



NOAO Investments in Common Infrastructure on Cerro Tololo and Cerro Pachón

Since 2009

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NOAO-S Facilities Operations

Executive Summary

In this report we present an overview of the NOAO investments in common infrastructure on Cerro Tololo and Cerro Pachón, as well as in La Serena, since the Facilities Operations department was reincorporated into NOAO-S in 2009. These investments are consistent with the NSF mandate for NOAO to manage and take charge of infrastructure common to the NSF funded programs on Cerro Tololo and Cerro Pachón. The investments were planned for and carried out with AURA and NSF oversight and approval through the ARRA¹ and NCE² plans.

In 2009 NOAO put in a request for ARRA funding to improve the infrastructure in the observatories, both in the north, at Kitt Peak, and in the south, at Cerro Tololo and Cerro Pachón. A significant portion of this funding was dedicated to upgrades of the common infrastructure. In Chile, this included for example the renovation of the pipes for the Cerro Tololo and Cerro Pachón water supply system, maintenance of the Cerro Tololo hotel, construction of a kitchen and dining facility on Cerro Pachón. The total amount of funding for common infrastructure in Chile was 1.64 MUSD.

In FY2016 NOAO-South Facilities Operations embarked on a major upgrade and improvement plan, to make the infrastructure more robust and to improve maintenance of the infrastructure, as described in the NOAO-S Facilities Operations FY2016 Budget Report (van der Bliet, Tapia, Valencia, v3.2 Feb. 1 2016). This has come at a significant cost, increasing the total budget from 1596 MCLP in FY2015 to 2097 MCLP in FY2016, of which 295 MCLP are specifically for upgrades and improvements. NOAO will financially support the smaller tenants on Cerro Tololo by taking over at least 40 MCLP of the 84 MCLP corresponding to the total of the project shares for the small tenants. At 640 CLP/USD this is equivalent to 62.5 kUSD.

One of the larger projects, the upgrade of the Tololo powerhouse, will be completely supported financially by NOAO, with the NOAO Blanco 4-m telescope being the largest telescope on Cerro Tololo. Therefore the project and its budget are not included in the FY2016 budget report. The total cost of this project, including FTEs is estimated to be around 1 MUSD.

An electric storm at the end of March 2015 caused severe damage to the system providing commercial power to Cerro Tololo. Significant effort was spent on troubleshooting and repairing the system. NOAO will assume the burden of these unforeseen, extra costs. In addition, during this period all facilities on Cerro Tololo ran on generator power, resulting in an increased effort to maintain the generator and increased fuel consumption, well beyond the average effort assumed in the FY2015 budget. NOAO will carry the financial burden of these extra costs, including rental of a backup generator.

¹ ARRA: American Reinvestment and Recovery Act 2009

² NCE: No Cost Extension to NOAO Cooperative Agreement 0809409

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1. Introduction

The NOAO-South (NOAO-S) Facilities Operations Department (Facilities Operations) maintains the common infrastructure for AURA Observatory (AURA-O) and the programs and smaller tenants present on the AURA-O properties, in La Serena and near Vicuña. This includes road maintenance, maintenance of the common electric power systems, water and wastewater systems and the communication system, which includes the radio communication with and on the mountain and the telephone service. Facilities Operations also manages the restaurant and hotel facilities on the two mountaintops as well as the hotel service on the La Serena recinto. Finally, the Facilities Operations department oversees the guard service, reception and the transportations services. A detailed description of the services provided by or supervised by the Facilities Operations department can be found in the Service Level Agreement July 22, 2014. The emergency medical service is included in the services, but falls under direction of the NOAO-S safety engineer.

Operations costs are fully recovered through charges to the programs and visiting astronomers. These charges are calculated annually based on the yearly budget and a cost-sharing model agreed upon by the programs. Departmental overhead and indirect costs associated with the NOAO Director's Office and Business Administration charged to NOAO by AURA Central Administrative Services (AURA CAS) and AURA Human Resources (AURA HR) are included as well.

Since about 2000, when cost sharing between the programs commenced and AOSS was established, the budget for non-payroll and in particularly staffing was decreased significantly, whereas the areas that were maintained by AOSS increased, sometimes by about 1/4. For example, the Facilities Operations group used to maintain the road to Tololo and the secondary road to Quebrada San Carlos. With the arrival of Gemini and SOAR the roadwork extended to Cerro Pachón, adding 14 km of main road and about 22 km of secondary road to enable maintenance of the power lines to Pachón, from Quebrada San Carlos to Cerro Pachón. At the same time, the team maintaining the road, decreased from 4.5 FTE to 1.5 FTE. The same has been the case in other areas and as a result some of the maintenance was deferred, and improvement projects were postponed.

At the start of FY2010, i.e. October 2009, the Facilities Operations department was reincorporated into NOAO-South. Since then an effort has been made to improve services, re-establish a vigorous maintenance plan and to carry out improvement projects to catch up on maintenance.

In this report we present an overview of the effort by NOAO to catch up on deferred maintenance, carry out upgrade projects and in general to improve the common infrastructure on Cerro Tololo, Cerro Pachón and on the La Serena compound. Part of this effort, between 2009 and 2014, which addressed critical issues was funded through the American Reinvestment and Recovery Act 2009 (ARRA). In FY2016 we plan to continue this effort and carry out several upgrade and improvement projects. A significant part of the projects, in particular those on Tololo, e.g. work on the Tololo powerhouse, will be funded directly by NOAO, decreasing the financial burden for the Tololo tenants.

2. ARRA Funded Projects

The American Reinvestment and Recovery Act 2009 provided an opportunity to apply for extra funding to support infrastructure at national facilities. NOAO applied for and was awarded funding to carry out a

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set of upgrade projects to addresses critical infrastructure issues. These projects included infrastructure upgrades for the facilities in Arizona and in Chile, and a large part of the projects concerned common infrastructure. The following projects to upgrade common infrastructure were carried out in Chile, for a total of 1.64 MUSD.

1. Water Supply System Renovation

The water supply system for Cerro Tololo was renovated. This included renewal of 4.5 km of piping from the well to the summit of Cerro Tololo, repairs of the pumping stations, as well as replacement of pumps. In addition, 1.3 km of underground piping from the Cerro Pachón utility yard to the dining/hotel area was replaced.

2. Dormitories Repair & Renovation

Three dormitory buildings on Cerro Tololo with a total of 39 rooms and a dining facility were renovated. Renovations included roof repairs, refurbishment of the bathrooms, upgrade of the heating systems and improvement of the dining facility.

3. Cerro Pachón Kitchen & Dining Facility

A new kitchen and dining facility was constructed on Cerro Pachón by adding a new wing to the Pachón hotel.

4. Cerro Pachón Emergency Generator

An emergency generator was purchased and installed on Cerro Pachón to provide a backup for the electricity services for the Cerro Pachón Hotel and Kitchen/Dining areas.

5. Cerro Tololo powerhouse upgrades

A backup generator for the Cerro Tololo powerhouse was purchased and installed, and the one of the two frequency converters was repaired.

6. La Serena Compound Water System

The pump system for the La Serena well was replaced and the fire fighting system was upgraded: new fire hose cabinets were purchased and installed and the fire suppression water system was replaced.

7. La Serena Meeting room renovation (casino area)

An underused area of the CTIO La Serena library was converted into a staff interaction space and a multipurpose meeting/dining area, including a kitchenette.

8. Security Fencing Repair La Serena Compound

The vehicle gate and guardhouse at the Cisternas entrance of the La Serena compound was relocated to facilitate safer access to the compound.

9. Vehicle fleet renewal

The Operations vehicle fleet is used intensively and it was necessary to replace several of the vehicles. ARRA funding was used to purchase three pickup trucks for Facilities Operations.

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3. FY2016 Projects

In preparations for the FY2016 plan and budget, several necessary upgrades and improvements were identified, some due to the severe winter weather in 2015, e.g. road maintenance, some due to the fact that we intend to have all critical installations upgrade to the Chilean Health and Safety standards, in preparations for official certification of these installations. These projects are:

1. Power line stability
Install automatic re-closers and other electric protection equipment on the Medium Tension (MT) power lines to improve stability and to be able to monitor incoming commercial power and behavior of the MT lines.
2. Communications Network
Move antenna on Cerro Pachón, upgrade repeaters and install a repeater on the La Serena compound to improve reliability of radio communications with the mountain.
3. Hotels Tololo, Pachón and La Serena
Carry out major maintenance on the hotels on Tololo, Pachón and La Serena, such as painting the outside of the Tololo hotel and refurbishing the bathroom of Pachón hotel
4. Certification of Equipment & Areas
Improve and upgrade equipment and (work) areas to comply with Chilean Health and Safety standards. This includes certification of electric substations, upgrades and certification of heaters, upgrades and certification of the kitchen facilities on Tololo and on Pachón.
5. Road maintenance
Intense road maintenance & repairs are planned to recover the road, which suffered severe damage during the 2015 storms, and to prepare for the increased usage of the road due to construction of LSST.

The total budget for these projects is 295 MCLP. NOAO's share of these costs is 86 MCLP in support for the Blanco 4-m telescope on Cerro Tololo and the SOAR Telescope on Cerro Pachón. In addition, NOAO will cover at least 40 MCLP of the Tololo's tenants share (84 MCLP total) for the project costs. This corresponds to about 62.5 kUSD at 640 CLP/USD.

4. Upgrade of the Tololo powerhouse

To ensure a robust power system the following upgrades and improvements will have to be implemented in the coming few years:

1. Upgrade commercial power system
 - a. Replace primary step-down transformer, including purchase of backup transformer
 - b. Purchase and install additional protection cells
2. Upgrade frequency converter & backup frequency converter
 - a. Upgrade starter of frequency converter

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- b. Upgrade backup frequency converter to be compatible with current needs on Cerro Tololo
3. Upgrade generator backup system
 - a. Purchase and install second backup generator
 - b. Expand automatic switchgear to include second backup generator
 - c. Replace fuel tank

The Electric Engineer of the Facilities Operations department, who was recently hired, leads these upgrade projects. The total budget for these upgrade projects, including the hire of the electric engineer amounts to about 1 MUSD. NOAO assumes the entire cost for the powerhouse upgrade under the No Cost Extension to the Cooperative Agreement 08094909.

5. Damage & extra effort as result of electric storm in March 2015

An electric storm in March 2015 damaged the main transformer and other parts of the electric system on Cerro Tololo. As a result, all telescopes and facilities on Cerro Tololo ran on generator power from the end of March 2015 till the beginning of January 2016. This came with extra costs for fuel, generator maintenance and, the cost for a rental backup generator. For this period tenants will only be charged for their electric consumption at the commercial rate they would have been charged by the electric company. NOAO will assume the difference between the actual cost of generating the electricity used and the commercial rate, including the cost of fuel, generator maintenance, and the rental cost of the backup generator.

The costs for repair of the transformer and other auxiliary equipment is also absorbed by NOAO.