***Title*:** QSU# 4 FY2014	***Author*:** L. Wingate, ADs	***Date*:** 11/19/2014
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National Radio Astronomy Observatory
Quarterly Status Update #4 FY2014

PREPARED BY	ORGANIZATION	DATE
L. Wingate, ADs	PMD/Director's Office	11/19/2014

Change Record

VERSION	DATE	REASON
0.02	11/18/2014	Final Report - Edits made per the NSF Meeting of 11/18/2014
0.01	11/14//2014	Draft QSU4

NRAO Quarterly Status Update (QSU4 FY2014)
July - Semptember 2014

dark gray (completed), blue (early), green (on track), yellow (behind), red (critically behind)

POP Section Number	POP Milestone	Task Name	Completion Date	Q1 Performance Assessment			Q2 Performance Assessment			Q3 Performance Assessment			Q4 Performance Assessment		
				Cost	Schedule	Technical	Cost	Schedule	Technical	Cost	Schedule	Technical	Cost	Schedule	Technical
		Observatory Science Operations													
3.1		**Science Support & Research**													
		Telescope Time Allocation (TTA)													
	1	SSR review of TTA	12/31/2013												
	2	CfP for semester 2014B	3/31/2014												
	3	CfP for semester 2015A	9/30/2014												
	4	SRP & tech review process, semester 2014B	3/31/2014												
	5	SRP & tech review process, semester 2015A	9/30/2014												
	6	TAC meeting for semester 2014A	12/31/2013												
	7	TAC meeting for semester 2014B	6/30/2014												
	8	Update SW tools requirements for TAC support 2014A	12/31/2013												
	9	Update SW tools requirements for PST 2014B	3/31/2014												
	10	Update SW tools requirements for TAC support 2014B	6/30/2014												
	11	Update SW requirements tools for PST 2015A	9/30/2014												
	12	Update documentation for CfP & tools 2014B	3/31/2014												
	13	Update documentation for CfP & tools 2015A	9/30/2014												
		Science User Services (SUS)													
	14	HD 4.5 documentation	12/31/2013												
	15	Update ALMA Cycle 2 proposal preparation documentation	12/31/2013												
	16	Update CASAGUIDES	12/31/2013												
	17	Update CASAGUIDES	6/30/2014												
	18	IAU Symposium 303 – The Galactic Center	12/31/2013												
	19	NRAO/China Science Workshop	6/30/2014												
	20	8th NAASC sponsored science workshop	9/30/2014												
	21	AAT/ASA science requirements	12/31/2013												
	22	Manual reduction of ALMA science data and QA2	12/31/2013												
	23	Manual reduction of ALMA science data and QA2	3/31/2014												
	24	ALMA pipeline tests complete between manual and pipeline products	6/30/2014												
	25	Requirements for integrated science portal	6/30/2014												
	26	Manual reduction of ALMA science data and QA2	6/30/2014												
	27	Reprocessing pipeline interface tested	9/30/2014												
	28	Manual reduction of ALMA science data and QA2	9/30/2014												
		Science & Academic Affairs													
	29	Jansky Fellow selection	12/31/2013												
	30	NRAO summer student selection	3/31/2014												
	31	SOS program selection for ALMA Cycle 2	6/30/2014												
	32	Summer student program begins	6/30/2014												
	33	Summer Student program concludes	9/30/2014												
		Science Support and Research Services													
	34	Renegotiate electronic journals	3/31/2014												
		Observatory TELESCOPE Operations													
4.1		**Atacama Large Millimeter/submillimeter Array**													
		Construction													
	1	ALMA Construction Completion and Operations Readiness Review	3/31/2014												
	2	Acceptance of Optical Pointing Telescopes	12/31/2013												
	3	Complete installation of 400V cables and fuse disconnects at AOS	12/31/2013												
	4	Complete delivery of FE Thermal Interlock Modules	3/31/2014												
	5	Complete delivery of NAOJ Band 4, 8, and 10 multipliers	3/31/2014												
	6	Delivery of first Front End Handling Vehicle (FEHV)	3/31/2014												
	7	Delivery of three remaining FEHVs	9/30/2014												
		Operations													
		NAASC/NA ARC													
	8	ALMA Construction Completion and Operations Readiness Review	3/31/2014												
	9	ALMA C1 User Survey	3/31/2014												
	10	C2 Phase 2 Software Tests	6/30/2014												
	11	Start of C2 observing season	6/30/2014												
	12	C1 Data Delivery Closeout	9/30/2014												
		Offsite HW													
	13	Establish long-term maintenance contracts for vendor bulk modules	6/30/2014												

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				Cost	Schedule	Technical	Cost	Schedule	Technical	Cost	Schedule	Technical	Cost	Schedule	Technical
4.2		**Very Large Array (VLA)**													
		Scientific Support for Operations													
	1	Support the 2014B semester (2014 Feb 1) Call for Proposals	3/31/2014												
	2	Support the 2015A semester (2014 Aug 1) Call for Proposals	9/30/2014												
	3	Support reconfiguration to B-config	12/31/2013												
	4	Support reconfiguration to BnA and A-configs	3/31/2014												
	5	Support reconfiguration to D-config	6/30/2014												
	6	Support reconfiguration to DnC-config	9/30/2014												
	7	Stabilize VLA capabilities: Y27, sub-arrays, & fast dumps	6/30/2014												
		Array Operations													
	8	Re-configurations to B config	12/31/2013												
	9	Re-configurations to BnA and A configs	3/31/2014												
	10	Re-configuration to D config	6/30/2014												
	11	Re-configuration to DnC config	9/30/2014												
	12	Complete evaluation of whether evening and nighttime array operations can be moved to Socorro	6/30/2014												
		VLA Prototype ACU													
	13	Critical Design Review of ACU prior to 2nd installation	12/31/2013												
	14	Install 2nd ACU	3/31/2014												
	15	Scientific evaluation of ACU performance	6/30/2014												
	16	Install 3rd ACU	9/30/2014												
		VLA Thermal Gap Retrofit													
	17	Install thermal gap on 3 VLA C-Band receivers.	9/30/2014												
	18	Install thermal gap on 6 VLA L-Band receivers.	9/30/2014												
		VLA Card Cage Upgrade													
	19	Install 48 card cage upgrades for VLA front ends	9/30/2014												
		VLA 3-Bit Sampler Upgrade													
	20	Install 3-bit sampler PCB in 2 VLA DTS modules	3/31/2014												
	21	Present performance analysis to NRAO staff	6/30/2014												
		VLA API Upgrade													
	22	Install final 2 API dishes	12/31/2013												
	23	Incorporate API output into VLA dynamic scheduler	6/30/2014												
		Capability Enhancements													
	24	Define and demonstrate new SR and general capabilities for 2014B	12/31/2013												
	25	Define and demonstrate new SR and general capabilities for 2015A	6/30/2014												
		Operational Enhancements													
	26	Improved referenced pointing	9/30/2014												
	27	Tipping scans implemented	3/31/2014												
	28	Improved switched power calibration	6/30/2014												
	29	Pipeline heuristic development	9/30/2014												
		Infrastructure Maintenance and Renewal													
	30	Overhaul total of 6 antennas	12/31/2013												
	31	Overhaul total of 6 antennas	3/31/2014												
	32	Overhaul total of 6 antennas	6/30/2014												
	33	Overhaul total of 6 antennas	9/30/2014												
	34	Replace azimuth bearing on one antenna (probably EA21)	9/30/2014												
	35	Replace 2500 ties	9/30/2014												
	36	Replace 3 intersections	9/30/2014												
	37	Develop proposal for VLA VAX building	9/30/2014												
	38	Replace VLA Activity Center transformer	6/30/2014												
	39	Preventive maintenance on 90 VLA site transformers	9/30/2014												
	40	Preventive maintenance on hatch gear	3/31/2014												
	41	Preventive maintenance on hatch gear	9/30/2014												
4.3		**Very Long Baseline Array (VLBA)**													
		Scientific Support for Operations													
	1	Support the 2014B semester (2014 Feb 1) Call for Proposals	3/31/2014												
	2	Support the 2015A semester (2014 Aug 1) Call for Proposals	9/30/2014												
	3	Complete verification tests of VLBA dual RDBE system	3/31/2014												
	4	Define and document calibration procedures for VLBA dual RDBEs	9/30/2014												
	5	Stabilize VLBA + Y27/GBT operations	3/31/2014												
		Retirement of VLBA VMEs													
	6	Design, build, and install VLBA Control Computer Interface Box in laboratory	12/31/2013												
	7	Test VLBA interface box in VLBA antenna	9/30/2014												

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				Cost	Schedule	Technical	Cost	Schedule	Technical	Cost	Schedule	Technical	Cost	Schedule	Technical
		Retirement of Legacy Recording System													
	8	Complete transition of projects using legacy system to DDC	6/30/2014												
	9	Re-integrate Mark 5A recorders from sites into correlator	6/30/2014												
		C-Band Receivers													
	10	Complete construction of spare VLBA C-Band receiver	3/31/2014												
	11	Upgrade two pre-production VLBA C-Band receivers	9/30/2014											Milestone Cancelled	
		Capability Enhancements													
	12	Define and demonstrate new SR and general capabilities for 2014B	12/31/2013												
	13	Define and demonstrate new SR and general capabilities for 2015A	6/30/2014												
		Infrastructure Maintenance and Renewal													
	14	Tiger Team maintenance visit to North Liberty	6/30/2014												
	15	Tiger Team maintenance visit to Hancock	9/30/2014												
4.4		**Green Bank Telescope (GBT)**													
		GBT Maintenance													
	1	Beginning of summer painting	6/30/2014												
	2	End of summer painting	9/30/2014												
	3	GBT track inspection will take place, any needed repairs completed	9/30/2014												
		Antenna Performance													
	4	A new pointing model for the GBT will be developed	12/31/2013												
		GBT Operations													
	5	A retirement plan for the GBT spectrometer and spectral processor will be put in place	9/30/2014												
		Observatory Development Programs													
5.1		**CDL Development**													
		Phased Array Feeds													
	1	Design improved low-noise amplifier with lower noise and improved reliability	3/31/2014												
	2	Design balanced low-noise amplifier for PAF integration	9/30/2014											Milestone Cancelled	
	3	Complete study on cryogenic efficiency, new window and IR filter materials, and modular cryogenic architectures for large PAFs	9/30/2014											Milestone Cancelled	
	4	Demonstrate single L-Band prototype integrated downconverter digital photonic link	3/31/2014												
	5	Integrate and test digital downconverter photonic links on existing PAF	9/30/2014												
	6	Demonstrate single-FPGA narrowband beamformer prototype	3/31/2014							Milestone Cancelled					
	7	Demonstrate three-FPGA intermediate-bandwidth beamformer prototype	9/30/2014												
	8	Demonstrate and verify PAF optimization algorithm with impedance matching network and feed geometry as input parameters	9/30/2014												
	9	Complete design study on optimum wideband antenna elements for a PAF	6/30/2014							Milestone Cancelled					
	10	Implement version control and document existing PAF software	12/31/2013												
	11	Demonstrate new release of PAF software with improved user interface and real-time analysis capability	6/30/2014												
		Advanced Receiver Technologies													
	12	Test triangular Digital OMT (DOMT) on the sky	12/31/2013							Milestone Cancelled					
	13	Demonstrate polarization isolation of DOMT using FPGA	3/31/2014												
	14	Measure W-Band phase stability of the LO distribution network	3/31/2014												
	15	Demonstrate printed circuit flexible thermal transition with low loss up to 40 GHz	6/30/2014												
	16	Build multi-channel digital back end for testing of digital photonic links	3/31/2014												
5.2		**ALMA Development**													
		Band 5 Local Oscillator													
	1	Unit production; WCA No. 04 - 05	12/31/2013												
	2	Unit production; WCA No. 06 - 20	3/31/2014												
	3	Unit production; WCA No. 21 - 50	6/30/2014												
	4	Unit production; WCA No. 51 - 75	9/30/2014												

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5.3		**GBT Developments**													
	1	ARGUS Cryostat Complete	3/31/2014												
	2	ARGUS Module delivery complete	6/30/2014												
	3	ARGUS IF/LO complete	6/30/2014												
	4	ARGUS Warm electronics complete	3/31/2014												
	5	ARGUS Feeds complete	9/30/2014												
	6	MUSTANG 1.5 Science commissioning begins	12/31/2013												
	7	MUSTANG 1.5 project complete	6/30/2014												
		OBSERVATORY-WIDE SERVICES													
6.1		**Central Development Lab**													
	1	Complete repairs of VLA L-Band LNAs	9/30/2014												
	2	Complete production of eight spare Band 6 SIS mixers	9/30/2014												
	3	Demonstrate 4-12 GHz balanced IF LNA with low power dissipation	3/31/2014										Milestone Cancelled		
	4	Demonstrate balanced 2SB SIS mixer with 4-12 GHz IF that exceeds noise performance of current Band 6 mixer	9/30/2014												
	5	Demonstrate Nb/Al-AlN/NbTiN SIS mixer with low noise up to 900 GHz	6/30/2014												
	6	Demonstrate low-loss hybrid for 800-950 GHz	9/30/2014										Milestone Cancelled		
	7	Complete design of reflective Band 2 optics	3/31/2014												
	8	Build and measure Band 2 feed	9/30/2014												
	9	Produce prototype data acquisition upgrade for PAPER	3/31/2014												
	10	Characterize beam pattern of MWA tiles and PAPER antennas using ORBCOMM satellite	3/31/2014												
	11	Deploy upgraded low-frequency antenna on Green Bank solar radio burst monitor	6/30/2014												
	12	Deploy improved data acquisition system on Green Bank solar radio burst monitor	6/30/2014												
	13	Deploy DARE engineering prototype in Green Bank	9/30/2014												
6.2		**Data Management & Software**													
		Software Development													
		Archive Access Tool													
	1	Develop initial design of ALMA Archive Tool	3/31/2014												
	2	Develop ALMA Archive Tool prototype	9/30/2014												
		CASA Pipeline													
	3	Develop CASA pipeline for ALMA Cycle 1 Early Science	12/31/2013												
	4	Integrate VLA Scripted Pipeline	12/31/2013												
	5	Develop CASA pipeline for ALMA Cycle 2 Early Science	3/31/2014												
		CASA													
	6	Release CASA version 4.2	12/31/2013												
	7	Release CASA version 4.3	6/30/2014												
	8	Develop CASA version 4.4	12/31/2013												
			3/31/2014												
			6/30/2014												
			9/30/2014												
	9	Develop CASA VO support	9/30/2014												
		Observing Preparation Tool													
	10	Implement OPT updates for Semester 2014A VLA observing	3/31/2014												
	11	Implement OPT updates for Semester 2014B VLA observing	9/30/2014												
		Proposal Handling Tool													
	12	Implement PHT updates for Semester 2014A TAC meeting	12/31/2013												
	13	Implement PHT updates for Semester 2014B TAC meeting	6/30/2014												
		Proposal Submission Tool													
	14	Implement PST updates for Semester 2014B Call for Proposals	12/31/2013												
	15	Implement PST updates for Semester 2015A Call for Proposals	6/30/2014												
		Reprocessing													
	16	Complete Reprocessing interface	9/30/2014												
		ALMA Systems Software													
		System Software Updates, Bundle 1													
	17	Deploy Dynamic Scheduling software	3/31/2014												
	18	Deploy Quick-look improvements software	12/31/2013												
	19	Incorporate TelCal calibrations in scan sequences	3/31/2014												
		System Software Updates, Bundle 2													
	20	Implement correlator improvements	9/30/2014												
		VLBI Modifications													
	21	Deploy ALMA phasing project correlator software	9/30/2014												

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				Cost	Schedule	Technical	Cost	Schedule	Technical	Cost	Schedule	Technical	Cost	Schedule	Technical
		VLA/VLBA System													
	22	Deploy software to support Semester 2013B observing	12/31/2013												
	23	Deploy software to support Semester 2014A commissioning	12/31/2013												
	24	Deploy software to support Semester 2014A observing	6/30/2014												
	25	Deploy software to support Semester 2014B commissioning	6/30/2014												
	26	Deploy hardware & software to support Full On-The-Fly Mosaics for VLA Resident Shared Risk Observing use	9/30/2014												
	27	Conduct observations with new, non-VME hardware	9/30/2014												
	28	Demonstrate quasi-real time spacecraft tracking	3/31/2014												
	29	Demonstrate wideband observing stabilization	9/30/2014												
		GBT System													
		WVSys-Archive													
	30	GBT Data in NRAO Archive	3/31/2014												
		WVSys - M&C													
	31	Core infrastructure changes complete	12/31/2013												
	32	M&C system modified to use new infrastructure	6/30/2014												
	33	Deliver Astrid modifications & commission on-site	9/30/2014											Milestone Cancelled	
		GBTPP - Pipeline													
	34	Deliver GBT imaging capability in CASA	12/31/2013												
	35	VEGAS supports highest data rates	3/31/2014												
	36	Complete GBT Pipeline parallelization	6/30/2014												
		Scientific Information Services													
		Archive & Cluster													
	37	Draft computer access policy for external users	12/31/2013												
	38	Enable early access to cluster resources	3/31/2014												
		XSEDE/Cloud													
	39	Install Grid/Cloud Middleware	3/31/2014												
	40	Prototype access available to non-NRAO computing cycles	9/30/2014												
		Network Performance													
	41	Enable improved monitoring of Internet 2 links	3/31/2014												
	42	Release remote link test procedures to users	6/30/2014												
		Cluster Performance													
	43	Complete cluster performance characterization	9/30/2014												
		Co-location at UVa													
	44	Install 10 Gigabit/s link to UVa Data Center	12/31/2013												
	45	Install storage at UVa	3/31/2014												
		Green Bank data													
	46	Install 10 Gigabit network hardware	12/31/2013												
	47	GB link go-live	3/31/2014												
	48	Condition access to PSC Data Supercell	6/30/2014												
		DMSD Administration													
	49	Complete Data Management & Services Department formation	12/31/2013												
	50	Organize and hold a Data Management & Services Review	6/30/2014								Milestone Cancelled				
6.3		**Program Management Department**													
	1	PMD SOP Development complete	9/30/2014												
	2	Audit complete – proposal development	12/31/2013												
	3	Audit complete – project management	3/31/2014												
	4	Audit complete – Documentation	6/30/2014												
	5	Audit complete – Analytics and Decision Support	9/30/2014												
	6	PMD F2F complete	12/31/2013												
6.4		**Education and Public Outreach**													
		News & Public Information													
	1	Specify, Develop, and Review Design NRAO Homepage	12/31/2013												
	2	Program, implement design, test, correct, migrate Homepage to live server	3/31/2014												
	3	Archive and houseclean deprecated web content	6/30/2014												
	4	NRAO lobby display: Define and specify project. Design digital signage display	12/31/2013												
	5	NRAO lobby display: Programming and graphical implementation	12/31/2013												
	6	NRAO lobby display: Procure digital signage software system, program digital signage display, publish to network	12/31/2013												
	7	Milky Way Explorer for public website: Design and specify project. Develop design	3/31/2014												
	8	Milky Way Explorer for public website: Produce scripts, narrations, graphics, videos, program and implement	6/30/2014												

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		STEM Education													
	9	Conduct online course for first cohort of Skynet Jr. Scholars educators	12/31/2013												
	10	Skynet science and education workshop II	6/30/2014												
	11	Educational Module Set II Development workshop	9/30/2014												
	12	Conduct Governor's School Program in GB	9/30/2014												
	13	Review existing inventory of assets and annotate in accordance with appropriate STEM-related teaching standards	6/30/2014							Milestone Cancelled					
	14	Create thematic STEM assets database/catalog/clusters and publish to NRAO public website	9/30/2014										Milestone Cancelled		
6.5		**Administration**													
		Business Services													
	1	Succession planning documentation for OAS divisions	12/31/2013												
		CAP													
	2	Create a process to label controlled items as "ITAR Controlled" or "EAR Controlled"	3/31/2014												
	3	Develop on-line Export Compliance training	3/31/2014												
	4	Develop labeling for "ITAR Controlled" and "EAR Controlled" shipments	6/30/2014												
	5	Develop Grants Lifecycle training program	6/30/2014							Milestone Cancelled					
		ES&S													
	6	Develop a comprehensive safety training plan	12/31/2013												
	7	Develop a safety work order system	9/30/2014												
	8	Develop a security policy	6/30/2014												
		MIS													
	9	Implementation of new cost allocation system	12/31/2013												
	10	Upgrade of J.D. Edwards to tools release 9.1.3	3/31/2014												
	11	Investigation and implementation of automated Personnel Evaluation Process	12/31/2013												
		TTO													
	12	Form at least one Cooperative Research Agreement with industry	9/30/2014												
6.6		**Human Resources**													
		Compensation													
	1	Complete the FY 2013 performance review process on time using a new performance software system	6/30/2014												
	2	Provide managers with the information and guidance to complete the FY 2014 Salary Review Process	6/30/2014												
		Policy													
	3	Complete update and consolidation of NRAO HR policies	12/31/2013												
		Training													
	4	Develop new management training courses	9/30/2014												
		Employment													
	5	Review the feasibility of replacing the existing applicant tracking system (PeopleAdmin) thru the use of an add-on tracking module to the performance management system	9/30/2014												
6.7		**Diversity**													
		Communication													
	1	Clarify and communicate the Diversity Mission	12/31/2013												
		New Initiatives													
	2	Develop action plan for Diversity Review Panel report	9/30/2014												
		Training													
	3	Continue diversity training – cultural workplace topics, gender, ADA, Veterans, etc	9/30/2014												
		International Outreach													
	4	Continue to build International relationships to create pipeline for next generation of scientists and engineers. Investigate alternative funding streams to sustain partnerships	9/30/2014												
		Domestic Outreach													
	5	Continue domestic outreach partnerships to maintain pipeline. Partner with EPO and SSR to maximize existing programs and funding	3/31/2014												
		Employment													
	6	Implement recruitment guide and provide training that focuses on diversity focus	12/31/2013												
6.8		**Computing & Information Services**													
	1	Installation of staff Helpdesk solution	3/31/2014												
	2	Standardization of platform patch solutions	6/30/2014												
	3	Evaluate Open Source NAS	6/30/2014												
	4	Installation of 10Gbps network equipment	3/31/2014												
	5	Retirement of leagacy LDAP	12/31/2013												

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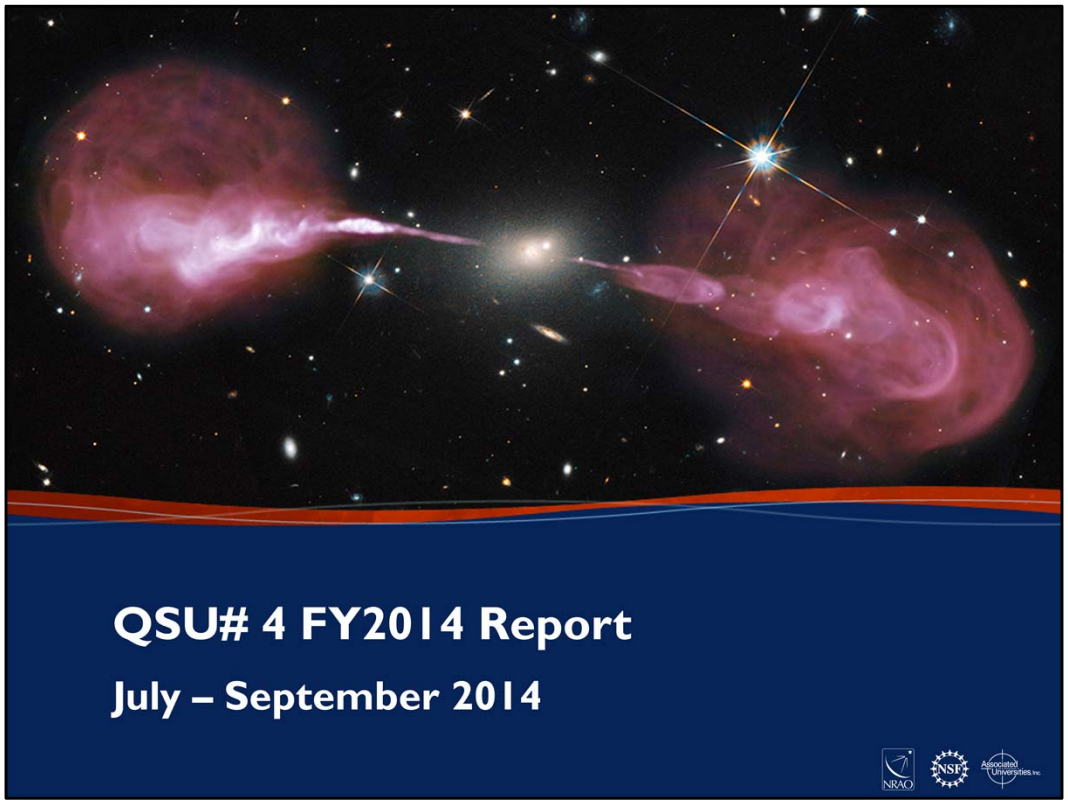
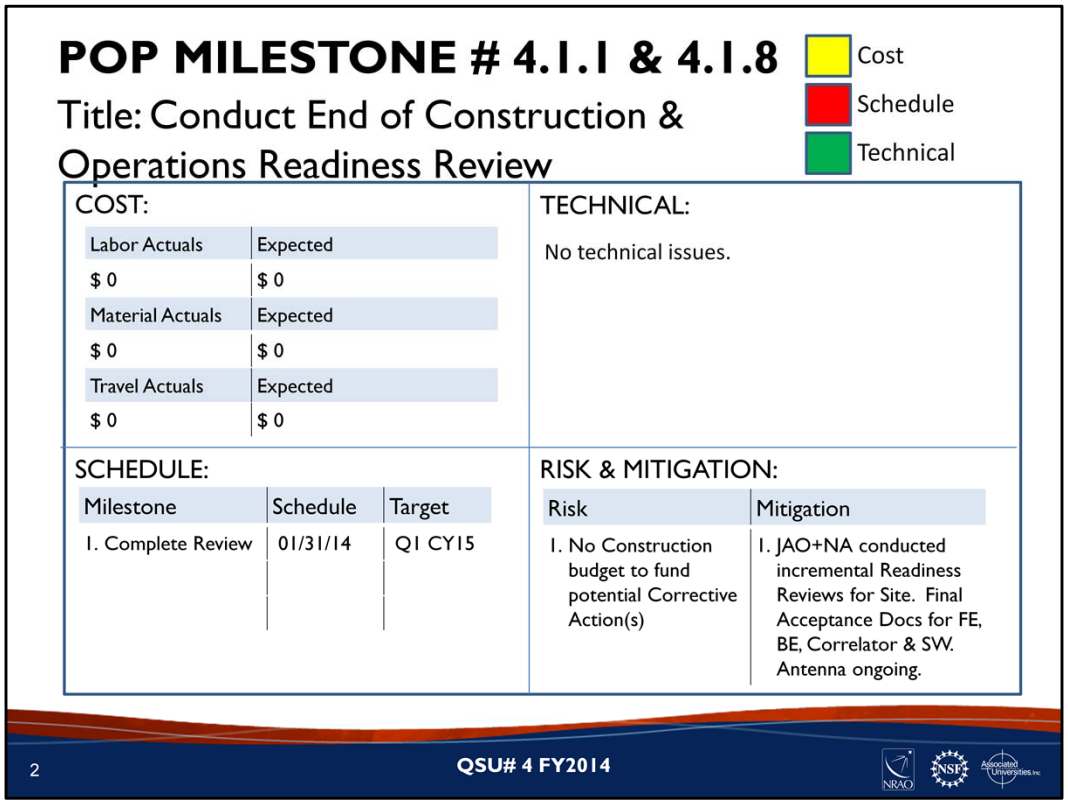
	6	Evaluation of interactive Web collaboration tool	12/31/2013												
	7	Installation and training for collaboration tool	9/30/2014												
	8	Evaluation of Bro tool	3/31/2014												
	9	Update to staff security training curriculum	9/30/2014												
	10	Specification and installation of ER generator	12/31/2013												
	11	Installation of archive servers in UVa Data Center	12/31/2013												
	12	Prox-card solution for Socorro doors	9/30/2014												
6.9		**Director's Office**													
		Communication													
	1	Publish NRAO 2013 Annual Report	9/30/2014												
	2	Complete NRAO exhibit re-design for January 2014 American Astronomical Society meeting	12/31/2013												
	3	Submit science symposium proposal(s) for 2015 American Association for the Advancement of Science Annual Meeting	6/30/2014												



QSU# 4 FY2014 Report

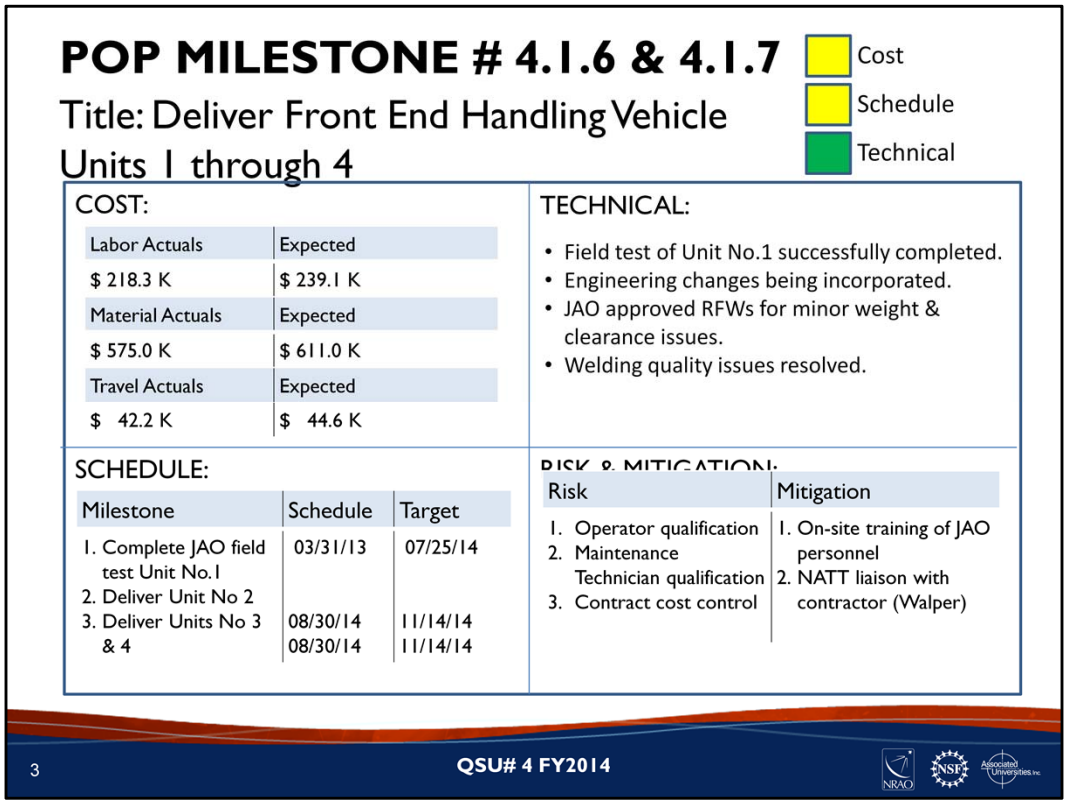
July – September 2014



COST: N/A

SCHEDULE: The JAO has postponed the entire *"ALMA Construction Completion and Operations Readiness Review (ACCOR)"* until early CY15.

RISK & MITIGATION: No expenses can be charged to the NA ALMA Construction budget after 31 December 2014 (expiration of the No-Cost Extension). If any cost impacts (shared or otherwise) arise from the ACCOR, the expense will have to been paid by NA ALMA Operations. The JAO and NA ALMA conducted incremental Readiness Reviews of AOS power infrastructure (a key North American deliverable). Discrepancies are being addressed by means of a NSF-authorized, No-Cost Extension.

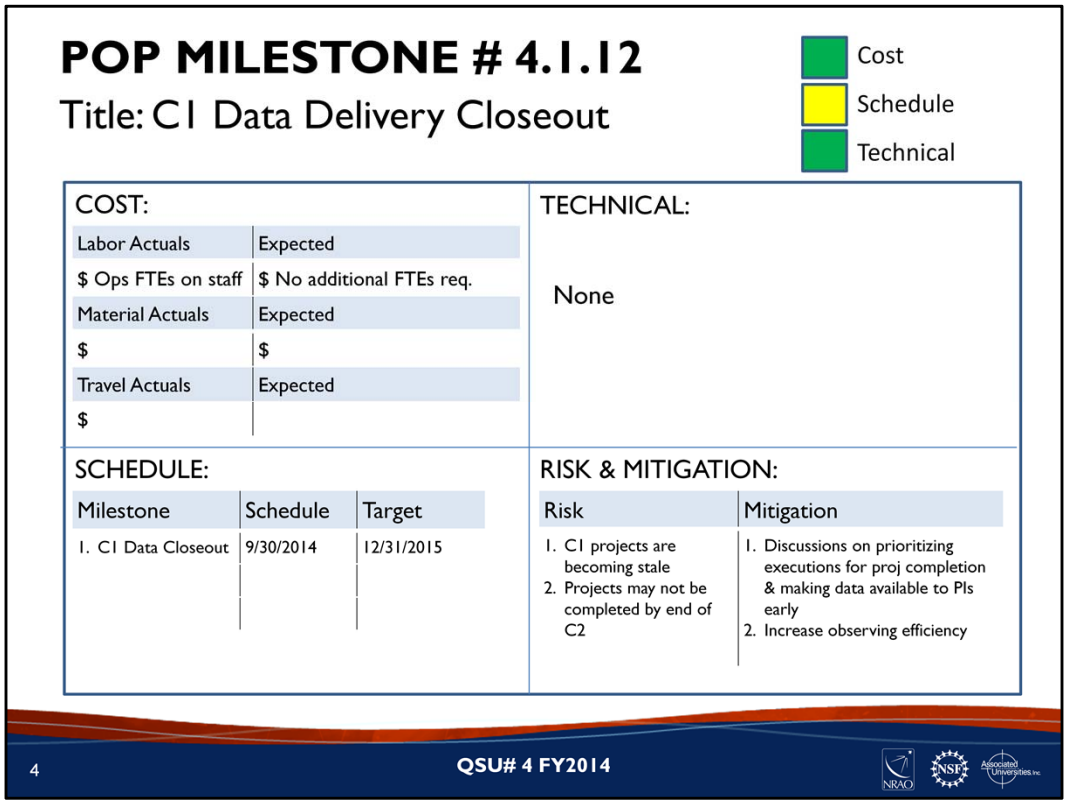


COST: Actuals include Non-Recurring Engineering and procurement of first unit. 93% of budget consumed ($835.5K / $894.7K).

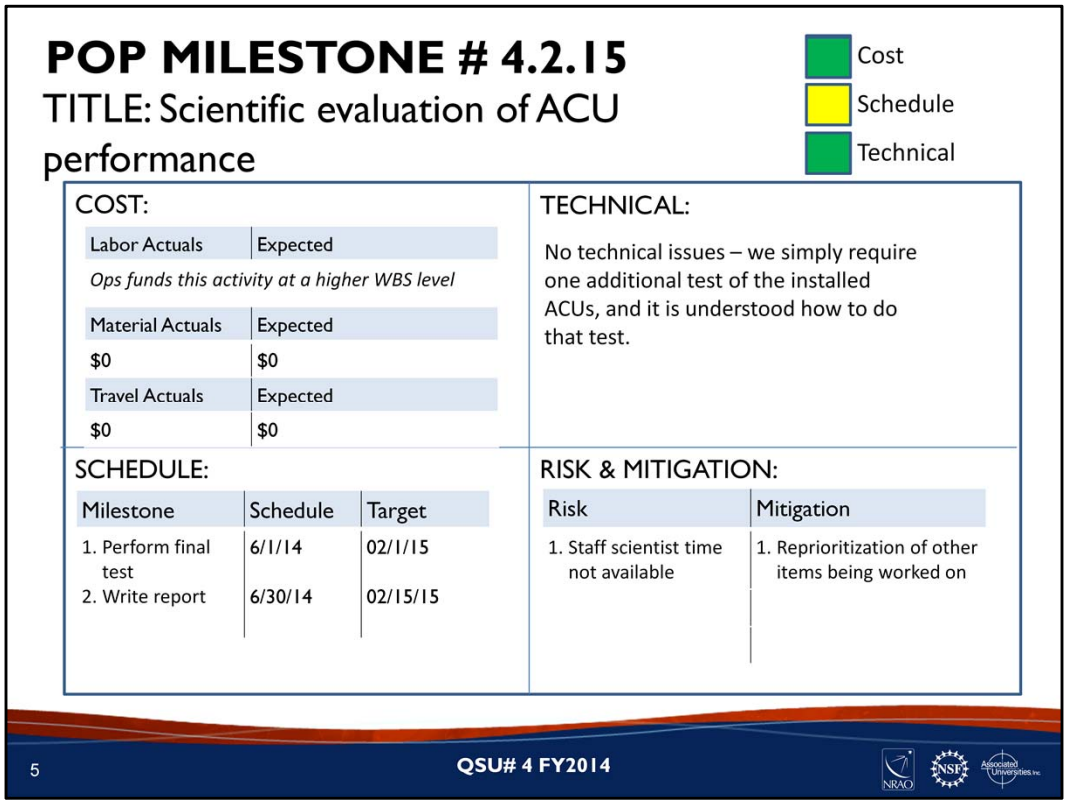
SCHEDULE: The FEHV subproject (originally scheduled to complete in Q2 FY13) was running late and then was suspended in Q3 FY13 when the NA ALMA Project *Cost To Complete* forecast indicated a significant cost overrun. The subproject was re-activated late in Q1 FY14. Incorporation of numerous design changes delayed the delivery schedule. A second fabricator was engaged to accelerate the delivery schedule. The second fabricator delivered non-conforming subassemblies (inferior welds) to the primary fabricator. Corrective action required significant non-destructive evaluation and rework, further delaying the delivery schedule. Final delivery will occur during the No-Cost Extension period (30 November 2014).

TECHNICAL: FE Handling Vehicle No.1 successfully field-tested in each of the four antenna configurations at the AOS using the FE Service Vehicle and current Operations handling procedures. The FEHV configuration exceeds the maximum weight specification by 50Kg and exceeds the minimum clearance specification by 9 cm. RfWs have been approved for each condition. Three (3) design changes were identified during the field test; design revisions are being incorporated (at the fabricator's facility) into Units 2, 3 and 4. Unit No.1 will be retrofitted at the OSF.

RISK & MITIGATION: Training sessions for JAO FEHV Operators and Maintenance Technicians will be conducted at the OSF during early December. Contract performance is being closely monitored by the North American Acceptance Tiger Team Leader.



SCHEDULE: ALMA originally planned to complete all Cycle 1 High Priority observations by the end of the cycle (May 31, 2014), and the original milestone for NA data delivery closeout (Sep 30, 2014) was based on this assumption. After analyzing C1 completion status, ALMA management decided to roll over uncompleted HP C1 projects into C2 – a significant number. At the end of Q3, an estimated 273 h of Cycle 1 projects remain uncompleted (~90hrs for NA). Even though these projects have a high priority (only the remaining 116hr of "A" graded proposals have a higher scheduling priority), they are spread over a range of required configurations and LST so that completion and close-out of these observations is not expected until the end of Cycle 2 (Q1 FY16).



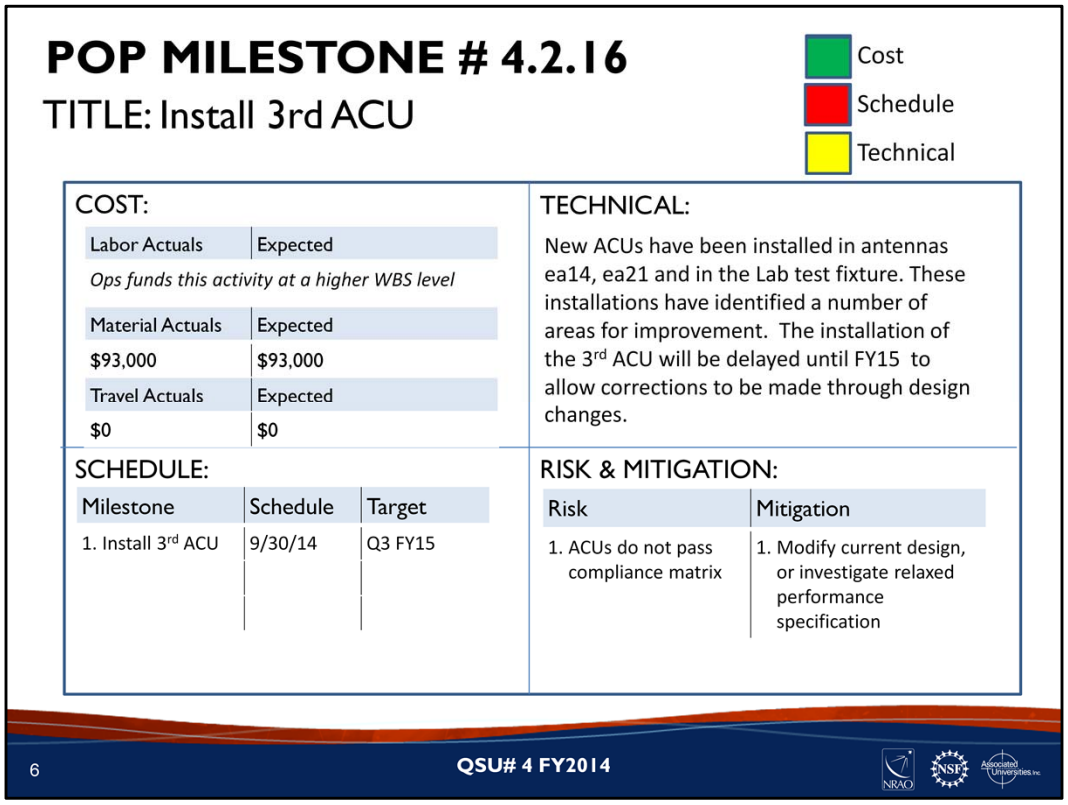
COST: Costs are tracked at a higher WBS level. There are no material or travel costs for this item, only labor.

SCHEDULE: Two tests were deemed sufficient to evaluate the performance of the new ACU units (in two VLA antennas): first, an observation consisting of repeated normal pointing cycles, at three frequencies (L-, C-, and X-bands); second, a super-sidereal test. The first was executed and a report distributed. The second has not been completed.

TECHNICAL: There are no technical issues – we know exactly how to do the super-sidereal test using OTFM.

RISK & MITIGATION: The only risk is continued unavailability of scientific staff effort (R. Perley). This milestone was re-scheduled for Q4, but commissioning tests of VLITE took priority. This has now been factored into FY15 planning.

NB: This milestone was identified at the beginning of FY2014 as one that would be impacted by VLITE. It will be carried forward as an exception for FY15.

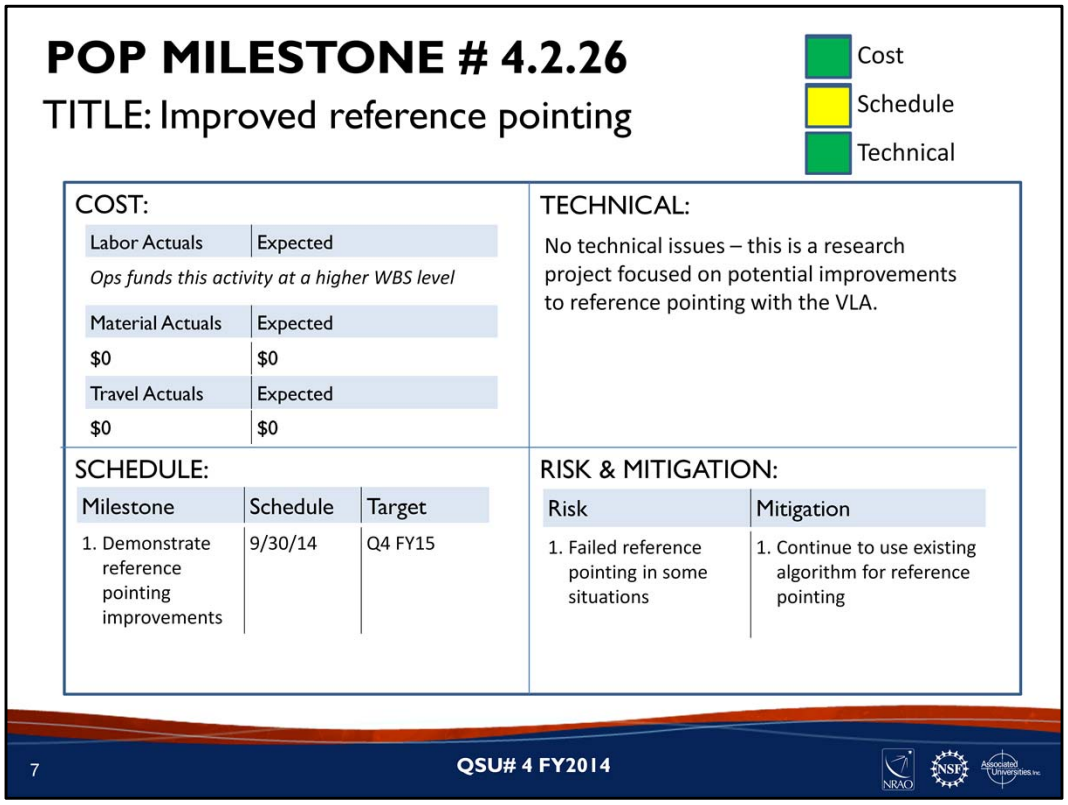


COST: Costs are tracked at a higher WBS level. The project is funded as part of the VLA Servo group, within NM Operations. The majority of the hardware costs for 2014, $60k, were allocated in January 2014. Additional funds, $33k, were added in July 2014. A total of $93k were allocated for M&S in FY2014. Approximately half of these expenses were for upgrading the 3rd ACU.

SCHEDULE: Technical issues have delayed the system installation. These include a need to relocate power supplies elsewhere in the enclosure and to correct minor PCB design issues with re-spun PCBs. The combination of such changes have impacted the rack enclosure design, and resulted in a schedule delay. We expect the new 3rd ACU to be installed in early Q3-FY15.

TECHNICAL: VLA Antenna Control Unit (ACU) Replacement Project: All of the legacy VLA antenna control units need to be replaced because of performance issues and the lack of replacement parts. The first upgraded VLA ACU was installed in antenna 21 in Q4-FY13. The 2nd ACU was installed in Q2-FY2014 . These installations have identified a number of deficiencies. The installation of the 3rd ACU will be delayed and rescheduled for Q3 FY15 (FY15-16 POP Milestone #3.4.39) to allow these deficiencies to be addressed.

RISK & MITIGATION: There are two specific risk items associated with the full delivery of the new ACUs, noted above. The ACUs do not pass the compliance matrix. The areas of concern include: 1) the self generated RFI which interferes with 4-band observations, 2) system reliability and required maintenance, and 3) pointing accuracy and the time to stable pointing.

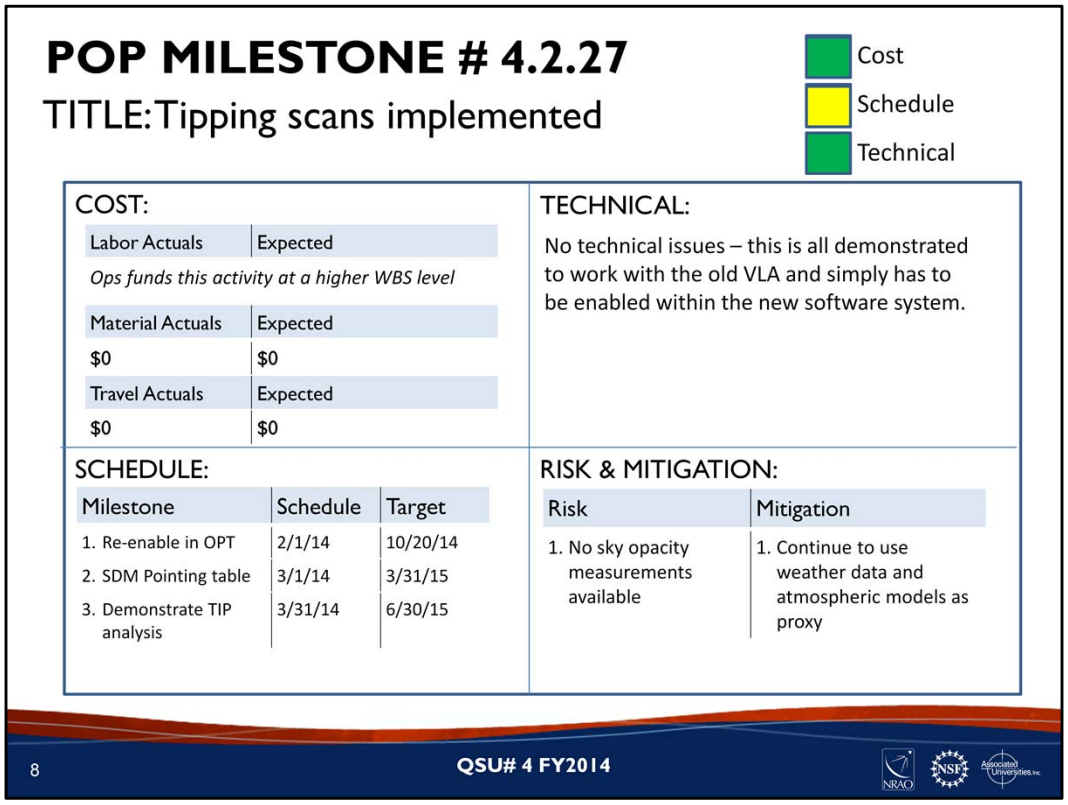


COST: Costs are tracked at a higher WBS level. There are no material or travel costs for this item, only labor.

SCHEDULE: The ability to specify a different reference antenna or sub-band was implemented within the online software in Q4, but has not been exposed to users, or used in any other way in the system. Scientific testing of this item was delayed due the redirection of effort to VLITE in Q4. However, other enhancements to referenced pointing were implemented in FY 2014, including improved robustness to misbehaving antennas or electronics. Further work on improving the robustness of reference pointing will continue and has been rescheduled for Q4 FY15 (FY15-16 POP Milestone #3.4.46).

TECHNICAL: There are no technical issues – this is a research project which has some known and some developmental aspects.

RISK & MITIGATION: The current method of reference pointing works in most cases, and will continue to be used in the absence of the improvements from this milestone.



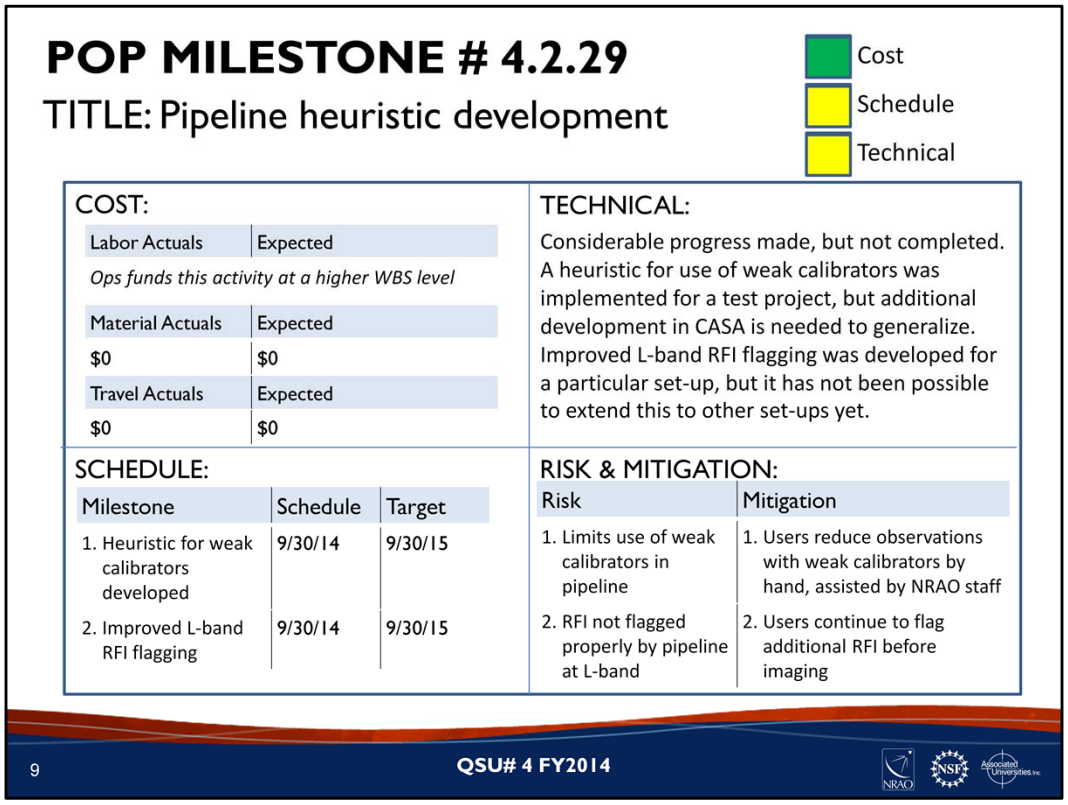
COST: Costs are tracked at a higher WBS level. There are no material or travel costs for this item, only labor.

SCHEDULE: The ability to specify a scan as a TIP scan, with the old default VLA elevations supported, was implemented in the OPT in Q4. However, further work in the OPT was needed for the system to validate such scans, which occurred after the end of the FY, in October 2014. Support in the SDM Pointing table is still needed, and a final implementation of the reduction of the TIP scan to derive the opacity (which means implementing the method described in VLA Scientific Memo 170). This milestone has now been re-prioritized and included in FY15 (FY15-16 POP Milestone #3.4.47).

TECHNICAL: There are no technical issues – this is all demonstrated to work with the old VLA and simply has to be enabled within the new software system.

RISK & MITIGATION: Tipping scans can in principle provide the best measurement of the sky opacity, needed for high frequency calibration. For the last four years (since turning on WIDAR) we have been using weather data and atmospheric models as a proxy, and will continue to do so until tipping scans are fully commissioned. Quantitatively, the impact of the lack of tipping scans is that any high frequency observations for which a primary flux density calibrator is not observed at a similar elevation to the target has an increased uncertainty in its absolute flux density scale, by a few percent.

NB: This milestone was identified at the beginning of FY2014 as one that would be impacted by VLITE.



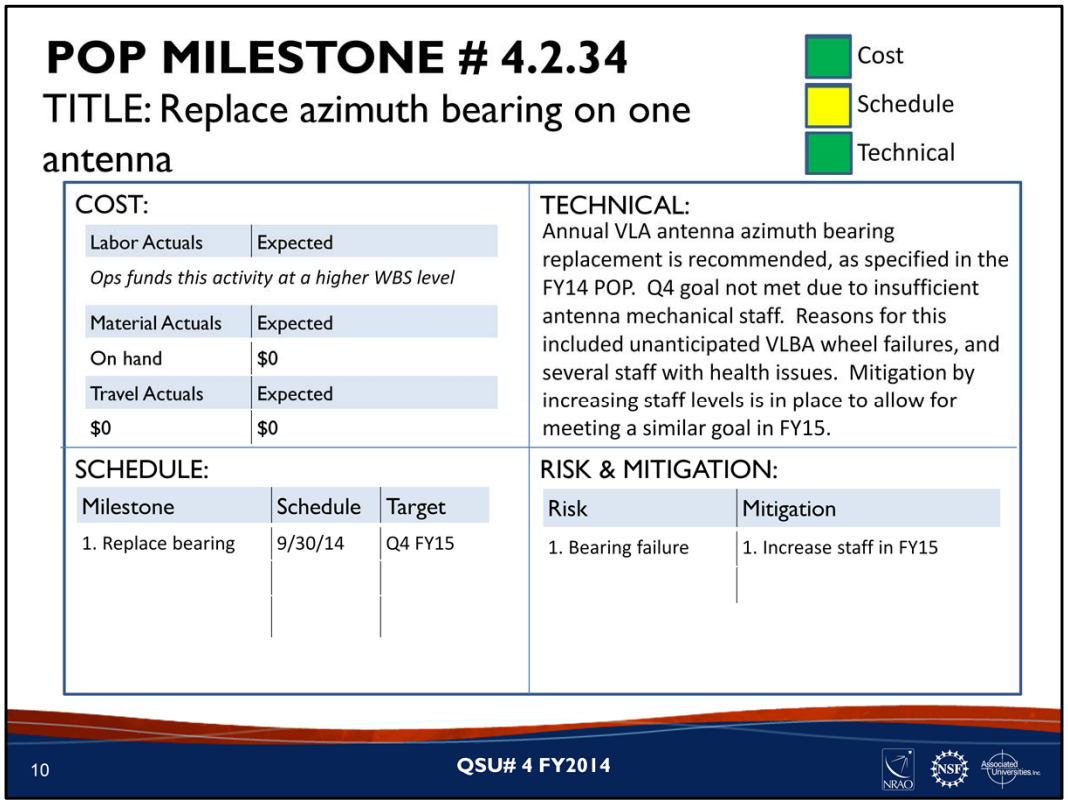
COST: Costs are tracked at a higher WBS level. There are no material or travel costs for this item, only labor.

SCHEDULE: General heuristics for handling weak calibrators require additional development in CASA before they can be implemented. These are scheduled for the CASA 4.4 release, due in FY15 Q3. More work is needed on general methods of L-band RFI flagging, and will continue in FY15-16 (Milestone # 3.4.49)

TECHNICAL: The heuristics for handling weak calibrators have been defined conceptually, and successfully tested on high frequency data (see Isella et al. 2014, ApJ, 788, 129). The technique has the potential to be more generally applicable; however, further development in CASA is needed to associate frequency to gain calibration solutions instead of spectral window IDs. This development is planned for CASA 4.4. Improved L-band RFI flagging techniques have been investigated, and found that improvements can be made when tailored to specific observing set-ups. As a result of the work done so far new options have been made available in the CASA task “statwt”, and additional modifications are being requested for CASA 4.4.

RISK & MITIGATION: The risks associated with a delay in the delivery of pipeline heuristics are that users have to continue to reduce and flag data by hand. The mitigation is to provide NRAO staff support through the helpdesk and face-to-face visits. In addition, we advise against using weak calibrators at observe time, if at all possible. If additional RFI flagging is needed prior to imaging this is noted in the QA2 reports sent to investigators upon completion of pipeline runs.

NB: This milestone was identified at the beginning of FY2014 as one that would be impacted by the Observatory shutdown.

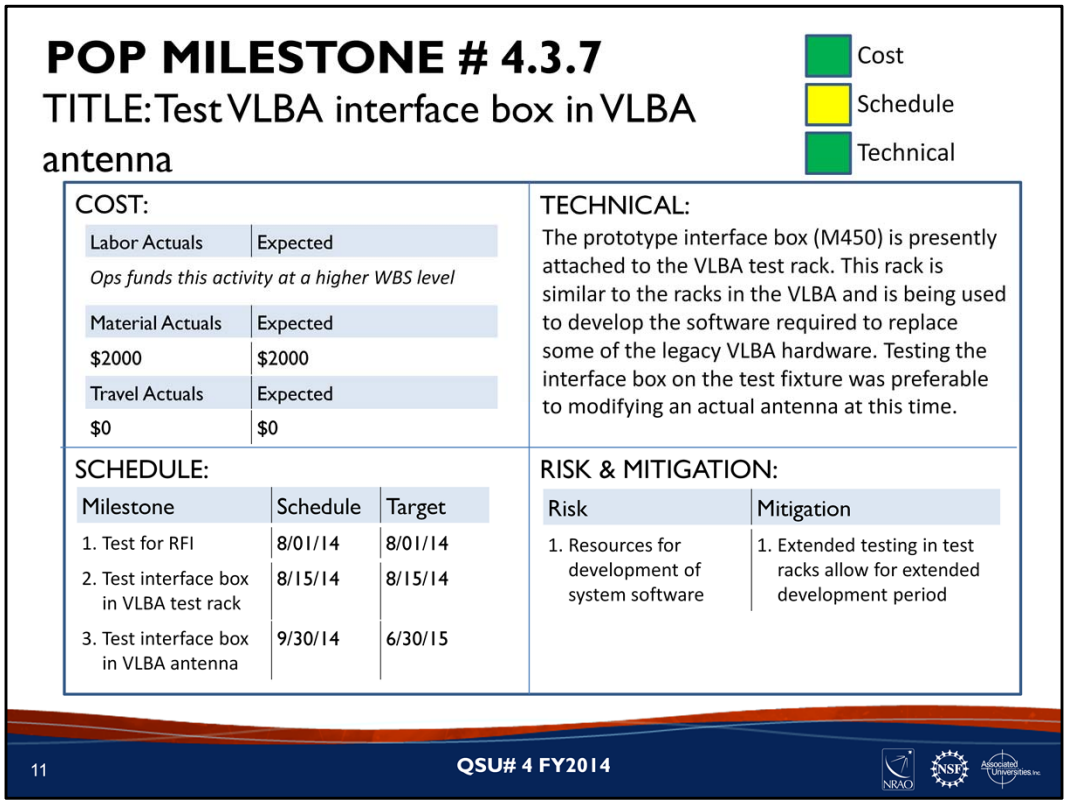


COST: Costs are tracked at a higher WBS level. This effort is funded in the VLA Antenna Mechanics group budget, within NM Operations. Hardware costs for this task were incurred several years ago when a quantity of bearings were purchased.

SCHEDULE: We strive to replace one VLA antenna bearing per year. Manpower issues have resulted in our failure to perform the task this year. These issues include lower than optimal FTE numbers in the group, an unusual number of serious health issues among the group members in FY14, and an unexpected problem with VLBA wheel assemblies, which resulted in a diversion of staff resources. This milestone has been delayed and rescheduled for Q4 FY15 (FY15 POP Milestone 3.4.20). Note that the antenna group did manage to complete nine overhauls (rather than the originally planned six) with the staff available.

TECHNICAL: No technical issues are associated with this milestone.

RISK & MITIGATION: The risk has been identified as one of inadequate staffing levels. NRAO management has mitigated this by creating, in effect, 3 additional positions in the mechanic group. One of these positions has been filled by way of an employee transfer from the NM Electronics Division. The other two positions are presently (10/1/14) being advertised.



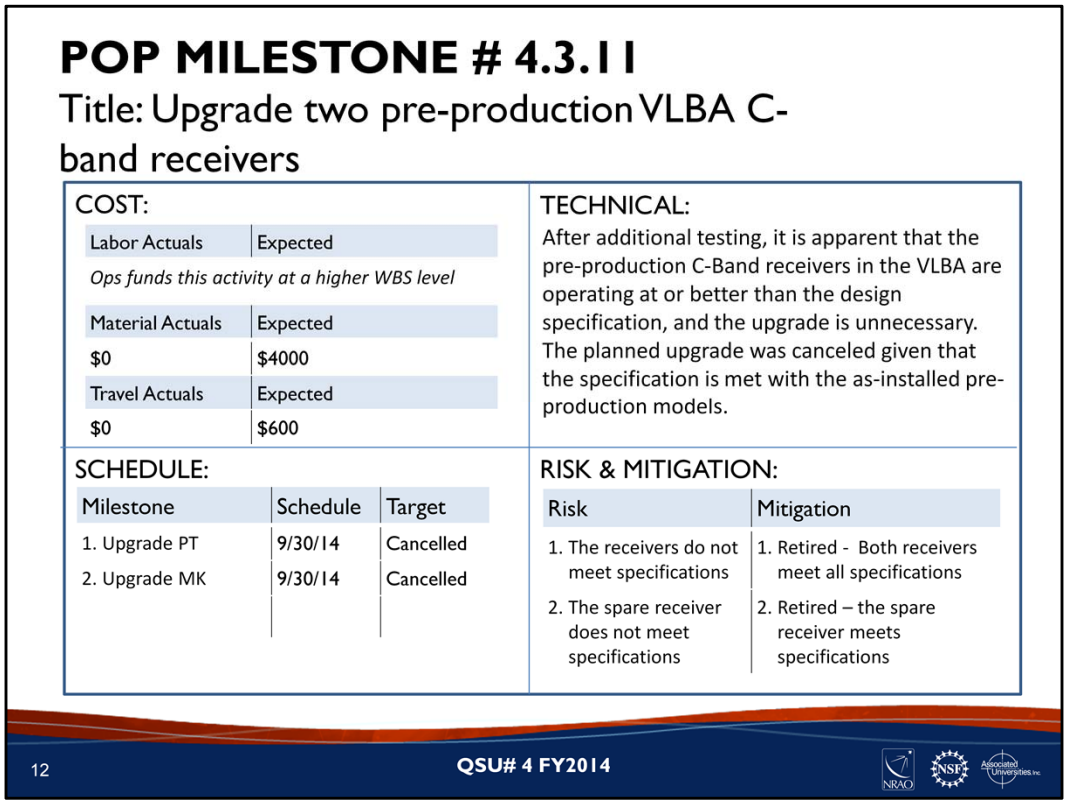
COST: Costs are tracked at a higher WBS level. The project is funded as part of the VLA DCS group, within NM Operations.

SCHEDULE: RFI testing concluded on August 1st. All remaining tests of the VLBA Interface Box (M450) on bench and in test racks, were completed in mid-August. The milestone for higher level testing was split from the original antenna-only into two testing milestones: in test rack (completed) and as part of production install on an antenna in FY15. This testing was changed to be done in-lab in order to utilize the VLBA racks there and minimize disruption on an antenna due to software development. The installation will be monitored as a FY15 POP milestone.

TECHNICAL: All hardware testing has been done and passed. Given the need to further develop the interfacing software systems, extensive testing of the prototype interface box (M450) was executed in the VLBA test rack instead of on an antenna. Testing the interface box on the test fixture is preferable to modifying and potentially disrupting an actual antenna at this time. Additional interface boxes will be built to install in the array and one will be tested on an antenna in Q3 FY15 (Milestone #3.4.58).

RISK & MITIGATION: With the hardware fully developed and tested in lab, the remaining risk associated with the full delivery of VLBA interface boxes in 2015 is based on the software interface. Due to limited staff resources that can update the system software to incorporate the M450, the in-rack lab testing has been extended to allow for a broader development period. This level of effort has been programmed in the FY15 POP.

NB: This milestone was identified at the beginning of FY2014 as one that would be impacted by VLITE.

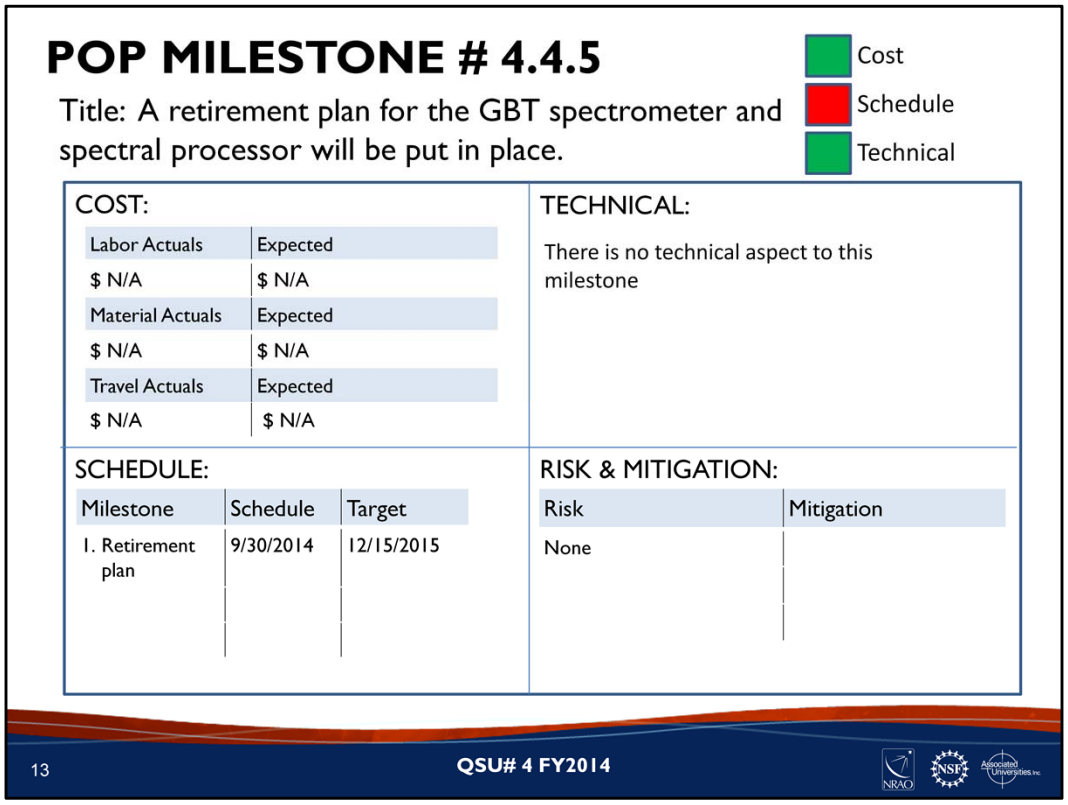


COST: Costs are tracked at a higher WBS level. The project is funded as part of the VLA Front-End group, within NM Operations.

SCHEDULE: An assessment of the VLBA C-Band receivers indicates that the units are within the design specification and that no upgrade is required. The assessment was completed in mid July, 2014. This milestone has been cancelled.

TECHNICAL: Initial inspections of the pre-production C-band receivers suggested their performance did not match the production models and an assessment and upgrade was proposed as part of the 2014 Program Operating Plan. However, the assessment of the pre-production C-band receivers in the field demonstrates that they are operating at or better than the design specification. The planned upgrade was canceled given that the intent was met with the as-installed pre-production models.

RISK & MITIGATION: Performance risks have been retired.

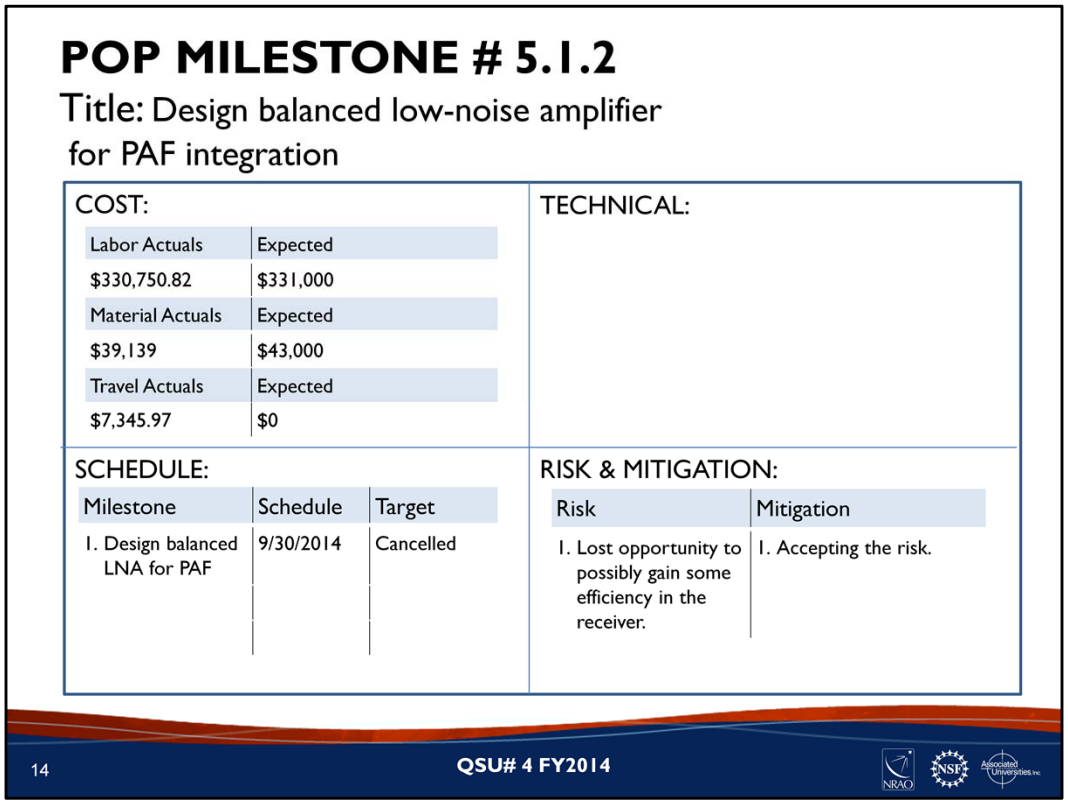


COST: This is not a separately budgeted activity – retirement of GBT instrument is part of GBT operations.

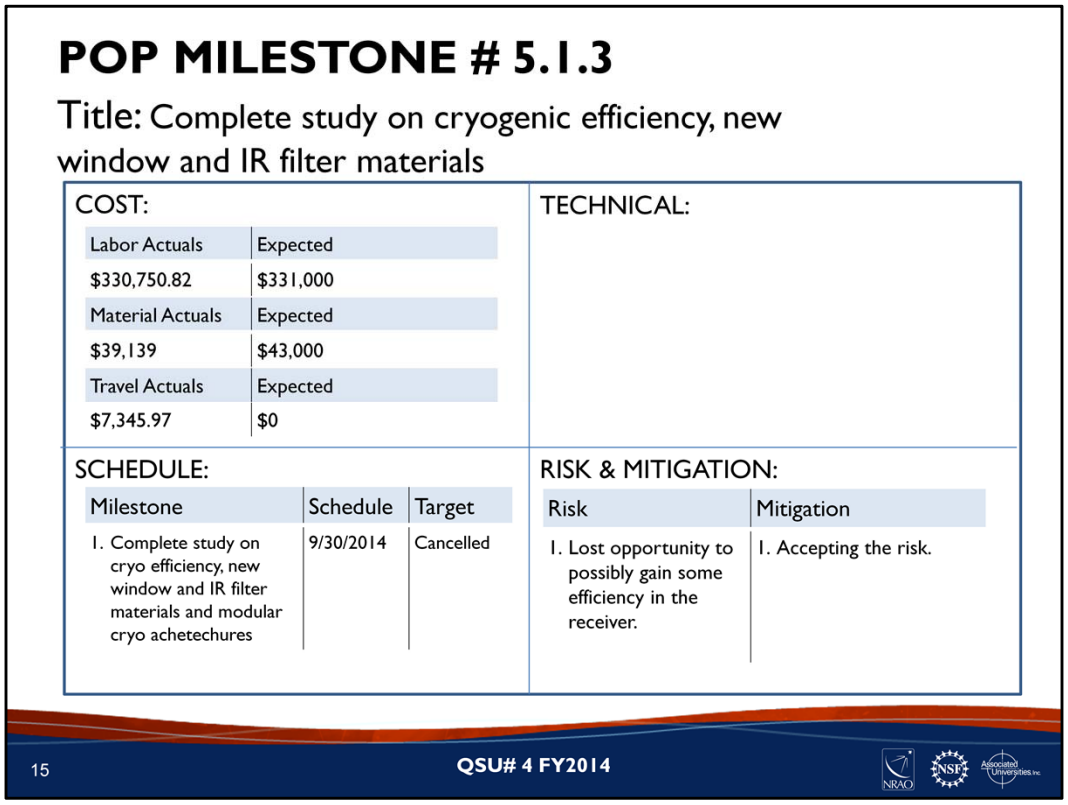
TECHNICAL: None

SCHEDULE: The GBT spectrometer and Spectral Processor have been replaced by VEGAS, but due to the delays in VEGAS deployment, the clean-up activity of documenting and publishing the retirement plan was not completed in FY 2104 as planned. The work has been assigned and is scheduled to be complete on 12/15/2015. It will be carried forward as an exception for FY15.

RISK & MITIGATION: There are not any risks associated with this milestone.



This milestone has been cancelled for FY14. This was one of several areas in which the Phased Array R&D group would investigate alternative technologies in parallel with the ongoing efforts to improve the L-band cryogenic PAF (with single-ended dipole and LNAs). The effort did not fit within budget constraints, and did not conform well with desire to work collaboratively with the Beamformer enhanced digital backend project.



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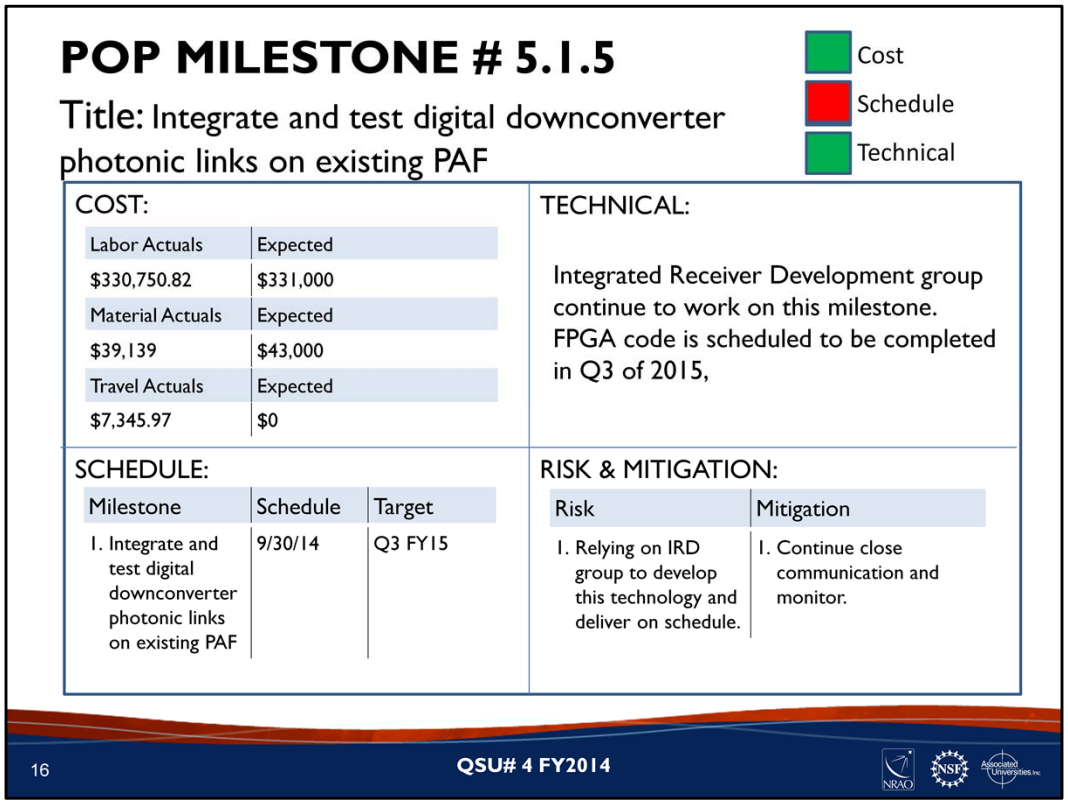
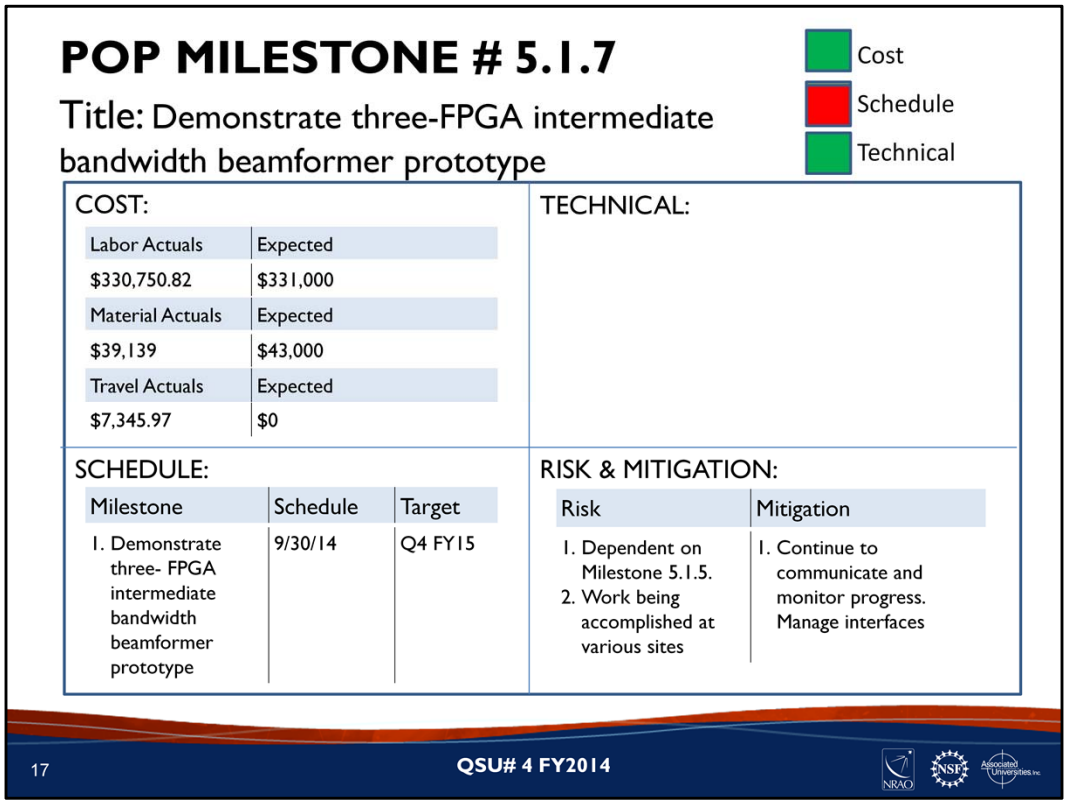
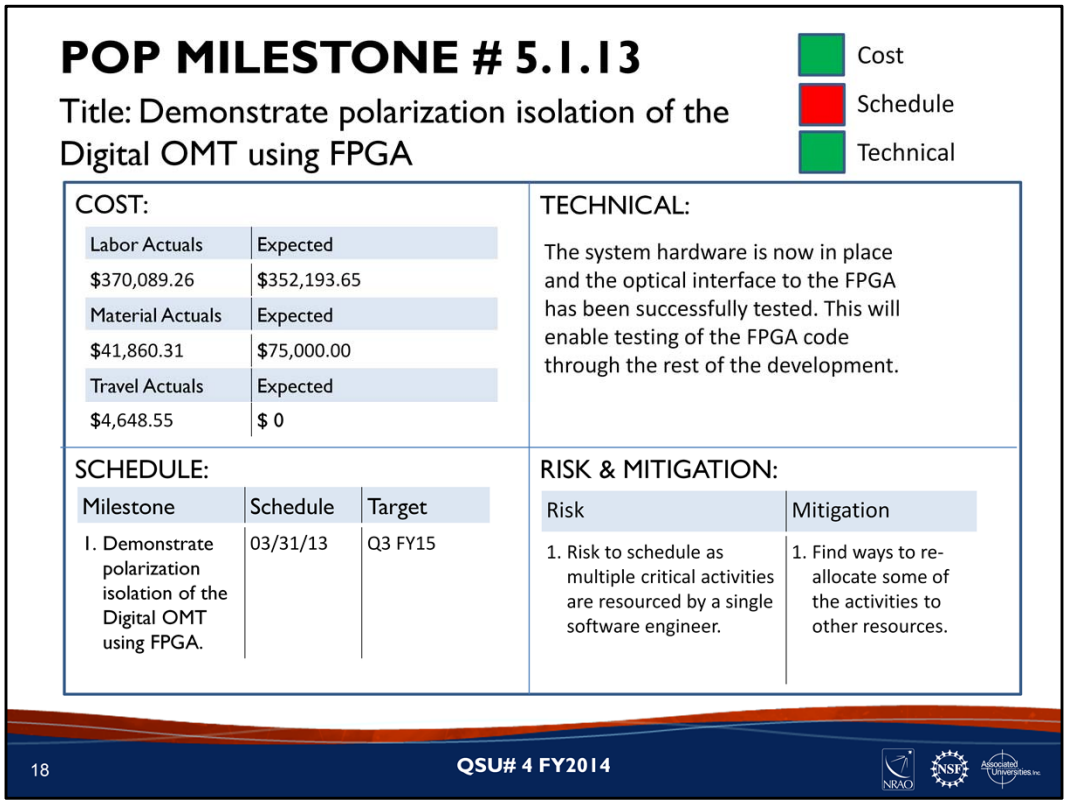


Schedule: This milestone was delayed and rescheduled for Q3 FY15 (FY15 POP Milestone #5.3.20). This work was impacted by lack of engineering resources both in terms of available budget and also by resources committed to other projects (C-Band upgrade). Additionally, there was some delay in completing the single blade lab prototype of the downconverter.



This milestone is significantly impacted by the Beamformer project. This milestone has been delayed and rescheduled for Q4 FY15 (FY15 POP Milestone #5.3.21). Since the Beamformer project is essentially funded to do a bigger-scope version of this milestone, we worked with them to forge an agreement in which both parties work to the same goal. We took on part of the work, which could be called "Digital-photonic receiver and Roach2 backend development" which has begun and is included as a FY15 POP.

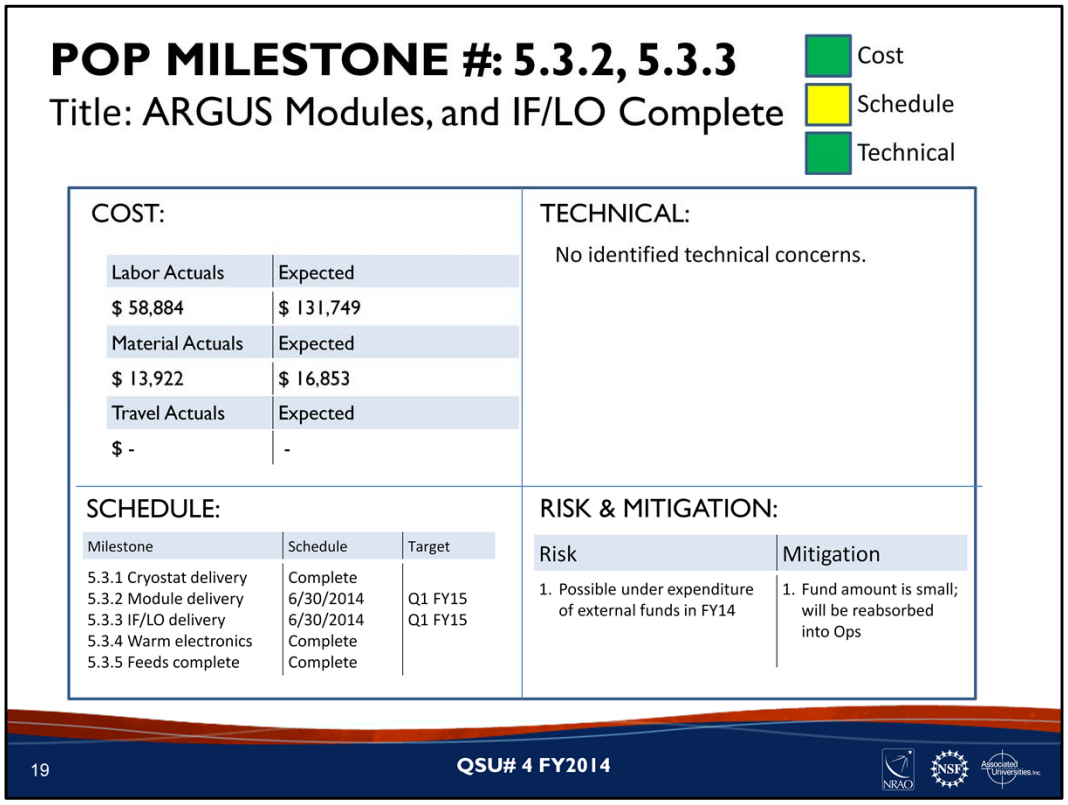


COST: On budget however the actuals do not include committed funds. Current commitments may put the cost over budget but still within 5% of budget. Commitments will carry over into 2015 Budget.

SCHEDULE: Initial delay was caused by a necessity to use an alternative FPGA and the learning curve associated with the new hardware however, the software development effort for this milestone was underestimated. Hardware development continued in parallel and the required optical interface to test the software is now tested. This will enable testing of the FPGA code as the development continues. This milestone has been delayed and rescheduled to Q3 of FY15 (Milestone # 5.3.16). This task is 65% accomplished.

TECHNICAL: none.

RISK & MITIGATION: The software engineer has multiple critical activities assigned to him. We are working to find methods to alleviate his workload by re-assigning as many tasks as possible to other people.



COST: The cost is currently within the project budget. There are no milestone budgets.

SCHEDULE: Milestone 5.3.1 Cryostat delivery was completed in Q4 FY14. The Warm electronics and the feeds complete milestones are also completed.

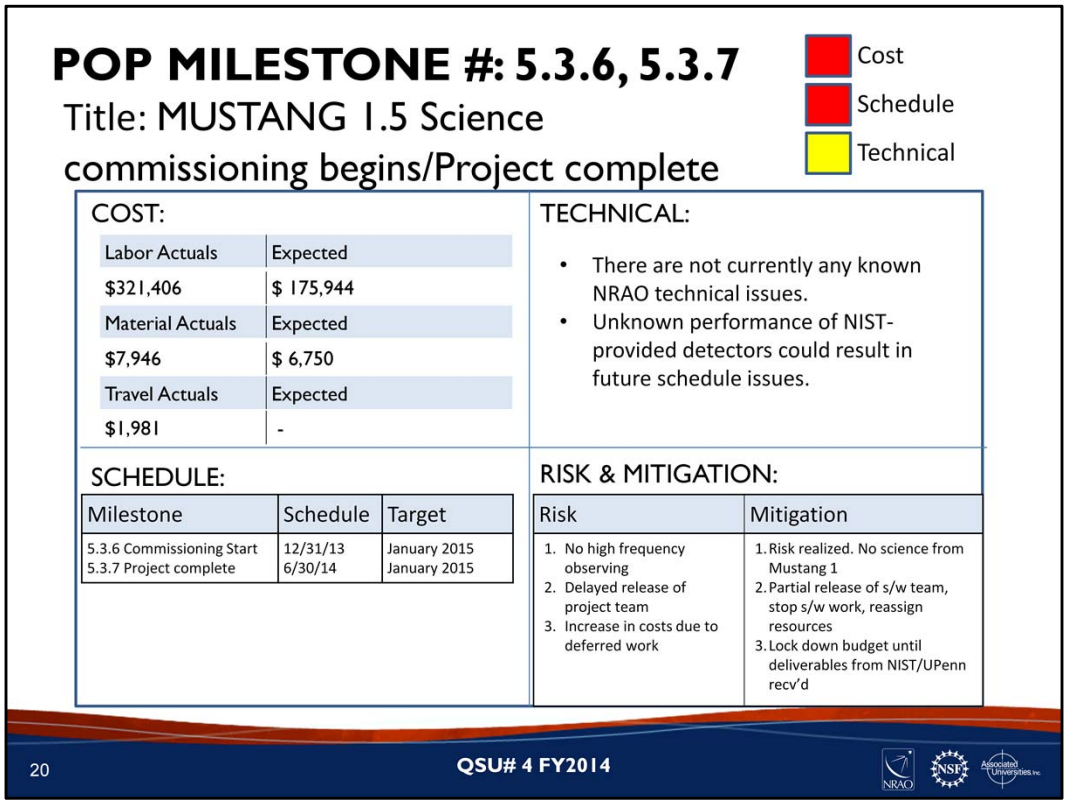
Milestone 5.3.2 – Module delivery complete is anticipated to be complete in Q1 FY15.

Milestone 5.3.3 – IF/LO delivery is anticipated to be complete in Q1 FY15.

The delay is accounted for by a delay in deliverables of the cryostat from the University of Miami to Stanford, the modules delivered by Caltech (FY14 Q3), and the IF/LO to be complete by Stanford (FY14 Q3) for integration with the warm electronics. NRAO has no ability to manage the delivery or integration at Stanford. This resulted in a delay to the project. Both milestones are anticipated for completion in January 2015 and will be reported in the FY15 exception report.

TECHNICAL: None noted.

RISK & MITIGATION: No new risks identified.

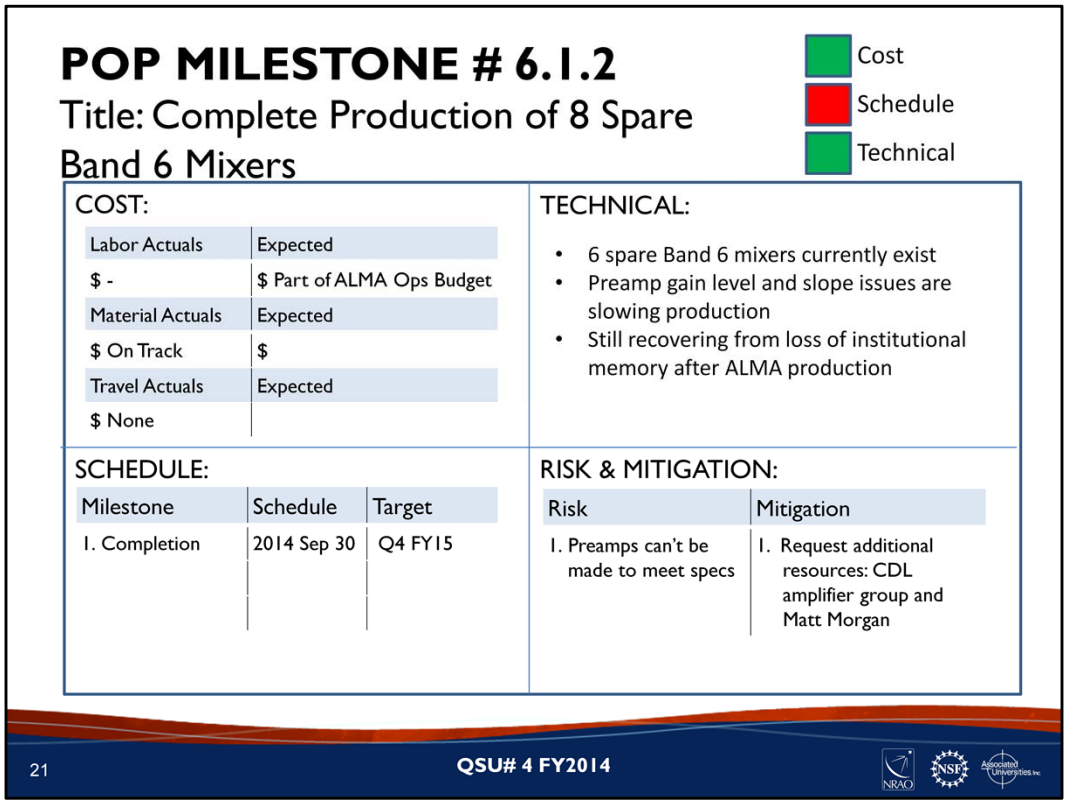


COST: Costs for the project are being actively monitored. The project has been re-baselined at the start of FY15 with respect to schedule and cost. The change has been accepted at the budget summit and the project is currently being monitored on the revised FY15 schedule and budget.

SCHEDULE: Due to the overrun on the schedule, the NRAO is meeting biweekly with UPenn and monthly with PMD and NRAO management, to monitor progress and control costs. As of October 2014, UPenn deliverables are planned to be sent to Green Bank for integration on the GBT in November/December 2014. Upon integration, we will mark project completion and science commissioning commencement. Both milestones are anticipated for completion in January 2015 and will be reported in the FY15 exception report.

TECHNICAL: There are currently no technical issues out of tolerance for the NRAO portions of the project. Potential UPenn technical issues are related to the performance of the NIST detectors. NRAO is monitoring the performance of the deliverables prior to acceptance.

RISK & MITIGATION: Current MUSTANG 1.0 has been permanently removed from the GBT so high frequency science capability is limited. NRAO has implementing a plan for our project staff based on well defined stopping points until which time the detectors arrive at UPenn. NRAO is managing the performance risk by monitoring the established gating criteria (performance characteristics) of the planned deliverables from UPenn.

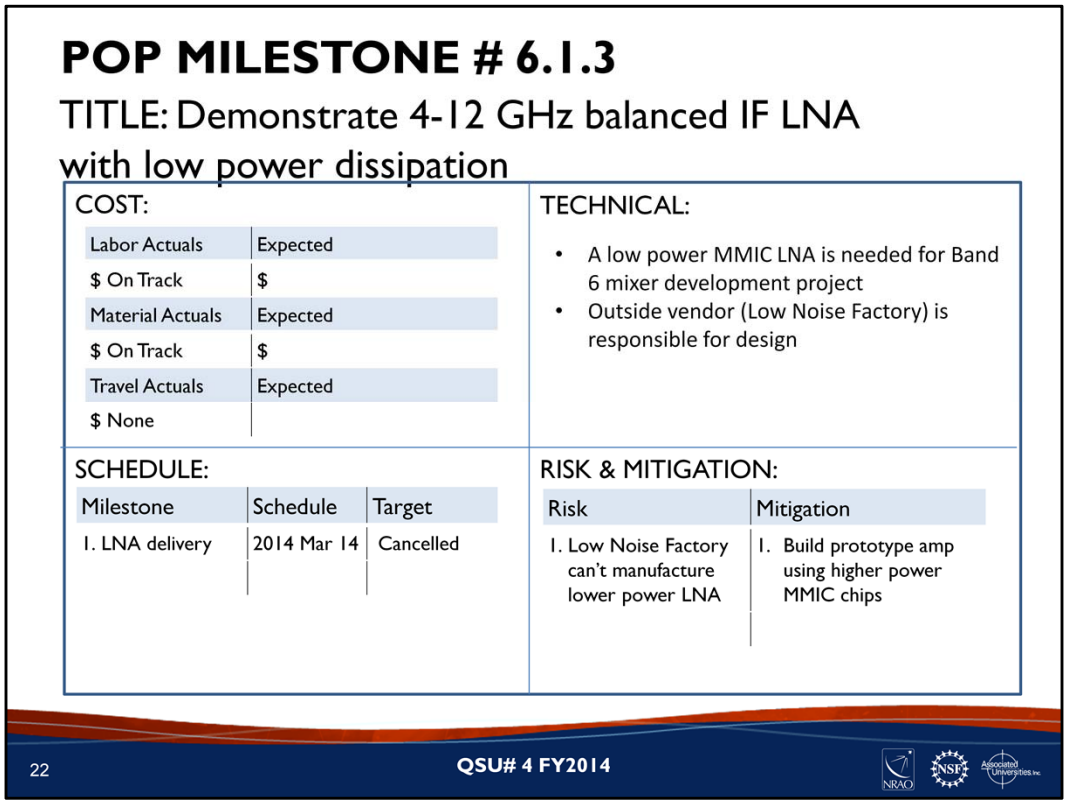


COST: Included in ALMA Ops budget.

SCHEDULE: During Band 6 production, the ALMA project accepted waivers for some Band 6 mixers when full-band gain slope was worse that specs, but during operation phase, waivers are processed too slowly to be useful for repairs. This milestone has been delayed and rescheduled for Q4 FY15 (FY15-16 POP Milestone #5.3.1).

TECHNICAL: We now have a reasonable model of the amplifier that is helping determine parts of the design that are most sensitive to gain slope. As an example of lost institutional memory, we just recently learned that during production, HFET pinch-off and Gm testing was used to pre-screen the amplifiers.

RISK & MITIGATION: We can use additional resources from the CDL if necessary.



COST: N/A

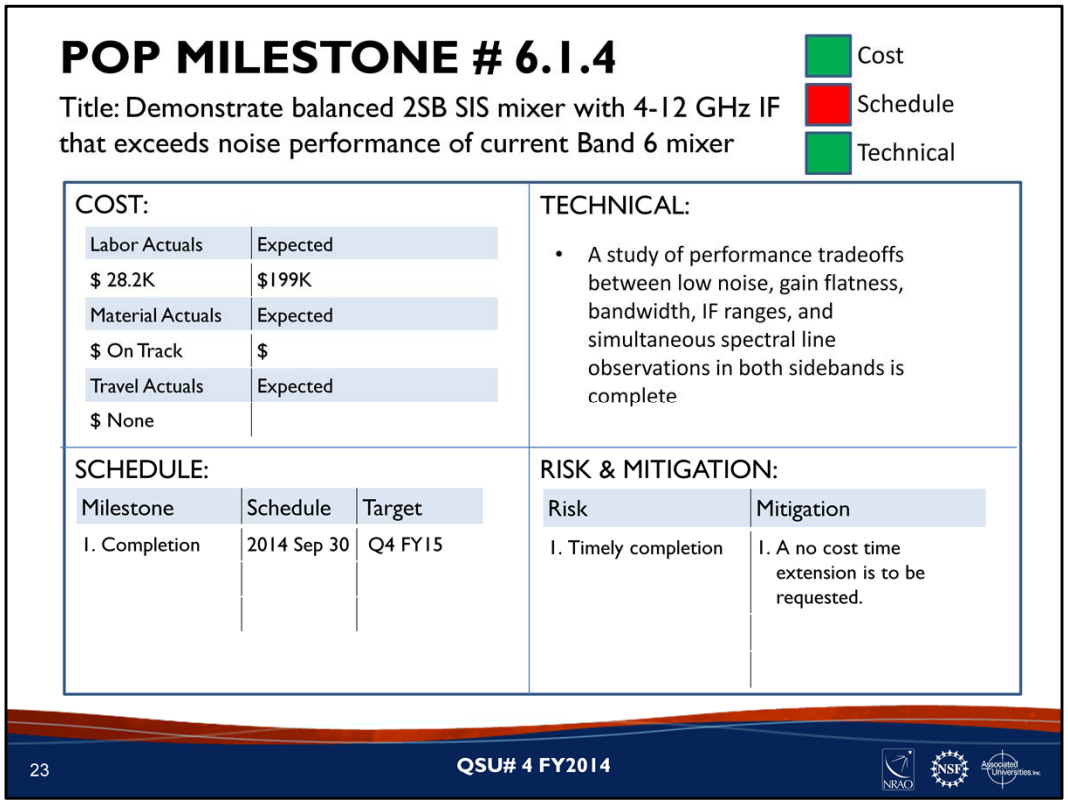
SCHEDULE: This task is dependent on an outside vendor, Low Noise Factory (Chalmers), to provide the low power MMIC chips. LNF has demonstrated higher-dissipation cryogenic MMICs with acceptable noise performance, and recent conversations with them indicate they are working on the lower-power versions, but a stepper motor failure at their fab facility has delayed mask production. This milestone has been cancelled for FY14.

TECHNICAL: This is a CDL R&D project that will be used for the ALMA Development Band 6 upgrade.

The MMIC chips required to build the LNA are dependent on an outside vendor, Low Noise Factory (Chalmers). LNF demonstrated higher-dissipation cryogenic MMICs with acceptable noise performance, and recent conversation with them indicate they are now working on the lower-power versions, but a stepper motor failure at their fab facility has delayed mask production.

We have cancelled this task but will prove the concept is feasible by building the LNAs with the existing higher power MMICs.

RISK & MITIGATION: If the low-power MMIC amps begin to delay the ALMA Development Band 6 upgrade, we will build an amp with the existing higher power MMICs to prove the concept.

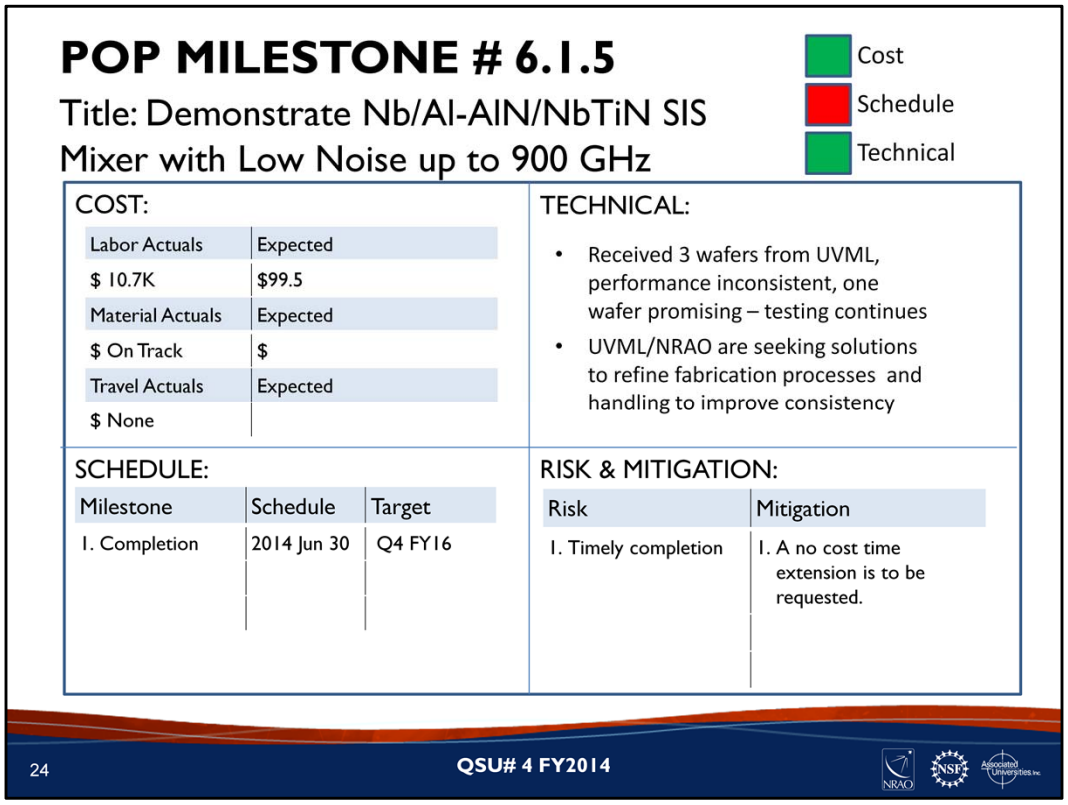


COST: Expenditures, (primarily in labor) are running behind schedule due to departures of several individuals who were expected to be involved.

SCHEDULE: Expected completion date has passed, a no cost time extension will be requested. This milestone has been delayed and rescheduled for Q4 FY15 (FY15-16 POP Milestone #5.3.2)

TECHNICAL: Design goals that include both low noise and wide bandwidth lead to optimization of different parameters, depending where the IF band is targeted. A study of performance tradeoffs between low noise, gain flatness, bandwidth, IF ranges, and simultaneous spectral line observations in both sidebands is complete. As a result of the study, the relative merits of different IF bands for future Band-6 receivers have been characterized.

RISK & MITIGATION: A request will be submitted proposing that FY14 funds will carry forward; thus ensuring study completion.

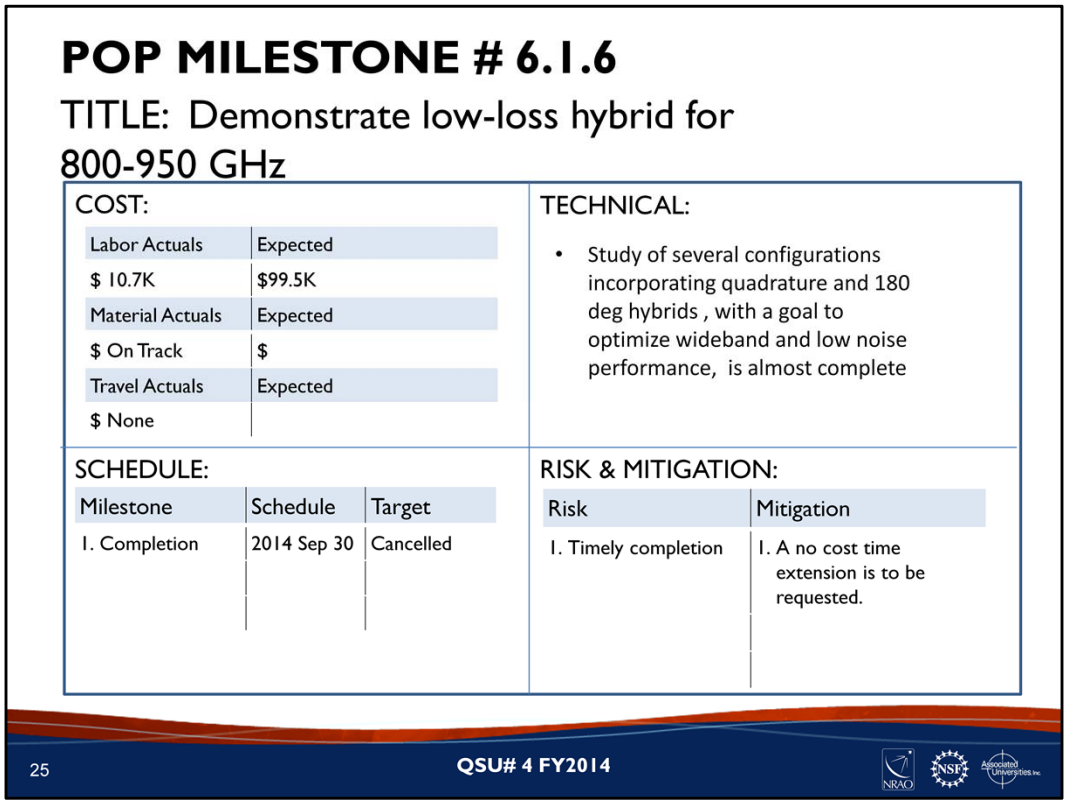


COST: Expenditures, (primarily in labor) are running behind schedule due to departures of several individuals who were expected to be involved.

SCHEDULE: Expected completion date has passed, a no cost time extension will be requested. This milestone has been delayed and rescheduled for Q4 FY16 (FY15-16 POP Milestone #5.3.2)

TECHNICAL: Three wafers of Nb/Al-AlN/Nb mixers have been delivered. One has exhibited promising initial results and testing continues with devices from this wafer. One exhibited higher noise temperatures than desired due to leakage current, and the other had good performance prior to dicing, after which the room temperature resistance changed greatly, significantly degrading performance. UVML/NRAO are seeking solutions to refine fabrication and handling processes to improve consistency.

RISK & MITIGATION: A request will be submitted proposing that FY14 funds will carry forward; thus ensuring study completion.



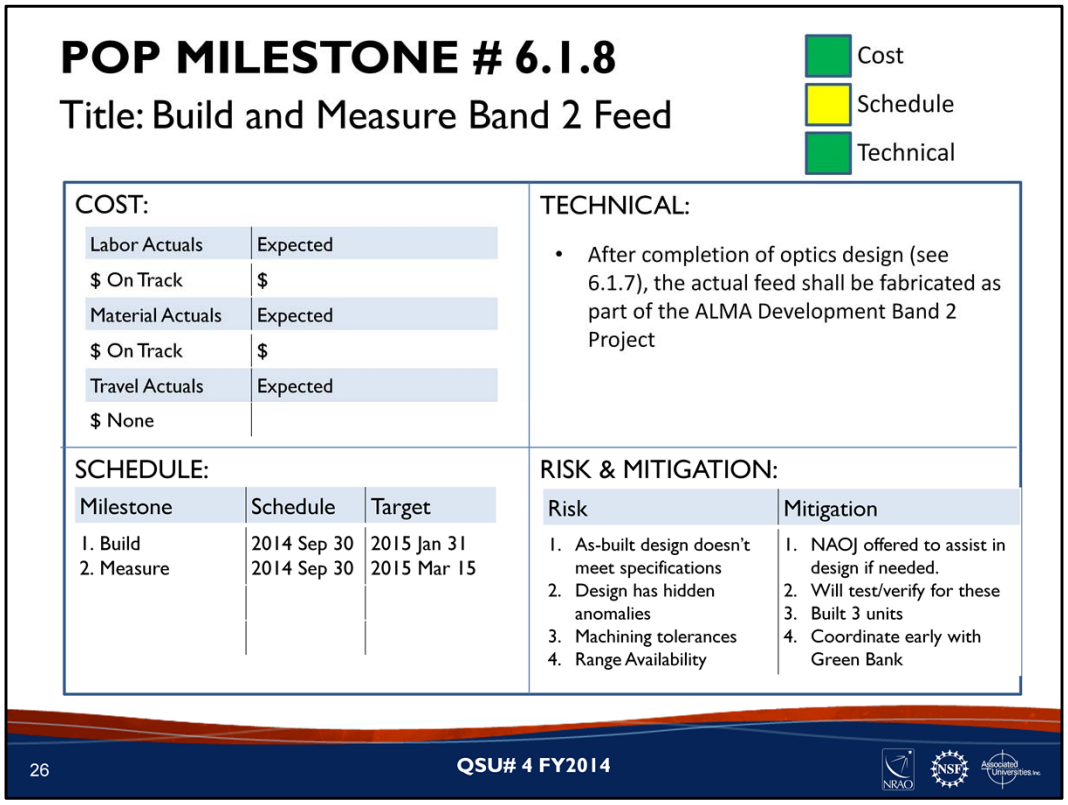
COST: Expenditures, (primarily in labor) are running behind schedule due to departures of several individuals who were expected to be involved.

Resource limitations require that we cancel this task, and the hybrid will be realized in an existing coax version, which will still prove the concept for the balanced mixer.

SCHEDULE: Expected completion date has passed, a no cost time extension will be requested. This milestone has been cancelled for FY14.

TECHNICAL: Balanced and sideband-separating SIS mixers can be realized in several configurations. The combination of quadrature and 180-degree hybrids in the signal and LO paths affects some important characteristics of a mixer not usually considered in radio astronomy receiver design, but which can be important when seeking the lowest noise over wide RF and IF bands. A comparative study of several possible configurations is almost complete.

RISK & MITIGATION: A request will be submitted proposing that FY14 funds will carry forward; thus ensuring study completion.

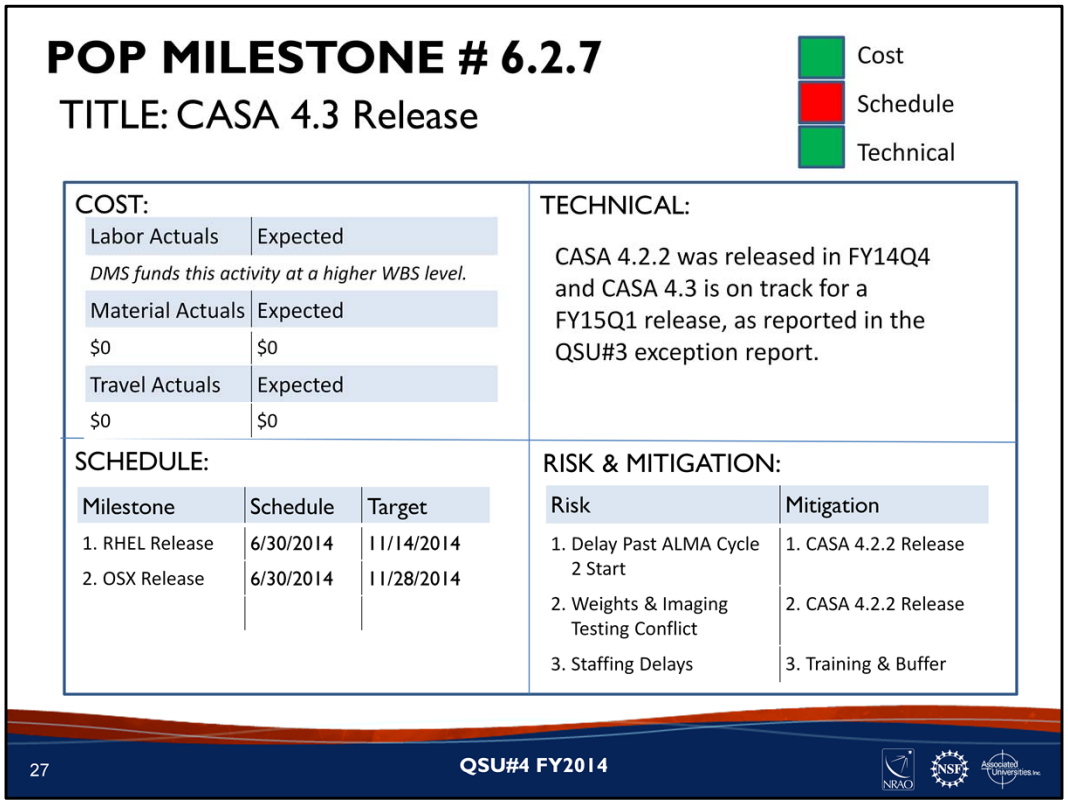


COST: N/A

SCHEDULE: Optics design is complete (6.1.7) , and the horn is now being machined in the shop. The design will be ready in time to be integrated into the prototype cartridge. This milestone was delayed and rescheduled for Q1 FY15 (FY15-16 POP Milestone 5.3.5)

TECHNICAL: This is a CDL R&D project with will be used for the ALMA Development Band 2 cartridge project.

RISK & MITIGATION: Hidden anomalies (i.e. trapped modes) – Thorough testing will confirm the absence of these anomalies.



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

SCHEDULE: As reported in QSU#3, the development schedule for CASA 4.3 was changed due to packaging and release problems at the end of the CASA 4.2 cycle. In an effort to accommodate all critical stakeholder needs, the scope of the CASA 4.3 cycle was revised and split into two deliverables. An intermediate release, CASA 4.2.2 would offer the most pressing functionality in time for ALMA Cycle 2 observing at the beginning of Q4. An expanded CASA 4.3 release was rescheduled for 1QFY15.

CASA 4.2.2 was released in 4QFY14 as planned and work in progressing on the CASA 4.3 release for 1QFY15. Dates reported above reflect the current expected completion dates for each milestone. The feature freeze date was extended in order to allow additional development time on a desirable calibration feature to be included in the release. As of late October, user testing on pre-release packages is in progress in anticipation of a November CASA 4.3 release.

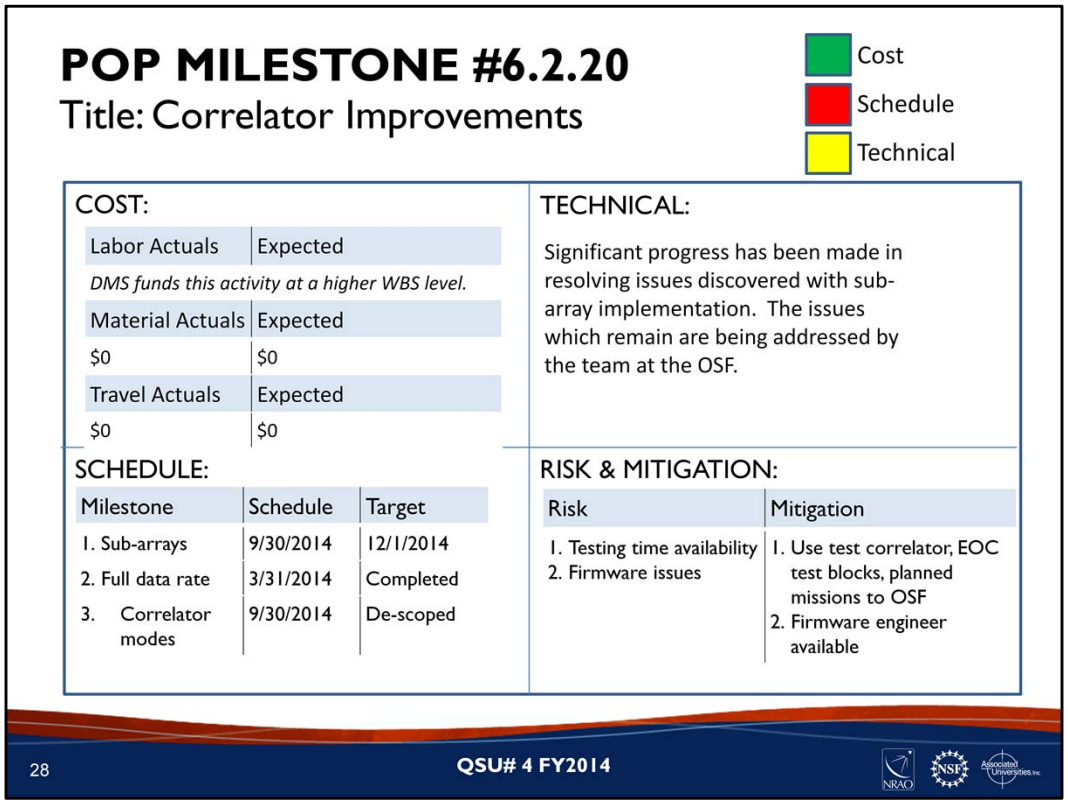
TECHNICAL: CASA 4.2.2 was released in FY14Q4 will all required features to support ALMA Cycle 2 observing. Technical progress on the CASA 4.3 cycle is largely matching the rebaselined plan developed in 2QFY14.

RISK & MITIGATION: The highest risk to the project was not releasing CASA 4.3 in time to support ALMA Cycle 2 observing. CASA 4.2.2 was built off the CASA 4.2 release branch in order to mitigate this risk.

The risk of complicated and ineffective testing given simultaneous major changes to the calibration tasks and imaging tasks was also identified as a concern early in the planning of the 4.3 cycle. This

risk was also mitigated with the CASA 4.2.2 release by providing the calibration changes in 4.2.2 and the imaging changes in 4.3. This allows for independent testing of each set of changes.

Vacancies within the CASA group and the DMS Testing group were identified as a risk to the 4.3 release. These vacancies remain open, but a combination of cross-training existing staff and a schedule buffer has kept the 4.3 development work on track.



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

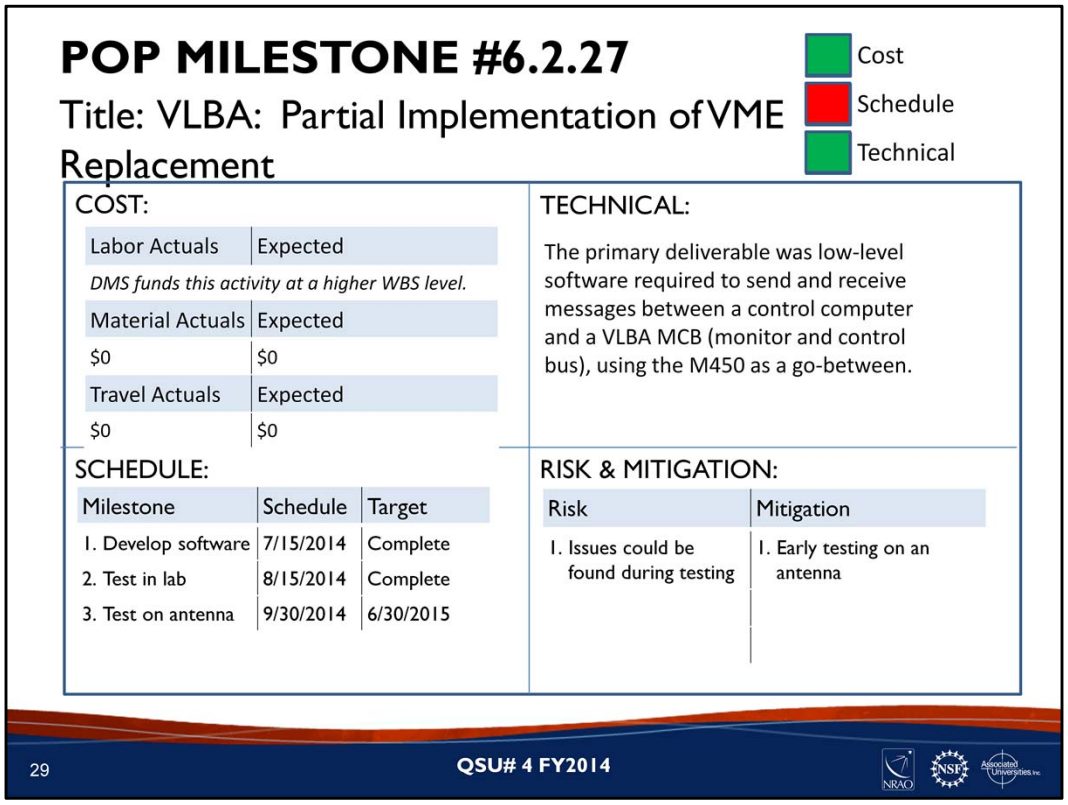
SCHEDULE: Development of sub-arrays was known to be a challenging goal. Technical issues described below and reduction in available testing time have delayed delivery on the POP timing, but the capability remains on schedule for inclusion for Cycle3 delivery. Sub-arrays are also included in the Spring 2015 Release scheduled for 3QFY15.

The full data rate (60 MB/s) delivery by the correlator was verified earlier this year (1/2014). Additional low-priority correlator modes (2x Nyquist, 3x3 and 4x4 bit modes) were de-scoped by ALMA to focus effort on sub-arrays for Cycle 3.

TECHNICAL: Significant progress has been made in resolving issues discovered with sub-array implementation. Problems in the software, and also in the firmware and hardware, have been discovered and fixed. The issues which remain are being addressed by a mission (Rodrigo Amestica, J Perez, Alejandro Saez) to the OSF with assistance from the rest of the Control/Correlator Team and Chilean staff. The mission will be extended if necessary, and Rafael Hiriart will continue testing if necessary as part of his OSF mission in late November.

RISK AND MITIGATION: Time available for testing at the OSF has been reduced to allow increased observing time. Testing and troubleshooting is being conducted on the test correlator in Charlottesville, during available slots of EOC time, and during focused missions to the OSF.

Previous testing has uncovered firmware issues outside the scope of the Control/Correlator team. While these have been fixed, it is possible that other firmware issues may be uncovered in testing. As a mitigation a firmware engineer, Alejandro Saez, is onsite to assist in resolving any issues discovered.

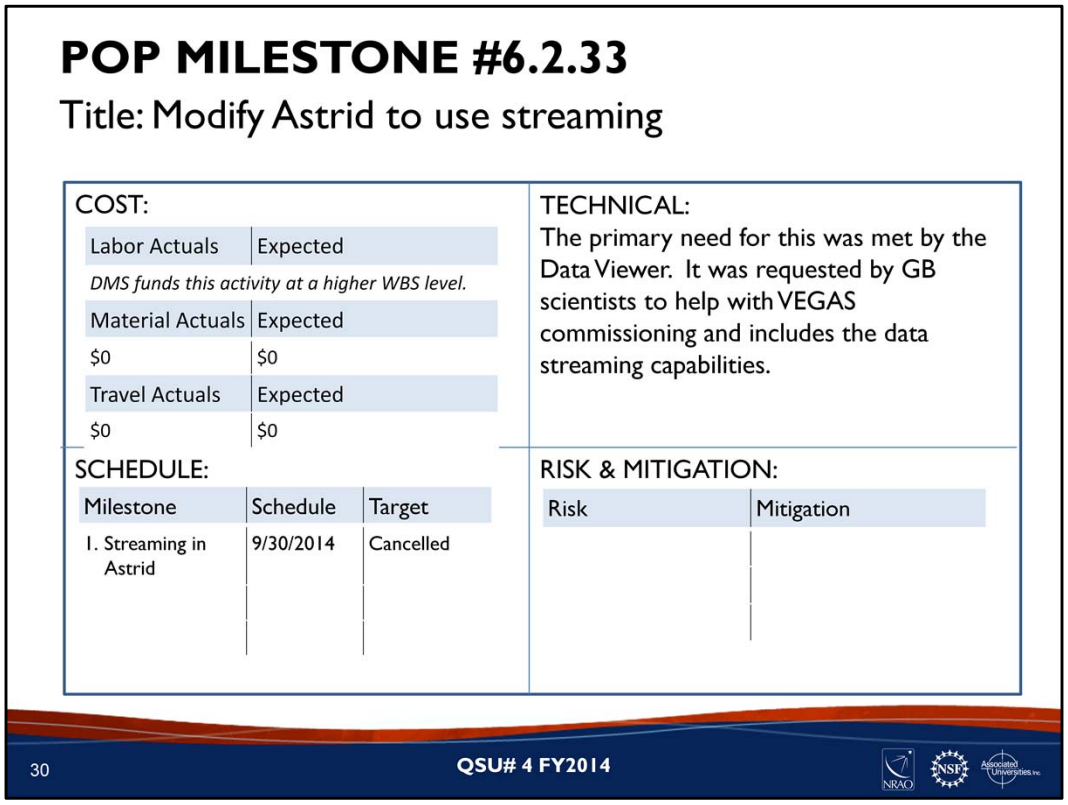


COST: DMS funds this activity at a higher WBS level. Costs are not tracked for this milestone.

TECHNICAL: The primary deliverable was development of software to support continued testing and development of the M450 module. This is low-level software is required to send and receive messages between a control computer and a VLBA MCB (monitor and control bus), using the M450 as a go-between.

SCHEDULE: Coordinated with #4.3.7, the target deliverable for this POP milestone was to test the partial VME replacement hardware and software on an antenna. The low-level software needed was developed, tested in the lab, but has not yet been deployed and testing on an antenna. This is rescheduled in 3Q FY15 (POP Milestone #3.4.58) in the NM Operations section of the FY15 POP, and is included as part of POP Milestone 7.4.24 in the DMS section.

RISK & MITIGATION: The main risk to the schedule is that issues or bugs could be found in the software during testing. Hardware could be ready to go on the antenna as early as November, providing a long time period for identification and resolution of issues. Based on lab testing, major issues are not anticipated.



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

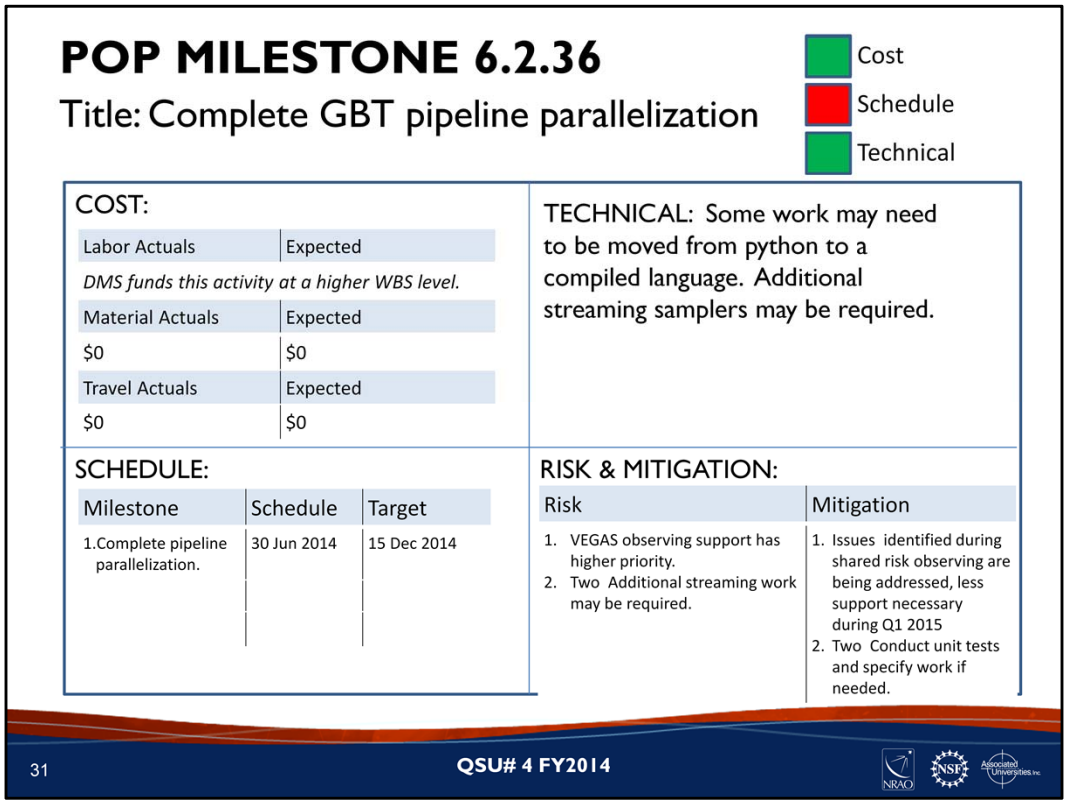
SCHEDULE: This milestone has been cancelled for FY14:
1) needed functionality was delivered in the VEGAS Data Display,
2) other efforts judged to be more impactful and higher priority by GB management at this time.

Higher priority work (e.g. WFO) diverted resources from data streaming so effort was prioritized to deliver data streaming on the M&C system, which was required in order to support eventual changes to Astrid.

TECHNICAL: The modifications to Astrid were originally included in the POP as part of the work to modify the M&C (Management & Control) system to use data streaming. The old system (M&C and Astrid) used/uses disk-based files as inter-process communication which is insufficient for the larger data rates associated with modern instrumentation (e.g. VEGAS). The benefit for Astrid would be that astronomers could use an existing interface to view VEGAS data in a way similar to how they view spectrometer data.

GB scientists requested a tool for viewing VEGAS spectral data to support commissioning and subsequent trouble shooting. The VEGAS Data Display was built using the data streaming modifications made to the M&C system.

This work is targeted for inclusion into Astrid via a refactor starting in 2016, provided resources are available.

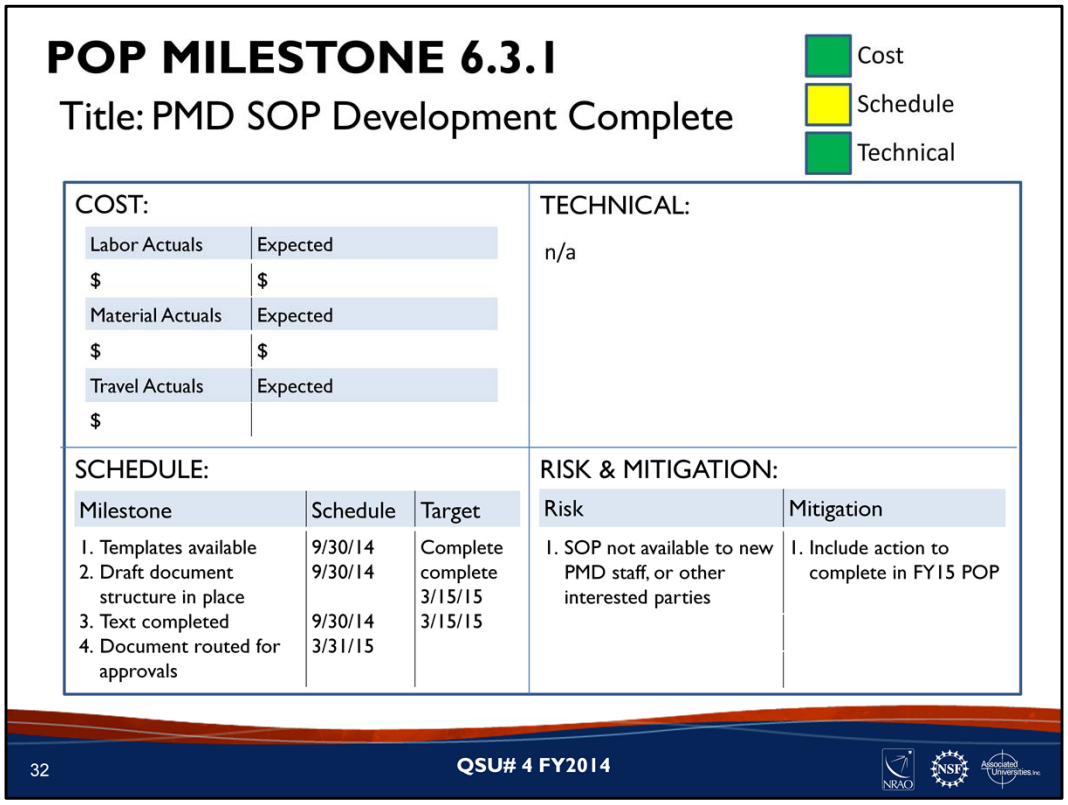


COST: DMS funds this activity at a higher WBS level. Costs are not tracked for this milestone.

SCHEDULE: Delays due to VEGAS commissioning and shared-risk observing support, resource constraints, delay of related streaming milestone (6.2.35).

TECHNICAL: Initial work in python, parts of work may need to be done in compiled language as necessary. May require additional streamed samplers not initially provided by Milestone 6.2.31. Existing unit tests will help manage risk.

RISK & MITIGATION: User support of VEGAS during the transition from shared risk to normal observing has higher priority. This has caused considerable slippage and could cause additional slippage. Most of the known VEGAS support issues identified to date were addressed by the end of Q4 2014, freeing up resources to work on this milestone. Progress and anticipated remaining work indicate that this milestone is on target for it's adjusted date. This is included as a 1Q FY15 POP Milestone # 7.4.31.

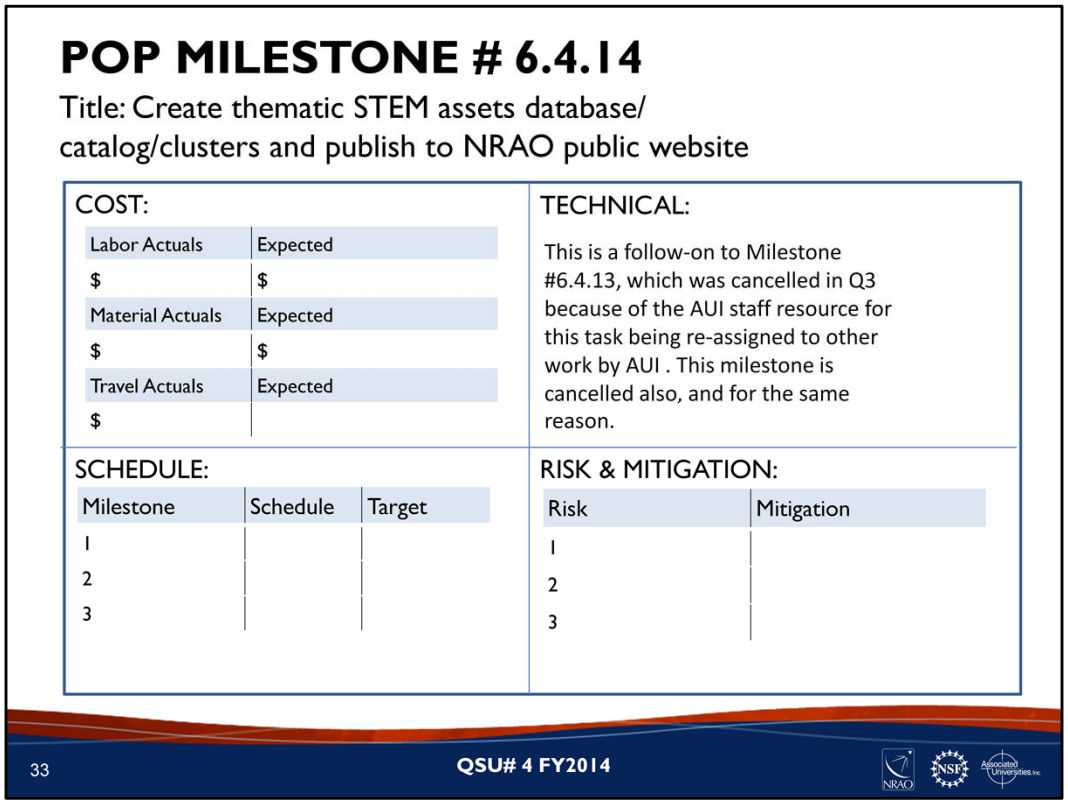


Cost: No issues

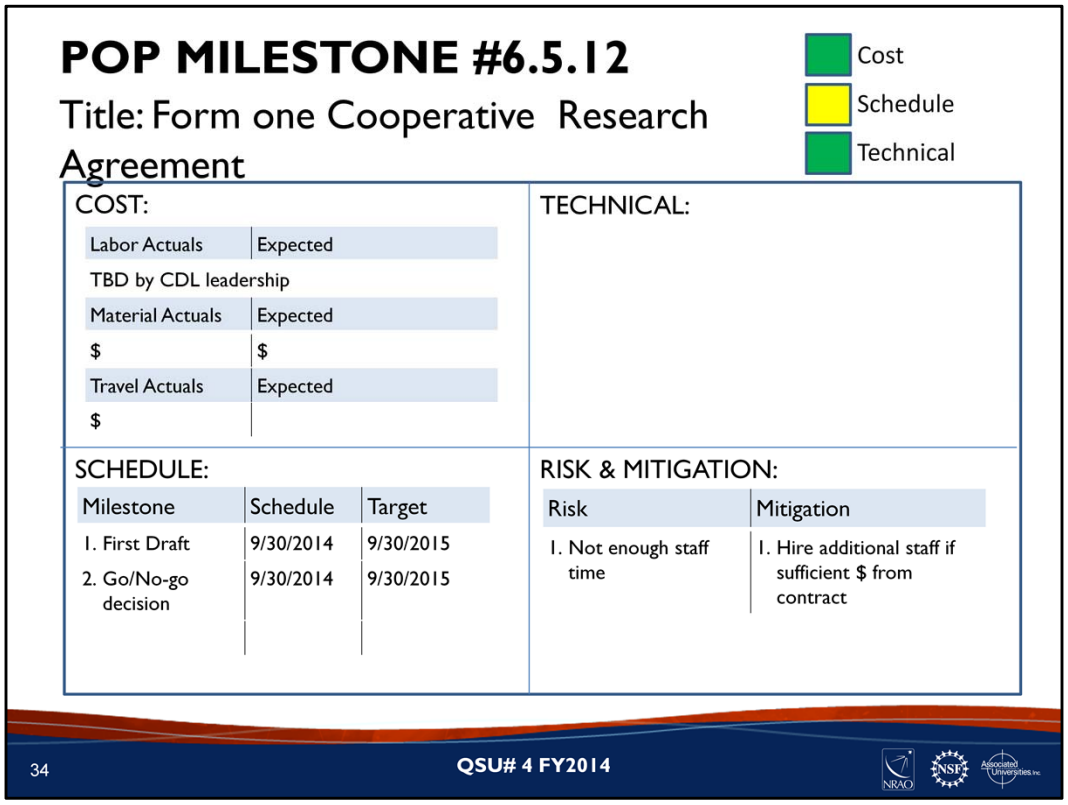
Schedule: The Standard Operating Procedure document development is behind schedule due to conflicting priorities associated with the Furlough, the Recompetition, and the loss of a key temporary staff member prior to the expected date of departure. The finalization of the SOP has been rescheduled for Q1 FY15 as Milestone 8.5.1.

Technical: No issues

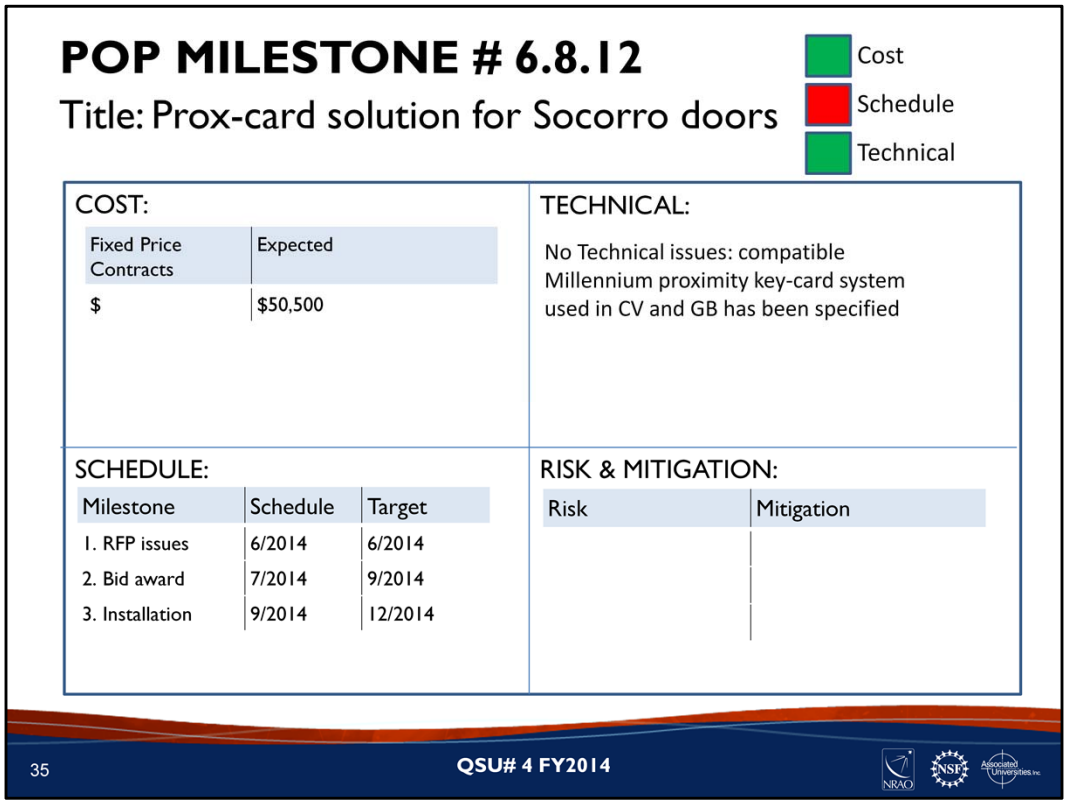
Risk & Mitigation: The draft has been started and as individual components are completed, will be routed for approval by the PMD staff and the ADs. This will help in both the understanding of the processes and with training in the processes.



TECHNICAL: This is a follow-on to Milestone #6.4.13, which was cancelled in Q3 because of the AUI staff resource for this task being re-assigned to other work by AUI . This milestone is cancelled for FY14 for the same reason.

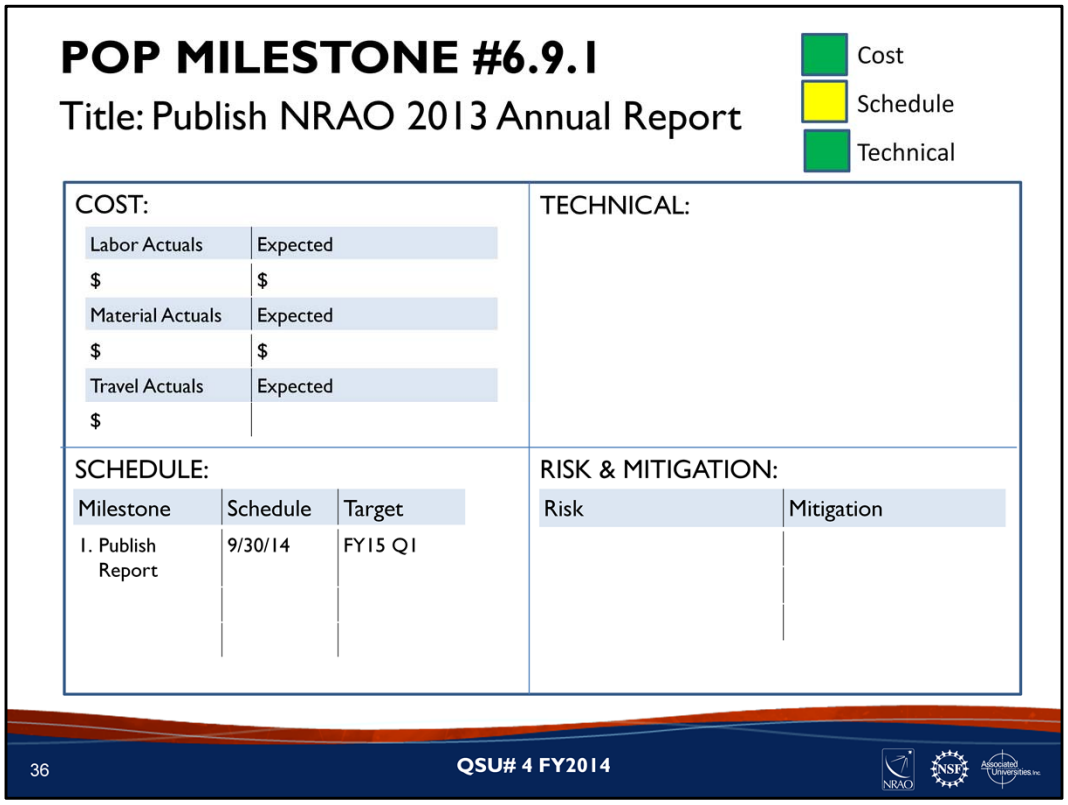


SCHEDULE: Transferred to CDL leadership and they are proceeding with contract negotiations with BrightSpec. There will be a Go/No-go decisions point based on whether or not the CDL has sufficient extra staff time. This milestone will be carried forward as an exception for FY15.



SCHEDULE: Bid award delayed due to increase in scope to include the DSOC computer room, in addition to the Engineering areas and exterior doors. Funds committed in FY14 on a fixed price contract, with installation in Q1 FY15

NOTE: This was not carried into FY15-16 POP due to the timing on the delay. The milestone will be carried forward as an exception for FY15.



SCHEDULE: Delayed. Report is still under review by NRAO Director. Milestone revised to 19 December 2014 (FY 2015, Q1). This milestone will be carried forward as an exception for FY15.

QSU# 4 FY2014 Report

Financials

Q4 FY14 Final Summary

- Overall Issues
  - Benefits – budgeted at 35%, final rate was 33.9%
    - Impact of HDHP and change in retiree medical not yet fully realized
    - Regular benefits true-ups impacted all operations – contribution to carryovers
  - Continued construction activity contributed to CSA underspend.
  - Payroll Advance Resolution
    - Original fund sources credited for payroll advance. Leave charges will occur in FY15 – contribution to carryover
    - Exempt payroll accrual for period 9/21-9/30 accommodated within budget envelope. Resolves issue for end of contract.
- NRAO Ops
  - Growing WFO & research activity providing ICC revenue assistance and salary support..
  - Overall CSA-1 & CSA-2 ended with carryover enabling stable operations in FY15.

FY14 YTD by Major WBS Category
ALMA Ops – Q4

	FY14 POP Budget (March)	FY14 Rev. Budget	FY14 YTD Expenses	YTD % Rev Budget
Telescope Ops	24,014	24,454	18,893	77.3
Development	5,445	6,757	4,136	61.2
Science Ops	5,864	6,281	5,107	81.3
Admin Services	4,556	4,556	4,054	89.0
Director's Office	2,952	3,043	2,591	85.1
FY14 , Total	**42,831**	**45,091**	**34,780**	**77.1**
NSF Allocation Reduction	(2,140)			
Canadian $ Not Shown Above	1,301			
Open Commits	5,033		4,408	
C/F For FY14		1,800		
C/F for Future Years	-	134	7,837	
All ALMA Resources	**47,025**	**47,025**	**47,025**	

FY14 YTD by Major WBS Category
NRAO Ops – Q4

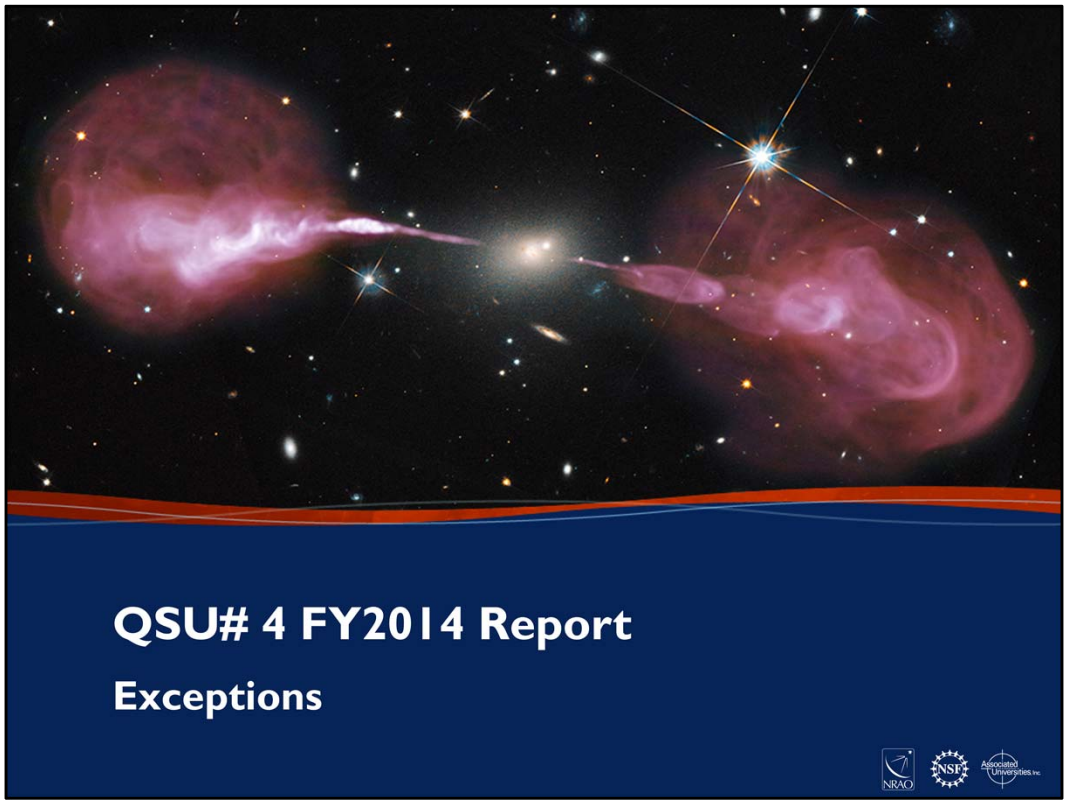
	FY14 POP Budget (March)	FY14 Rev. Budget	FY14 YTD Expenses	YTD % Rev Budget
NSF	41,000	43,140	43,140	
WFO	1,594	1,594	1,994	
Carryforward/Other	1,335	1,335	1,419	
Total CSA-1 Revenues	43,929	46,069	46,553	
Telescope Ops	18,013	18,013	17,546	97.4
Development	2,248	2,248	2,610	116.1
Science Ops	5,152	5,152	5,998	116.4
Admin Services	15,834	15,834	13,110	82.8
Director's Office	3,308	3,308	3,220	97.3
FY14 , Total	**44,555**	**44,555**	**42,485**	**95.4**
FY14 CSA-1 NET	**(626)**	**1,514**	**4,068**	

- Prior year commitments are shown as expenses; open commitments of $855K are not.

FY14 YTD by Major WBS Category
ICC (Internal Common Costs) – Q4

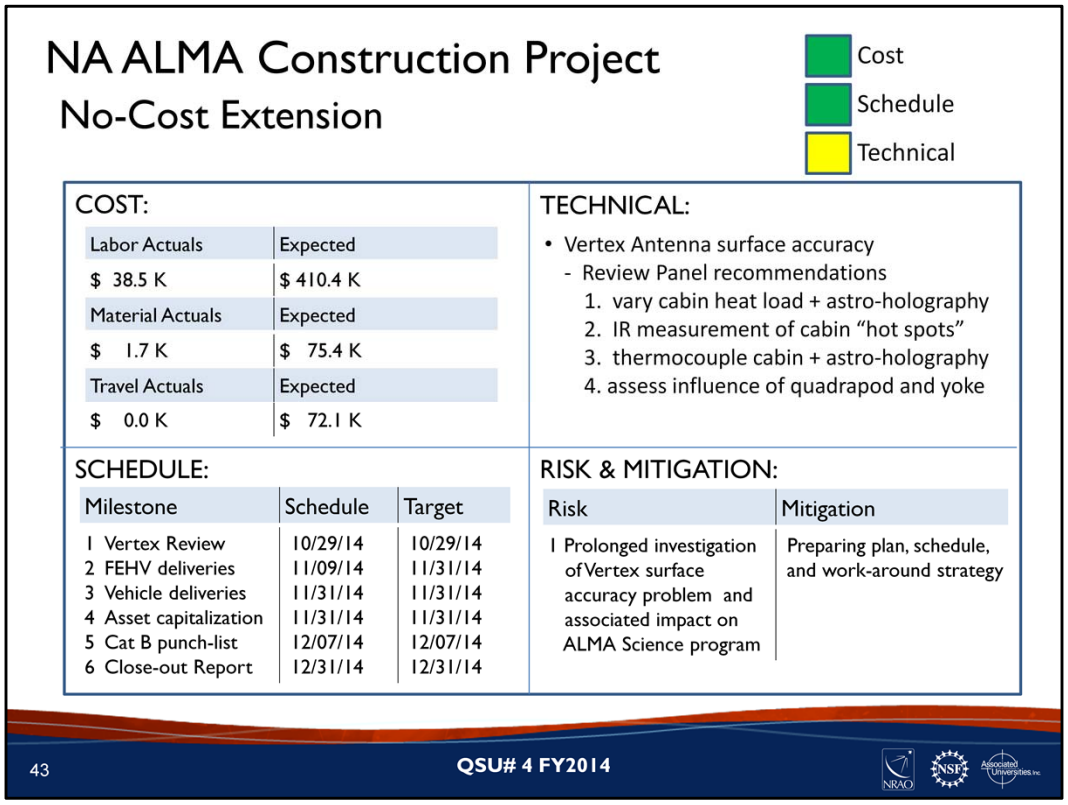
	FY14 POP Budget (March)	FY14 Rev. Budget	FY14 YTD Expenses	YTD % Rev Budget
Telescope Ops	519	522	399	76.4
Development	989	941	774	82.3
Science Ops	1,943	1,757	1,721	98.0
Admin Services (Gross)	11,744	11,779	11,327	96.2
Director's Office	1,660	1,310	1,194	91.1
FY14 Total, Non CSA Sources	**16,855**	**16,309**	**15,415**	**94.5**
Admin Recoveries (CSA's)	(14,209)	(13,653)	(12,376)	90.6
External Recovery	(2,787)	(2,787)	(2,994)	107.4
FY14 NET	**(141)**	**(131)**	**46**	

Prior year commitments are shown as expenses; open commitments of $312K are not



QSU# 4 FY2014 Report

Exceptions



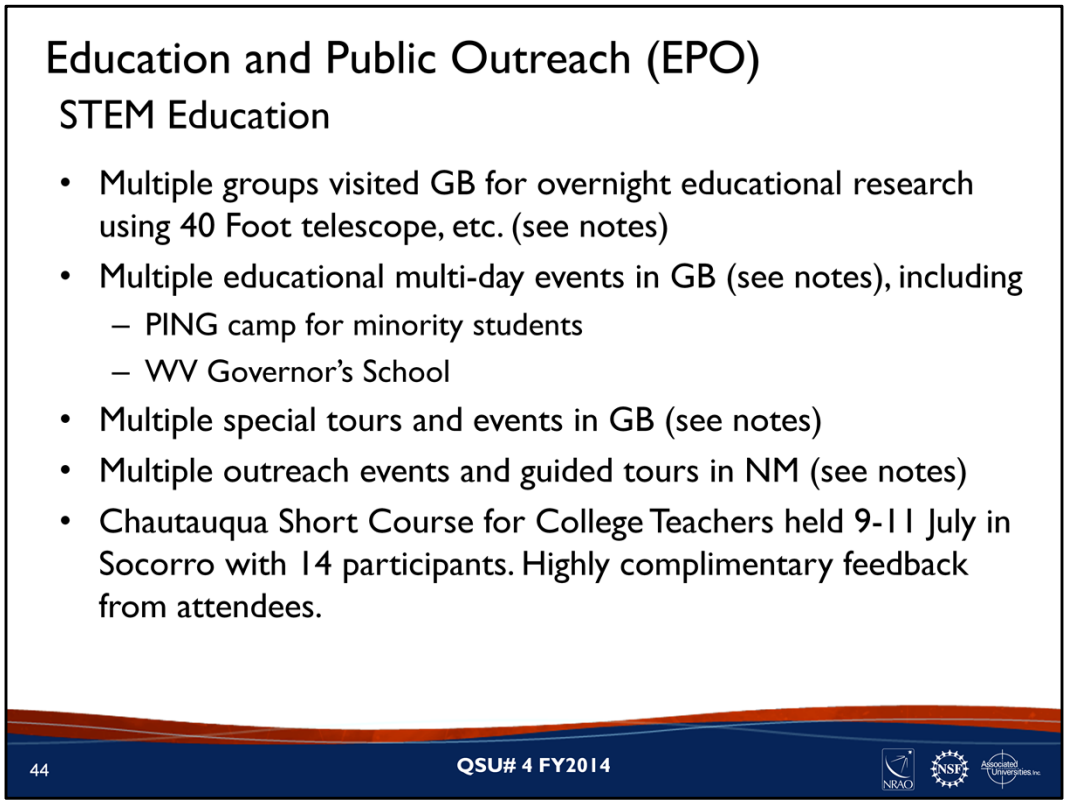
COST: Labor actuals predominantly associated with preparations for the Vertex Antenna Review. Budget for ongoing investigation and corrective action(s) TBD.

SCHEDULE:

- Vertex Review conducted in Charlottesville, 27-29 October; follow-on actions in work
- Manufacture of FEHV Units 2, 3 & 4 80% complete; Operator and Maintenance Technician training scheduled for early December on-site at the OSF.
- General purpose utility vehicles have arrived in Chile; integration of specialty bodies and equipment in work
- NA ALMA Product Tree divided into proposed capital items; financial accounting process (AUI vs. NSF) TBD
- Category B Punch-list work 70% complete

TECHNICAL: 11 of 25 antennas do not meet the total surface accuracy requirement of 25µm rms. The most probable root cause of the non-conformance is inadequate temperature control of the antenna cabin wall. With the assistance of the Review Panel, a series of tests are being designed to enable identification and verification of root cause.

RISK & MITIGATION: Proposals for Cycle 3 Science will be received for consideration during Q2 CY15. Cycle 3 Observations begin in Q4 CY15. High frequency observing with Bands 9 and 10 will be impaired without resolution of the surface accuracy problem. A work-around plan is being prepared; this will entail re-setting of reflector panels with a mechanical bias corresponding to a mean operating temperature of approximately -5°C (versus the anticipated O°C mean temperature).

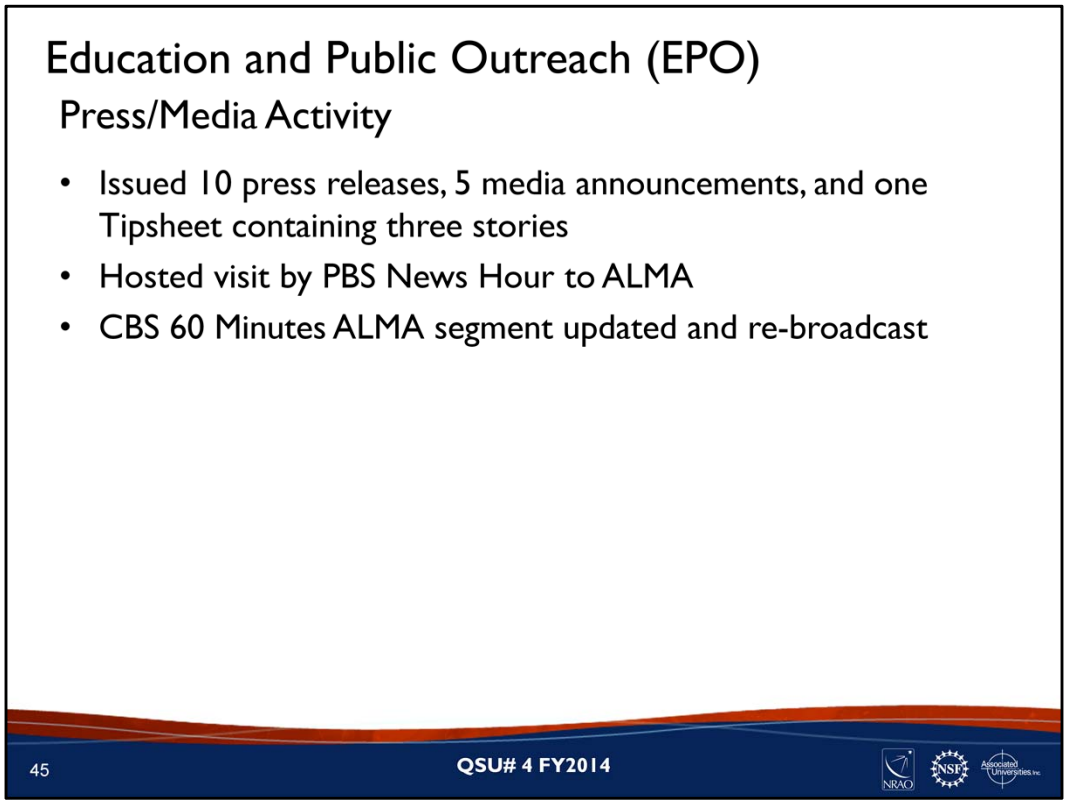


GB Overnight educational groups: Mtn. Vista Governor's School (VA); Albemarle high School (VA); Charlottesville VA High School Robotics Group; Almost Heaven Star Party (DC area); NYSC Directed Study; Civil Air Patrol

GB Educational Multi-Day events: Week-long PING Camp for Minority students (total 18 students, 1 graduate students and 4 undergraduate students also participated); 2 week-long WV Governor's School for Math and Science (60 rising 9th graders from WV); Week-long Educational Research in Radio Astronomy workshop (annual UNC-led camp); 10 day long West Virginia Youth Science Camp; Star Quest multi-day star party; Annual Society of Amateur Radio Astronomy conference; Radio Jove Conference; WV SPOT Training Workshop for Undergraduate ambassadors

GB Special Tours: Annual National Youth Science Camp Tour; Annual Family Science Day Open House (>700 guests); Train Ride Star Parties with NRAO staff; Pocahontas County Memorial Youth Health Fair; Pioneer Days Parade; Family Science Lab

NM Outreach Events and Tours: July 1 Boy Scout tour (22) & NM Tech Summer student tour (42); July 2 Socorro library black holes (28); July 3 NSO tour (16); July 9 Upward Bound student tour (26); July 9 Chautauqua short course (12 teachers); July 12 UNM tour (42); July 14 Agave health Center students starlab in Santa Fe (58); July 19 NRAO Summer Student host tours (102); July 21 Chinese student tour (28); July 23 CV summer student tour (12); July 25 Magdalena library black holes (18); July 26 NRAO Summer Student host tours (36); July 27 Socorro Teachers tour (12); August 1 NM Leadership tour (32); September 7 UW college tour (11); September 9 ABQ School star party digital planetarium; September 12 Alamo School Box of Stars (24 teachers); September 24 - 27 ESSP (21 paid participants), NM Tech & community involvement (32 participants)



Press Releases: Young Binary Star System May Form Planets with Weird and Wild Orbits, ALMA Pinpoints Pluto to Help Guide NASA's New Horizons Spacecraft, Comets Forge Molecules in Their Dusty Atmospheres, Merging Galaxies in Distant Universe, Orion Rocks! Pebble-size Particles May Kick Start Planet Formation, Radio Telescopes Settle Controversy Over Distance to Pleiades, SETI, Astrobiology Pioneer Awarded Jansky Lectureship, Newly Identified Galactic Supercluster Is Home to the Milky Way, Galaxy Mergers Defy Expectations to Produce Disk Galaxies, Infant Solar System Shows Signs of Windy Weather

Media Announcements: Japan and Republic of Korea Sign Agreement on ALMA, First of ALMA's Fleet of Front End Handling Vehicles Delivered, Compliments of NRAO, ALMA Achieves New Observing Capabilities: High Frequency Vision Shows Uranus in New Light, ALMA Extends Its Arms: Longest baseline ever achieved for ALMA, You Are in Command as NRAO's Milky Way Explorer Tours the Solar System

Tip Sheet Stories: ALMA Finds that Organic Molecules are Branching Out, VLA Reveals Details of Still-Forming Planetary System, New NRAO Patent for Radio Synthesizer

ALMA & PBS: In August, NRAO hosted a production team from PBS News Hour at ALMA for a one-week shoot and a series of interviews with NRAO and ALMA scientists. This coverage stems from NRAO's earlier news release about the maser upgrade to support the Event Horizon Telescope. Initially the reporters were interested in the EHT story and to shadow Shep Doeleman as he tested the new components. After learning more about ALMA, however, the reporters decided to dedicate a greater portion of the story to the array. Though filming of the on-air segment continues, this effort has already borne fruit with an online synopsis of the reporters' visit: http://www.pbs.org/newshour/updates/reporters-notebook/. This web-based coverage was promoted through both the NRAO and ALMA social media channels. A complete on-air segment is anticipated by the end of the calendar year.

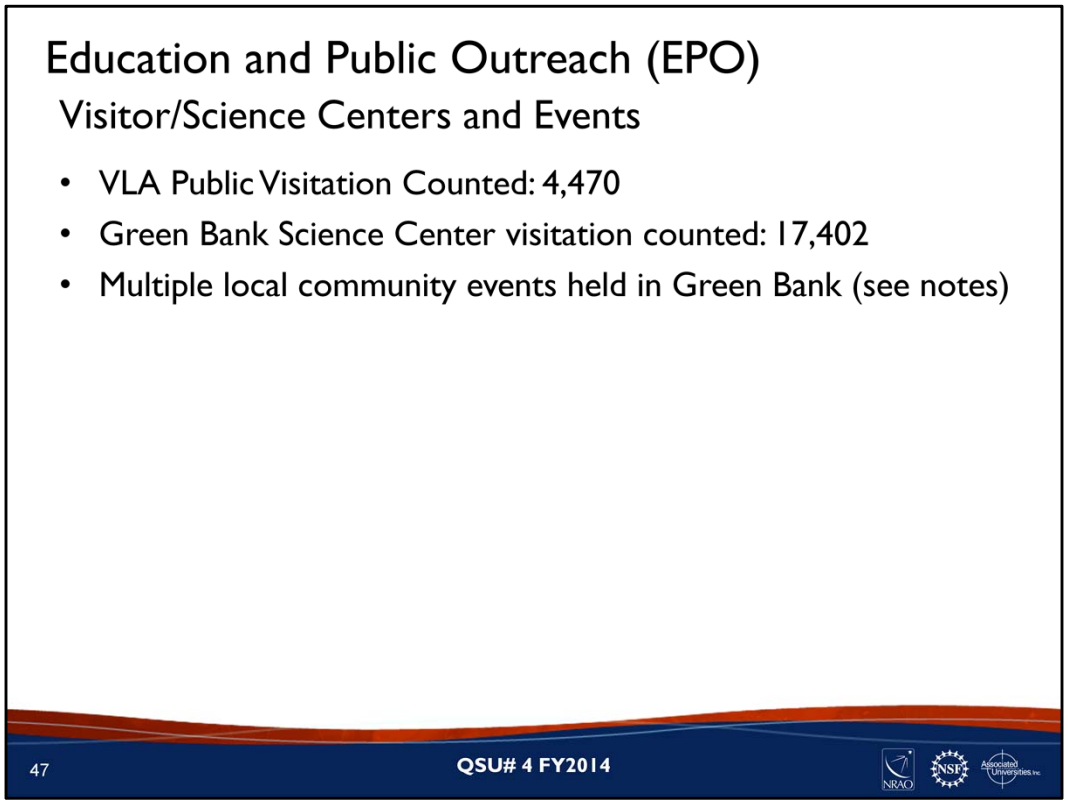
ALMA & CBS 60 Minutes: NRAO's work with 60 Minutes in 2013 has carried over into 2014 with

rebroadcast of an updated version of the piece that was aired earlier in the year. NRAO staff provided new results and enhanced visuals that enabled the producers to highlight the most recent science from ALMA. The updated segment was aired toward the end of July 2014 and is once again featured on their website.

Education and Public Outreach (EPO)

Social Media and Web

- Facebook audience increased from 39,420 to 45,798 during Q4
- Twitter following increased from 5,153 to 5,605 during Q4
- Launched the Solar System expansion module of the Milky Way Explorer on public website with 13 new, exclusive videos about radio astronomy studies of our own Solar System
- Completed Phase I of public responsive design test on latest version of Joomla on test site (project to enable convenient viewing of public.nrao.edu on smartphones and other devices)



Green Bank community events: Pocahontas County Herb Fair; Garth Newell Concert (public event); Seth Maynard Osmosis Jazz Quartet; Office of science and Technology Policy Visit; Pocahontas County Convention and Visitors Bureau Retreat; Pocahontas County Libraries Summer Reading Program Capstone Event

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