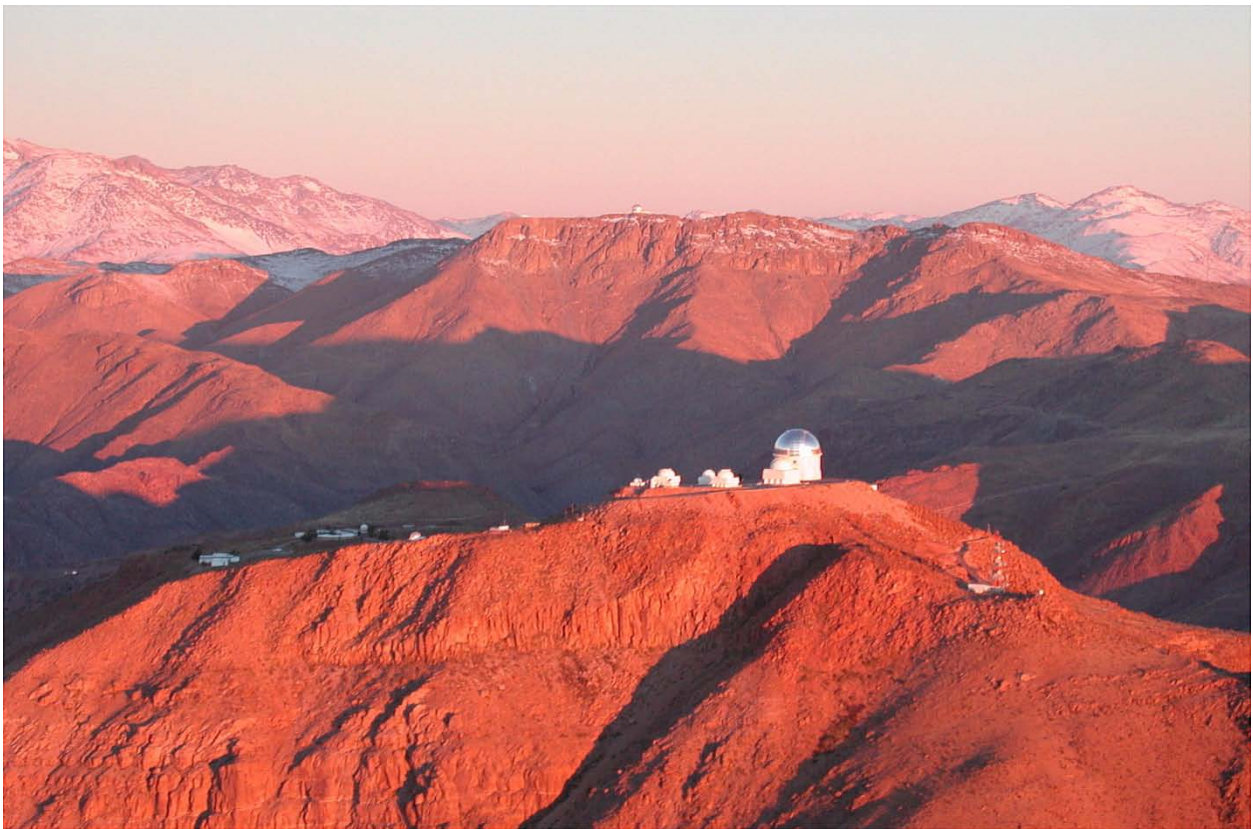


AURA-OBSERVATORY & NOAO-SOUTH FACILITIES

SITE FINANCIAL REPORT

YEAR-END RESULTS for FISCAL YEAR 2013



December, 2013

I. Introduction:

This report addresses the costs and revenues related to the operation and maintenance of the AURA Observatory sites in Chile as carried out by the Facilities and Operations department of the National Optical Astronomy Observatory South (NOAO-S) during FY-2013. The detailed financial results are reported as well as the major events and developments that impacted operational logistics and costs. Status and performance of networking infrastructure for AURA Observatory and NOAO-S as well as improvement projects related to networking connectivity are described as well. The projected FY-2014 budget and fees NOAO-S Facilities and Operations will be addressed a subsequent separate report.

II. Executive Summary of 2013 Budget and Financial Results:

The NOAO-S Facilities and Operations budget for each fiscal year is based primarily on the previous year's budget and other long-term experiential data regarding costs for goods and services in Chile. An adjustment for inflation is made each year, along with discretionary corrective adjustments to the budgets for the specific services and the fees charged to the Clients to cover those services. For all administrative and operational activities in Chile, direct accounting is in Chilean Pesos (CLP). Correspondingly, all monetary figures in this report are in CLP.

The FY-2013 budget for NOAO-S Facilities was **\$1,431,557,373** CLP, which included a 5% inflationary adjustment over the budget of the previous year. That budget proved to be an overestimate, as total NOAO-S Facilities expenses in FY-2013 amounted to **\$1,340,130,404** approximately 6.4% under the budget. It should be noted, however, that the FY-2013 expenditures did not directly include the General and Administrative (G&A) costs, which had been previously reported for FY-2012 and previous years.

The total for expenses of **\$1,340,130,404** (without G&A) in FY-2013 was very close to the total revenue from Share Fees, Census Fees and Per-Use Fees of **\$1,353,649,614**, resulting in a modest (1%) surplus of **\$13,519,210**. This minimal surplus indicates that fees will need to be adjusted upward in FY-2014 to fully cover the cost of the services, including the G&A.

III. FY-2013 Developments and Events:

The following significant developments and events occurred during FY-2013, which impacted NOAO-S Facilities & Operations:

- All references to months are from October 2012 through September 2013 unless noted otherwise.
- Program-specific support activities (denoted by *) were funded by the program requesting the support.
- NOAO-South Facilities became a separate entity from AURA Administration at the start of FY-2013, as part of an overall consolidation of the AURA support departments that serve all the NSF-funded astronomical centers managed by AURA. The separation of NOAO-South Facilities from AURA Administration was largely transparent from an operational standpoint, as all of the established procedures for services continued as in past years.
- Transitions in personnel occurred during FY-2013, which had a beneficial impact on operational capability and efficiency. A mountain-based electrician and HVAC technician were hired to refill those necessary positions, which had been vacated in a budget-driven layoff in April, 2012. The NOAO-S safety-environmental professional resigned and a new, more highly qualified person was hired as a replacement. An equipment operator, who had been on an extended temporary contract, was hired as an AURA employee, to more permanently augment the road maintenance service. These four employees came on staff in January.
- A new administrative assistant was hired in July, funded half by NOAO-S mountain operations and half by CTIO telescope operations. This 0.5 FTE of additional support for mountain operations was considered necessary to allow the mountain operations manager to more effectively address Client concerns and requirements, both in the field and in the office.

- Rolando Puño, a mountain Nurse/Paramedic with more than 30 years of service at Tololo, passed away in August. This was a major loss both personally and professionally for the operations team.
- Facilities continued to provide support for DECam commissioning on Tololo. A dedication ceremony for DECam was hosted on Tololo in November.*
- Gemini activities – including commissioning of the GEMS instrument, and SOAR activities – including construction of a new instrument room and dome repair work, required some special support services.*
- Major renovation projects for all 3 dormitory buildings at Tololo were completed in December. All renovated rooms were put back into service starting in January.
- Installation of solar water heaters at the dormitories and hotel on Tololo was contracted and completed.
- A project to replace the primary water supply piping that serves Cerro Tololo and Cerro Pachón was completed in March. The new mountain plumber took over the final startup of this renovated system.
- The leach field at the Las Tacas facility on Tololo was replaced to address persistent drainage problems.
- The main Pachón transformer, which had been completely replaced in February of 2012, continued to experience problems. In March (2013), on reenergizing the transformer after a power line maintenance, a fault occurred in one of the transformer windings requiring factory repair and use of generators for 20 days.
- The frequency converter on Tololo experienced problems in January requiring troubleshooting and a major maintenance in February.
- New borrow-pit areas were identified on Tololo for road resurfacing material, one of which erroneously included an old landfill, resulting in glass and other foreign objects being laid on the roadway and causing multiple flat tires. This required immediate remedial road repair and correction of the borrow-pit area.
- A front-end loader that was no longer needed at NOAO-N (Kitt Peak) was shipped to Chile for use at the mountain sites. It was delivered in March and went into use following initial checks and minor repairs.
- A new water truck, principally for transport of water to Pachón, was purchased using FY-2012 surplus funds and delivered in September.
- The bus contract was competitively rebid during the first part of FY-2013 and a new provider, Buses Hualpen, took over the service beginning in April. The schedule, route and other requirements of this service are essentially the same as for the previous bus contract.
- A new integrated Tololo/Pachón shuttle (carryall) contract was competitively bid and West (formerly Hertz) began providing the new integrated service to both mountains in April. The integration of the shuttle service required developing a new itinerary and establishing conditions for joint use.
- An on-line reservation system for both the bus and the carryall was developed, tested and implemented.
- There were 4 road accidents – 2 involving contractor personnel/vehicles and 2 with NOAO staff/vehicles, requiring follow-up investigation and, in the case of the AURA vehicles, repair work.
- The KMTNet (KASI) telescope facility was substantially completed in January. Necessary repair of a defect in the main electrical feed line and satisfactory completion of minor punch list items required protracted interaction with the contractor. In October 2013 these items were successfully completed.*
- The PROMPT 7 telescope was installed and began operations in November. The building and dome for PROMPT 8 telescope was completed and telescope was installed in September.*
- The MEarth facility construction project was contracted and started work on Tololo in August.*
- NOAO-S supported the installation of the CATCOS green house gas monitoring station in April.
- Upgrades to the ALO facility were contracted and completed prior to an observing campaign in September.*
- Inadequacy of the electrical power capacity in Pachón hotel/ALO area required repeated attention – addressing brown-outs at the kitchen/hotel, providing a temporary generator for ALO, and other measures.
- The Pachón microwave antenna was moved and the new communications building went into use in August.
- On-site progress of the LSST project continued on hold. A container was placed on site to support visits and the start-up of construction, anticipated to begin in late FY-2014.*

- A relatively mild winter resulted in minimal need for repair of roads, power lines and other infrastructure.
- Underground fuel storage tanks in La Serena Recinto and on Cerro Tololo were removed and disposed of. This was carried out as part of a comprehensive contract for scrap removal.
- A remodeling project was completed to convert a section of the existing La Serena library into a staff interaction space and a meeting/dining area.
- Renovation of the La Serena Recinto water system was contracted and completed, including replacement of well pump, renovation of filtration system and installation of new chlorination equipment. This required purchase of water from the municipal water company for the duration of the repairs
- Renovation of the Modulux building in La Serena was contracted and completed to support its use as the consolidated AURA-CAS and AURA-HR department. This project was funded by AURA.
- Multiple office moves for La Serena based staff were required in support of the AURA CAS-HR centralization and other departmental reorganization.
- Renovation of roofs on the main CTIO building and the Modulux building were contracted and completed in September.
- There were multiple closings by the University of La Serena of the Recinto gate that crosses their property, continuing to highlight the need to develop a new access point in the near future.

IV. FY-2013 Financial Results by Main Cost Center:

- A. **Mountain Cost Centers:** These include all expenses for operation and maintenance of the facilities on Tololo and Pachón (excluding G&A), divided into two basic categories for tracking and recovery of costs:

Share-Fee accounts cover the support services that cannot be directly tracked and billed to the individual programs, and therefore are instead billed as comprehensive fees calculated separately for Pachón and Tololo. This includes safety/security services, road and power line maintenance, power generation and communications networking services. For Share-fee services in FY-2013 there was a total expenditure of \$340,011,325 versus a budgeted amount of \$385,447,633. This underspend was due to several factors, including a mild winter with lower than normal burden for road maintenance, power line maintenance, and power generation. The revenues from Share fees were \$399,000,310 covering the costs and resulting in a \$58,988,985 surplus.

Mountain Per-Use accounts cover the expenses that can be directly tracked and charged based on consumption by the programs. These include dining services (per meal), dormitory use (per room-night), janitorial services (per hour) and water supply (per cubic meter). For Mountain Per-use services in FY-2013 the total expenditure was \$586,308,693 versus a budgeted amount of \$598,503,007. Total revenues from billing for these mountain-based Per-use services were \$584,087,630 resulting in a slight deficit of \$2,221,063.

- B. **La Serena and General Cost Centers:** These include all of the expenses for operation and maintenance of the base facilities on the AURA Recinto in La Serena and general costs such as safety and transportation (excluding G&A). Similar to the Mountain, these are divided into two basic categories for tracking and recovery of costs.

Census-Fee accounts, based proportionately on the number of employees each program has in Chile, cover services that cannot effectively be tracked directly based on use by the programs. This includes safety services, security (Recinto guard) service, and communications maintenance. For Census-Fee services in FY-2013 there was a total expenditure of \$197,096,222 versus a budgeted amount of \$213,760,060. The revenues from Census fees were \$233,797,542 covering the costs and resulting in a \$36,701,320 surplus.

La Serena Per-Use accounts cover the base facility expenses that can be tracked directly based on consumption. These include water and sewer (per cubic meter), vehicle and building maintenance (per hour), transportation (per trip) and hotel (per room-night). For La Serena Per-Use services in FY-2012 the total expenditure was \$216,714,164 versus a budgeted amount of \$233,846,673. Total revenues from billing for these La Serena-based Per-Use services were \$136,764,132, resulting in a deficit of \$79,950,032.

C. Overall Balance of Revenues and Expenses:

The bottom line of Table 1 shows that a net overall surplus of \$13,519,210 was generated. That modest surplus was retained within the Operations accounts to which the services are charged and will be utilized for infrastructure improvements that benefit the served programs. The specific accounts that generated the overall surpluses or deficits can be seen in the right column of Table 1. The most notable variances of actual costs in FY-2013 versus the budgeted amount for each line item are addressed in the Table Notes.

Description of Service	FY2013 Budget (CLP)	FY2013 Actual (CLP)	Budget Variance	Actual Revenue FY2013	SURPLUS/ (DEFICIT)
MOUNTAIN SHARE-FEE ACCOUNTS					
Security	36,405,278	23,208,350	-36.25% ¹	44,339,868 ¹	21,131,518
Visitor Center	12,161,693	14,020,092	15.28% ²	3,438,000	(10,582,092)
Emergency Medical Services	141,861,911	145,236,620	2.38%	133,362,369	(11,874,251)
Road Maintenance Gate-Quisco	64,390,662	58,145,528	-9.70% ³	61,931,982	3,786,454 ³
Road Maintenance Tololo-Quisco	5,519,730	5,879,614	6.52% ³	7,239,154	1,359,540 ³
Road Maintenance Pachón-Quisco	8,691,867	12,537,412	44.24% ³	8,963,712	(3,573,700) ³
Power Line Maintenance Gate-San Carlos	26,183,064	24,158,696	-7.73%	31,346,056	7,187,360
Power Line Maintenance San Carlos - Tololo	13,005,628	1,853,323	-85.75% ⁴	16,720,339	14,867,016
Power Line Maintenance San Carlos - Pachón	26,163,827	17,962,506	-31.35% ⁴	27,222,600	9,260,094
Communications-Tel. Radio Maintenance	31,280,904	26,958,287	-13.82% ⁴	38,098,627	11,140,340
Power Generation	19,783,069	10,050,898	-49.19% ⁵	26,337,603	16,286,705 ⁵
TOTAL - MOUNTAIN SHARE FEE ACCOUNTS	385,447,633	340,011,325	-12%	399,000,310	58,988,985
MOUNTAIN PER-USE ACCOUNTS					
Janitorial Services (Mountain)	45,950,212	36,896,990	-19.70% ⁶	30,962,262	(5,934,728)
Kitchen Operations Tololo	201,299,343	211,659,791	5.15%	155,837,444	(55,822,347)
Kitchen Operations Pachón	191,156,067	192,668,642	0.79%	208,670,458	16,001,816
Dormitory Operations Tololo	80,368,759	101,455,821	26.24% ⁷	86,058,063	(15,397,758)
Dormitory Operations Pachón	61,526,319	29,188,558	-52.56% ⁷	73,837,643	44,649,085
Water Supply	15,986,057	12,305,579	-23.02% ⁸	26,994,948	14,689,369
Water Transport	2,216,250	2,133,312	-3.74%	1,726,812	(406,500)
TOTAL - MOUNTAIN PER USE ACCOUNTS	598,503,007	586,308,693	-2%	584,087,630	(2,221,063)
LA SERENA and GENERAL CENSUS-FEE ACCOUNTS					
Safety	32,398,765	52,658,964	62.53% ⁹	36,129,208	(16,529,756)
Reception	48,492,411	23,908,239	-50.70% ¹⁰	55,517,087	31,608,848
Garage and Transport (operations vehicles)	49,082,898	49,088,377	0.01%	49,404,138	315,761
Communication & Telephone Maintenance	13,409,852	11,706,606	-12.70%	14,844,050	3,137,444
Security La Serena	70,376,134	59,734,036	-15.12% ¹¹	77,903,059	18,169,023
TOTAL - LA SERENA CENSUS FEE ACCOUNTS	213,760,060	197,096,222	-8%	233,797,542	36,701,320
LA SERENA PER-USE ACCOUNTS					
Water & Sewer	25,554,506	43,925,857	71.89% ¹²	4,709,819	(39,216,038)
Garage & Transport (program vehicles)	21,035,528	21,037,876	0.01%	21,173,202	135,326
Maintenance Group	76,738,047	40,472,227	-47.26% ¹³	8,246,469	(32,225,759)
Shuttle Transportation (Carryall)	41,000,889	43,123,829	5.18%	20,582,250	(22,541,579)
Janitorial Services (La Serena)	27,753,564	36,788,814	32.56% ¹⁴	49,983,755	13,194,941
LS Hotel	41,764,139	31,365,561	-24.90% ¹⁵	32,068,638	703,077
TOTAL- LA SERENA PER USE ACCOUNTS	233,846,673	216,714,164	-7%	136,764,132	(79,950,032)
Grand Totals	1,431,557,373	1,340,130,404	-6%	1,353,649,614	13,519,210

Table 1 – FY-2013 Budget vs. Actual Expenses

Notes for Table 1

¹ Security (gate guard) services were erroneously overestimated in the cost model for FY-2013. The actual cost was close to previous years. It is also notable that the revenue to cover that service, calculated as a percentage of the Share fee, requires downward correction.

² Visitor Center was not budgeted adequately for payroll expenses, resulting in a deficit.

³ Freight from the U.S. for the front-end loader relocated from Kitt Peak was charged to the Pachón-Quisco road account, resulting in a notable deficit. The overall requirement for road maintenance, however, was relatively low due to a mild winter, resulting in an overall surplus for road maintenance taking into account all 3 sectors.

⁴ Power line maintenance costs were lower than normal because 3 contracted services were performed instead of the 4 that were budgeted. This elimination of one of the contracted services was due to the ~1-month down time caused by the transformer failure in March coupled with a relatively mild winter season. Another factor in the lower cost for power line maintenance was that the mountain electrician was only on staff for 9 months of the fiscal year.

⁵ Power generation costs were notably lower than budgeted due to relatively little use of the generator on Tololo.

⁶ The budget for mountain janitorial services was set slightly high. The difference between budget and actual costs was further exaggerated by less administrative time being charged to janitorial services, as more administrative cost was proportionally assigned to other mountain accounts which experienced higher spending.

⁷ Dormitory services accounting requires correction to appropriately charge overhead costs for the Tololo janitor who provides daily and weekend cleaning service at Pachón. In this and previous years the entire cost for meals and lodging for that janitor were all charged to his home, Tololo, account, which partly explains the notable imbalance. Another factor was that non-capital equipment costs, a holdover from initial startup of the new Pachón dorm wing, were still budgeted in 2013 but not expended. Appropriate corrections will be made in the cost model for future years.

⁸ Mountain water supply cost was low as the mountain plumber was on staff for 9 months of the fiscal year.

⁹ Safety costs were higher than budgeted as the NOAO-S Safety Officer resigned and was replaced by a more highly qualified and experienced person. The increase is particularly noticeable because the majority of the hours of the previous Safety Officer had been charged to a CTIO account, largely for safety oversight of the DECAM installation.

¹⁰ Reception payroll costs were lower than anticipated as the main receptionist charged a significant portion of his time to the facilities general management account. Another contributing factor was a reduced volume of material sent in the international mail pouch, which is budgeted to the reception account.

¹¹ Security in La Serena, similar to mountain security (note 1), was overestimated in the budget though not as significantly as for the mountain. Corrections will be made to the cost model for both security services.

¹² Water supply in La Serena was significantly higher due to the need to purchase water from the commercial supplier during the replacement of the deep-well pump and extensive maintenance of the treatment system.

¹³ Building maintenance cost in La Serena were low, as a significant amount of time of the maintenance crew was charged by time card to other NOAO departments, especially related to the extensive office moves.

¹⁴ La Serena per-use janitorial service costs were higher than budgeted, as more janitorial hours were sold to programs, related to the office moves and other maintenance activities. The revenues from fees were correspondingly higher, more than covering the increased cost.

¹⁵ La Serena hotel budget for supplies and materials was overestimated. This will be corrected as needed.

D. Consumption of Per-Use Services: Determination of the budget for each fiscal year includes the review of the quantities (Qs) of Per-Use services that were used in the previous year as a means to predict the Qs that are expected to be billed in the coming year.

Table 2 shows the budgeted and actual Qs for FY-2013 and the percentage that they were over or under the estimated (budgeted) amount.

<u>Mountain Per -Use Service</u>	Quantity (Q)	FY-2013 Budgeted Qs	FY-2013 Actual Qs	% Over/Under Budget
Janitorial Services (Mountain)	hours	3,008	2,889	-4.0%
Kitchen Operations Tololo	meals	17,583	14,380	-18.2%
Kitchen Operations Pachón	meals	15,156	19,268	27.1%
Dormitory Operations Tololo	room-nights	7,412	6,181	-16.6%
Dormitory Operations Pachón	room-nights	3,140	3,467	10.4%
Water Supply	cubic meters	2,528	3,780	49.5%
Water Transportation	cubic meters	779	364	-53.3%
<u>La Serena Per-Use Service</u>	Quantity (Q)	FY-2013 Budgeted Qs	FY-2013 Actual Qs	% Over/Under Budget
Water & Sewer	cubic meters	23,115	21,770	-5.8%
Garage	hours	1,324	2,172	64.0%
Building Maintenance	hours	3,324	3,556	7.0%
Shuttle (Carryall) Transportation	one-way trips	942	517	-45.1%
Janitorial Services (La Serena)	hours	2,933	3,952	34.7%
La Serena Recinto Hotel	room-nights	1,230	1,059	-13.9%

Table 2 – Predicted and Actual Consumption of Per-Use Services in FY-2013

V. Facility and Infrastructure Projects – completed in FY-2013 or to be developed in FY-2014:

A number of NOAO-South Facilities projects were completed in 2013 or will be completed, initiated or studied for feasibility and cost during FY-2014. These projects are described below in Table 5. The funding source for each project is also identified.

The first section of Table 5 lists projects funded through the American Recovery and Reinvestment Act (ARRA) which were completed in FY-2013. By the end of September 2013 all of the ARRA-funded projects were complete.

The second section of Table 5 lists the projects that are funded or potentially funded by NOAO-South Operations accounts. The financial feasibility of these projects depends on potential surplus income generated from fees or special authorization of funds by Client organizations or by AURA on behalf of all the clients.

The third section of Table 3 describes projects involving NOAO Facilities & Operations support, which are in development or planning and are funded by other sources. These include support of projects for tenant telescopes – funded by other institutions – and projects that are capitalized by the users of specific services, such as maintenance projects for the rented housing in the La Serena Recinto.

Project	Funding Source	Status at End of FY-2012
American Recovery and Reinvestment Act (ARRA) (Mountain)		
Tololo/Pachón Water System Renovation	ARRA	Completed in February 2013
Dormitories Repair and Renovation	ARRA	Completed in December 2012

4m (Blanco) Mirror Coating Chamber Improvements	ARRA	Remainder of funds utilized for a new fork-lift, with NSF approval
(ARRA La Serena)		
La Serena Machine Shop Modification & Refurbishment	ARRA	Funds diverted to cover overruns and currency exchange loss on other projects
La Serena Compound Water System Renovation	ARRA	Completed in August 2013
La Serena Meeting Rooms Renovation	ARRA	Completed in July 2013
Vehicle Fleet Renewal	ARRA	Completed in September 2013
NOAO South Operations Accounts (subject to funding) (Mountain)		
Conversion of old Pachón dining facility to paramedics/nurses office or other use	NOAO-S Operations	Evaluation/scoping in progress, requires purchase of building from Gemini/SOAR
Interior finishes and outfitting of multi-purpose area in Pachón dining facility	NOAO-S Operations	Evaluation/scoping in progress
Complete construction and outfitting of a networking facility on Pachón	NOAO-S Operations	Completed in August 2013
(La Serena and common)		
Repair of La Serena office facility roofs	NOAO-S Departments	Main office & Modulux done in Sept. 2013 Engineering & library pending contract
Repainting of La Serena office, shop and warehouse buildings	NOAO-S Operations	Cost estimates received, evaluation of available funding in progress
Replacement of aging HVAC equip	NOAO-S Departments	In 2014 budget, planning in progress
Projects with Other Funding Sources (Mountain)		
Support of installation of PROMPT 8 telescope on Tololo	PROMPT Project	Building construction bid, evaluation of proposals in progress
Installation of MEarth telescopes on Tololo	MEarth Project (Harvard)	Completion anticipated in December 2013
Support of facility construction for KMTN Telescope on Tololo	KASI (Korean Astronomical Agency)	Building construction 80% complete, dome installation in progress.
Pachón main transformer replacement	Charge by % to programs using transformer	Purchase in progress
ALO Improvements on Pachón	ALO (Univ. of Illinois)	Initiated and completed authorized part of project, remainder pending
(La Serena)		
Various, repairs, improvements and refurbishments to La Serena houses	Housing rent account	Scheduled throughout the year based on maintenance needs and housing turnover
Improvements to swimming pool facility	Pool user fee account	Authorized improvements completed, remainder pending funding
Repair to La Serena athletic court	AURA for repairs – fees from users for upkeep	Bids for work received, contract pending
Construction and implementation of a new gate into the La Serena Recinto	TBD	Potential locations being studied for feasibility. Communications with the University of La Serena and Municipal authorities in progress.

Table 3 – Facility and Infrastructure Projects completed in FY-2013 or to be developed in FY-2014

VI. AURA/NOAO-S Networking Report

Introduction

The AURA network in Chile comprises of the following sections that are maintained by NOAO-South Computer Infrastructure Services South (CISS):

- Connectivity from La Serena to Cerro Tololo and Cerro Pachon which is served by a common backbone utilizing Microwave radios to produce two STM-1s or 310 Megabits per second (Mbs)
- Connectivity from La Serena to Santiago which is operated by REUNA, the Chilean Education and Research Network that provides 622Mbs. This is sub-divided into 570Mbs for research traffic and 50Mbs for commodity.
- Connectivity from Santiago to Miami which is operated by LAUREN and AMLIGHT who are funded by NSF grants and funds from Brazil which provide our 622Mbs. The AURA International commodity traffic is trunked to Miami where it is funneled to a local provider.
- Connectivity from Miami onwards is provided by research networks in the U.S. such as I-2, NLR, ESNET, Atlantic Wave, Pacific Wave, CENIC and others.

Status at End of FY-2013

- It had been anticipated that this year there would be the incremental increase to 1Gbs but the Clara terrestrial link has still not come to fruition. Once again Ampath has stepped into the breach and is provisioning a 10Gbs sonet ring around South America, which will give complete redundancy. At the conclusion of 2013 with funds from the AURA backbone account we purchased a switch for the Santiago POP that will facilitate the landing in Chile and thus enable access to 1Gbs+. REUNA has moved forward in the process of providing a 10Gbs sonet ring in Santiago which will give us redundancy within the Santiago region.
- During FY-2013 the AURA backbone from La Serena to the summits of Cerro Tololo and Cerro Pachon has undergone major changes. The Microwave radio and shared networking equipment on Cerro Pachon was relocated from the Gemini computer room to a building especially constructed to house all Cerro Pachon shared equipment. This infrastructure will serve Gemini, SOAR, ALO, Hotel and LSST in the future. Power to the building is backed up by the hotel Generator and two new on-line UPS units were purchased for remote monitoring of power, humidity and temperature. The potential upgrade of the bandwidth for the backbone proved to be considerably more expensive than anticipated, mainly due to the age and availability of parts. It would basically mean buying all new radios which is not considered viable considering that fiber should be available in FY-2015. Discussions ensued whether to replace some of the aging backbone network devices (10 years+) but considering the decreased reliance on this equipment in light of the fiber installation, it was decided to increase our spares stock.
- An instructor for the Harris Microwave radios conducted a course in La Serena for several of our employees. This filled a void in our maintenance team that previously had limited support. The result of the course enabled the smooth transition of the microwave equipment on Cerro Pachón.
- During the last two years AURA has been negotiating with Entel for backup links for all our locations in return for their Microwave tower usage on AURA property. Agreements were signed in 2013 and Entel has commenced installing MPLS equipment in Santiago, La Serena, Cerro Tololo and Cerro Pachón.
- There was installed a shared ASA in the front of AURA network. Also added was a Barracuda Web Filter in response to illegal usage of the 139.229.0.0 usage.

Detailed Performance

The graph in Figure 1 is provided by Ampath and shows the uptime for the circuit from the Santiago POP gateway router to AMPATH in Miami. The majority of outages were caused by fiber breaks and equipment failure along various parts of the circuit.

State	Type / Reason	Time	% Total Time	% Known Time
UP	Unscheduled	299d 4h 13m 22s	99.587%	99.587%
	Scheduled	0d 0h 0m 0s	0.000%	0.000%
	Total	299d 4h 13m 22s	99.587%	99.587%
DOWN	Unscheduled	1d 5h 46m 54s	0.413%	0.413%
	Scheduled	0d 0h 0m 0s	0.000%	0.000%
	Total	1d 5h 46m 54s	0.413%	0.413%
UNREACHABLE	Unscheduled	0d 0h 0m 0s	0.000%	0.000%
	Scheduled	0d 0h 0m 0s	0.000%	0.000%
	Total	0d 0h 0m 0s	0.000%	0.000%
Undetermined	Nagios Not Running	0d 0h 0m 0s	0.000%	
	Insufficient Data	0d 0h 0m 0s	0.000%	
	Total	0d 0h 0m 0s	0.000%	
All	Total	300d 10h 0m 16s	100.000%	100.000%

Figure 1.

Figure 2 is the latency and ping RTT for the last year. The five gaps observed are problems with the machine that monitors the network and not outages of the link

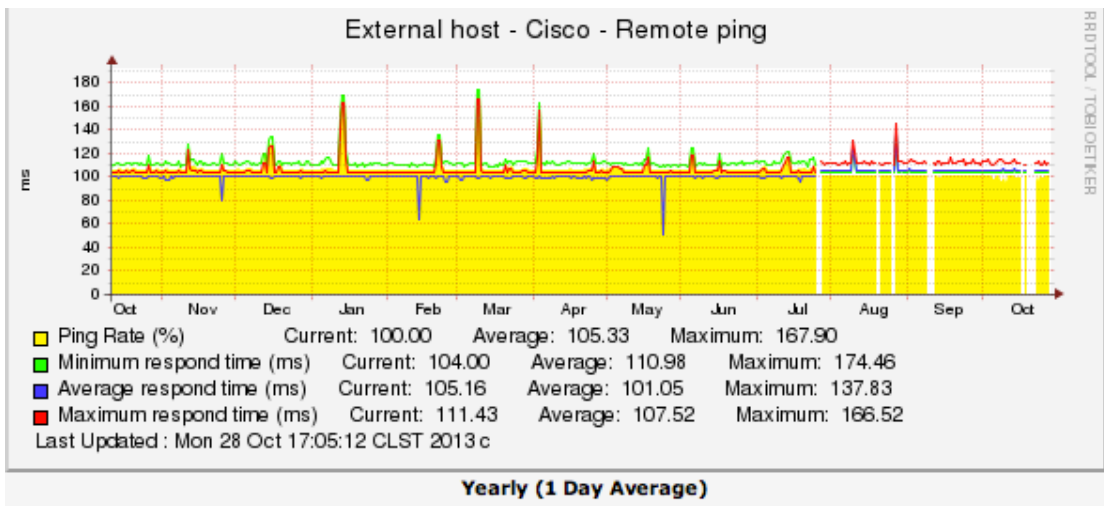


Figure 2.

Networking Milestones for FY-2014

- Installation of the Santiago 10Gbs switch to enable 1Gbs+ from La Serena to Miami.
- Completion of the sonet ring in Santiago.
- Possible commencement of the fiber installation from La Serena to summits. Pending outcome of LSST construction funding decision.
- This will be a year to ensure our aging backbone equipment continues to provide good service in anticipation of the fiber installation.
- Trim the trees that are a continually threatening to block the Microwave path from La Serena to Cerro Tololo.