



**BUDGET FISCAL YEAR 2017**  
**FACILITIES OPERATIONS**

**NOAO-S**

Nicole van der Blik

V4.1

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# NOAO-S Facilities Operations

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## Executive Summary

In this report the fiscal year 2017 (FY2017) annual budget for the NOAO-S Facilities Operations Department (hereafter Facilities Operations) is discussed. Facilities Operations maintains the common infrastructure on the AURA recinto (including the recinto hotel) in La Serena and the AURA-Observatory near Vicuña, i.e. telescopes and facilities located on Cerros Tololo and Pachón.

In FY2016 Facilities Operations initiated a program of upgrading and improving the common infrastructure. This program includes continuous improvements, the implementation of a rigorous maintenance plan, training and certification of staff, and where necessary, an increase in the staffing levels. An outline of the plans and budget outlook for the coming years can be found in the report “Outlook Budget Fiscal Years 2017-2019”, v1.2, Feb. 15 2016.

The FY2017 base is 2068 MCLP, compared to a base budget of 1802 MCLP in FY2016. This base budget consists of the costs corresponding to on-going activities, i.e. operations, maintenance, regular, minor upgrades as well as training. The base budget increase, compared to the FY2016, is 15%, i.e. **less than the 19.82% increase forecast in the report “Outlook Budget Fiscal Years 2017-2019”**.

The FY2017 budget for critical projects is 177 MCLP (see section 4); **i.e. a 25% decrease compared to the FY2016 projects budget, instead of a 7% decrease forecast in the “Outlook Budget Fiscal Years 2017-2019” report.**

The baseline budget for Facilities Operations includes both base services and projects and is 2245 MCLP. This compares to 2097 MCLP in FY2016 or an 8% increase.

In Section 5 two “extra” projects, with an associated budget of 44 MCLP, are discussed. These projects have lower priority than the critical upgrades described in Section 4. Yet it would be prudent not to postpone these projects much longer. The total budget for the Facilities Operations department, 2289MCLP, includes the costs for these “Extra Projects.” See Table 1.

In addition to the regular activity and projects in FY2017, Facility Operations will complete several contracted projects from FY2016 with carry forward funding. These projects took more time to scope and bid due to the need for expert definition, which became possible only after hiring two new senior engineers in FY2016. Since the projects are largely to be executed as external contracts, they should not impact the Facilities Operations effort planned here.

All costs to provide the services are recovered through charges to the users: mountain share, census and per-use charges. The charges are calculated yearly and are based on the costs for providing the services and a cost-sharing model (van der Blik & Heathcote 2014). Charges for the mountain share are calculated based on the “Two-Mountain Model”, census charges are based on the number of employees per program, and per-use charges are based on the estimated usage of these services. The FY2017 charges are presented in the Table 5 in this report.

Note, added after the September 9, 2016 meeting with the Advisory Committee: The Total Share charges for FY2017 will only consist of the Base Share charges and the Project Share charges. The “Extra Projects” will be postponed to FY2018. This change is reflected in the Tables 5 and 6 of this report.

# NOAO-S Facilities Operations

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## 1. Introduction

The NOAO-S Facilities Operations Department (Facilities Operations) maintains the common infrastructure for 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. 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 transportation 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. Included in the services, but under direction of the NOAO-S safety engineer, is the emergency medical service. The description of this service is not yet included in the Service Level Agreement, pending a reorganization of this service.

The department operations costs are fully recovered through charges to the programs and visiting astronomers. The charges for the services are calculated annually on the basis of the yearly budget and a cost-sharing model agreed upon by the programs. Departmental overhead is distributed over the cost centers in terms of percentage of the budget per cost center. Services provided internally, to other groups within the NOAO-S Facilities Operations Department, are charged an internal rate to avoid double charging of overhead in the cost center using the service. Indirect costs associated with the NOAO Director's Office (in Tucson) and Business Administration charged to NOAO by AURA CAS and AURA HR are added to direct costs at a rate of 5.5%. The 5.5% represents the "All-sites" portion of NOAO General and Administrative (G&A) rate charged to externally funded projects. All NOAO rates are developed with the assistance of AURA-CAS and submitted to NSF for approval on an annual basis.

The budget is primarily based on the previous year's budget and other long-term experience 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 specific services. For FY2017 we assumed an inflation of 3.5%. Planned upgrade and improvement projects are also included in the budget. 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 and, charges for the services are calculated and charged in CLP. US dollar budgets are obtained using a peso to dollar exchange rate of 640 CLP/USD consistent with the other AURA centers operating in Chile.

## 2. The FY2017 plan & FY2017 budget

The FY2017 budget is presented in Table 1. This totals 2289 MCLP, covering all cost centers, departmental overhead and the AURA Business Service Charges (accounting, procurement, HR, AURA indirects) and it includes the budget for regular operations, critical projects, and two "extra" improvement projects (44 MCLP). The regular operations budget is 2068 MCLP and critical FY2017 improvement and upgrade projects: 177 MCLP. The budget for regular operations was 1802 MCLP in FY16, while there was 295 MCLP budgeted for the FY2016 improvement and upgrade projects.

There are some notable increases in the regular operations budget compared to FY2016. The budget for "Payroll and Fringe Benefits Expenses" increased by 19%. This increase is largely due to increased

# NOAO-S Facilities Operations

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staffing in the Facilities Operations department. In FY2016 the positions for senior electric and civil engineers were filled, as was one position of janitor. In FY2017 the positions of an extra heavy equipment operator, an additional janitor and the position of a business analyst will be filled.

The budgets for “Supplies & Materials” and “Utilities & Office Expenses” are increased by 25% and 22% respectively based on the FY2016 actual expenses. Included in the maintenance plans developed over the past year are additional maintenance contracts, extra equipment and, more regular replacement of equipment. This is reflected in an increased budget in “Contracted Services” with is increased by 18% compared to the FY2016 budget.

In FY2016 an exchange rate adjustment for expenses in USD was incorrectly budgeted for under the expense code “Miscellaneous”. This has been corrected for in the FY2017 budget. Other notable changes are the expected usage of the Maintenance group and Garage group. This is work related to the infrastructure, hotel end restaurants, and is budgeted under the expense code “NOAO Services”. The FY2017 usage is expected to be lower than in FY2016.

In addition to regular operations, we plan to carry out several outstanding improvement- and upgrade projects in FY2017. The costs for these projects are included in the FY2017 budget and the projects are discussed in detail in Section 4, “FY2017 Projects”.

Some of the projects planned for in FY2016 have not been carried out yet. Funds allocated to those projects will be carried forward to FY2017, to allow for execution of these projects in FY2017. A preliminary summary of projects completed, underway and to be completed in FY2017 will be distributed as addendum to this report. An updated status report on the FY2016 projects will be distributed at the end of September 2016, while an update on the associated carry-forward funds will be included in the FY2016 financial report. We expect that in FY2017 we will complete upgrading most equipment and infrastructure to meet Chilean Health and Safety standards. Once that has been established we will be able to maintain this quality by including yearly smaller upgrade and improvement projects. Note that we do expect that road repairs will continue in the coming years.

The upgrade and improvement projects require “Supplies & Materials”, “Contracted Services”, and “Capital Equipment”. Departmental overhead, i.e. “Facilities Support”, and the Business Service Charges are also included in the budget of these projects.

A subset of the upgrade projects is earmarked as “Extra Projects”. The “Extra Projects” are important, but less urgent than the projects included in the regular budget. These projects are discussed in the Section 5, “Extra Projects” and the corresponding budget is 44 MCLP. No departmental overhead (Facilities Support) is charged to these extra projects, to be able to determine the share, census and per-use charges, while the “Extra Projects” are still under discussion.<sup>1</sup>

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<sup>1</sup> Departmental overhead is distributed over the cost centers in terms of percentage of the budget. Thus, if this overhead were also distributed over the “Extra Projects”, removing one or two projects from the annual plan & budget, would affect all rates.

# NOAO-S Facilities Operations

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## 3. Details per work package

In Table 2 the budget per activity, or work package, is presented with information on the budgeted cost for labor, non-payroll and internal sales. The table is divided into three parts, grouping the work packages by mountain share, census, and per-use services.

In this Section we discuss the general operations and safety work packages. We also discuss work packages with significant budget changes, with the exception of the work packages “Projects” and “Extra Projects” which are discussed in Section 4 and 5 respectively.

### 3.1. General operations

In FY2016 we developed a program to train and certify the Facilities Operations staff to be able to provide better and more reliable service. This includes training and certification of the electrical technicians, plumbers and emergency brigades. Training and certification is included in the base budget of the department, in the work packages “Safety & General Ops” and “Mnt General Ops”. These work packages also includes maintenance of the Facilities Operations fleet and renewal of one of the Facilities Operations vehicles. The work package “Mnt General Operations” covers general operations costs for mountain infrastructure, while the work package “Safety & General Operations” covers safety and general operations costs for all departmental activities, independent of location.

In comparison with FY2016 the budget for the work package “Mnt General Ops” increased significantly, more than 50%. This is mostly due to an increased staff effort budgeted in this work package, capturing e.g. all support from the Computer Support Services group. The increase in non-payroll is mostly due to increased usage of meals & lodging for Facilities Operations staff.

### 3.2. Security, Emergency Medical Services

The work packages “Security Mnt”, “Security La Serena” and “Emergency Medical Services” include services provided through external contractors and, a large fraction of the budget for those work packages consists of the costs of those contracts. Upgrades to the accommodation for the guards and paramedics/nurses are budgeted for in these work packages as well. In FY2016 the guardhouse at gate to the mountain was renovated; in FY2017 we plan to improve the accommodation for the guards in La Serena. This is reflected in the non-payroll budget for these packages. The budget for the work package “Emergency Medical Services” also includes meals & lodging for medical personnel.

### 3.3. Maintenance of Roads, Power Lines and Power Generation

The work packages “Road Maintenance”, “Power Line Maintenance” and “Power Generation” contain the efforts for maintaining common mountain infrastructure: roads, power lines and the equipment in the Tololo power house. Staffing efforts in these work packages have been increased, to provide safe and reliable services and, budget for additional maintenance and extra equipment have been included in the FY2017 budget. The costs for these additions, labor and non-payroll, are included in the budgets of these work packages.

# NOAO-S Facilities Operations

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## 3.4. Communications Network

The work packages “Communications Network”, for the mountains and the La Serena recinto, comprise the efforts to maintain the radio communication system as well as the telephone system. The FY2016 budget for the La Serena based “Communications Network” work package contained funds to replace the call managers, which is not included in the FY2017 budget for this work package. resulting in a budget decrease of about 40%.

## 3.5. Kitchen and Hotel Services

The work packages “Mnt Kitchens”, “Mnt Hotels” and “La Serena Hotel” contain the effort to provide meals and lodging on the mountains and lodging in La Serena. There is no significant difference between the FY2017 and FY2016 budgets for the “Mnt Kitchens”. The budgets for the “Mnt Hotels” and “La Serena Hotel” on the other hand, increased by 17% (Mountain) and 9% (La Serena). These increases are a result of an effort to provide improved services in response to requests and recommendations from our clients and the CPHS’s<sup>2</sup>: additional custodial staff is budgeted for, as is regular renewal of hotel equipment and furnishings.

## 3.6. Water & Sewage and Water Transport

The work packages “Mnt Water & Sewage”, “Water Transport” and “La Serena Water & Sewage” contain the effort to provide water on the two mountains and in La Serena. The La Serena work packages also include the costs for usage of the municipal sewage system. The estimated usage of water on Cerro Pachón is significantly less than the estimate for FY2016, based on actual FY2016 usage. As a result the budgeted effort to provide water, including the effort to transport water to Cerro Pachón has been decreased compared to FY2016. The budgets for those work packages decreased accordingly. The FY2017 budget includes the costs for maintenance of the water supply system in La Serena.

## 3.7. Janitor Service, Maintenance Group and Garage

The work packages “Mnt Janitorial Service”, “La Serena Janitorial Service”, “Maintenance Group”, and “Garage” contain of the services that are provided on an hourly basis. While the budgets for the janitorial services remain constant, the budgets for both “Maintenance Group” and the “Garage” show a significant increase. These increases are the result of an estimated decrease in internal sales.

## 4. FY2017 Projects

In this Section we discuss the upgrade and improvement projects planned for in FY2017. The costs associated with these projects are presented in Table 3. These costs are recovered through the “FY2017 Projects Share Charge”: 72 MCLP for the projects common for both mountains, recovered through the common part of the Mountain Share Charge; 32 MCLP for the Tololo specific projects, included in the Tololo Mountain Share Charges; and, 59 MCLP for the Pachón specific projects, included in the Pachón Mountain Share Charge.

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<sup>2</sup> CPHS: Comité Paritario de Higiene y Seguridad

# NOAO-S Facilities Operations

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## 4.1. Water & Sewage System

In FY2017 several projects to upgrade the water and waste water systems on the mountain are planned:

- Improving the water fill system for the three water storage tanks on Cerro Tololo
- Upgrading the chlorination system for the water storage tanks on Cerro Tololo
- Improvement of the sewage system on Cerro Tololo
- Installation of a water treatment plant on Cerro Tololo

## 4.2. Hotels Tololo, Pachón, and La Serena

Regular maintenance for the hotels on Cerro Tololo and Cerro Pachón is included in the base budget. In FY2017 we will be moving the La Serena hotel rooms to another location on the recinto, possibly converting Casa 9 to function as a hotel.

## 4.3. Mountain Electric System

The installation of three automatic re-closers in FY2016 was a major upgrade of the electric system on the mountain. In FY2017 we continue to improve the reliability of the electric system. We will renew part of the MT power lines between the bifurcation (Quebrada San Carlos) and Cerro Pachón. We will also purchase spares and electrical measuring equipment.

## 4.4. Road Maintenance

The heavy equipment used to carry out maintenance of the roads to Cerro Pachón and Cerro Tololo consists of a road grader, a frontend loader and, a dump truck. To improve the quality and efficiency of the road maintenance work and to work safely we will be adding, renewing or repairing equipment on a regular basis. In FY2017 we plan to purchase a backhoe loader.

## 5. Extra Projects

In FY2017 we propose to carry out two additional upgrade projects, both related to the water supply system. The water supply system consists of

- A water well at the bottom of Quebrada San Carlos, with a deep-well pump and measuring equipment;
- Pumps, piping, monitoring equipment and three water tanks to bring the water up from the Quebrada to the summit on Cerro Tololo;
- Water storage tanks on Cerro Tololo, including a chlorination system and piping. Currently there are three water tanks; there is space for a fourth tank;
- A truck with a water tank, to transport water from Cerro Tololo to Cerro Pachón;
- A water storage tank on Cerro Pachón, including a chlorination system.

During the 2015 September 16 earthquake in the IV<sup>th</sup> region the Cerro Tololo storage tanks and the connecting water tubes suffered severe damage. Structural repairs of the tanks and the tubes were carried out in FY2016.

# NOAO-S Facilities Operations

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In FY2017 we plan to carry out preventative maintenance of three tanks on Cerro Tololo and the three tanks between Quebrada San Carlos and the summit. Maintenance of the water tank on Cerro Pachón will be included in the plans for FY2018. In the future, the purchase of a second water tank for Cerro Pachón and a fourth tank on Cerro Tololo may be considered. This would make operations on both mountains less vulnerable during maintenance of the water supply system or when problems in this supply system occur.

The budget for these two projects, 44 MCLP is given in Table 4. The Business Service Charges associated with these projects are also included in the table for completeness.

## 6. The cost recovering charges for FY2017

The FY2017 charges to recover the costs of maintaining the infrastructure and providing the services are presented in Table 5. The charges are based on the costs for providing the services and are calculated based on the “Two-Mountain Model” in case of the Mountain Shares, on number of employees, in case of the census charges, and on the estimated usage in case of the per-use charges. The estimated cost per program for FY2017 is listed in Table 6.

### 6.1. Mountain Share Charges

Mountain share charges are calculated based on the Two-Mountain Model, described in “Two Mountain Share Model 2016, v5<sup>3</sup> by Heathcote & van der Blik. Cost for infrastructure common to both mountains is split 50/50 over the two mountains, Cerro Tololo and Cerro Pachón. The cost for infrastructure on Cerro Pachón and the “Pachón-share” of the common infrastructure is split between LSST, Gemini-S and SOAR, whereby LSST and Gemini-S each count as one share, and SOAR as 0.8 of a share. The cost for infrastructure on Cerro Tololo, and the “Tololo-share” of the common infrastructure is split between the tenants / programs, proportional to the diameter of the telescopes, with a reduction of 70% for remote telescopes, and telescopes which are in use less than one third of the year. Some telescope projects have changed or will be changing configuration or mode of operation in FY2017, e.g. a telescope is added, or instead of full year operation the project will run part time in FY2017 or vice versa. These changes are included in the calculation of the FY2017 Tololo Mountain Share Charges.

The mountain share charges are split up in a regular share charge and an extra share charge. The regular share charge, column “Share” in Tb. 5, covers routine maintenance of the infrastructure, column “Base” in Tb. 5, and the critical improvement and upgrade projects, column “Projects” in Tb. 5. The extra share charge, column “Extra Share” in Tb. 5, covers the costs for the two additional improvement projects presented in Section 5.

Compared to the FY2016 the Mountain Share Charges are increased by 18% for the Tololo based programs, and by 8% for the Pachón based program, when including the “Extra Projects”. The largest component of this increase is the budget for additional staff and the costs associated with the improved maintenance program, as discussed in Section 2, although IPC and salary increases also contribute to the increase.

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<sup>3</sup> [http://www.ctio.noao.edu/noao/sites/default/files/Facilities/Documents/TwoMountainModelDescriptionV5\\_Signed.pdf](http://www.ctio.noao.edu/noao/sites/default/files/Facilities/Documents/TwoMountainModelDescriptionV5_Signed.pdf)

# NOAO-S Facilities Operations

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## 6.2. Census Charges

The “All Places, All Staff” census charge covers the costs for reception, including the mail pouch to Santiago and the USA, and general safety and operations for all areas under supervision of the Facilities Operation department. The census charge for La Serena based staff covers the costs for the communications network, the La Serena guard service, maintenance of the common areas and, the La Serena based projects. Note, the costs for the common areas, mostly water and the gardener service, are shared with the residents of the La Serena recinto; only the part corresponding to the programs is included in the NOAO-S Facilities Operations budget. The FY2017 census charges are about 20% higher in FY2017 compared to FY2016, because of a significant decrease in staff: 9% fewer staff members in La Serena, and 12% at all sites.

## 6.3. Charges for the Per-Use Services

The charges for the Per-Use Services depend very much on the estimated quantity of use, and as a result fluctuate from year to year. This effect is most noticeable in the charges for water provided on the mountain. The charges for water and water transport increases by 16% when comparing the FY2017 charges with the FY2016 charges, despite the fact that the budget for these work packages is decreased by more than 30%. The estimated water use on Pachón has been adjusted based on actual usage in FY2016.

The charges for water usage on the La Serena “recinto” increase (17%) in accordance with the increased budget for the work package “Water and Sewage La Serena” (see Section 3).

The increases in charges for lodging on the mountain (23%) and in La Serena (10%) result from a combination of an increased effort to improve the services and, an estimated decrease in demand, with Gemini-S starting remote operations. Note that for the usage of the Cerro Pachón hotel an extra charge of 16,201 CLP is included to pay off the debt with AURA for building the Hotel Pachón.

The hourly rate for the maintenance group and the garage increase significantly, 43% and 50% respectively. Estimated usages were adjusted to FY2016 actuals.

Charges for meals provided on the mountain as well as the charges for janitorial services both on the mountain and in La Serena, remain stable.

# NOAO-S Facilities Operations

**Table 1: NOAO-S Facilities Operation FY2017**  
**The FY2016 base budget and projects budget are included for comparison.**

	Budget FY 2017 Base	Budget FY2017 Projects	Budget Extra Projects	Total Budget FY 2017	Budget FY 2016 Base	Budget FY 2016 Projects
<b>TOTAL REVENUES</b>	<b>2,068,390,227</b>	<b>176,531,395</b>	<b>44,113,770</b>	<b>2,289,035,391</b>	<b>1,801,997,467</b>	<b>294,537,447</b>
Payroll and Fringe Benefits Expenses	974,212,380	-	-	974,212,380	820,057,136	-
Supplies & Materials	574,469,198	1,705,680	-	576,174,878	460,781,808	11,648,000
Utilities & Office Expense	236,293,115	-	-	236,293,115	193,937,442	-
Equipment Repair & Maintenance	-	-	-	-	-	-
Equipment & Building Leases	-	-	-	-	-	-
Travel Expenses	35,556,012	-	-	35,556,012	34,353,636	-
Foreign Travel - Staff	503,136	-	-	503,136	486,122	-
Miscellaneous Expense	3,003,933	-	-	3,003,933	20,209,866	-
Insurance	1,992,732	-	-	1,992,732	1,925,345	-
Conferences & Mtgs\Training	16,885,978	-	-	16,885,978	14,314,954	-
Contracted Services	381,991,029	52,635,960	-	434,626,989	323,333,455	204,256,000
NOAO South Services	118,821,900	-	-	118,821,900	156,486,391	-
Recruitment - Ads & Misc Exp	103,424	-	-	103,424	99,926	-
Facility Support	(29,990,692)	29,990,692	-	-	(33,842,727)	33,842,727
Freight	27,763,872	-	-	27,763,872	26,824,998	-
Capital Equipment	33,814,688	84,559,500	41,814,000	160,188,188	48,171,196	31,200,000
Non-Payroll Expenses Subtotal	1,401,208,325	168,891,832	41,814,000	1,611,914,157	1,247,082,412	280,946,727
Internal Sales	(416,424,727)	-	-	(416,424,727)	(360,849,370)	-
Business Service Charges	109,394,248	7,639,563	2,299,770	119,333,581	95,707,289	13,590,720
<b>TOTAL EXPENSES</b>	<b>2,068,390,227</b>	<b>176,531,395</b>	<b>44,113,770</b>	<b>2,289,035,391</b>	<b>1,801,997,467</b>	<b>294,537,447</b>

Note on Expense Code "Facilities Support": Departmental overhead is distributed over the cost centers in terms of percentage of the budget per cost center, except for the "Extra Projects". The FY2017 base budget includes the costs of this overhead, but only part of the "revenue". The remainder of the "revenue" is budgeted in the work package "FY2017 Projects". The FY2017 base budget shows a negative "Facilities Support", matching the "Facilities Support" in FY2017 Projects. No departmental overhead is charged to the "Extra Projects", so that, if one or more of these projects are not approved, the share charges, census charges and per-use charges are not affected.

# NOAO-S Facilities Operations

**Table 2: Labor & non-payroll, per work package**  
 The FY2016 budget is included in the last column for comparison.

## Shared mountain infrastructure & services

Work Package	Labor	Non-Payroll	Total Budget	FY2016 Budget
Mnt General Ops	40,521,365	220,230,559	260,751,924	166,375,612
Security Mnt	0	30,883,041	30,883,041	35,012,224
Emergency Medical Services	40,331,243	134,925,605	175,256,848	157,521,028
Road Maintenance	37,773,657	199,993,180	237,766,837	199,964,697
Power Line Maintenance	35,202,975	97,030,296	132,233,271	90,013,288
Power Generation	10,056,863	16,846,635	26,903,498	26,917,396
Communication Network	6,610,775	19,676,095	26,286,870	23,564,973
	170,496,878	719,585,412	890,082,290	699,369,218
FY2017 Projects	0	163,377,435	163,377,435	294,537,447
Extra Projects	0	44,113,770	44,113,770	
	170,496,878	927,076,617	1,097,573,495	993,906,665

## General and La Serena common infrastructure & services

Work Package	Labor	Non-Payroll	Total Budget	FY2016 Budget
Safety & General Ops	15,324,715	78,484,462	93,809,177	90,257,902
Security La Serena	0	74,428,454	74,428,454	64,125,933
Common Areas	3,178,317	64,015,496	67,193,813	62,169,549
Reception	26,396,952	41,628,253	68,025,205	67,028,930
Communication Network	3,818,209	15,622,966	19,441,175	34,405,922
FY2017 Projects	0	13,153,959	13,153,959	
	48,718,193	287,333,590	336,051,783	317,988,238

## Per-use services

Work Package	Labor	Non-Payroll	Internal Sales	Net Budget	FY2016 Budget
Mnt Janitorial Services	12,463,879	13,751,461	(10,624,968)	15,590,373	16,006,528
Mnt Kitchens	213,947,271	408,341,045	(169,343,972)	452,944,344	430,569,732
Mnt Hotels	49,012,796	214,394,086	(72,420,623)	190,986,259	162,555,266
Mnt Water & Sewage	20,383,087	34,959,701	(31,099,105)	24,243,683	36,854,776
Mnt Water Transportation	12,773,253	18,226,333	(11,976,519)	19,023,067	29,970,451
LS Janitorial Service	27,156,138	11,831,179	(1,002,507)	37,984,809	34,450,987
LS Hotel	7,721,730	25,229,471	-	32,951,201	30,317,626
LS Water & Sewage	6,479,091	32,998,610	(12,762,649)	26,715,052	20,884,242
Maintenance Group	57,931,493	23,681,202	(60,073,352)	21,539,344	9,143,839
Garage	61,004,391	19,548,622	(47,121,032)	33,431,981	13,886,564
	468,873,129	802,961,711	(416,424,727)	855,410,113	784,640,011
<b>Total</b>	<b>688,088,200</b>	<b>2,017,371,918</b>	<b>(416,424,727)</b>	<b>2,289,035,391</b>	<b>2,096,534,914</b>

# NOAO-S Facilities Operations

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**Table 3: FY2017 Improvement & Upgrade Projects**

FY2017 Projects	Estimated Cost
<b>Water &amp; Sewage</b>	
Water Supply System Improvements	12,300,000
Upgrade Tololo Sewage System	15,800,000
<b>Hotel</b>	
La Serena Hotel Upgrade	10,000,000
<b>Electric System</b>	
Renew cables MT lines	19,300,000
Equipment & spares	11,400,000
<b>Road</b>	
Backhoe	65,400,000
<b>Overhead &amp; IPC</b>	
IPC	4,700,000
Business Service Charges	7,600,000
Overhead	30,000,000
<b>Total</b>	<b>176,500,000</b>

**Table 4: FY2017 Extra projects**

FY2017 Extra Projects	Estimated cost
<b>Water Supply System</b>	
Maintenance Water Tanks San Carlos	20,200,000
Maintenance Water Tanks Tololo	20,200,000
<b>Overhead &amp; IPC</b>	
IPC	1,400,000
Business Service Charges	2,300,000
<b>Total</b>	<b>44,100,000</b>

# NOAO-S Facilities Operations

**Table 5: Cost recovering charges for FY2017**  
**Mountain Share Charges consist of base charge and regular projects charge**  
**FY2016 charges are included in the last column for comparison.**

## FY2017 Mountain Share Charges, based on 2-mountain model

Program	Base	Projects	Share Total	FY2016 Share Total
CTIO 4M	132,207,882	21,108,565	153,316,448	135,938,119
KASI	53,282,774	8,507,230	61,790,004	54,786,144
SMARTS 1.5m	-	-	-	17,120,670
SMARTS 1.3m	43,292,254	6,912,125	50,204,378	44,513,742
PROMPT	37,064,830	5,917,842	42,982,672	38,110,611
SMARTS 0.9m	29,971,560	4,785,317	34,756,877	30,817,206
LCOGT	37,963,976	6,061,402	44,025,378	39,035,127
T80S	27,507,232	4,391,858	31,899,090	28,283,347
Other	16,650,867	2,658,509	19,309,376	17,120,670
LSST	165,067,255	33,949,664	199,016,919	191,721,079
GEMINI	165,067,255	33,949,664	199,016,919	191,721,079
SOAR	132,053,804	27,159,731	159,213,535	153,376,863

## FY2017 Census Charges

	FY 2017	FY 2016	
La Serena Based	1,262,445	1,057,246	per employee/yr
All Places All staff Census	856,267	731,567	per employee/yr

## FY2017 Per-use Charges

Mountain Facilities	FY 2017	FY 2016	
Water - Tololo	8,553	7,344	per cubic meter
Water - Delivered to Pachon	17,459	15,076	per cubic meter, includes transport
Tololo Meals	14,329	13,965	per meal
Tololo Lodging	32,349	26,367	per night
Pachon Meals	14,329	13,965	per meal
Pachon Lodging	48,550	42,568	per night, incl. 16,201 CLP for AURA loan
Janitorial Services	14,436	13,474	per hour
<b>La Serena Facilities</b>	<b>FY 2017</b>	<b>FY 2016</b>	
Garage - Labor	29,021	19,287	per hour
Maintenance Group - Labor	24,256	16,933	per hour
Janitorial Services	9,534	9,444	per hour
La Serena Hotel	42,245	38,572	per night
Water and Sewage La Serena	1,095	934	per cubic meter

# NOAO-S Facilities Operations

**Table 6: Estimated Costs per Program for FY2017**

Estimated FY2017 Costs per program	Share Charges Regular	Share Charges Projects	Census Charges Total	Per-use Charges Total	Total per program, CLP	@640CLP/USD USD
LSST	165,067,255	33,949,664	13,568,536	60,624,890	273,210,345	426,891
GEMINI	165,067,255	33,949,664	151,010,335	140,296,773	490,324,027	766,131
SOAR	132,053,804	27,159,731	12,712,269	40,612,293	212,538,097	332,091
CTIO	132,207,882	21,108,565	115,080,059	333,375,242	601,771,748	940,268
SMARTS 1.3m + 1.5m	43,292,254	6,912,125	1,712,533	26,136,826	78,053,737	121,959
SMARTS 0.9m	29,971,560	4,785,317	-	-	34,756,877	54,308
Schmidt	-	-	-	-	-	-
URAT	16,650,867	2,658,509	-	-	19,309,376	30,171
PROMPT	37,064,830	5,917,842	-	-	42,982,672	67,160
LCOGT	37,963,976	6,061,402	-	-	44,025,378	68,790
KASI	53,282,774	8,507,230	1,712,533	26,716,154	90,218,691	140,967
T80S	27,507,232	4,391,858	-	844,585	32,743,675	51,162
WHAM	16,650,867	2,658,509	-	-	19,309,376	30,171
SARA	16,650,867	2,658,509	-	-	19,309,376	30,171
Mearth	16,650,867	2,658,509	-	-	19,309,376	30,171
Other	-	-	-	198,416,643	198,416,643	310,026
AURA (O, CAS, HR)	-	-	40,255,519	-	40,255,519	62,899
Houses	-	-	-	28,386,707	28,386,707	44,354
<b>Total</b>	<b>890,082,290</b>	<b>163,377,435</b>	<b>336,051,783</b>	<b>855,410,113</b>	<b>2,244,921,621</b>	<b>3,507,690</b>