the RVTM.


Carryover Milestones



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 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 propose to cancel this milestone for FY2015 since its ultimate resolution is beyond our control. 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.

FY2018 Carryover Milestones – 1 of 2

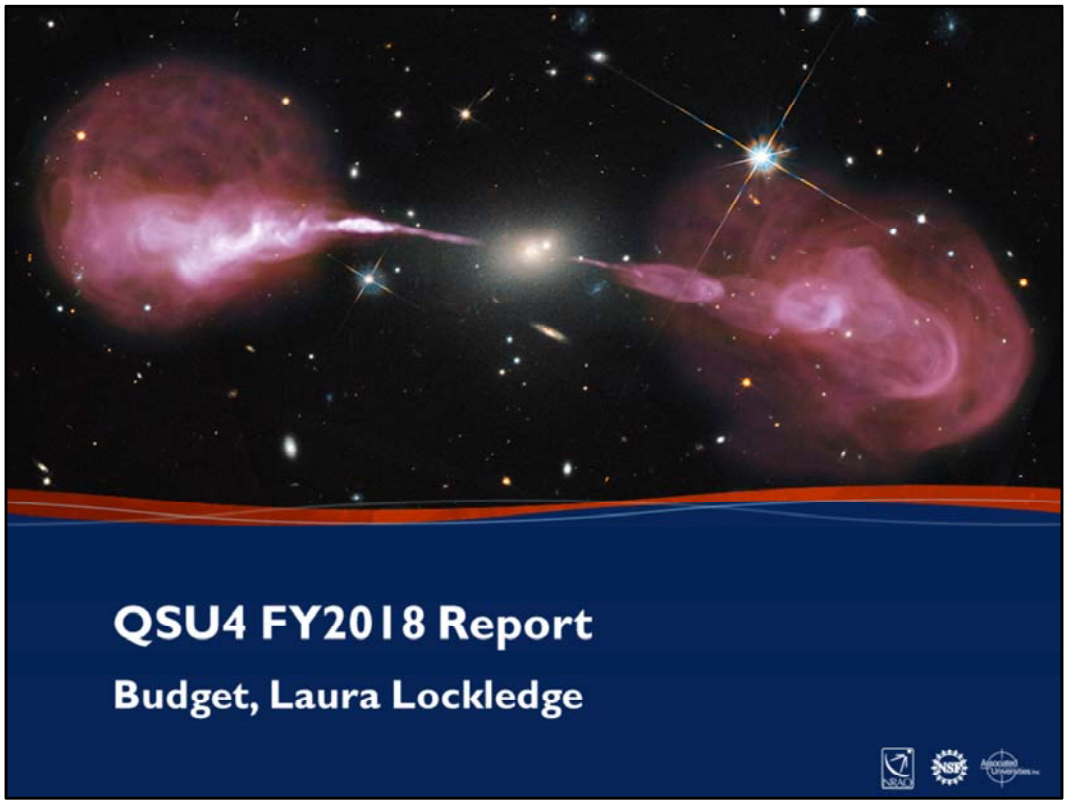
POP Section	POP Milestone	Milestone	Completion Date	New Completion Date	Q4 Performance Assessment		
					Cost	Schedule	Scope
2.5		**Atacama Large Millimeter/submillimeter Array (ALMA)**					
		Maintenance, Renewal, and Warranty Claims					
	29	NA Antenna Surface Accuracy Installation (25 antennas)	3/31/2018	Q3			
	32	Deliver FEMVs 1 & 2 to JAO	3/31/2018	Q2			
	33	Deliver FEMVs 3 & 4 to JAO	6/30/2018	Q4			
3.4		**Very Large Array**					
		VLA Development					
	27	Realfast operational for limited observing modes	9/30/2018	Q1			
4.3		**Central Development Laboratory**					
		Research and Development					
	8	Explore DOMT calibration using hot-cold-noise	9/30/2018	Q2			
	9	Demonstrate high-bandwidth unformatted serial link with integrated FE	9/30/2018	Q1			
	10	Balanced 4–12 GHz IF amplifier	9/30/2018	Q4			
5.6		**Science Support and Research**					
		Scientific User Support & Student Programs					
	28	CASA Guides	6/30/2018	Q1			
	33	Student Observing Support Selection (ALMA)	9/30/2018	Q1			
6.5		**Data Management & Software**					
		Scientific Information Services					
	6	NGAS storage replacement	9/30/2018	Q2			
		SSA					
	25	Archive Access Tool release 4.0	9/30/2018	Q3			
		ARDG					
	33	Algorithm R&D Roadmap v.1	6/30/2018	Q1			
7.5		**Program Management Department**					
		Headquarters					
	24	PMSE Training/Workshop	9/30/2018	Q1			
		Sport Facility at ALMA OSF					
	28	Sport facility at ALMA OSF Construction Complete	9/30/2018	Q3			
		VLA Electrical Infrastructure Upgrade					
	32	VLA Electrical Infrastructure Upgrade Closeout	6/30/2018	Q1			

FY2018 Carryover Milestones – 2 of 2

POP Section	POP Milestone	Milestone	Completion Date	New Completion Date	Q4 Performance Assessment		
					Cost	Schedule	Scope
8.5		Education and Public Outreach					
		STEAM					
	3	NM participants travel to Chile	9/30/2018	Q3			
10.3		Office of Diversity & Inclusion					
		Local and National Programs					
	5	NAC Annual Workshop	9/30/2018	Q2			
13.7		Administration					
		Budget					
	2	Develop and test tool for use in budget planning	6/30/2018	Q2			
		ngVLA					
2		*Antenna Reference Design*					
	3	Conduct formal documenttion and design reviews of ngVLA Reference Design	9/30/2018	Q2			
4		*Conceptual Design & Development*					
	5	Release first issue of Array Calibration document	9/30/2018	Q1			
	12	Algorithmic Study released	9/30/2018	Q3			
	15	RFI Mitigation study released	9/30/2018	Q3			
	19	WVR Testing begins	9/30/2018	Q1			
5		*Administration and Management*					
5.6		Requirements Management					
	6	Conduct gap analysis of stakeholder and system requirements	6/30/2018	Q2			
	8	Release concept documents, system requirements and updated RVTM	9/30/2018	Q1			

Annual POP Scorecard

Annual POP Score Card		
Total number of 2018 POP Milestones:	Total Q4 2018 milestone deadlines: 110	Total number of 2017 POP Milestones: 303
352 with 454 quarterly deadlines	Total completed on time: 85	Percent of total completed on time: 82.84%
	Percent of total completed on time: 77.3%	Percent of total completed in the year: 89.11%
Total 2018 milestone deadlines completed on time: 375		Percent of total postponed to next year: 5.94%
Percent completed on time: 82.6%	Total Q3 2018 milestone deadlines: 112	Percent of total 2017 milestones cancelled: 4.62%
	Total completed on time: 88	
Total completed in the year 2018: 420	Percent of total completed on time: 78.6	
Percent completed in the year: 92.5%		Total number of 2016 POP Milestones: 311
	Total Q2 2018 milestone deadlines: 118	Percent of total completed on time: 85.21%
Total moved to next year: 25	Total completed on time: 92	Percent of total completed in the year: 91.32%
Percent postponed to next year: 5.5%	Percent of total completed on time: 78	Percent of total postponed to next year: 3.86%
		Percent of total 2016 milestones cancelled: 4.82%
Total 2018 milestones cancelled: 12	Total Q1 2018 milestone deadlines: 107	
Percent of 2018 milestones cancelled: 2.4%	Total completed on time: 89	
	Percent of total completed on time: 83.2	


QSU4 FY2018 Report
Budget, Laura Lockledge

FY2018 Overall Comments

- All fund sources completed the year within available resources.
- Final benefits rate of 34.5% vs. budget of 36% reflects health expenses below projection and includes a mid-year unbudgeted contribution to HSA/HRAs. $646K over-recovery returned to the fund sources.
- FY2018 rates approved in August and new rate structure now in place.
- Results as of 10/26 – adjustments continue.

CSA-V Q4 Results

	FY18 POP Budget	FY18 Rev. Budget	FY18 YTD Expenses	YTD % Rev Budget
NSF	32,860	39,960	39,960	100.0%
Carryforward/Other	405	1,306	1,306	0.0%
Total CSA-V Revenu	**33,265**	**41,266**	**41,266**	100.0%
Telescope Ops	11,476	12,439	11,207	90.1%
Development	3,506	2,569	2,367	92.1%
Science Ops	5,905	6,316	6,220	98.5%
Admin Services	9,464	10,044	7,816	77.8%
Director's Office	2,161	2,154	1,974	91.6%
Education & Public Out	753	820	726	88.5%
ngVLA		6,921	5,363	77.5%
FY18, Total	**33,265**	**41,263**	**35,673**	**86.5%**
FY18 CSA-V Net	**0**	**3**	**5,593**	

- Telescope ops looks underspent due to track $.
- Admin services underspent due to unspent reserve funds.
- Includes WIP – Electrical infrastructure project.

CSA-V Surplus/Carryover Analysis

FY18 Available Funds		41,266
less Expenses		35,673
less Open Commitments		1,276
Closing Balance		**4,317**
Other Commitments & Adjustments		
ngVLA Carryforward		1,570
VLA Track Allocation		1,000
Carryforward Budgeted		510
Preliminary Uncommitted C/F		**1,238**
Carryforward Items		
NAC Conference		40
VLA Hwy 60 Crossing		250
DMS 2-year Surge		948
Total, Carryforward items		**1,238**

CSA-A Q4 Results

	FY18 POP Budget	FY18 Rev. Budget	FY18 YTD Expenses	YTD % Rev Budget
NSF	43,480	38,550	38,550	100.0%
Carryforward	13,700	16,291	16,291	100.0%
Canadian Contribution	1,500			0.0%
Other	400	754	754	100.0%
Total CSA-A Revenues	**59,080**	**55,595**	**55,595**	100.0%
Telescope Ops	22,521	24,551	23,339	95.1%
Development	5,585	9,894	2,885	29.2%
Science Ops	6,869	7,215	6,105	84.6%
Admin Services	7,759	9,653	8,729	90.4%
Director's Office	2,894	3,620	3,069	84.8%
Education & Public Outreach	679	662	659	99.5%
FY18, Total	**46,307**	**55,595**	**44,786**	**80.6%**
FY18 CSA-A Net	**12,773**	**0**	**10,809**	

- Telescope ops looks underspent due to track currency/fuel reserve.
- Development line includes full ALMA development resources, including future year development activities.
- Includes WIP – multicancha project.
- No FY2018 drawdown of Canadian funds

CSA-A Surplus/Carryover Analysis

FY18 Available Funds		55,595
less Expenses		44,786
less Open Commitments		829
Closing Balance		**9,980**
Other Commitments & Adjustments		
Development Reserves		6,983
JAO Forward Funded Projects		492
JAO Currency Reserve		1,500
Multicancha		380
Uncommitted C/F		**625**

Q4 CSA F & CSA H Results

- CSA-F
  - $2.5M awarded in Q4
  - Planning/acquisitions work underway
  - No expenditures as of 9/30/18
- CSA-H
  - $2M awarded in Q4
  - $368K expended inclusive of pre-award costs (tiger team visit) and antenna work.
  - 18.4% expended; 23.3% committed.

ICC Q4 Results

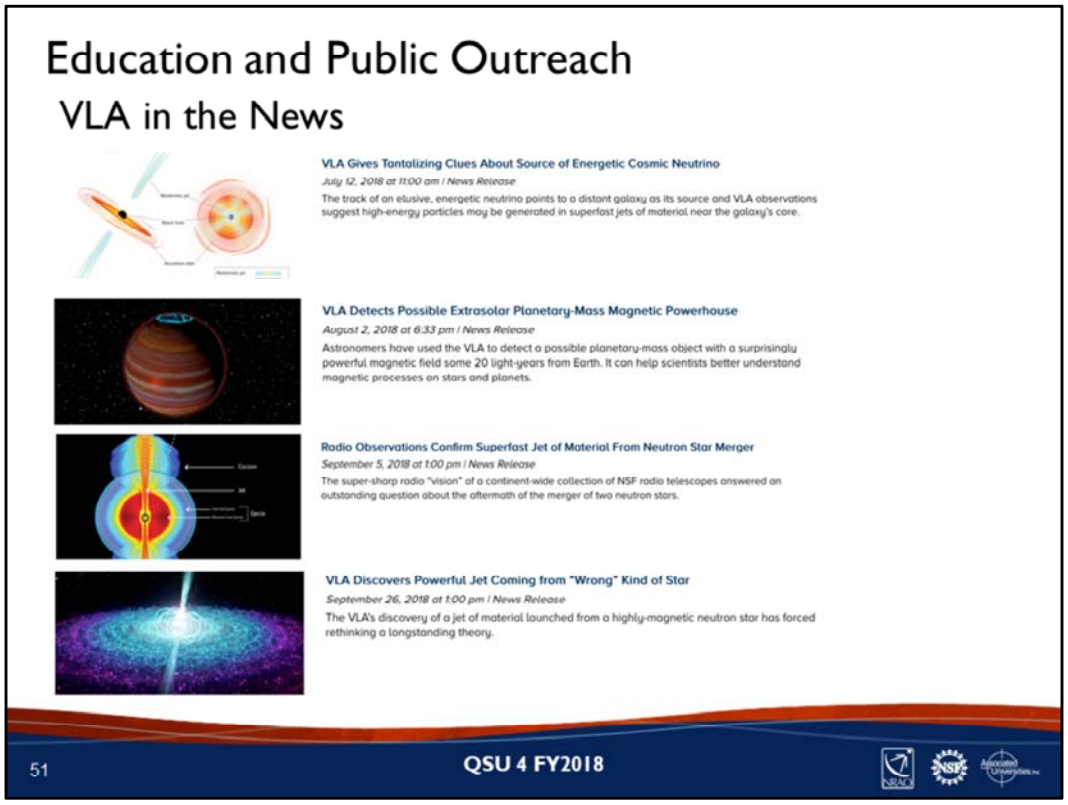
	FY18 POP Budget	FY18 Rev. Budget	FY18 YTD Expenses	YTD % Rev Budget
NRAO Recoveries	12,828	12,865	12,438	96.7%
External Recoveries	3,381	3,381	3,246	96.0%
Total ICC Revenues	**16,209**	**16,246**	**15,684**	96.5%
Telescope Ops	105	106	133	125.5%
Development	429	444	429	96.6%
Science Ops	2,379	2,463	2,310	93.8%
Admin Services	11,244	11,162	10,688	95.8%
Director's Office	2,052	2,071	1,649	79.6%
FY18, Total	**16,209**	**16,246**	**15,209**	**93.6%**
FY18 ICC Net	**0**	**0**	**475**	

- ICC over-recovered by $475K (~.5%). Underspends related to benefits credit, unused compensation funds, and open positions.

FY2019 Preview

- Reintegration of VLBA into NRAO reporting. Requesting de/re-obligation of ~$300K LBO cumulative surplus.
- As of 10/31, FY2019 funds have not been awarded for CSA-V or CSA-A.
- First year of new health insurance vendor poses financial uncertainty.


QSU4 FY2018 Report
EPO/Suzanne Gurton

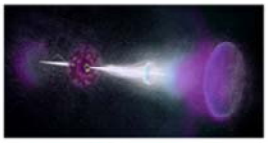


It's been a good year for news, with a total of 57 news products, four of the seven VLA press releases were in this forth quarter of the year. Each took its turn grabbing the headlines. This August release made lots of headlines as a "Rogue Planet."

Observatory	**Releases**	**Announcements**
ALMA	16	3
VLA	7	
CDL	1	2
NRAO	4	8
GBO	9	1
VLBA	6	

Education and Public Outreach

ALMA in the News



Enduring 'Radio Rebound' Powered by Jets from Gamma-Ray Burst

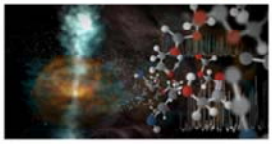
July 26, 2018 at 11:00 am / News Release

Astronomers using ALMA studied a cataclysmic stellar explosion known as a gamma-ray burst, or GRB, and found its enduring "afterglow." The rebound, or reverse shock, triggered by the GRB's powerful jets slamming into surrounding debris, lasted thousands of times longer than expected.

Pair of Colliding Stars Spill Radioactive Molecules into Space

July 30, 2018 at 11:00 am / News Release

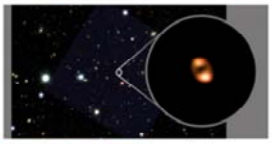
Astronomers have made the first definitive detection of a radioactive molecule in interstellar space: a form, or isotopologue of aluminum monofluoride. The new data reveal that this radioactive isotopologue was created by the collision of two stars, a tremendously rare cosmic event that was witnessed on Earth as a "new star," or nova, in the year 1670.



First Science with ALMA's Highest-Frequency Capabilities

August 17, 2018 at 11:00 am / News Release

Band 10, ALMA's highest frequency vision, has given scientists a new view of jets of warm water vapor streaming away from a newly forming star and uncovered an astonishing assortment of molecules.



Fierce Winds Quench Wildfire-like Starbirth in Far-flung Galaxy

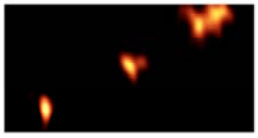
September 6, 2018 at 2:00 pm / News Release

Astronomers using ALMA, with the aid of a gravitational lens, have detected the most-distant galactic "wind" of molecules ever observed, seen when the universe was only one billion years old. By tracing the outflow of hydroxyl (OH) molecules – which herald the presence of star-forming gas in galaxies – the researchers show how some galaxies in the early universe quenched an ongoing wildfire of starbirth.

Four of the 16 ALMA releases were in this quarter.

Education and Public Outreach

LBO in the News



Distant Quasar Providing Clues to Early-Universe Conditions

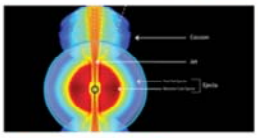
July 9, 2018 at 9:00 am | News Release

The sharp radio "vision" of the VLBA gives astronomers a detailed look at a galaxy as it appeared when the Universe was a small fraction of its current age, giving clues about conditions at that early time.

Observatory Receives Funds to Repair St. Croix Radio Telescope

August 7, 2018 at 1:26 pm | News Release

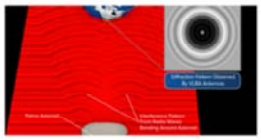
The National Science Foundation has provided funding to repair damage to the Very Long Baseline Array station on St. Croix caused by Hurricane Maria in 2017.



Radio Observations Confirm Superfast Jet of Material From Neutron Star Merger

September 5, 2018 at 1:00 pm | News Release

The super-sharp radio "vision" of a continent-wide collection of NSF radio telescopes answered an outstanding question about the aftermath of the merger of two neutron stars.



VLBA Measures Asteroid's Characteristics

September 13, 2018 at 9:59 am | News Release

Astronomers used the VLBA in an unusual way to learn new details about an asteroid's size, shape, and orbit.

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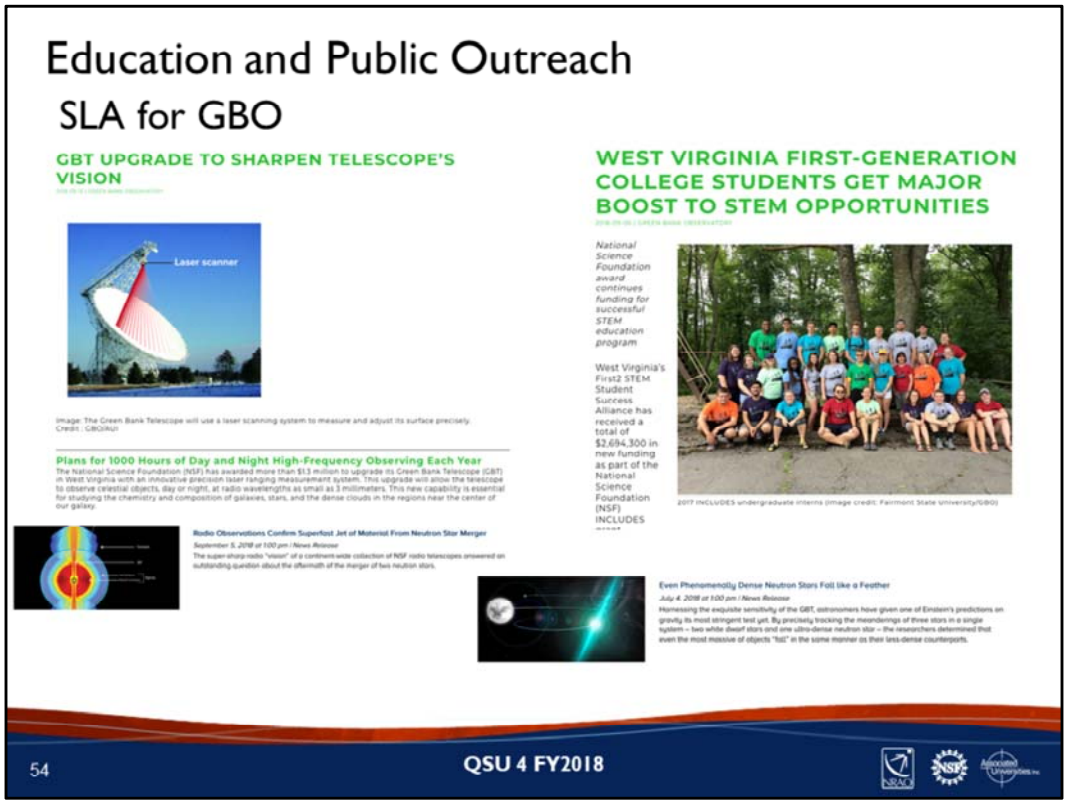
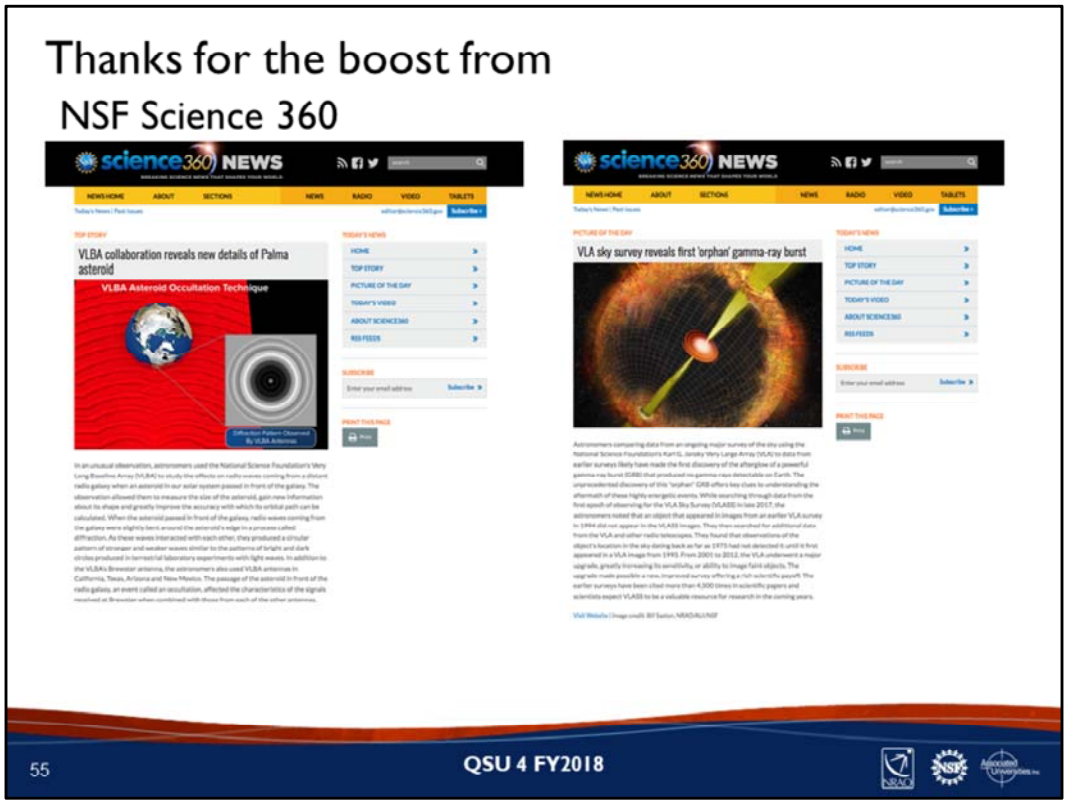
And four of the six VLBA releases were this quarter, but that's double counting the superluminal jet release which included both VLA and VLBA data.



Also under the service level agreement, we created two press releases celebrating additional awards that GBO won. Additional releases were cross posted on their site--there's that superluminal jet release again.



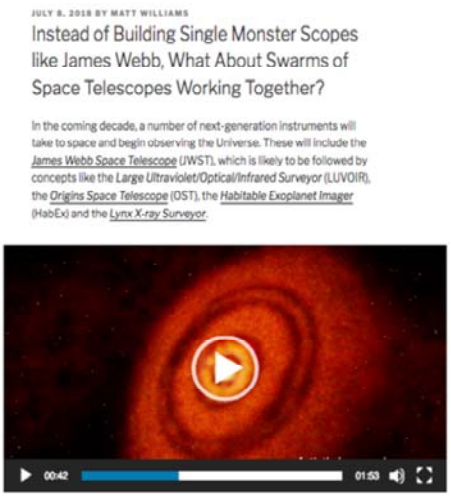
Thanks to NSF Science 360 for featuring two of our results, one as the top story and one as the picture of the day.

ngVLA in the News

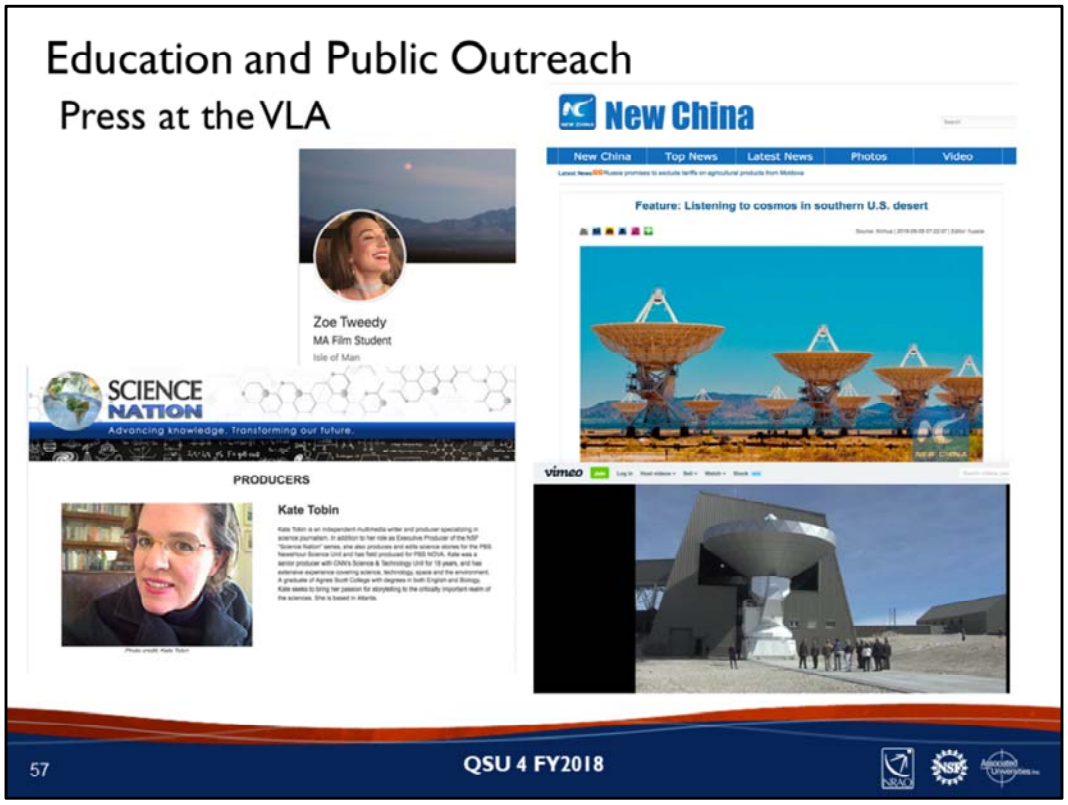
An anomaly not associated with a press release

This *Universe Today* article included a reference to ngVLA and video that is on the NRAO science website. As as result of the article, there were more than 18,000 accesses to the video (174 MB). Almost all of these occurred in the day following the release of the article (July 9). The resulting download volume on that day was roughly equivalent to the download traffic from that website for the previous entire year!

https://www.universetoday.com/139566/instead-of-building-single-monster-scopes-like-james-webb-what-about-swarms-of-space-telescopes-working-together/



This unsolicited nod to the brilliance of ngVLA had a curious effect on our servers. Most of our animations are on Vimeo, but this one lives in two places: on Vimeo and on a page on our science website.

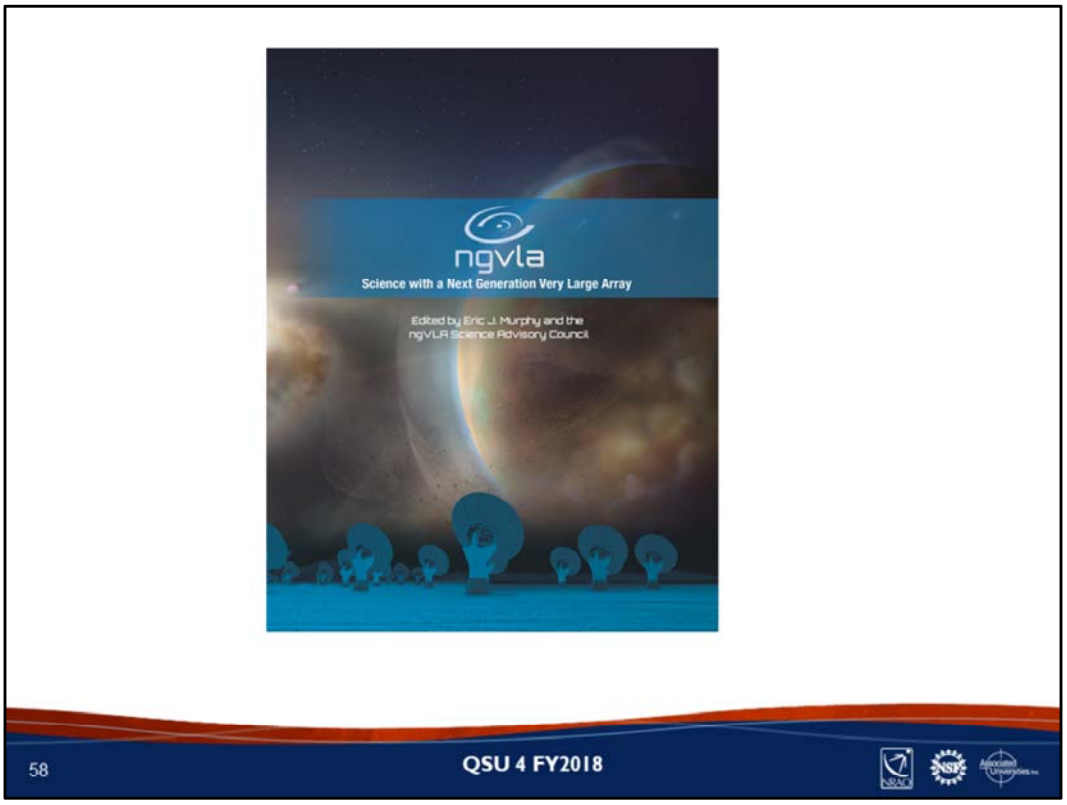


Hosted Zoe Tweedy, a Master's student in film at Queen's University Belfast, who was producing a documentary as part of her graduate coursework. In July, she filmed at the VLA and interviewed me here in the DSOC.

In August, we hosted Kate Tobin, working under contract to NSF-MPS for the Science Nation video series. This included scientist interviews (Mark McKinnon and Claire Chandler) here in town and scenics at the VLA. This project is in production and expected to be completed early in 2019.

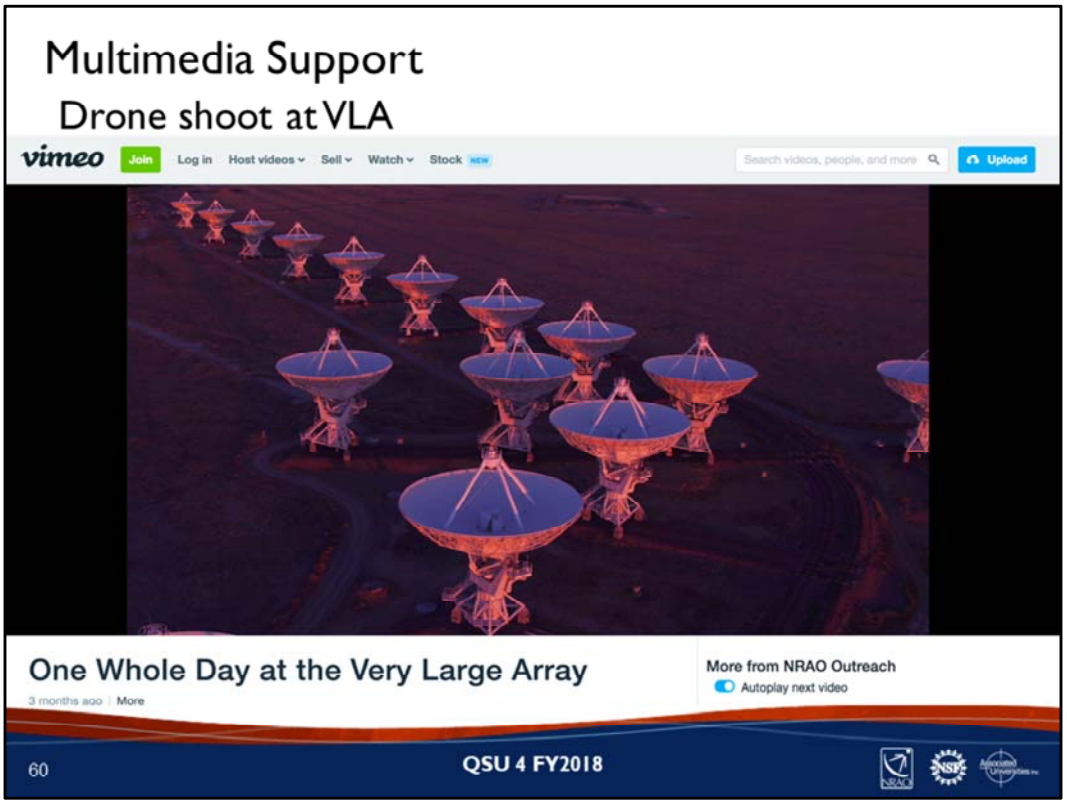
Hosted Richard Lakin, a video correspondent for China's Xinhua News Agency, in August. This included interviews with Chris Carilli and Dave Finley in the DSOC and scenics at the VLA. This appeared as a news feature in Chinese, with a brief English text summary on their English-language web site.

NRAO was contacted by Karin Zacher, a PIO for IRAM, the French institute that operates millimeter-wave telescopes. They are experiencing a sharp increase in filming and photo requests and wanted guidance on how to handle them. I provided advice by email, sent copies of an NRAO filming memo that included lessons learned from experience, and also pointed them to our online filming guidelines. They were very appreciative of the help.
https://vimeo.com/108204255



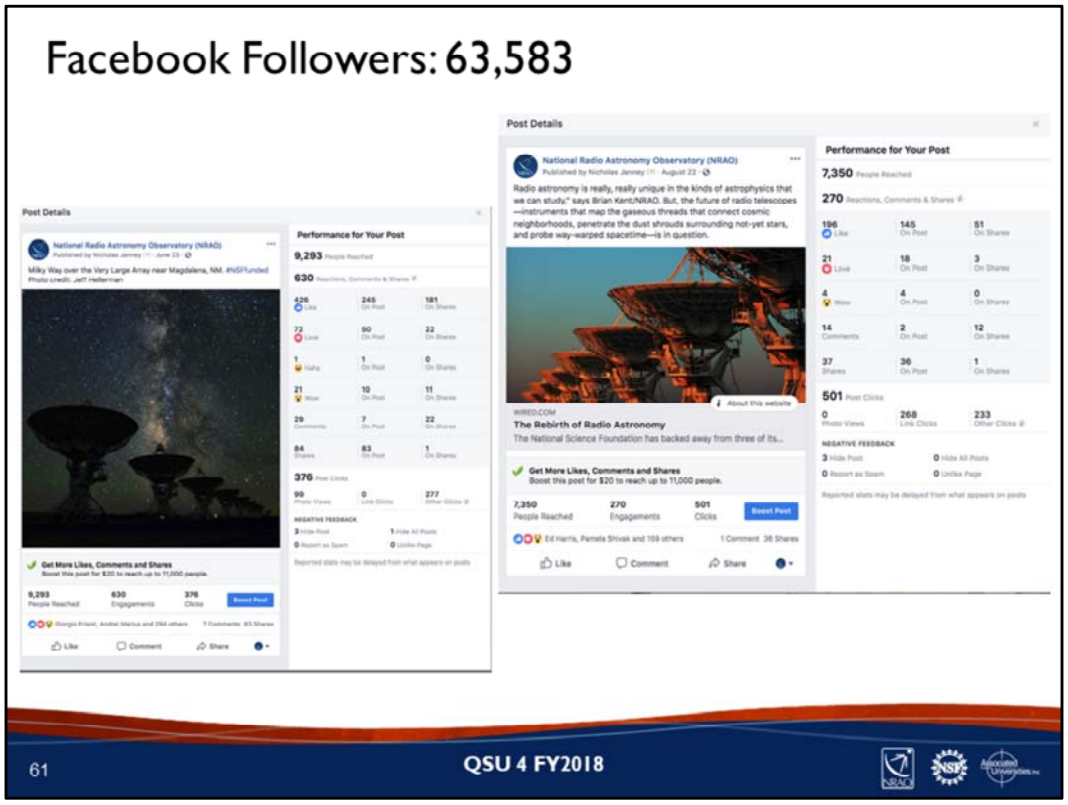
Sophia Dagnello created the cover art for the ngVLA science book. Four additional science cases will be illustrated and animated for the Winter AAS meeting.

We had an unusual number of image requests for both popular books and physics text books as well as a Japanese online Encyclopedia. Some of the more publicly visible images were featured in *National Geographic* and *Wired*. A summer student's time lapse of the Bracewell Sundial was featured on Astronomy Picture of the Day (APOD).



https://vimeo.com/280796493

We made good use of the Electrical Infrastructure Upgrade and got some amazing drone footage in high def. The radio control signals would normally be an issue for our sensitive receivers, but with all power off we could safely fly the drone. Employee Brian Kent is an FAA certified pilot and they went out to capture the array at sunrise, sunset and the transporters in action during the day.



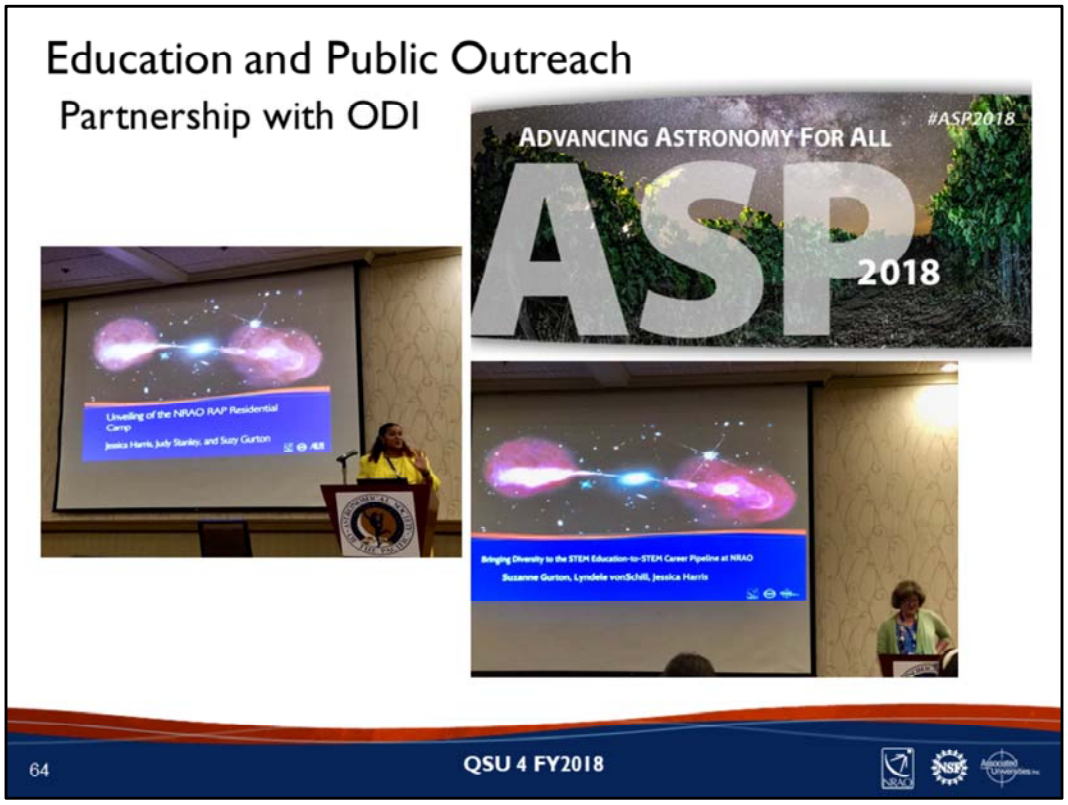
We seem to have hit a plateau with this account as growth is slowing, with just 153 new followers this quarter.

Instagram Followers: 1,177

This graphic is a screen shot of the top photos for the year. Of the twelve depicted, eight are from 4th quarter.

This account is gaining some momentum.

Twitter grew by over 1200 followers this quarter. We don't know all the details about the changing algorithms, but we suspect that the Facebook changes that emphasize family and friends in your feed are cutting us out and Twitter is still giving us good visibility.



Unveiling of the NRAO RAP Residential Camp

The National Radio Astronomy Observatory (NRAO) in New Mexico has piloted a one-week residential camp on the campus of New Mexico Tech for rising 9th grade students called the Radio Astronomy and Physics (RAP) camp. This camp provides an opportunity for students to participate in an immersive science research experience. Students also participate in engaging lessons and hands-on activities designed to enhance their knowledge and enthusiasm for physics and radio astronomy. We will report on the development of radio astronomy lessons, best practices, and evaluation report of our 2018 camp.

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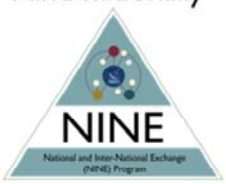
Strand: Science Education
Audiences: K-12: Teachers and Students
Strategies/Practices: Engaging with Diverse and Underserved Communities

Education and Public Outreach

Partnership with ODI

- EPO and NINE program partnering with the AATF, the Hampton City School system (H2O), and the Boys and Girls Club to:
  - Develop a set of scaffolded lesson plans and activities for K-12 students, connected to Virginia SOLs and Common Core standards
  - Provide students with a basic understanding of radio astronomy principles
  - Test and evaluate lesson plans/activities in AY2018-2019
  - Eventually deploy this set of plans through all NINE hubs
  - Locally in VA and NM and nationally



Our STEM Ed group had nearly monthly outreach events this year and Quarter 4 was no exception. Although July and August had no events, we had two in September. This ESTEAM event community outreach included the following list of events:

10/3/17 Cosmic Address activity at ABQ ES
11/16/17 Saracino MS science event all day
1/10/18: AAS 231st Meeting in National Harbor, EPO event
1/13/18 The Albuquerque Astronomical Society Perihelion Dinner with NRAO's Bryan Butler Keynote speaker
2/6/18 Cottonwood school science day outreach demos in Socorro
3/9/18: Ruckersville Elementary School Science Expo
3/13-14/18: PVCC 7th Grade Explore Careers Day
4/5/18 USA Science and Engineering Festival, NRAO booth featuring ngVLA
4/12/18 Parkview Science Night
4/14/18 NRAO speaker at Black Girls Code event in Brooklyn
5/19/18 ABQ Science Fiesta
6/6/18 AAS 232nd meeting in Denver, EPO activity in the booth
6/25/18 Astronomy Festival on the Mall. NRAO booth
6/26/18 VLA Science Club Connection Skype call to Maine
9/12-13/18 Presentations at ASP Annual Meeting
9/20/18 Saracino Middle School Math and Science Night

Education and Public Outreach

Saracino Middle School Science Night

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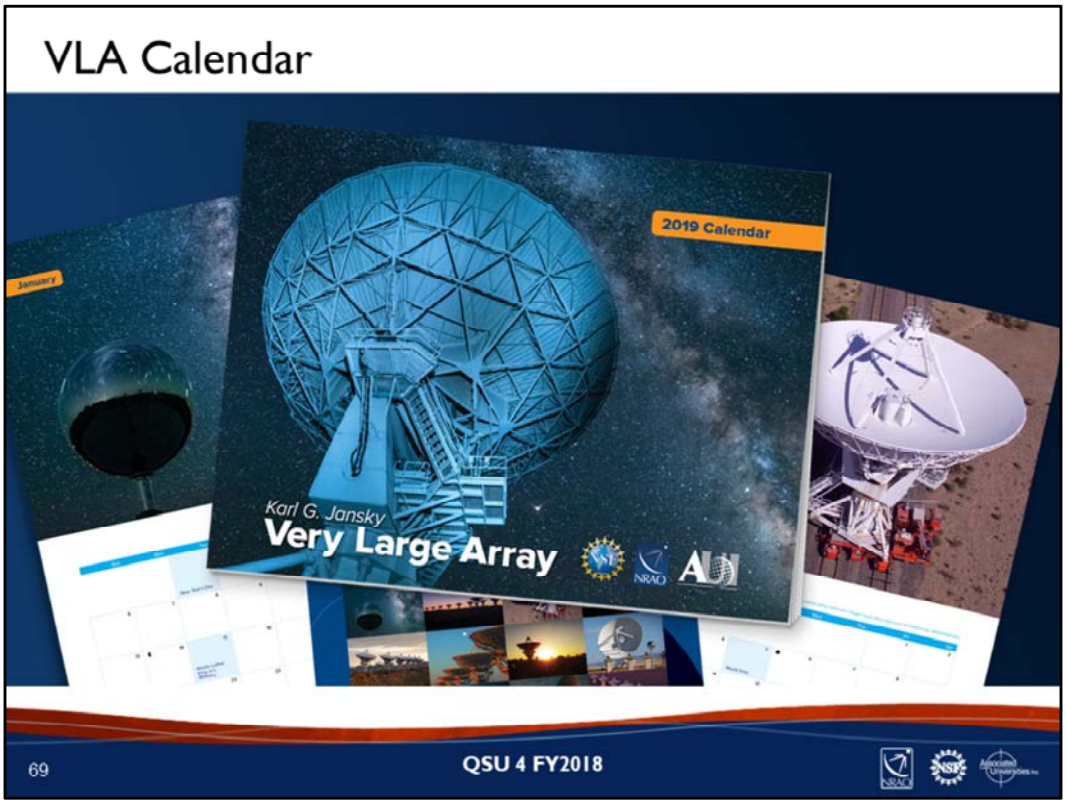
And the crew in NM had a booth at the Saracino Middle School Science Night.

Dragon Con: One of the largest fan gatherings in the U.S. (approximately 85,000 attendees). NRAO's Charles Blue presented on three panels during four full days of science and astronomy presentations. He wrote about the experience for the NRAO blog at https://public.nrao.edu/nrao-meets-the-dragon-dragon-con-that-is/

Can't See, Sense, or Interact With It, But Dark Matter Holds the Universe Together: Other panelists included Nicole Gugliucci, Roy Kilgard, and Steph LaMassa

What's Exploring the Universe? Launches, Telescopes, & Ongoing Surveys: Tabetha Boyajian (of Tabby's Star fame) and William Keel, covered space-based observatories, with a special focus on Kepler and JWST. I discussed some of the most intriguing and productive ground-based facilities, including the VLA, ALMA, VLBA and the emerging plans for the Next Generation VLA.

Infant Stars & Baby Planets: Sex Talk for Solar Systems: Nicole Gugliucci (aka "The Noisy Astronomer") and Charles reviewed ALMA's amazing capabilities in advancing our understanding of the planet- and star-formation process. Showcasing evocative images, including the famed HL Tau image, we took a standing-room-only audience through the various stages of solar system development and presented some of ALMA's latest discoveries.



A small VLA calendar was designed for the gift shop at the VLA. It features a variety of day and night views of the array. A limited run was made to test the waters for this new item.

VLA Visitor Center

Q4: 6134 visitors, 644 on special tours

7/1/18	REU Tours (Tierra & Miles) 3 tours
7/6/18	City of Socorro Summer Youth
7/8/18	REU Tours (Conner & Montana)
7/10/18	Summer Science Program NM Tech
7/13/18	UNM STEM Collaborative
7/14/18	REU tours (Justin & Seth, Carmen)
7/15/18	REU Tours (Justin & Seth) 89
7/22/18	REU Tours (Indu & Lucas) 102
8/25/18	NM Tech Student tour
9/14/18	Grants HS MEAS Club tour

25,238 total visitors in FY2018

Very few tours are booked in the summer, but this number (644 served) includes the additional tours conducted by REU students for our visitors.

www.nrao.edu
science.nrao.edu

The National Radio Astronomy Observatory is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc.